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1. **PART I**

| **1. Personal Background** |
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| The following table is provided for you to fill in the requested information. |

| Student's name | [Nibaldo Andres Quezada Garay](mailto:nib.quezada@duocuc.cl) |
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| Identification Number | **19.116.353-2** |
| Degree Program | **Ingeniería en Informática** |
| Campus | **San Bernardo** |

| Student's name | **Nicolás Gabriel Peña Muñoz** |
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| Identification Number | **18.795.757-5** |
| Degree Program | **Ingeniería en Informática** |
| Campus | **San Bernardo** |

| Student's name | [Cristian Mauricio Arroyo Bossardt](mailto:cri.arroyo@duocuc.cl) |
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| Identification Number | **15.893.730-1** |
| Degree Program | **Ingeniería en Informática** |
| Campus | **San Bernardo** |

| **2. APT Project Description** |
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| In the description, you should briefly state the name of your APT project and the competencies from the graduation profile that you will be applying. If your degree program defines performance areas, also mention which performance areas the project is linked to. |

| Project Name | TechApps - SCAV (Vehicle Access Control System) |
| --- | --- |
| Performance Areas | IT Project Management  Analysis and Evaluation of IT Solutions  Software Development |
| Competencies | 1. Manage the configuration of environments, application services, and databases in a business setting to enable operability or ensure the continuity of systems that support business processes according to industry standards. 2. Offer IT solution proposals by analyzing processes comprehensively according to the organization’s requirements. 3. Develop a software solution using techniques that systematize the development and maintenance process, ensuring the achievement of objectives. 4. Build data models to support the organization's requirements based on a defined and scalable design over time. 5. Program queries or routines to manipulate information from a database according to the organization’s requirements. 6. Implement comprehensive systemic solutions to automate and optimize business processes according to the organization's needs. 7. Resolve systemic vulnerabilities to ensure that the constructed software meets the security standards required by the industry. 8. Manage IT projects, offering alternatives for decision-making according to the organization’s requirements. |

| **3. APT Project Justification** |
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| Below are various fields that you need to complete with the requested information. This section aims to describe your project in detail and justify its relevance and appropriateness. |

| Relevance of the APT Project | Our client is the Vista Parque 1 and 2 condominium, located in San Bernardo at Almirante Riveros #630. The condominium comprises 570 apartments and 30 houses, totaling 600 residences. The condominium faces two major issues, described as follows:   1. Due to the high volume of vehicles on the premises and the manual operation by concierges, there are traffic jams both at the entrance to the condominium and on the street where it is situated. 2. Due to high crime rates, the administration needs a system that restricts vehicular access, ensuring entry is exclusive to residents and authorized personnel to prevent theft and “car-jackings,” which have recently affected the condominium.   At TechApps, our primary focus is on improving the quality of life and work for individuals. In response to the issues presented by the condominium, we have decided to propose a comprehensive and efficient solution to address their vehicular access management problem. As a company, we believe that a project of this magnitude allows us to apply all the knowledge acquired during our training at Duoc, from project management and product quality to software development and implementation. |
| --- | --- |
| APT Project Description | The objective of the project is to develop a system that allows improving the management and security of vehicular access in the condominium. The system must register, authorize and monitor the entry and exit of vehicles, ensuring efficient and safe control.  **High Level Requirements:**  **Use Administrators and Security Personnel:**   * **Resident Registration Management:**   + Registration and updating of residents' vehicle and personal information.   + Administration of access permissions for each resident's registered vehicles. * **Visitor Record Management:**   + Advance registration of visits by residents or administrative staff.   + Authorization or denial of access to visitors, based on policies defined by the venue.   + Notificación automática a los residentes sobre la llegada de una visita. * **Commercial Vehicle Authorization:**   + Registration of access requests for commercial vehicles (e.g. parcel deliveries, food services, transportation services).   + Review, approval or rejection of said requests by authorized personnel. * **Entry of Emergency Vehicles:**   + The concierge authorizes entry manually in the case of vehicles that correspond to Firefighters, ambulances, police. * **Access Monitoring and Reporting:**   + Real-time monitoring of vehicle entries and exits, through logs and reporting.   + Generation of daily, weekly or monthly access reports, which include data on all entries, with filters by type of vehicle, resident, visit, etc. * **Integration with External API for Vehicle Validation:**   + Automatic validation of vehicle data (make, model, owner) through an external API, ensuring that only registered vehicles can access it. * **Automatic application of fines:**   + The system must be able to identify when a visitor remains for more than the authorized hours (Defined by the condominium), and apply the corresponding fine.   **System Architecture**   * **Patent reader: Python** * **Database: SQL Server** * **Rest API: Spring Boot** * **Mobile App: Flutter** * **External Api: Auth ApiKey** * This system will allow effective management of vehicular access, improving security and control in residential areas, and guaranteeing a fluid experience for both residents, visitors and suppliers. |
| Relevance of the project with the graduation profile | The project, due to its magnitude, addresses all the competencies mentioned above, from project management to software development, as defined above |
| Relationship with professional interests | Within the team we have diverse interests, some focused on project management, and others on software development purely. For the reason mentioned above, we believe that the project adapts to our team and its professional interests, since it covers all areas. |
| Feasibility of development of the APT Project | As a team we believe that the project is viable to implement, since the CAPSTONE subject consists of 90 hours, plus what we will develop during the week. Regarding materials, one of the problems we could have is the implementation of a camera that reads the patent, which will simulate the flow of entry to the condominium. As for external factors that could facilitate, we believe that integration with external APIs to obtain information about vehicles is of great help and importance. For external factors that make it difficult, we believe that the possibility of modifications within external integrations could hinder the development of the project, delaying activities. |

