# Software Design Description

## Design Overview

* This document describes the technical and user interface design of MIC system. It includes the architectural design, the detailed design of common functions and business functions and the design of database model.
* The architectural design describes the overall architecture of the system and the architecture of each main component and subsystem.
* The detailed design describes static and dynamic structure for each component and functions. It includes class diagrams, class explanations and sequence diagrams for each use cases.
* The database design describes the relationships between entities and details of each entity.
* Document overview:
  + Section 2: gives an overall description of the system architecture design.
  + Section 3: gives component diagrams that describe the connection and integration of the system.
  + Section 4: gives the detail design description, which includes class diagram, class explanation, and sequence diagram to details the application functions.
  + Section 5: describe a fully attributed Entity Relationship Diagram.

## System Architecture Design

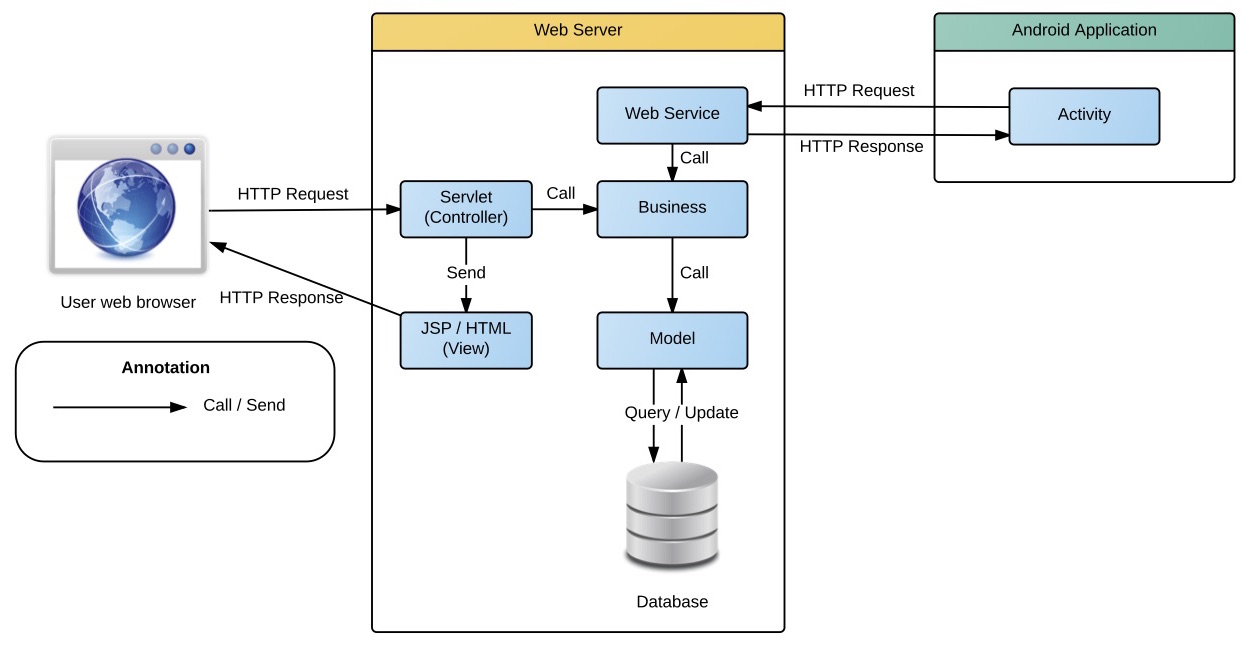


Figure System architecture design

This diagram is referenced and modified from an original concept from: Chapter 6 Architecture Design, SOFTWARE ENGINEERING 9th Edition, by Ian Sommerville.

### Web Application architecture description

In Web Application, the system is developed under J2EE MVC architecture style. We choose this architecture for Web application because of following advantages:

* Web app contains a Web service (public API for mobile app), with MVC architecture, we can separate business code with Controller and View, so we can use the business code in web service without repeat the code.
* Current system only supports motor insurance card, with MVC architecture, we can organize the code better for maintainability, extensibility, reusability so we can expand the scope to other kind of insurance services such as Heath insurance or Asset insurance…
* In scope of 4-member team, MVC architecture make it easier to split the big project into small modules and make it easier to assign each module for members in our team.

This project follows MVC architecture with following components:

* **Servlet (Controller)** is the parts of the application that acts like event handler to handles user interaction. Typically, controller read data from a request and calls appropriate Business’s method then selects view to return to user.
* **JSP/HTML (View)** is the parts of the application that handles the display of the data. The selection of View is under control of Controller.
* **Business** is the parts of the application that do business processing to solve domain problems.
* **Model** is the parts of the application that acts like a data transfer object between the system and database.
* **Web Service** is the parts of the application that acts like event handler for web and mobile communication via REST method.

### Mobile Application architecture description

The application is developed as an Android native application. In general, the application architecture conforms to Android architecture.



**Reference:** [Android Developer Guide - Application Fundamentals](http://developer.android.com/guide/components/fundamentals.html)

http://developer.android.com/guide/components/fundamentals.html

This project follows Android application architecture with following component:

* **Activity** is the basic core of an android application that handles user input,create thread to run asynchronous tasks, send request and receive data from server via web services ...

## Component Diagram

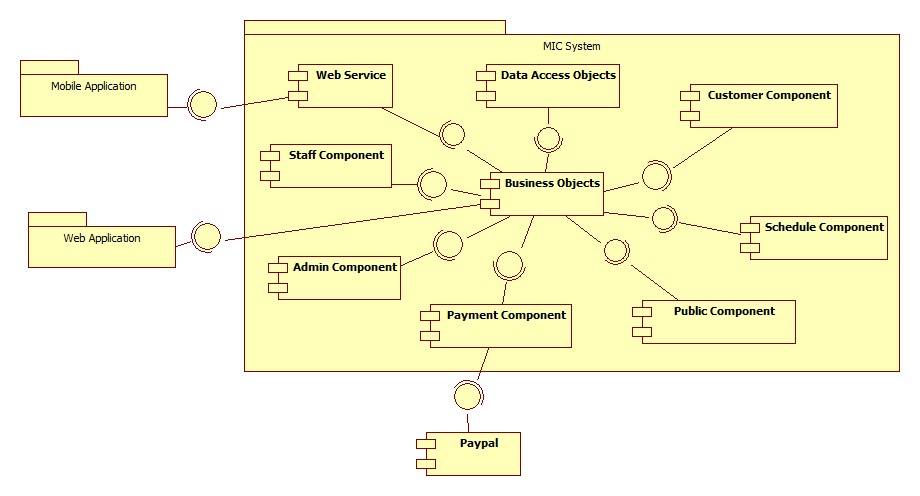


Figure Component Diagram

|  |  |
| --- | --- |
| Component Dictionary: Describes components | |
| Web Application | Web application package: View, Controller |
| Mobile Application | Mobile application package |
| PayPal | Handle payment process with PayPal API |
| Payment Component | Component to handle payment process |
| Web Service | operations o handle interaction between the system and database.Provide API for mobile applications to interact with the system. |
| Staff Component | Component to handle staff activities in the system |
| Customer Component | Component to handle customer activities in the system |
| Public Component | Component to handle guest activities in the system |
| Admin Component | Component to handle admin activities in the system |
| Schedule Component | Component to handle scheduler in the system |
| Business Objects | Common objects to handle domain business operations for each components |
| Data Access Objects | Component to handle interaction between the system and database |

