STUDY CONTROL SYSTEM FOR UNIVERSITIES DIPLOMADA#1100266 DOCUMENTATION OF THE SYSTEM ARCHITECTURE (Annex No. 4)

General Pattern of Architecture

As is well known, the design of a software architecture presupposes established and tested patterns based on development experiences. Thus, for the design of the architecture of the DiplomAdA Project, and in general, we will base ourselves on the following pattern:

1. Requirements
2. Key Components
3. Connection between components
4. Modeling

1. Requirements

To define our requirements, we start from the objective and scope of the project, which indicates: "Develop a decentralized platform for the control of university studies, using the Cardano Blockchain, to guarantee the security of the records, their transparency and traceability."

In this sense, we start with the Functional Requirements that imply:

1. It must be a decentralized platform
2. It must be oriented to Study Control for Universities
3. It must be associated with and operate on the Cardano Blockchain
4. It must guarantee security, transparency and traceability of records

Next we continue with the Non-Functional Requirements that arise from the functional requirements previously identified.

To develop software that constitutes a decentralized platform based on the Cardano Blockchain, it is important to consider two overlapping scenarios:

1.- The first scenario is the development of the backend and frontend on the web, which involves a battery of applications related to the authentication of applicants to study at a university, the download and validation of their documentation from previous studies, and other documentation. that proves your identity, and others that may be required depending on the particular case. Other applications have to do with the certification of the applicant as a formally registered student, and in parallel, a payment system, web applications for all the most used access devices, as well as the corresponding APIs. It is also necessary to propose the applications corresponding to the monitoring and control of students' studies and records, the participation of teachers and the administrative aspects of the training processes.

2.- The second scenario is in development for the Cardano Blockchain, which involves the generation of smart contracts, NFT, the use of Wallet, Token ADA, and everything that allows

operating, consulting and interacting with this platform. Blockchain, to comply with the objective of guaranteeing the security of records, their transparency and traceability.

1. Key Components

As indicated by the name of the project, “STUDY CONTROL SYSTEM FOR UNIVERSITIES”, the key components are associated with the teaching activity of a university, which involves the reception of new students, the training process and graduation; In this sense, five Key Components have been defined, namely:

1. Applicant Registration
2. Income Certification
3. Continuation of Training
4. Closing of Training
5. Graduation Certification

From the beginning, the applicant registration processes will involve the generation of smart contracts and NFT, associated with the validation and certification of the documentation delivered by the applicant, as well as for compliance with the training process, the registration of grades, the approval of the different levels (courses, semesters, years, etc.), and for the closing of the file with all its requirements and the graduation certification process.

2. Connection between components

This third step is closely related to the deliverables of Milestones 2, 3, 4 and 5, where deliverables are established on “(2) Configuring the API development environment, developing APIs, performing API unit tests, configuring the web development, developing UI and administration.” “(3) The design of smart contracts and NFTs, the definition of structure, coding of smart contracts and NFTs, and unit testing contracts and NFTs”, “(4) Integration of the web portal with API, integration of the web portal with smart contracts and NFTs, notification system integration with web portal and API” and “(5) The application must be thoroughly tested to ensure that it meets the requirements and expectations of the users. Tests should cover different usage scenarios and edge cases. Therefore, the application must be deployed on a testnet for p2. - The second scenario is in development for the Cardano Blockchain, which involves the generation of smart contracts, NFT, the use of Wallet, Token ~~ADA~~ , and everything that allows operating, consulting and interacting with this platform. Blockchain, to comply with the objective of guaranteeing the security of records, their transparency and traceability.

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It is important to highlight that the effective and efficient interrelation between the Key Components of the System takes on great importance, due to the need for immediacy, reliability and security of the data and information, to be consulted to generate reports by the administrative, academic area. , professor and university student.

This will allow providing an excellent service to all users, it will provide prestige to the university that uses it, great recognition and prestige to the Cardano Platform as a means and guarantee for the security, transparency and traceability of the records involved.

3. Modeling

Development Architecture

The study control system based on a web system will be structured by implementing the Client-Server software development methodology based on the HTTPS web protocol (Secure Hypertext Transfer Protocol). Jointly, the MVC (Model View Controller) development architecture will also be implemented to define the development in a structure that works together and meshes with the Client-Server model previously exposed.

The tools contemplated for development and that adapt to the aforementioned model and architecture are the following:

1. Development of graphical interfaces, User Interface (Front End) using HTML, CSS, JavaScript, these three tools are integrated into Bootstrap as a framework.

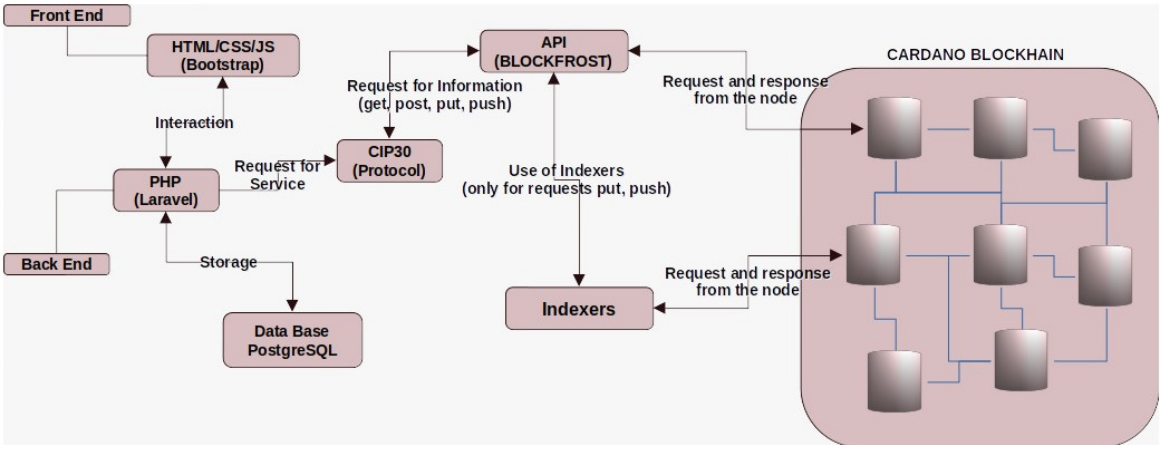
2. Development of business modeling integrating the PostgreSQL database engine as an administrator and database manager, as well as the use of SQL as a relational data query language for the Diplom~~A~~d~~A~~ system.

3. Development of the logical process through the implementation of an Apache server as a web service system, integrated with the PHP programming language in its version 8.3.2 (most recent), all using a framework called Laravel that integrates the architecture MVC implicit in its structure.

4. Consumption of RESTful API services (Application Programming Interface), based on the blockfrost platform for the verification of Blockchain addresses, registration and consultation of information in the nodes integrated into the CARDANO network.

5. Construction of smart contracts designed and programmed in PLUTAR under PLUTUS CORE for the creation of smart contracts that will build the NFTs necessary for system transactions (implementation of the CIP-30 protocol).

In the following image we describe the interaction process and the previously defined structure graphically for compression.



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