1. **PART II**

| **4. Goals** |
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| In this section you must define general and specific objectives of the APT Project. It is important to clarify that the objectives must be stated clearly, concisely and without giving further explanations, that is, they must be understood on their own. It is suggested to write them using an infinitive verb, as this requires specifying specific actions. |

| General objective | Develop a comprehensive vehicle access control system that improves security, streamlines the entry and exit of vehicles, and optimizes access management in the Vista Parque 1 and 2 condominium, ensuring exclusive control of residents and authorized personnel. |
| --- | --- |
| Specific objectives | Specific objectives:   * Implement an automatic vehicle license plate reader using Python and a camera to validate the entry of registered vehicles. * Develop a mobile application in Flutter so that residents can register visits in advance and receive notifications in real time. * Create a REST API in Spring Boot that manages vehicle access permissions and integrates with an external API to validate vehicle information. * Design a database in SQL Server that stores and manages records of residents, visitors, and commercial providers. * Deploy a reporting system that allows real-time monitoring of vehicular access and the generation of periodic reports with the data collected. * Ensure that the system complies with computer security standards, protecting user data and guaranteeing the reliability of the information. |

| **5. Methodology** |
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| In the next section you must describe the methodology, specific to your discipline, that you will use to solve the APT project described above, including the stages and work methods. |

| Description of the Methodology |
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| Description of the Methodology: To carry out the TechApps - SCAV project, an agile methodology based on Scrum will be used, which allows us to adapt to the client's requirements and progressively improve the system. The stages and work methods are described below:   1. **Survey of Requirements:**:    * Meeting with the client to define the specific needs of the system, such as access types, vehicle information and security restrictions.    * Analysis and prioritization of requirements to define the main and secondary functionalities. 2. **Sprint Planning**:    * The project tasks will be divided into sprints, development cycles of 2 to 3 weeks.    * Assignment of specific tasks to each team member according to their competencies. 3. **System Architecture Design**:    * The structure of the database in SQL Server, the REST API flow, and the components of the mobile app will be defined.    * A prototype of the system and the user interface (UI) will be designed for the mobile application and the system dashboard. 4. **Development**:    * **Patent reader:** Implementation of the patent recognition system using Python and OpenCV.    * **REST API:** Development of the API in Spring Boot, which will be integrated with the database and the external API for vehicle validation.    * **Mobile Application:** Development of the mobile app in Flutter, connected to the API so that residents can register visits and receive notifications. 5. **Testing and Validation**:    * nit, integration and security tests will be carried out on each module of the system.    * Simulations of vehicle entry and permit validation scenarios will be carried out to verify the correct functioning of the system. 6. **Deployment and Maintenance:**    * The system will be deployed in the production environment, and technical support and updates will be provided during the period of use.    * The team will carry out constant monitoring to detect possible failures and will improve the system according to the feedback received.  Team Roles and Responsibilities:  * **Product Owner**: Responsible for planning and controlling the progress of the project. Decision making and team coordination. * **Backend Developer**: In charge of the REST API in Spring Boot and the database in SQL Server. * **Mobile Develope**r: Responsible for the mobile application in Flutter and the user interface. * **Quality analyst**: Performs tests and validates the correct functioning of the system in each sprint. |

| **6. Evidence** |
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| Next, describe what evidence will be evaluated in the progress report and final report of your APT project. This evidence must be agreed upon with your teacher. Evidence will be understood as the products that are developed during the project and whose purpose is to make visible or document how the work has been implemented. |