Table Component Dictionary

## Detailed Description

### Class Diagram

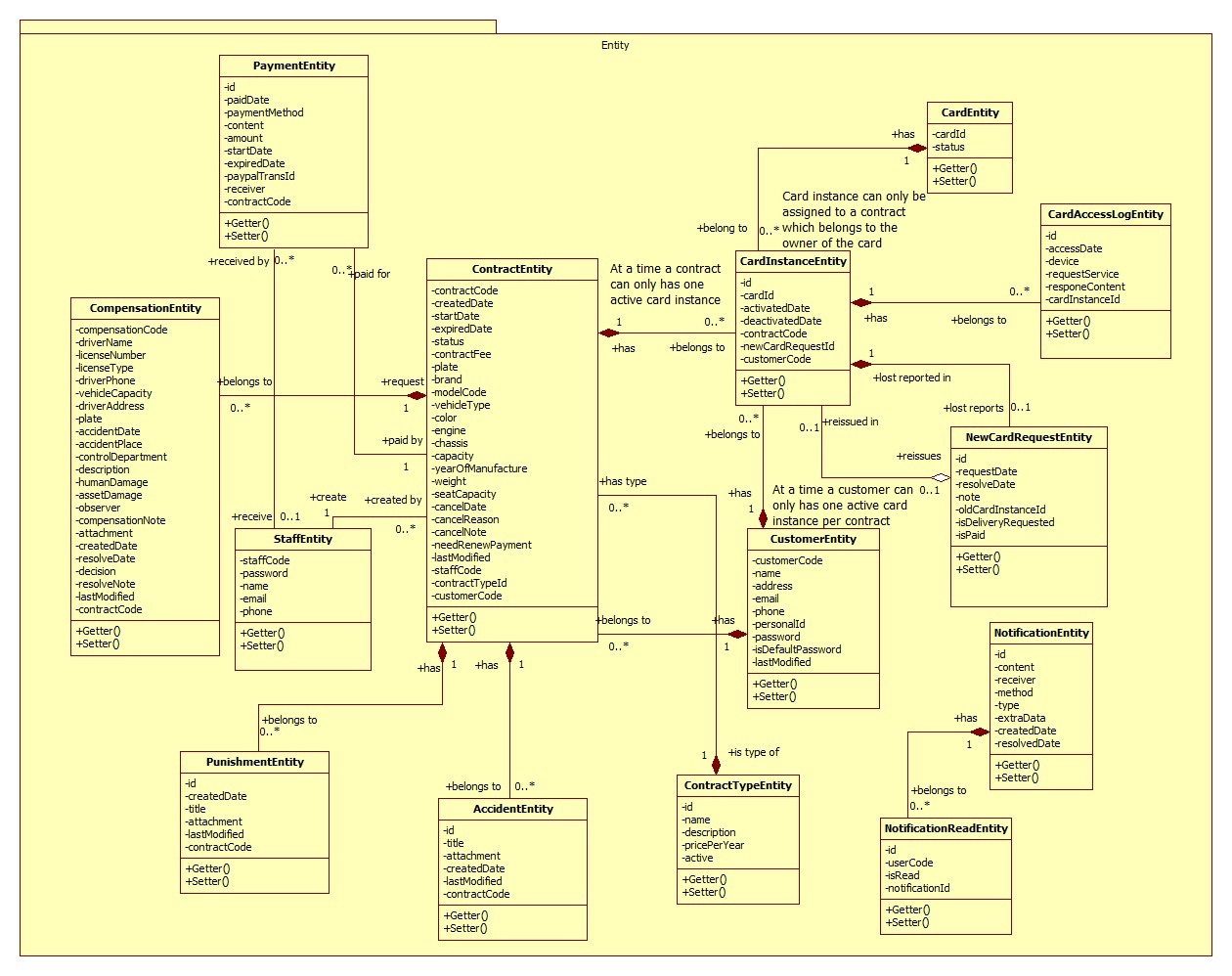


Figure Class Diagram

|  |  |  |
| --- | --- | --- |
| Class dictionary: describe Class | | |
| Class Name | **Mapping column with Conceptual diagram** | **Description** |
| PaymentEntity | Payment | Contain the payment information. |
| CardEntity | Card | Contain the card information. |
| CardInstanceEntity | CardInstance | Contain the card instance information |
| CustomerEntity | Customer | Contain the customer information. |
| ContractEntity | Contract | Contain the contract information. |
| StaffEntity | Staff | Contain the staff information. |
| CompensationEntity | Compensation | Contain the compensation information. |
| PunishmentEntity | Punishment | Contain the punishment information. |
| AccidentEntity | Accident | Contain the accident information. |
| ContractTypeEntity | ContractType | Contain the contract type information. |
| NewCardRequestEntity | NewCardRequest | Contain the new card request information. |
| CardAccessLogEntity | N/A | Not exist in conceptual diagram. But needed in class diagram to contain the card access log information. |
| NotificationEntity | N/A | Not exist in conceptual diagram. But needed in class diagram to contain the notification information. |
| NotificationReadEntity | N/A | Not exist in conceptual diagram. But needed in class diagram to know what notifications is read. |

Table Class dictionary

### Class Diagram Explanation

#### PaymentEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| Id | int | Private | Unique identifier of an payment |
| paidDate | Timestamp | Private | The day process the payment |
| paymentMethod | String | Private | The payment method |
| content | String | Private | The content of the payment |
| amount | Double | Private | Total amount of the payment |
| receiver | String | Private | The payment receiver |
| paypalTransId | String | Private | The PayPal transaction ID |
| contractCode | String | Private | The contract code. |

Table PaymentEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table PaymentEntity Method

#### CardEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| CardId | String | Private | Unique identifier of a card |
| Status | Integer | Private | Status of the card |

Table CardEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table CardEntity Method

#### CardInstanceEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| Id | Integer | Private | Unique identifier of a card instance |
| cardId | String | Private | Card id of the instance |
| activatedDate | Timestamp | Private | The date the card was activated. |
| deactivatedDate | Timestamp | Private | The date the card was deactivated. |
| contractCode | String | Private | The contract code |
| newCardRequestId | String | Private | The new card request ID. |

Table CardInstanceEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table CardInstanceEntity Method

#### CustomerEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| customerCode | String | Private | Unique identifier of an customer |
| name | String | Private | Customer’s name. |
| address | String | Private | Customer’s address. |
| email | String | Private | Customer’s email. |
| phone | String | Private | Customer’s phone number. |
| personalId | String | Private | The customer’s personal ID. |
| password | String | Private | Customer’s password. |
| customerCode | String | Private | The customer’s code. |

Table CustomerEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table CustomerEntity Method

#### ContractEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| contractCode | String | Private | Unique identifier of a contract |
| startDate | Timestamp | Private | The start date of the contract. |
| expiredDate | Timestamp | Private | The expired date of the contract. |
| status | String | Private | The status of the contract. |
| contactFee | Double | Private | The contract fee. |
| plate | String | Private | The plate number of the motor. |
| brand | String | Private | The brand of the motor. |
| modelCode | String | Private | The model code of the motor. |
| vehicleType | String | Private | The vehicle type. |
| color | String | Private | The motor’s color. |
| engine | String | Private | The motor’s engine. |
| chassis | String | Private | The motor’s chassis. |
| capacity | String | Private | The motor’s capacity. |
| yearOfManufacture | int | Private | The year of manufacture. |
| weight | int | Private | The motor’s weight. |
| seatCapacity | int | Private | The seat capacity. |
| cancelDate | Timestamp | Private | The cancel date of the contract. |
| cancelReason | String | Private | The cancel reason. |
| cancelNote | String | Private | The cancel note. |
| contractTypeId | int | Private | The contract type ID. |
| customerCode | String | Private | The customer code. |

Table ContractEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table Contract Method

#### StaffEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| staffCode | String | Private | Unique identifier of a staff |
| password | String | Private | The staff’s password |
| name | String | Private | The staff’s name. |
| email | String | Private | The staff’s email. |
| phone | String | Private | The staff’s phone number. |

Table StaffEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table StaffEntity Method

#### CompensationEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| compensationCode | String | Private | Unique identifier of a compensation |
| driverName | String | Private | The driver name. |
| licenseNumber | String | Private | The license number of the motor. |
| licenseType | String | Private | The license type of the motor. |
| driverPhone | String | Private | The driver’s phone number. |
| vehicleCapacity | String | Private | The vehicle capacity. |
| driverAddress | String | Private | The driver’s address. |
| plate | String | Private | The plate number. |
| accidentDate | Timestamp | Private | The accident date. |
| accidentPlace | String | Private | The accident place. |
| controlDepartment | String | Private | The police control department. |
| description | String | Private | The compensation’s description. |
| humanDamage | String | Private | The human damages. |
| assetDamage | String | Private | The asset damages. |
| observer | String | Private | The observer. |
| compensationNote | String | Private | The compensation note. |
| attachment | String | Private | The attachment. |
| createdDate | Timestamp | Private | The created date of the compensation. |
| resolveDate | Timestamp | Private | The resolve date. |
| decision | String | Private | The decision. |
| resolveNote | String | Private | The resolve note. |
| contractCode | String | private | The contract code. |

Table CompensationEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table CompensationEntity Method

#### PunishmentEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | Unique identifier of a punishment |
| createdDate | Timestamp | Private | The created date. |
| title | String | Private | The title of the punishment. |
| attachment | String | Private | The attachment. |
| contractCode | String | Private | The contract code. |

Table PunishmentEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table PunishmentEntity Method

#### AccidentEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | Unique identifier of an accident |
| title | String | Private | The title of the accident. |
| attachment | String | Private | The attachment. |
| createdDate | Timestamp | Private | The created date. |
| contractCode | String | Private | The contract code. |

Table AccidentEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table AccidentEntity Method

#### ContractTypeEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | unique identifier of a contract type |
| name | String | Private | The contract’s name. |
| description | String | Private | The description. |
| pricePerYear | Double | Private | The price per year of the contract. |

Table ContractTypeEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table ContractTypeEntity Method

#### NewCardRequestEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | Unique identifier of a new card request |
| requestDate | Timestamp | Private | The request date. |
| resolveDate | Timestamp | Private | The resolve date. |
| note | String | Private | The new card request note. |
| oldCardId | String | Private | The ID of the old card. |
| customerCode | String | Private | The customer code. |

Table NewCardRequestEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table NewCardRequestEntity Method

#### CardAccessLogEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | Unique identifier of an card access log |
| accessDate | Timestamp | Private | The access date. |
| device | String | Private | The device name. |
| requestService | String | Private | The request service. |
| responseContent | String | Private | The response content. |

Table CardAccessLogEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table CardAccessLogEntity Method

#### NotificationEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | Unique identifier of the notification. |
| content | String | Private | Content of the notification. |
| receiver | String | Private | A regex pattern that match with staffCode or customerCode. |
| method | int | Private | Notification method such as email or web notification. |
| type | int | Private | Type of the action were notified. |
| extraData | String | Private | The extra data such as contractCode, compensationCode,etc. |
| createdDate | Timestamp | Private | The created date. |
| resolvedDate | Timestamp | Private | The resolved date. |

Table NotificationEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table NotificationEntity Method

#### NotificationReadEntity

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| id | int | Private | Unique identifier of the notification read. |
| userCode | String | Private | Customer code or staff code. |
| isRead | int | Private | Check if the notification is read. |
| notificationId | int | Private | Notification’s Id. |

Table NotificationReadEntity Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return Type | Visibility | Description |
| Getter | Attribute type | Public | Get attribute value. |
| Setter | Void | Public | Set value of attribute. |

Table NotificationReadEntity Method

### Interactive Diagram

#### Web Application

##### Staff

###### Create new contract

Summary: this diagram show process of staff creates new contract

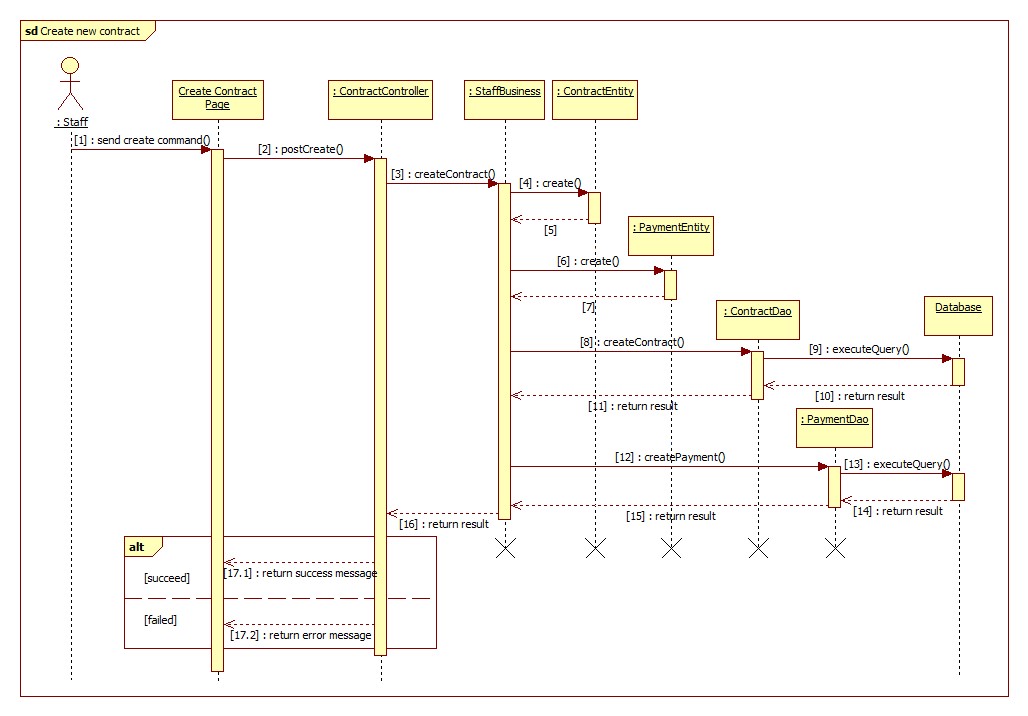


Figure Sequence diagram - <Staff> Create new contract

###### Renew contract

Summary: this diagram show process of staff renews contract

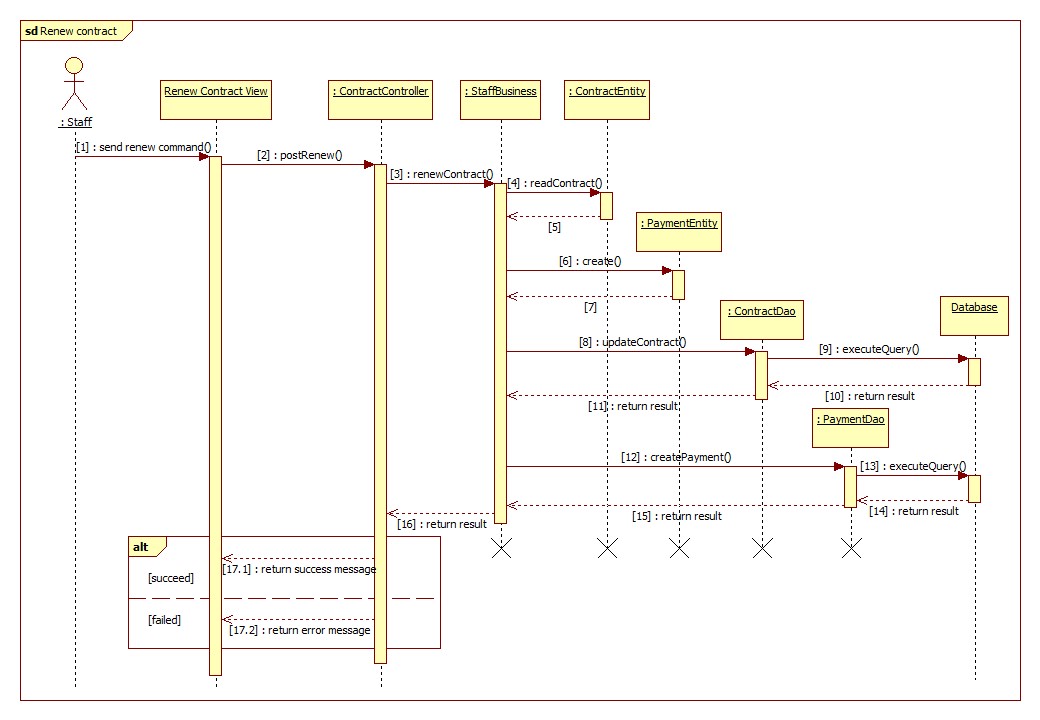


Figure Sequence diagram - <Staff> Renew contract

###### Cancel contract

Summary: this diagram show process of staff cancels contract

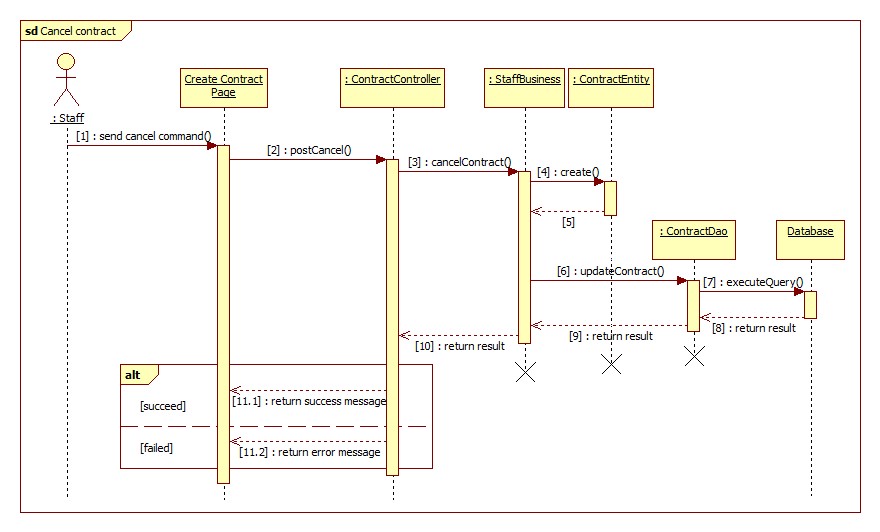


Figure Sequence diagram - <Staff> Cancel contract

##### Customer

###### Cancel contract

Summary: this diagram show process of customer cancels contract

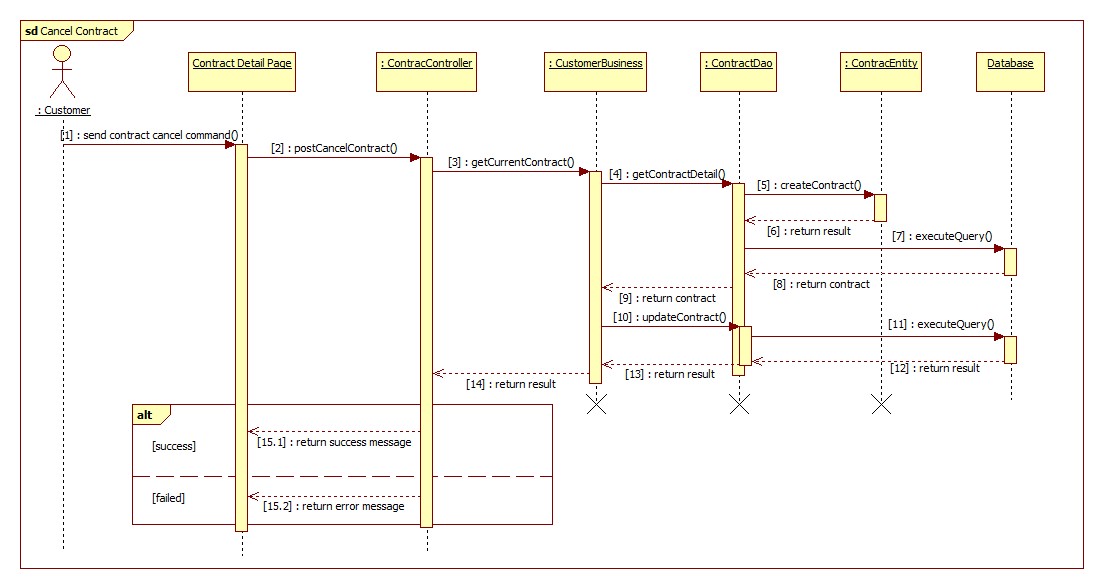


Figure Sequence diagram - <Customer> Cancel contract

###### Renew contract

Summary: this diagram show process of customer renews contract

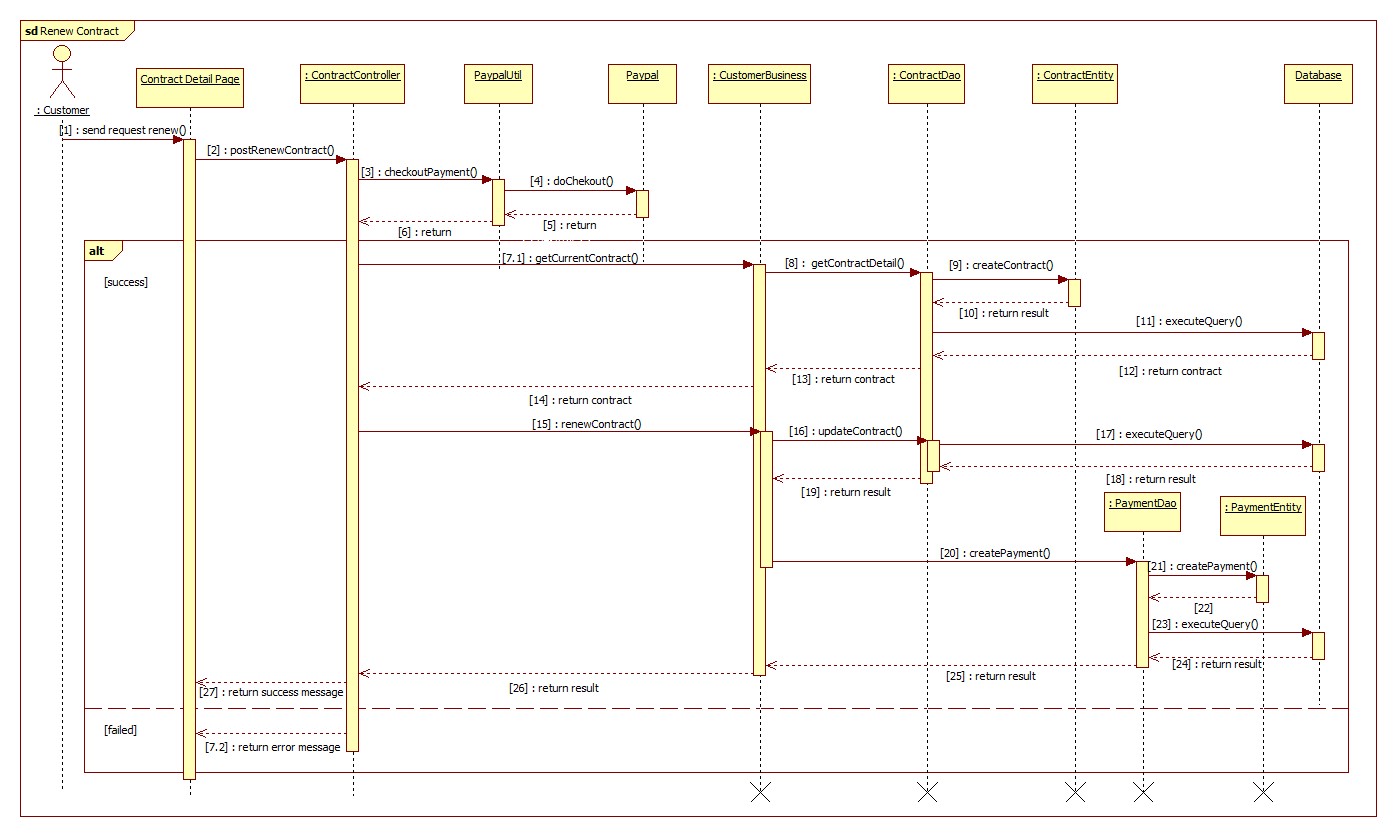


Figure Sequence diagram - <Customer> Renew contract

##### Guest

###### Register new contract

Summary: this diagram show process of guest registers new contract

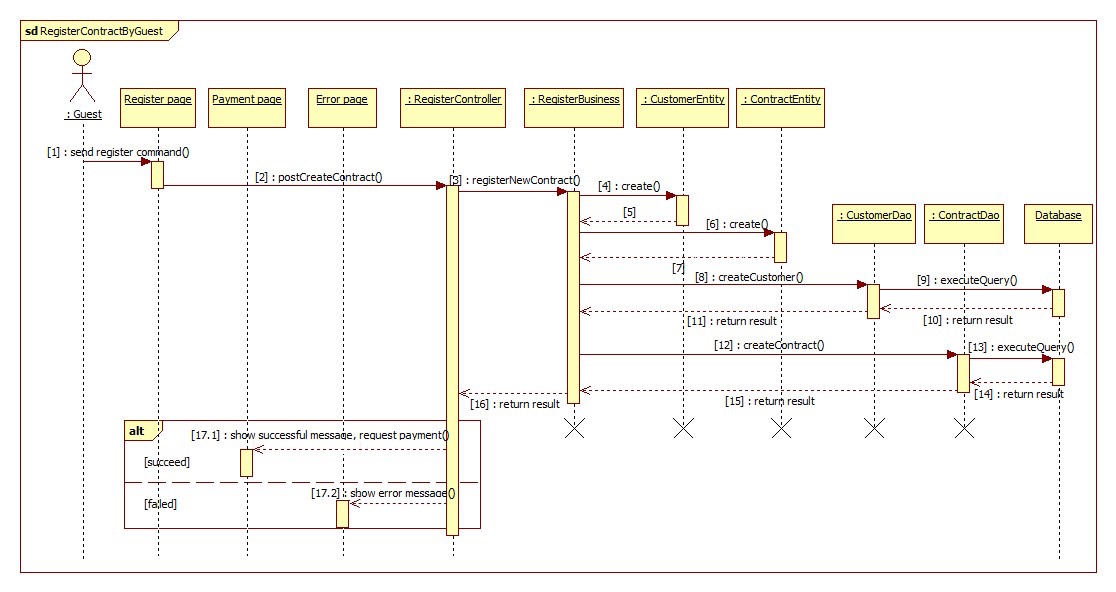


Figure Sequence diagram - <Guest> Register new contract

###### PayPal payment

Summary: this diagram show process of guest does payment

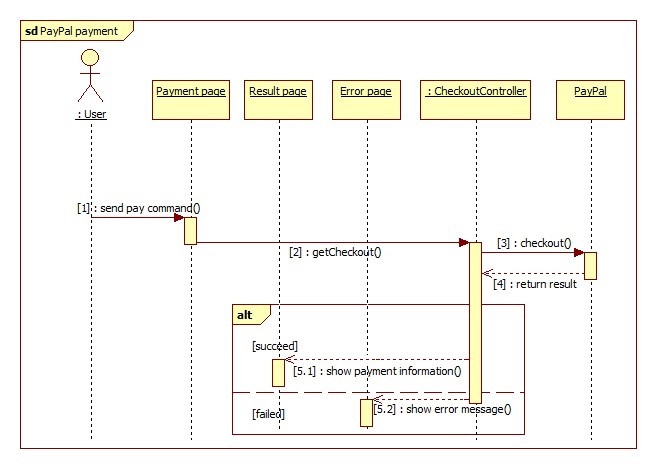


Figure Sequence diagram - <Guest> PayPal payment

#### Mobile Application

##### Checker Mobile Application

###### <Police> Verify card validation

Summary: this diagram show process of police checks card validation.

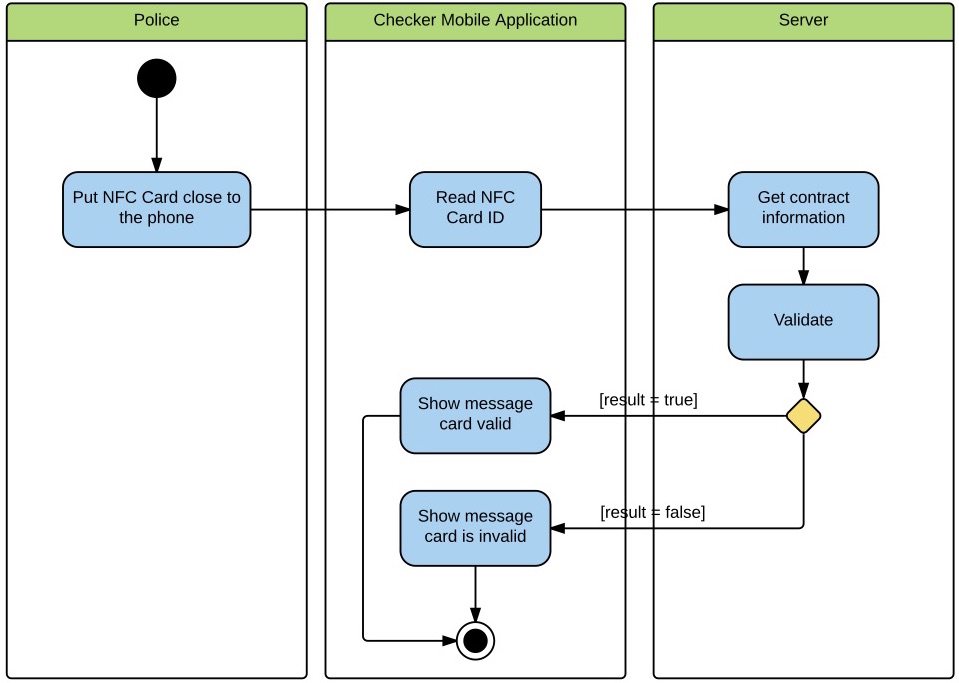


Figure <Police> Verify card validation

###### <Police> Add punishment information

Summary: this diagram show process of police adds punishment information.

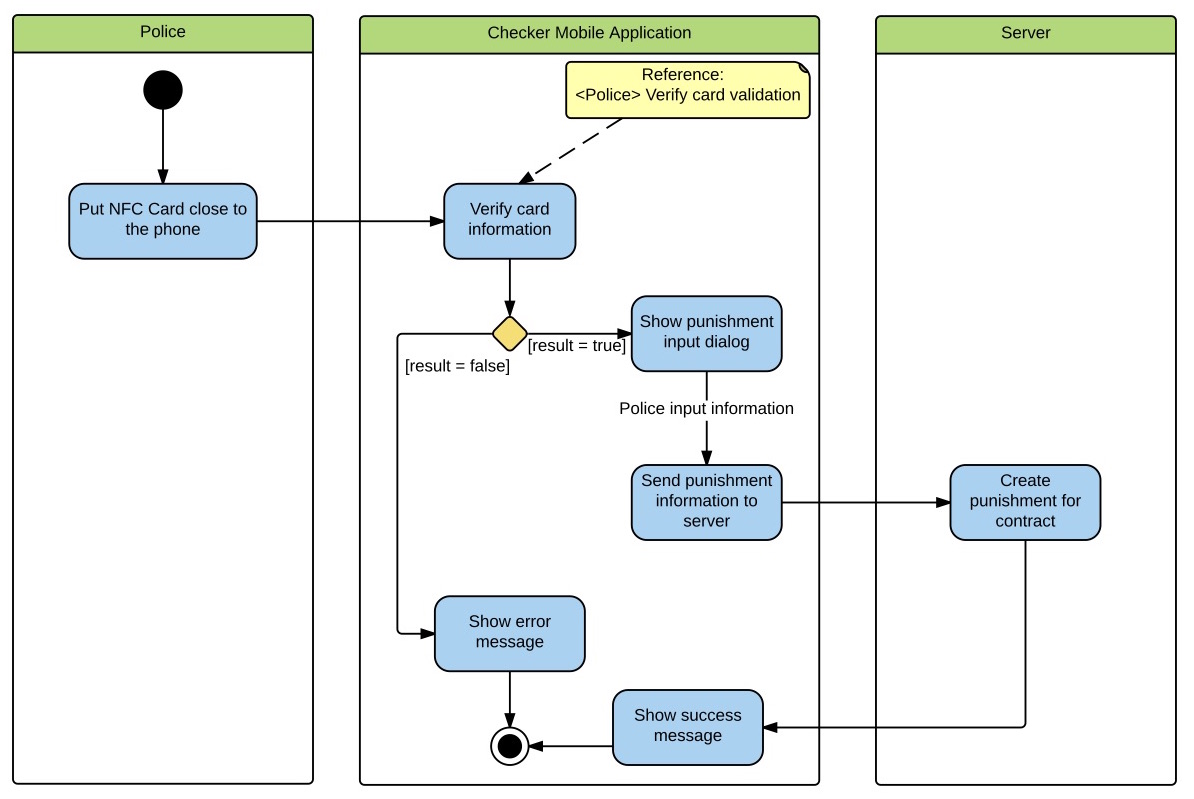


Figure <Police> Add punishment information

##### Printer Mobile Application

###### <Staff> Search contract

Summary: this diagram show process of staff searchs for contracts.

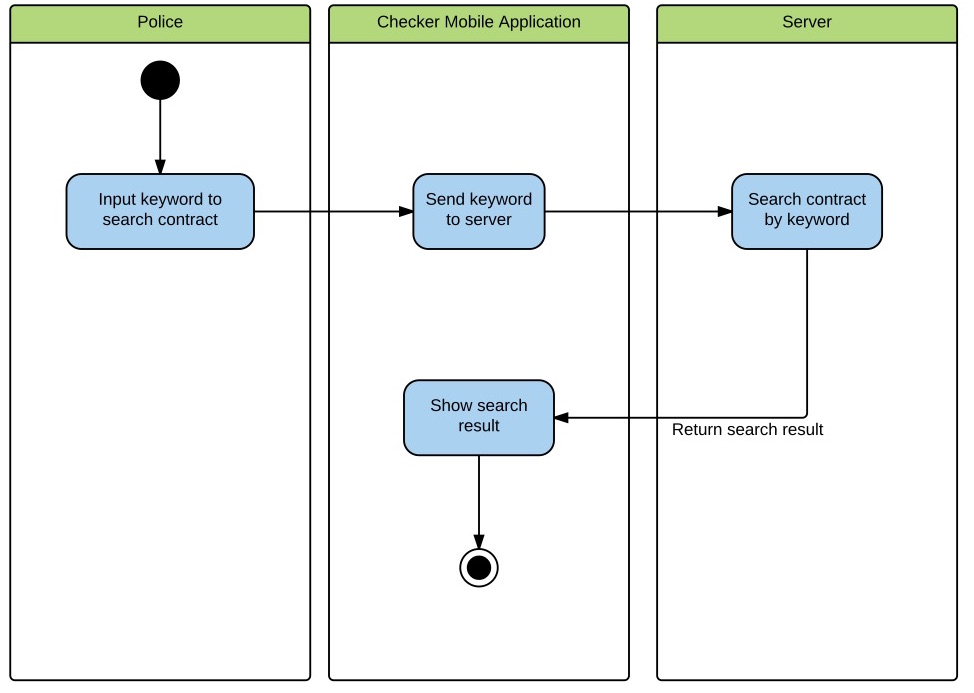


Figure <Staff> Search contract

###### <Staff> View contract information

Summary: this diagram show process of staff views contract information.

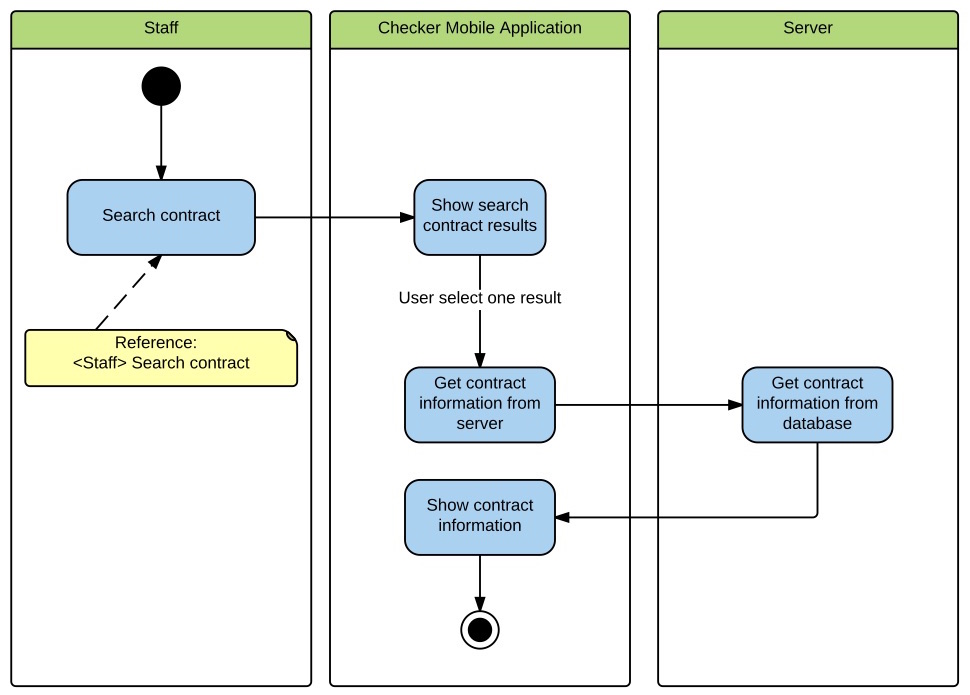


Figure <Staff> View contract information

###### <Staff> Print information to NFC Card

Summary: this diagram show process of staff print information to NFC Card.

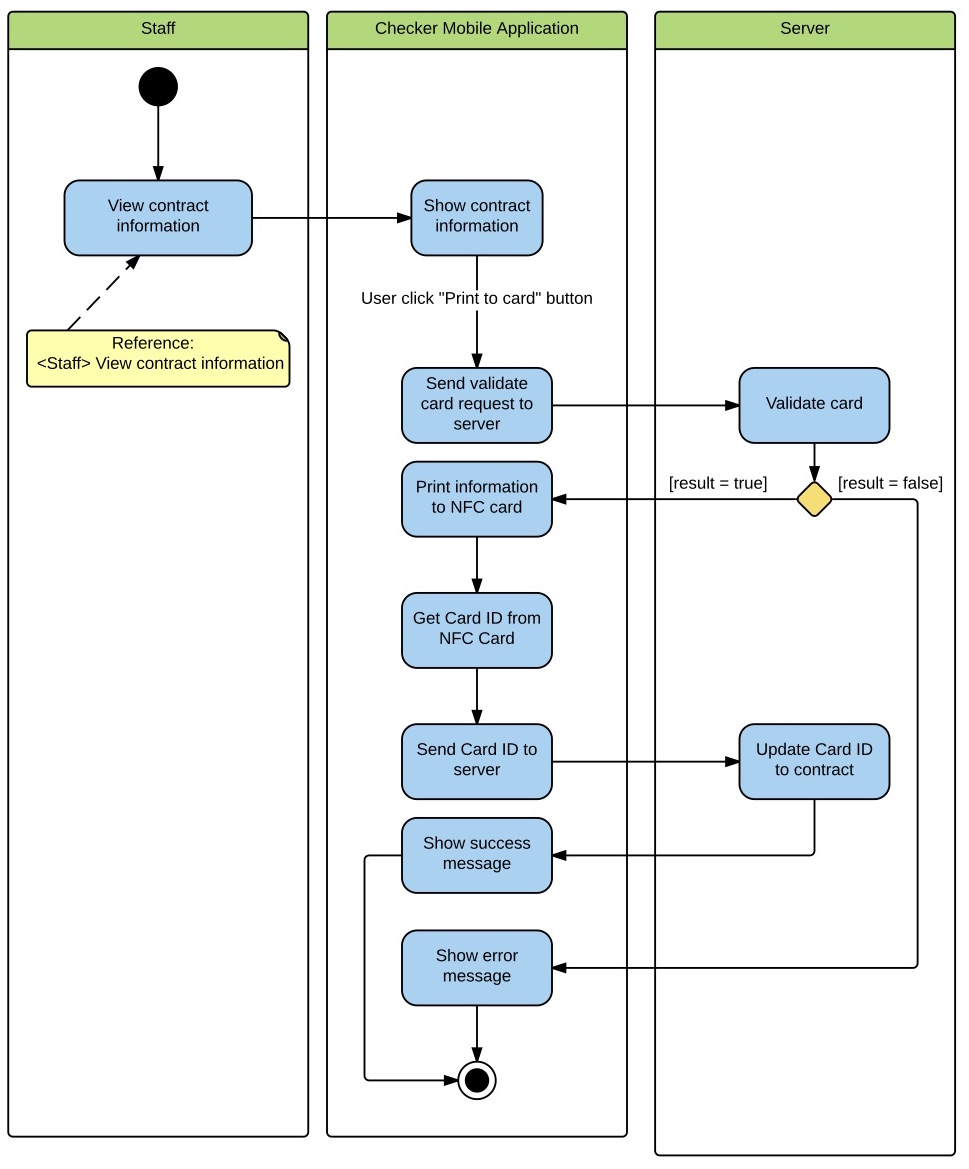


Figure <Staff> Print information to NFC card

## Interface

### Component Interface

#### Web Service Interface

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Signature | Description | Input | Output | Output Format | Exception |
| public ResponseObject getCheckConnection(R r) | Check server status | Request object r | Json Boolean the status of server | Boolean | JsonProcessingException |
| Contractlean if the update is successntractpublic ResponseObject getContracts(R r) | Search contracts by code or customer name | Request object r contains:  Keyword: String | Json string List of ContractSearchResultDto | ContractEntity  CustomerEntity | JsonProcessingException |
| public ResponseObject getUpdateCardID(R r) | Update card ID to a contract | Request object r contains:  cardID: String  contractCode: String | Json CardEntity object | CardEntity | JsonProcessingException  NoResultException |
| public ResponseObject getCheckCard(R r) | Check the validation of the card | Request object r contains:  cardID: String | Json CardEntity object | CardEntity | JsonProcessingException  NoResultException |
| public ResponseObject getUpdatePunishment(R r) | Update punishment information to a contract | Request object r contains:  contractCode: String  punishmentInfo: PunishmentInfoObject | Json Boolean the update result | Boolean | JsonProcessingException |

Table Web Services Interfaces

|  |  |
| --- | --- |
| Entity | Description |
| ContractEntity | contractCode  startDate  expiredDate  status  contractFee  plate  brand  modelCode  vehicleType  color  engine  chassis  capacity  yearOfManufacture  weight  seatCapacity  cancelDate  cancelReason  cancelNote  staffCode  contractTypeId  customerCode  needRenewPayment  lastModified  createdDate |
| CustomerEntity | customerCode  name  address  email  phone  personalId  password  isDefaultPassword  lastModified |
| CardEntity | cardId  activatedDate  deactivatedDate  contractCode  newCardRequestId |

Table Output format description

|  |  |
| --- | --- |
| Exception | Description |
| JsonProcessingException | encountered when processing (parsing, generating) JSON content that are not pure I/O problems |
| NoResultException | Thrown by the persistence provider when getSingleResult() is executed on a query and there is no result to return |

Table Exception description

### Web application Design

#### Staff Interface Design

##### Staff home page



Figure Interface - <Staff> Home page

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Menu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | Title | Title of the page | Yes | Yes | Label | N/A | N/A |

Table Staff home page fields

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 3 | viewContract | List all contract | N/A | Transfer to list contract page |
| 4 | viewCompensation | List all compensation | N/A | Transfer to list compensation page |
| 5 | viewNewCardReq | List all new card request | N/A | Transfer to list new card request page |
| 6 | viewCancelContract | List all cancel contract request | N/A | Transfer to list contract page |

Table Staff home page buttons/hyperlinks

##### Manage customer



Figure Interface - <Staff> Manage customer

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Menu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | Title | Title of the page | Yes | Yes | Label | N/A | N/A |
| 3 | Number | Number of available customer | Yes | No | Label | N/A | N/A |
| 4 | txtSearchValue | Fill search keyword | No | Yes | Textbox | String | N/A |
| 5 | Table | Table of available customer | Yes | Yes | Table | N/A | N/A |

Table <Staff> Manage customer fields

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 6 | btnCreate | Create new customer | N/A | Transfer to create new customer page |
| 7 | btnSearch | Search by input keyword | N/A | Transfer to search result page |
| 8 | customerDetail | View customer detail | N/A | Transfer to customer detail page |

Table <Staff> Manage customer buttons/hyperlinks

##### Create customer



Figure Interface - <Staff> Create customer

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Menu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | Title | Title of the page | Yes | Yes | Label | N/A | N/A |
| 3 | txtName | Fill customer name | No | Yes | Textbox | String | 3 – 80 |
| 4 | txtAddress | Fill address | No | Yes | Textbox | String | 3 – 250 |
| 5 | txtEmail | Fill email | No | Yes | Textbox | String | 3 – 250 |
| 6 | txtPhone | Fill phone | No | Yes | Textbox | Integer | 8 – 15 |
| 7 | txtPersonal ID | Fill personal ID | No | No | Textbox | Integer | 8 – 15 |

Table <Staff> Create customer fields

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 8 | btnCreate | Create new customer | N/A | Transfer to create new customer successful page |

Table <Staff> Create customer buttons/hyperlinks

##### Manage contract



Figure Interface - <Staff> Manage contract

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Menu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | Title | Title of the page | Yes | Yes | Label | N/A | N/A |
| 3 | Number | Number of available contract | Yes | No | Label | N/A | N/A |
| 4 | txtSearchValue | Fill search keyword | No | Yes | Textbox | String | N/A |
| 5 | Table | Table of available customer | Yes | Yes | Table | N/A | N/A |

Table <Staff> Manage contracts fields

**Button/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 6 | btnCreate | Create new contract | N/A | Transfer to create new contract page |
| 7 | btnSearch | Search by input keyword | N/A | Transfer to search result page |
| 8 | contractDetail | View contract detail | N/A | Transfer to contract detail page |
| 9 | customerDetail | View customer detail | N/A | Transfer to customer detail page |

Table <Staff> Manage contracts buttons/hyperlinks

##### Create contract



Figure Interface - <Staff> Create contract

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Menu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | Title | Title of the page | Yes | Yes | Label | N/A | N/A |
| 3 | txtCustomerCode | Fill customer code | No | Yes | Textbox | String | 6 |
| 4 | ddlContractType | Select contract type | No | Yes | Select | N/A | N/A |
| 5 | txtStartDate | Select start date | No | Yes | Date input form | N/A | N/A |
| 6 | txtExpiredDate | Select expired date | No | Yes | Date input form | N/A | N/A |
| 7 | txtContractFee | Contract fee | Yes | Yes | Label | N/A | N/A |
| 8 | txtPlate | Fill vehicle plate | No | Yes | Textbox | String | 4 – 15 |
| 9 | txtBrand | Fill vehicle brand | No | Yes | Textbox | String | 2 – 20 |
| 10 | txtEngine | Fill vehicle engine | No | Yes | Textbox | String | 2 – 20 |
| 11 | txtChassis | Fill vehicle chassis | No | Yes | Textbox | String | 2 – 20 |
| 12 | txtCapacity | Fill vehicle capacity | No | Yes | Textbox | String | 2 – 20 |
| 13 | txtColor | Fill vehicle color | No | No | Textbox | String | 2 – 20 |
| 14 | txtType | Fill vehicle type | No | No | Textbox | String | 2 – 20 |
| 15 | txtModel code | Fill vehicle model code | No | No | Textbox | String | 2 – 20 |
| 16 | txtYearOfMan | Fill vehicle year of manufacture | No | No | Textbox | String | 4 |
| 17 | txtWeight | Fill vehicle empty weight | No | No | Textbox | String | 1 – 4 |
| 18 | txtSeatCapacity | Fill vehicle seat capacity | No | No | Textbox | String | 1 – 3 |
| 19 | txtPaidDate | Select paid contract fee date | No | Yes | Date input form | N/A | N/A |

Table <Staff> Create contract fields

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 20 | btnSelect | Select customer | N/A | Transfer to select customer modal |
| 21 | btnCreate | Create new contract | N/A | Transfer to create new contract successful page |

Table <Staff> Create contract buttons/hyperlinks

##### Renew contract



Figure Interface - <Staff> Renew contract

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Title | Title of the modal | Yes | Yes | Label | N/A | N/A |
| 2 | Start date | Contract’s start date | Yes | Yes | Label | N/A | N/A |
| 3 | txtExpiredDate | Select expired date | No | Yes | Date input form | N/A | N/A |
| 4 | txtAmount | Renew contract fee | Yes | Yes | Label | N/A | N/A |
| 5 | txtPaidDate | Select paid contract fee date | No | Yes | Date input form | N/A | N/A |

Table <Staff> Renew contract fields

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 6 | btnRenew | Renew contract | N/A | Transfer to renew contract successful page |
| 7 | btnClose | Close modal | N/A | Transfer to contract detail page |

Table <Staff> Renew contract buttons/hyperlinks

##### Cancel contract



Figure Interface - <Staff> Cancel contract

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | Title | Title of the modal | Yes | Yes | Label | N/A | N/A |
| 2 | txtCancelDate | Select cancel contract date | No | Yes | Date input form | N/A | N/A |
| 3 | txtCancelReason | Fill cancel contract reason | No | Yes | Textbox | String | 1 – 250 |
| 4 | txtCancelNote | Fill note about cancel contract | No | No | Text area | String | 1 - 2000 |

Table <Staff> Cancel contract fields

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 5 | btnCancel | Cancel contract | N/A | Transfer to cancel contract successful page |
| 6 | btnClose | Close modal | N/A | Transfer to contract detail page |

Table <Staff> Cancel contract buttons/hyperlinks

#### Customer Interface Design

##### Manage contract

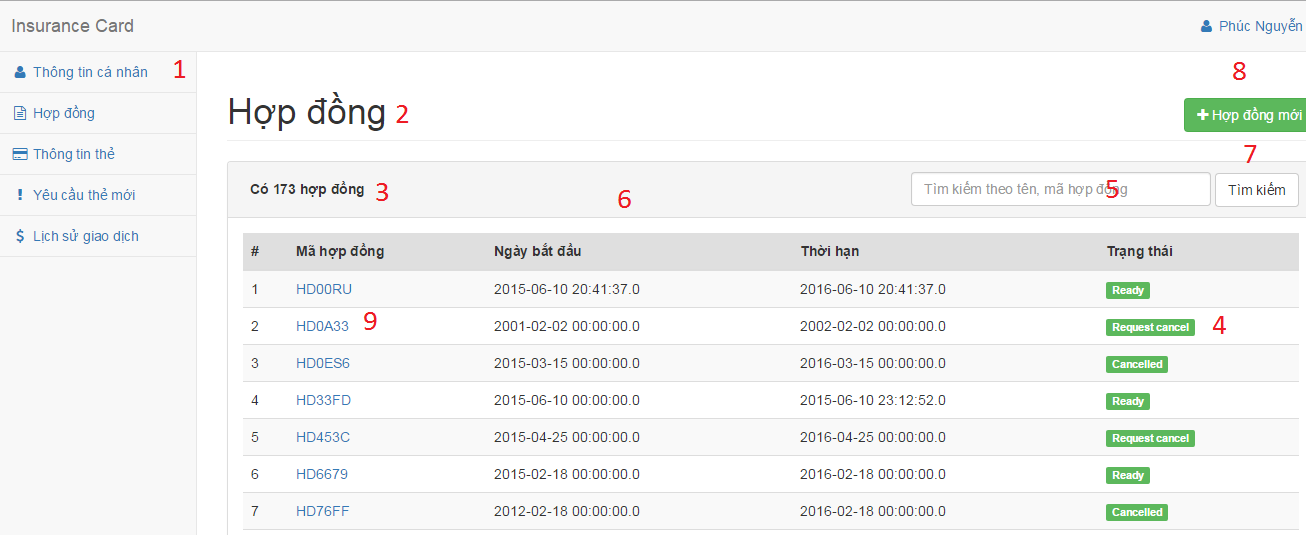


Figure Interface - <Customer> Manage contract

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | lblMenu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | lblTitle | Title of the page | Yes | Yes | Label | N/A | N/A |
| 3 | lblAmountContract | Number of available customer | Yes | No | Label | N/A | N/A |
| 4 | lblContractStatus | Status of contract | Yes | No | Label | N/A | N/A |
| 5 | txtSearch | Fill search keyword | No | Yes | Textbox | String | N/A |
| 6 | contractTable | Table of available contract | Yes | Yes | Table | N/A | N/A |

Table <Customer> Manage contract fields

**Buttons / Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 7 | btnSearch | Search by input keyword | N/A | Transfer to search result page |
| 8 | btnCreate | Create new customer | N/A | Transfer to create new customer page |
| 9 | linkContractDetail | View contract detail | N/A | Transfer to contract detail page |

Table <Customer> Manage contract buttons/hyperlinks

##### Contract detail

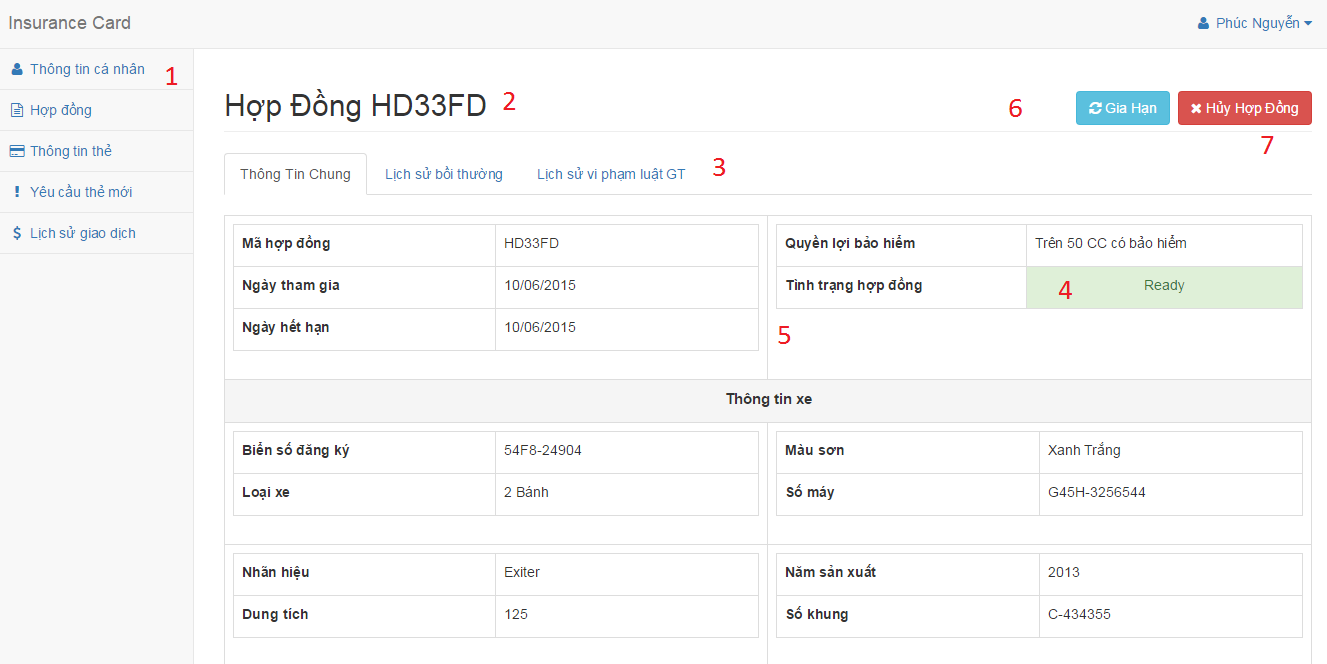


Figure Interface - <Customer> Contract detail

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | lblMenu | Navigation bar | Yes | Yes | Menu bar | N/A | N/A |
| 2 | lblTitle | Contract code | Yes | Yes | Label | N/A | N/A |
| 3 | txtTab | Information about contract | Yes | No | Tab | N/A | N/A |
| 4 | lblContractStatus | Status of contract | Yes | No | Label | N/A | N/A |
| 5 | txtInformation | Information about contract | No | Yes | Textbox | String | N/A |

Table <Customer> Contract detail fields

**Buttons / Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 6 | btnRenew | Renew contract | N/A | Show popup to choose the reason cancel |
| 7 | btnCancel | Cancel contract | N/A | Show popup to provide new time for contract and the way to pay for renew contract |

Table <Customer> Contract detail buttons/hyperlinks

##### Cancel contract

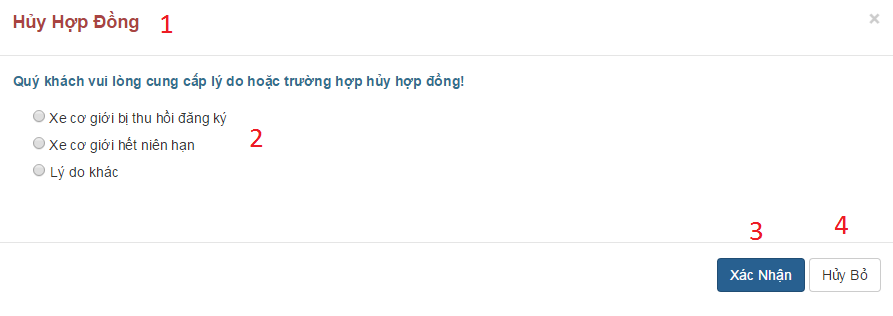


Figure Interface - <Customer> Cancel contract

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | lblTitle | Title | Yes | Yes | Label | N/A | N/A |

Table <Customer> Cancel contract fields

**Buttons / Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 2 | chkOptionCancel | Choose reason why customer cancel contract | N/A | N/A |
| 3 | btnConfirm | Confirm to cancel contract | If customer doesn’t input the reason in case they choose another reason, the system will notify. | Reload contract detail with information about contract is canceled |
| 4 | btnLeave | Leave request cancel | N/A | Return to contract detail |

Table <Customer> Cancel contract button/hyperlinks

##### Renew contract

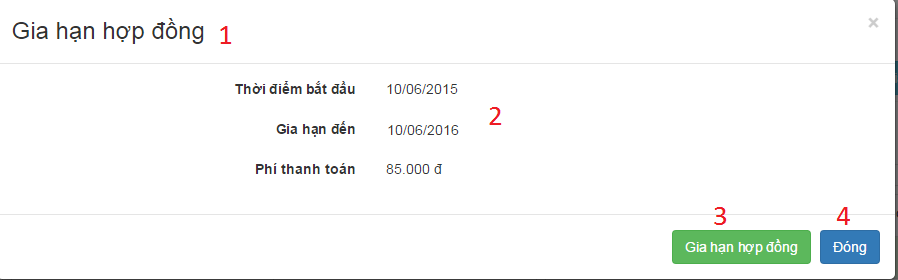


Figure Interface - <Customer> Renew contract

**Select paypment method**

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | lblTitle | Title | Yes | Yes | Label | N/A | N/A |
| 2 | txtInformation | Information about renew contract | Yes | Yes | Label | N/A | N/A |

Table <Customer> Renew contract fields

**Buttons / Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 3 | btnConfirm | Confirm to renew contract | N/A | Transfer to checkout page |
| 4 | btnLeave | Leave request renew | N/A | Return to contract detail |

Table <Customer> Renew contract button/hyperlinks

##### Select payment method

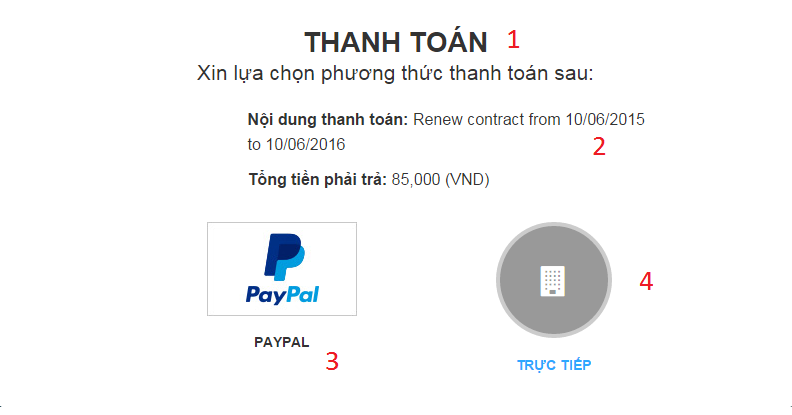


Figure Interface - <Customer> Select payment method

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | lblTitle | Title | Yes | Yes | Label | N/A | N/A |
| 2 | txtInformation | Information about renew contract | Yes | Yes | Label | N/A | N/A |

