**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Report 4

**Building the laboratory tests management system**

|  |  |
| --- | --- |
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# **Software Design Description**

## **Design Overview**

This document describes the technical and user interface design of Building the laboratory tests management system (eLTMS).

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 details design description which includes class diagram, class explanation, and sequence diagram to detailss the application functions.

Section 5: describes screens design.

Section 6: describes a fully attributed ERD.

Section 7: describes algorithms.

## **System Architectural Design**

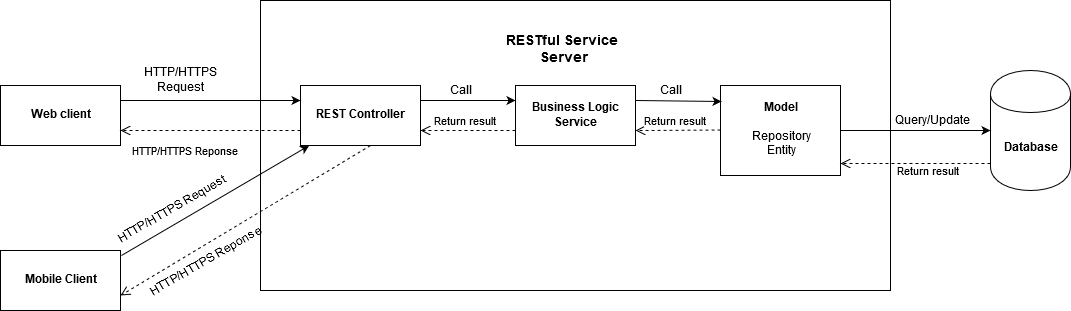


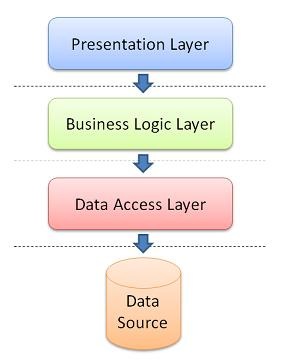
Figure 1 - System Architecture Design

Our system has been developed under the 3-layer architecture. The 3-layer architecture is different from the 3-tier architecture, because 3 components are separated logically (can be deployed on the same server), not physically (on different servers).

We choose this architecture for our system because of following advantages:

* **Speed of development:** a specific layer can be upgraded with minimal impact on the other layers.
* **Scalability**: By separating out the different layers we can scale each independently depending on the need at any given time.
* **Performance:** This allows you to load balance each layer independently, improving overall performance with minimal resources.

The 3-layer architecture consists of:



* **Presentation Layer:** consists of the user interface. This user interface is often a graphical one accessible through a web browser or web-based application and which displays content and information useful to an end user.
* **Business Logic Layer:** contains the functional business logic which drives an application’s core capabilities.
* **Data Access Layer:** provides simplified access to data source.