| **Type of evidence** | **Name of evidence** | **Description** | **Justification** |
| --- | --- | --- | --- |
| Advance | Patent Reader Prototype | Presentation of a functional prototype of the patent recognition system implemented in Python, demonstrating vehicle detection. | It allows you to validate the feasibility of the access control system from an early stage, ensuring that the patent reader works correctly in the project. |
| Advance | Database Design | ER Model of the database in SQL Server, detailing the structure that will support the records of residents, visits, vehicles and access permissions. | It ensures that data will be managed in an efficient and scalable manner, providing the necessary basis for the implementation of vehicle management functionalities. |
| Final | REST API in Spring Boot | API implemented to manage vehicle access, integrated with the database and the external vehicle validation API. | The API centralizes the business logic of the system, connecting all functionalities and guaranteeing that only authorized vehicles can access the condominium. |
| Final | Mobile Application in Flutter | Final version of the mobile application where residents can register visits, receive notifications and manage vehicle access permissions. | It is the key tool for residents' interaction with the system, ensuring a seamless experience and complete control over their visitors' access. |
| Final | Security Report | Document that details the security tests carried out and how vulnerabilities have been addressed to comply with security standards. | Justifies the implementation of good computer security practices, ensuring the integrity and protection of sensitive system data. |

| **7. Work Plan** |
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| In the following table, define the planning of your APT Project according to what is required. |

| **Competence** | **Name of Activities / Tasks** | **Description Activities / Tasks** | **Resources** | **Duration of the activity** | **Responsible Person** | **Observations** |
| --- | --- | --- | --- | --- | --- | --- |
| Project management | Taking requirements | Identification of the problem and possible solutions | **N/A** | 4 weeks | Project Manager (Cristian Arroyo) | The project, its functionalities and requirements are detailed from general to specific. |
| Software Development | Implementation of the Patent Reader | Develop the vehicle license plate recognition system using Python and OpenCV. | Python, OpenCV, USB Camera | 2 weeks | Backend Developer (Nicolas Pena) | Recognition accuracy may be affected by camera quality and lighting conditions. |
| Analysis and Evaluation of IT Solutions | Database Design | Create the ER model and database structure in SQL Server. | SQL Server, ER Modeling Tool | 1 week | Backend Developer (Cristian Arroyo) | The design should consider future expansions, such as new types of access or integration with other systems. |
| Software Development | REST API development in Spring Boot | Implement the API to manage vehicle registrations and authorizations, integrating the database and the external API. | Spring Boot, SQL Server, external API | 3 weeks | Backend Developer  (Nibaldo Quezada) | Integration with external API depends on the availability of the provider and possible changes in its policies. |
| Software Development | Mobile App Development | Implement the mobile app in Flutter that allows residents to register visits and receive notifications. | Flutter, REST API, UI/UX design tools | 3 weeks | Frontend Developer  (Cristian Arroyo, Nibaldo Quezada) | Compatibility must be ensured on both Android and iOS devices for better reach. |
| Software Quality | System Testing and Validation | Perform functional, security and integration tests on each module, verifying that they meet the requirements. | Testing Tool, Test Scripts | 2 weeks | Tester  (Nicolas Pena) | Stress testing is key to ensuring the system operates under high vehicle load and simultaneous access. |
| Implementation | Start-up and Closure of the Vehicular Access Control | Project Implementation in Production. User Training. Trial and Adjustment Period. Final Documentation. Delivery and Acceptance of the Project. Closing Meeting and Lessons Learned | Production environment (servers, network, etc.)  Training material  System documentation  Meeting room for training and closing | 3 weeks | Product Owner(Cristian Arroyo) | The trial period may reveal unforeseen necessary adjustments, so it is important to maintain flexibility in the schedule. Complete and clear documentation |

| **8. Gantt chart** |
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| Find a Gantt Chart format that suits you and organize in it the activities planned in the previous point considering the period assigned for the development of your APT Project. You must maintain the temporality of the academic period in the development of the three phases contemplated by the Title Portfolio Subject. |

| **Actividad** | **Phase 1** | | | | **Phase 2** | | | | | | | | | | | | **Phase 3** | | | |
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| **S 1** | **S 2** | **S 3** | **S 4** | **S 5** | **S 6** | **S 7** | **S 8** | **S 9** | **S 10** | **S 11** | **S 12** | **S 13** | **S 14** | **S 15** | **S 16** | | **S 17** | **S 18** |
| Project management |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |
| Software Development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |
| Analysis and Evaluation of IT Solutions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |
| Software Development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |
| Software Development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |
| Software Quality |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |
| Software Quality |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |