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| **­** | **MINISTRY OF EDUCATION AND TRAINING** |

**FPT UNIVERSITY**

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| **Report 3** | |
| **Parking Guidance System Solution** | |
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| **Ext. Supervisor** | N/A |
| **Capstone Project Code** | PGSS |

- Ho Chi Minh City, Jan, 2017

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# Definitions, Acronyms and Abbreviations

|  |  |
| --- | --- |
| **Name** | **Definition** |
| PGS | Parking Guidance System |
| Parking area | An area set aside for parking vehicles, aircraft, etc. |
| Parking lot | A place inside parking area that provide space for one vehicle |
| IoT | Internet of Things |
| CCU | Central Control Unit |

Table : Definitions, Acronyms and Abbreviations

# C. Software – Hardware Requirement Specification

## User Requirement Specification

## System Requirement Specification

### External Interface Requirement

#### User Interface

#### Hardware Interface

##### Block Diagram – Overview

##### Block Diagram Details

##### Arduino Uno

##### Triple – Axis Digital Compass HMC5883L

##### RF module nRF24L01+

#### Software Interface

#### Communication Protocol

### System Overview Use Case

E:\Downloads\CapstoneUseCases.png

**Figure 1: Overview use case diagram**

### List of Use Case

#### Manager Use Case

E:\Downloads\ManagerUseCase.png

**Figure 2: Manager Use case diagram**

**Use case specifications**

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case-1 specification** | | | |
| **Use-case no.** | PGSS01 | **Use-case version** | 1.0 |
| **Use-case name** | Configuration System | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * Manager   **Summary:**   * This use case allow user to change the configuration of their system.   **Goal:**   * Manager can change the information of car park, which show to the end user.   **Triggers:**   * User click on “Setting” button.   **Preconditions:**   * Mobile application is already launch. * Manager has been logged in   **Post Conditions:**   * **On Success:** New configuration is apply and save to server * **On Failure:** Show error message   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User click on “Setting” button | Application navigate to “Setting” menu | | 2 | User select option in the Menu  Change by click toggle or change value in the text box  Select “Submit” button | Change the value and save to server |   **Alternative Scenario:**   * N/A   **Exceptions:**   * N/A   **Business Rules:**   * N/A | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case-2 specification** | | | |
| **Use-case no.** | PGSS02 | **Use-case version** | 1.0 |
| **Use-case name** | Manage Car Park | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * Manager   **Summary:**   * This use case allow user to change their car park info.   **Goal:**   * Manager can change the information of car park, which show to the end user.   **Triggers:**   * User select their car park. * Click “Edit”   **Preconditions:**   * Mobile application is already launch. * Manager has been logged in   **Post Conditions:**   * **On Success:** New information of edited car park saved to server. * **On Failure:** Show error message   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User select car park.  User click on “Edit” button | Application navigate to “Setting” menu | | 2 | User select option in the Menu  Change by click toggle or change value in the text box  Select “Submit” button | Change the value and save to server |   **Alternative Scenario:**   * N/A   **Exceptions:**   * N/A   **Business Rules:**   * N/A | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case-3 specification** | | | |
| **Use-case no.** | PGSS03 | **Use-case version** | 1.0 |
| **Use-case name** | Manage Area | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * Manager   **Summary:**   * This use case allow user to change the status of each area.   **Goal:**   * The status of selected area updated and change in mobile app.   **Triggers:**   * User select their car park. * User select area in selected car park.   **Preconditions:**   * Mobile application is already launch. * Manager has been logged in   **Post Conditions:**   * **On Success:** New configuration is apply and save to server * **On Failure:** Show error message   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User select car park | Application change to car park detail page | | 2 | User select area in the selected car park | Application change to area detail page | | 3 | User select status in the drop down list.  Click “Update” button | The status of the area will change on server and update in mobile application |   **Alternative Scenario:**   * N/A   **Exceptions:**   * N/A   **Business Rules:**   * N/A | | | |

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| --- | --- | --- | --- |
| **Use Case-4 specification** | | | |
| **Use-case no.** | PGSS04 | **Use-case version** | 1.0 |
| **Use-case name** | Manage Parking Slot | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * Manager   **Summary:**   * This use case allow user to manage the parking slot.   **Goal:**   * The status of selected area updated and change in mobile app.   **Triggers:**   * User select their car park. * User select area in selected car park. * Then select parking slot   **Preconditions:**   * Mobile application is already launch. * Manager has been logged in   **Post Conditions:**   * **On Success:** New configuration is apply and save to server * **On Failure:** Show error message   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User select car park | Application change to car park detail page | | 2 | User select area in the selected car park | Application change to area detail page | | 3 | User select parking slot to edit  After change information, select “Update” button | The information of parking slot is change on server and update in mobile application. |   **Alternative Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User select car park | Application change to car park detail page | | 2 | User select area in the selected car park | Application change to area detail page | | 3 | User click menu beside list parking spot to delete. | The parking spot will be set to deleted in server and update in mobile app. |   **Exceptions:**   * N/A   **Business Rules:**   * N/A | | | |

#### Administrator Use Case

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case-5 specification** | | | |
| **Use-case no.** | PGSS05 | **Use-case version** | 1.0 |
| **Use-case name** | Add Car Park | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * Administrator   **Summary:**   * This use case allow user to add new car park to the system   **Goal:**   * New car park is added and save to server.   **Triggers:**   * User click on “Add” button.   **Preconditions:**   * Mobile application is already launch. * Administrator has been logged in   **Post Conditions:**   * **On Success:** New car park is save to server * **On Failure:** Show error message   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User click on “Add” or “+” button | Application navigate to add car park menu | | 2 | User fill in the textbox  Select “Submit” button | New car park with filled in info is added to server |   **Alternative Scenario:**   * N/A   **Exceptions:**   * Name of the car park is unique * Address of the car park is unique (don’t has same latitude and longitude)   **Business Rules:**   * N/A | | | |

#### End User Use Case

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case-6 specification** | | | |
| **Use-case no.** | PGSS06 | **Use-case version** | 1.0 |
| **Use-case name** | Check number of empty slot | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * End User   **Summary:**   * This use case allow user view number of empty slot in each car park   **Goal:**   * Show number of empty slot   **Triggers:**   * User login to the mobile application   **Preconditions:**   * Mobile application is already launch. * End user had logged in.   **Post Conditions:**   * **On Success:** User know the number of empty slot in car park * **On Failure:** Don’t show number of empty slot in car park   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User log in to the application | Show the map with the marker as car park and the number, which indicate the number of empty slot |   **Alternative Scenario:**   * N/A   **Exceptions:**   * The number will have tick/ exclamation points to show that the number is recently update or not.   **Business Rules:**   * Tick: recently update * Exclamation points: number is not update in more than 1 hour. | | | |

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| --- | --- | --- | --- |
| **Use Case-7 specification** | | | |
| **Use-case no.** | PGSS07 | **Use-case version** | 1.0 |
| **Use-case name** | Book parking slot | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * End User   **Summary:**   * This use case allow user to book parking slot before go to the car park   **Goal:**   * Book the parking slot before go to car park   **Triggers:**   * User has selected the car park to book   **Preconditions:**   * Mobile application is already launch. * End user had logged in.   **Post Conditions:**   * **On Success:** User book the parking slot success * **On Failure:** Show error message when book   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User log in to the application | Show the map with the marker as car park and the number, which indicate the number of empty slot | | 2 | User select the car park they want to book | Show the “Book” button if has empty slot | | 3 | Fill information for transaction  Click “Submit” | Make a transaction and set one parking slot to booked  Show the address of booked parking slot to the user |   **Alternative Scenario:**   * N/A   **Exceptions:**   * Transaction fail by 3rd party.   **Business Rules:**   * N/A | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case-8 specification** | | | |
| **Use-case no.** | PGSS08 | **Use-case version** | 1.0 |
| **Use-case name** | Search car park | | |
| **Author** | Bui Phu Hiep | | |
| **Date** | 13/02/17 | **Priority** | High |
| **Actor:**   * End User   **Summary:**   * This use case allow user to search a car park by name or address   **Goal:**   * Show the searched car park   **Triggers:**   * User login to the mobile application   **Preconditions:**   * Mobile application is already launch. * End user had logged in.   **Post Conditions:**   * **On Success:** Show the searched car park on the map if success * **On Failure:** Show message error   **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User log in to the application | Show the map with the marker as car park and the number, which indicate the number of empty slot | | 2 | Enter the name or address in the search bar  Press “Enter” or click “Search” | Find the car park base on name or address then focus on the map. |   **Alternative Scenario:**   |  |  |  | | --- | --- | --- | | **No.** | **Actor Action** | **System Response** | | 1 | User log in to the application | Show the map with the marker as car park and the number, which indicate the number of empty slot | | 2 | Enter the name or address in the search bar  Press “Enter” or click “Search” | Show message don’t have car park if the name or address is incorrect |   **Exceptions:**   * N/A   **Business Rules:**   * N/A | | | |

## Software System Attribute

### Usability

* User controls all system components via only mobile application.
* The system can install easily.
* User can learn how to use the system fast.

### Reliability

### Availability

* The mechanical component require electrical system to work well.
* Hardware components are easy to find in the market.

### Security

* Mobile application require authentication and authorization implement well because manager and end user use the same application.

### Maintainability

* Use plug and play component so we can easily replace it.

### Portability

* Easy to construct.

### Performance

* Detection car is fast, less then 50ms.
* The speed of server can scale base on the budget easily.

## Conceptual Diagram

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**Figure 3: Conceptual Diagram**

**Data Dictionary**

|  |  |
| --- | --- |
| **Entity Data dictionary: describe content of all entities** | |
| **Entity Name** | **Description** |
| CarPark | Descript all car park information in the system |
| Area | Describe all area detail in car park |
| ParkingLot | Describe parking lot information in the area |
| Item | Describe hardware item in each parking lot |
| BookingHistory | Describe the booking history of the user |
| Transaction | Save the transaction of each booking |