## **Component Diagram**

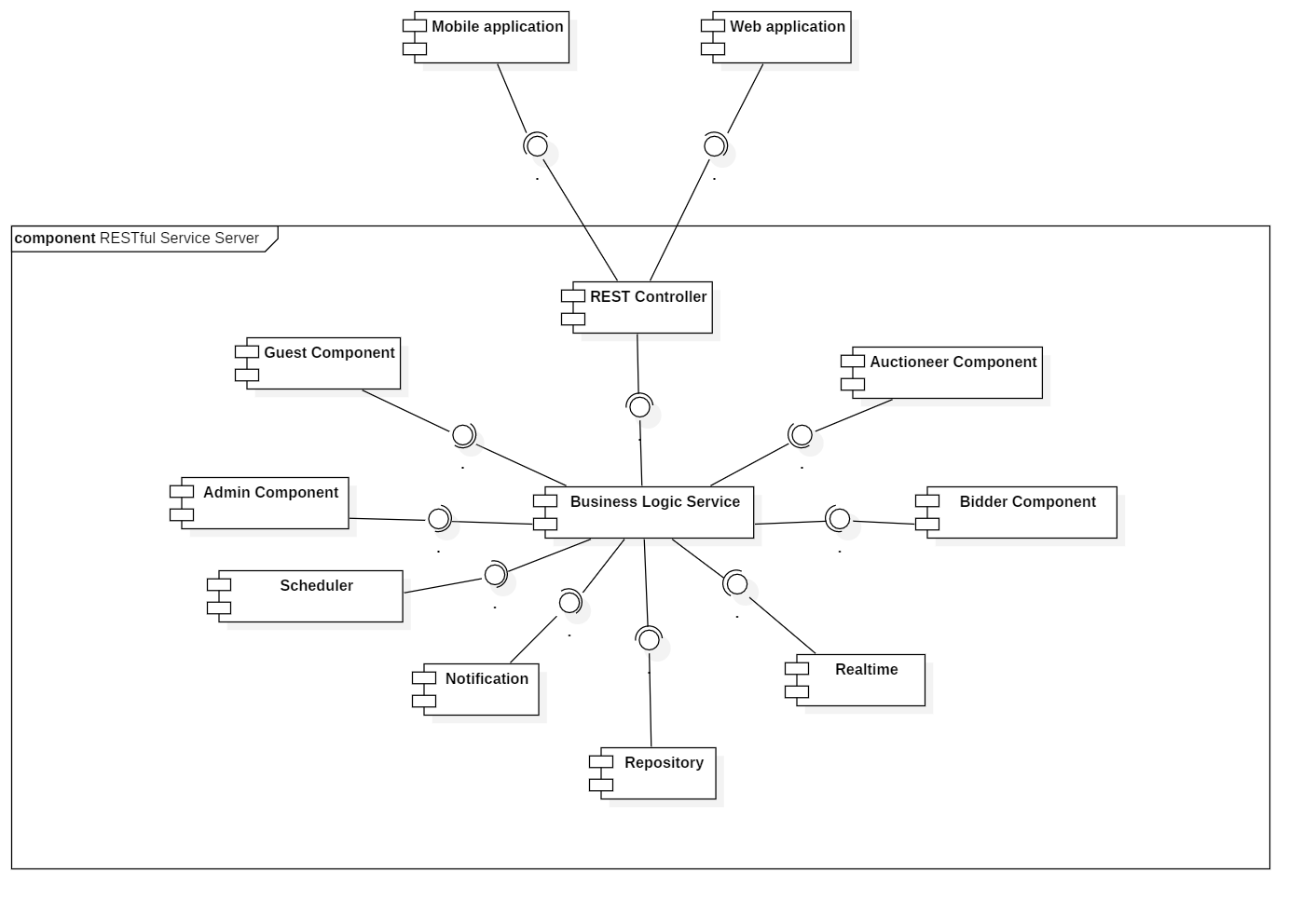


Figure 2 - Component Diagram

|  |  |
| --- | --- |
| COMPONENT DICTIONARY: DESCRIBES COMPONENTS | |
| Mobile Application | Component to contain system’s functions for end user on mobile device |
| Web Application | Component to contain system’s functions for end user on web |
| REST Controller | Component to receive requests, call services to process information, get data back from services and respond result to clients |
| Business Logic Service | Component to handle system’s business operations |
| Guest Component | Component to handle guest’s activities in the system |
| Admin Component | Component to handle admin’s activities in the system |
| Bidder Component | Component to handle bidder’s activities in the system |
| Auctioneer Component | Component to handle auctioneer’s activities in the system |
| Scheduler | Component to handle scheduling future tasks |
| Realtime | Component to handle realtime operations |
| Notification | Component to handle sending notifications |
| Repository Component | Component to handle data reading/writing operations from/to database |