Table <Customer> Select payment method fields

**Buttons / Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 3 | btnPaypal | Payment by paypal | N/A | Transfer to paypal page |
| 4 | btnDirect | Payment direct at company | N/A | Show address of list company |

Table <Customer> Select payment method buttons/hyperlinks

**Select paypment method**

### Checker Mobile Application Design

#### Scan NFC card screen

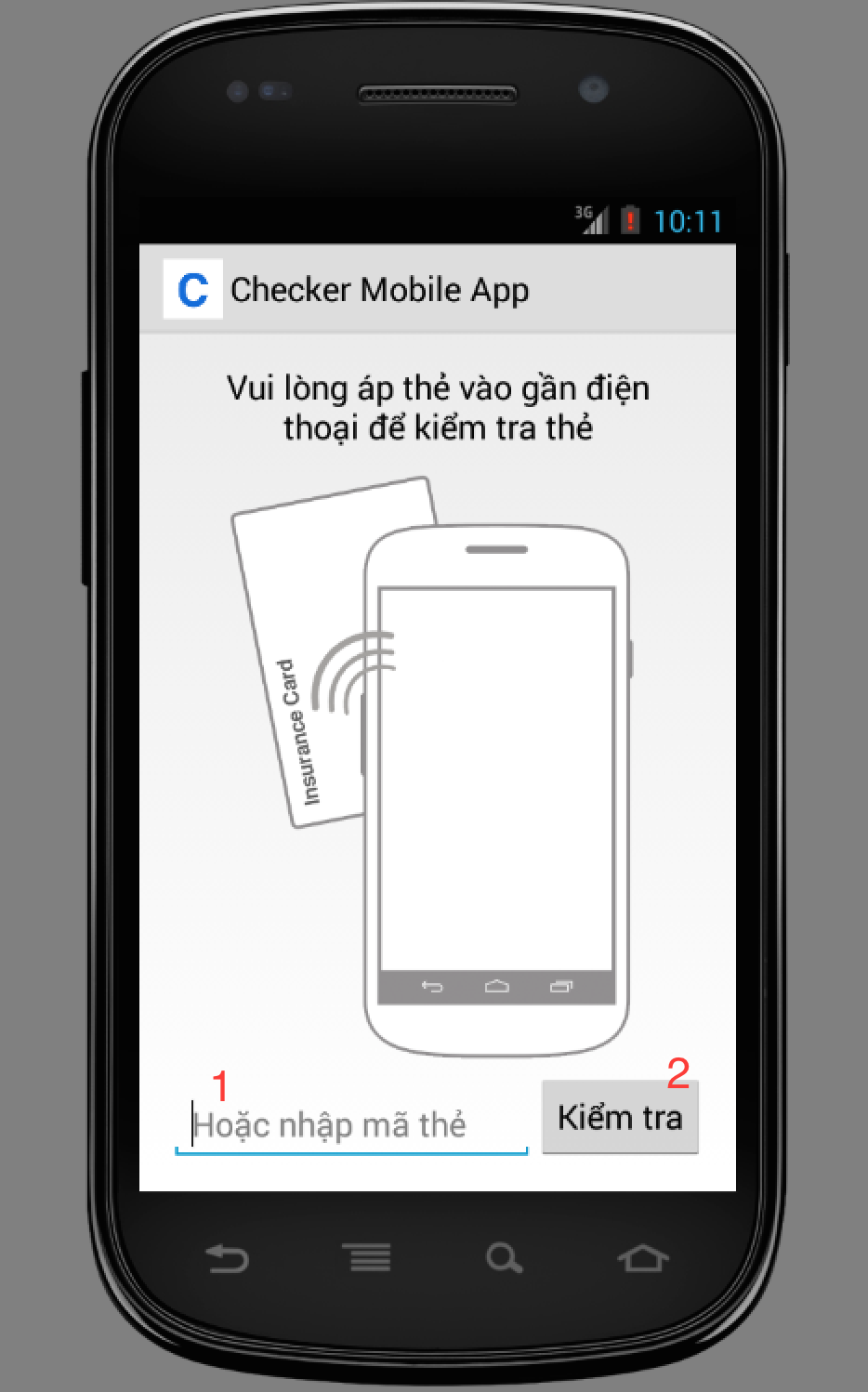


Figure Scan NFC card screen

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | txtCardIDnpen print card screen supporto view detail information of that contractCard | ID of the card | No | No | Textbox | String | 20 |

Table Scan NFC card screen - Fields

### Printer Mobile Application Design

#### Search contract screen

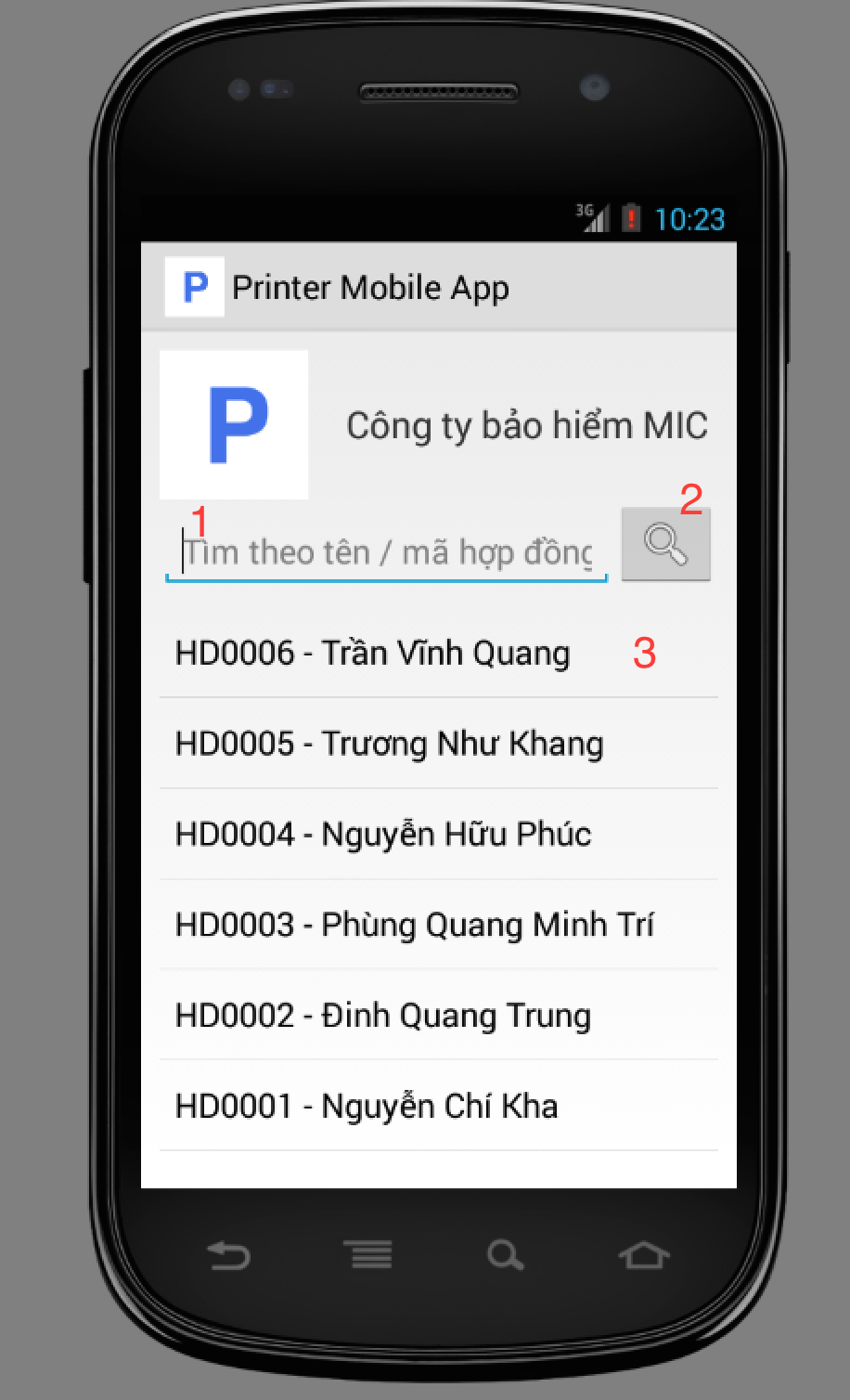


Figure 29 Search contract screen

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Field Name | Description | Read only | Mandatory | Control Type | Data Type | Length |
| 1 | txtSearch | Search box where user input search keyword | No | No | Textbox | String | 0 - 200 |

Table 59 Search contract screen - Fields

**Buttons**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 2 | btnSearch | Search contract with keyword | N/A | The list will be updated with search results |
| 3 | lstContracts | Click to a row from the list to view detail information of that contract | N/A | Show view contract screen |

Table 60 Search contract screen - Buttons

#### View contract screen



Figure 30 View contract screen

**Buttons**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Function | Description | Validation | Outcome |
| 1 | btnPrint | Click to print information to NFC card | Phone have to have NFC support | Open print card screen |

Table 61 View npen print card screen supporto view detail information of that contractcontract screen - Buttons

#### Print card screen



Figure 31 Print card screen

## Database Design

### Entity relationship diagram