Table 1 - Component Dictionary

## **Details Description**

### Class Diagram

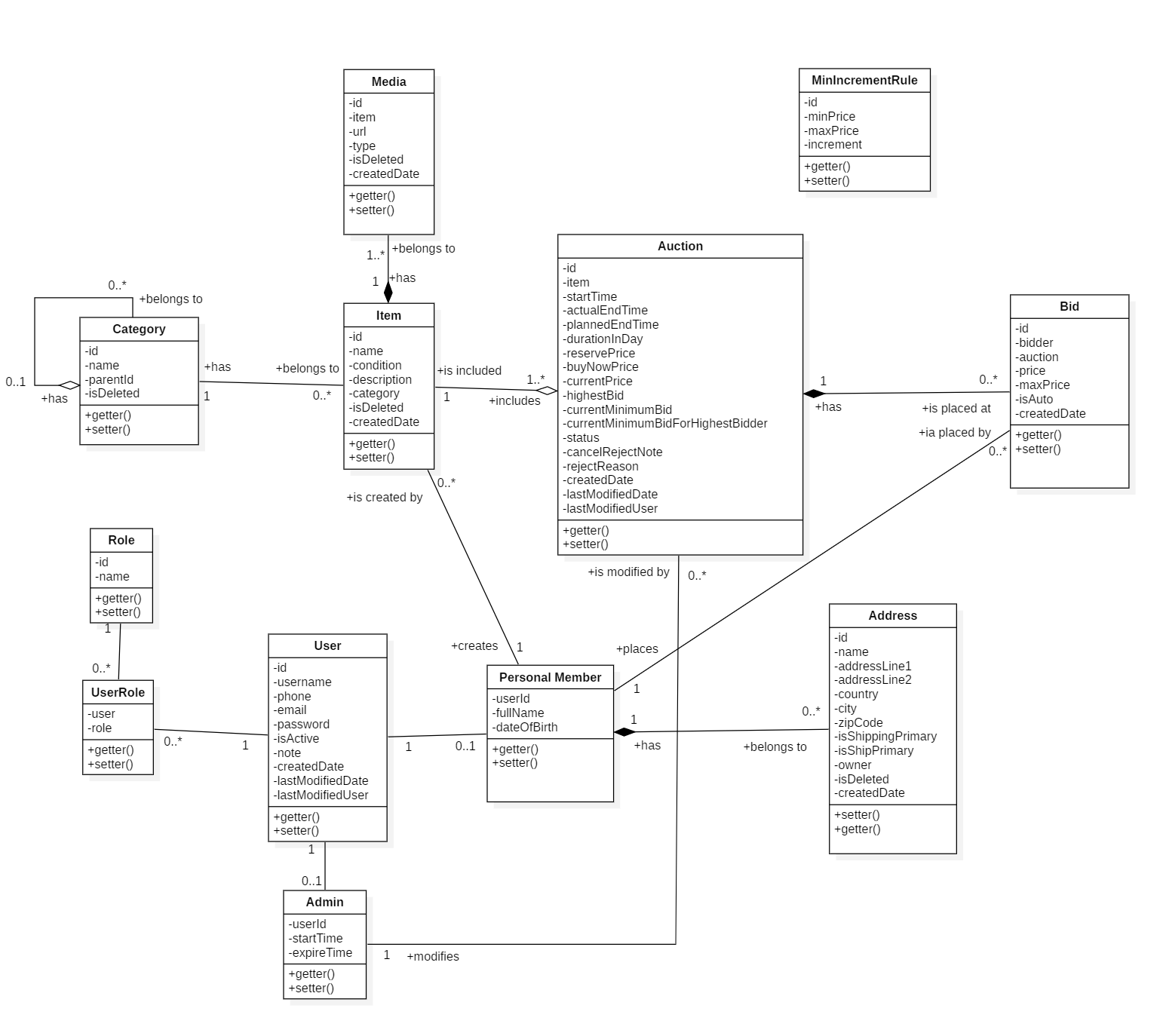


Figure 3 - Class Diagram

|  |  |  |
| --- | --- | --- |
| CLASS DICTIONARY: DESCRIBE CLASS | | |
| Class Name | **Mapping column with Conceptual diagram** | **Description** |
| User | User | Contains the user information |
| Admin | Admin | Contains the admin information |
| Personal Member | Auctioneer/Bidder | Contains the personal member (auctioneer, bidder) information |
| Role | Role | Contains the role information |
| UserRole | N/A | Contain the user’s roles information |
| Address | Address | Contain the address roles information |
| Item | Item | Contains the item information |
| Auction | Auction | Contains the auction information |
| Category | Category | Contains the category information |
| Media | Media | Contains the media information |
| Bid | Bid | Contains the bid information |
| MinIncrementRule | N/A | Contains the minimum increment rule information (for calculating minimum bid that bidder has to place on an item). |

Table 2 - Class Dictionary

### Class Diagram Explanation

#### User

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of a user |
| username | String | Private | User’s username |
| password | String | Private | User’s password |
| phone | String | Private | User’s phone |
| email | String | Private | User’s email |
| status | String | Private | User’s status |
| note | String | Ptivate | User’s note (reason for being restricted) |
| createdDate | ZonedDateTime | Private | User’s created date |
| lastModifiedDate | ZonedDateTime | Private | User’s last modified date |
| lastModifiedUser | User | Private | User who modified lastly this one |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 3 - Class Diagram Explanation <User>

#### Admin

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| userId | Integer | Private | Unique identifier of an admin (from that of his/her user account) |
| startTime | ZonedDateTime | Private | Admin’s start time for performing operations |
| expireTime | ZonedDateTime | Private | Admin’s expire time for performing operations |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 4 - Class Diagram Explanation <Admin>

#### Personal member

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| userId | Integer | Private | Unique identifier of a personal member (from that of his/her user account) |
| fullName | String | Private | Personal member’s full name |
| dateOfBirth | ZonedDateTime | Private | Personal member’s date of birth |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 5 - Class Diagram Explanation <Personal member>

#### Role

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of a role |
| name | String | Private | Role’s name |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 6 - Class Diagram Explanation <Role>

#### UserRole

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| user | User | Private | User who is assigned to the role |
| role | Role | Private | Role which is assigned to the user |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 7 - Class Diagram Explanation <UserRole>

#### Address

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of an address |
| name | String | Private | Address’s name |
| addressLine1 | String | Private | Address’s addressline1 (Street name, town, ward, etc) |
| addressLine2 | String | Private | Address’s addressline2 (floor number, apartment number, etc) |
| country | String | Private | Address’s country |
| zipCode | String | Private | Address’s ZIP code or portal code |
| isShippingPrimary | String | Private | Is address is default for shipping address or not (receiving item) |
| isShipPrimary | String | Private | Is address is default for ship address or not (sending item) |
| owner | User | Private | Address’s owner |
| isDeleted | Boolean | Private | Address is deleted or not |
| createdDate | ZonedDateTime | Private | Address’s created date |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 8 - Class Diagram Explanation <Address>

#### Item

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of an item |
| name | String | Private | Item’s name |
| condition | String | Private | Item’s condition |
| category | Category | Private | Item’s category |
| isDeleted | Boolean | Private | Item is deleted or not |
| createdDate | ZonedDateTime | Private | Item’s created date |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 9 - Class Diagram Explanation <Item>

#### Auction

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of an item |
| item | Item | Private | Auction’s item |
| startTime | ZonedDateTime | Private | Auction’s start time |
| actualEndTime | ZonedDateTime | Private | Auction’s actual end time |
| durationInDays | ZonedDateTime | Private | Auction’s duration in days |
| plannedEndTime | ZonedDateTime | Private | Auction’s planned end time |
| reservePrice | BigDecimal | Private | Auction’s reserve price |
| buyNowPrice | BigDecimal | Private | Auction’s buy now price |
| currentPrice | BigDecimal | Private | Auction’s current price |
| highestBid | Bid | Private | Auction’s highest bid |
| currentMinimumBid | BigDecimal | Private | Auction’s current minimum bid |
| currentMinimumBid  ForHighestBidder | BigDecimal | Private | Auction’s current minimum bid for highest bidder |
| status | String | Private | Auction’s status |
| note | String | Private | Auction’s note for being rejected by admin |
| rejectReason | String | Private | Auction’s reason for being rejected by admin |
| createdDate | ZonedDateTime | Private | Auction’s created date |
| lastModifiedDate | ZonedDateTime | Private | Auction’s last modified date |
| lastModifiedUser | User | Private | User who modified lastly this auction |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 10 - Class Diagram Explanation <Auction>

#### Category

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of category |
| name | String | Private | Category’s name |
| parentId | Integer | Private | Unique identifier of category’s parent |
| isDeleted | Boolean | Private | Category is deleted or not |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 11 - Class Diagram Explanation <Category>

#### Media

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of media |
| item | Item | Private | Media’s Item |
| url | String | Private | Media’s URL |
| type | String | Private | Media’s type |
| isDeleted | Boolean | Private | Media is deleted or not |
| createdDate | ZonedDateTime | Private | Media’s created date |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 11 - Class Diagram Explanation <Media>

#### Bid

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of bid |
| bidder | User | Private | Bid’s bidder |
| auction | Auction | Private | Bid’s auction |
| price | BigDecimal | Private | Bid’s price |
| maxPrice | BigDecimal | Private | Bid’s maxPrice |
| isAuto | Boolean | Private | Bid is placed by automatic bidding system or not |
| createdDate | ZonedDateTime | Private | Bid’s created date |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 12 - Class Diagram Explanation <Bid>

#### MinIncrementRule

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| id | Integer | Private | Unique identifier of rule |
| minPrice | BigDecimal | Private | Rule’s minimum price |
| maxPrice | BigDecimal | Private | Rule’s maximum price |
| increment | BigDecimal | Private | Rule’s increment |
| **Method** | **Return Type** | **Visibility** | **Description** |
| getter | Attribute type | Public | Get value of attribute |
| setter | Void | Public | Set value for attribute |

Table 13 - Class Diagram Explanation <MinIncrementRule>

### Interactive Diagram

#### Guest

##### Login

Summary: this diagram shows process for login.

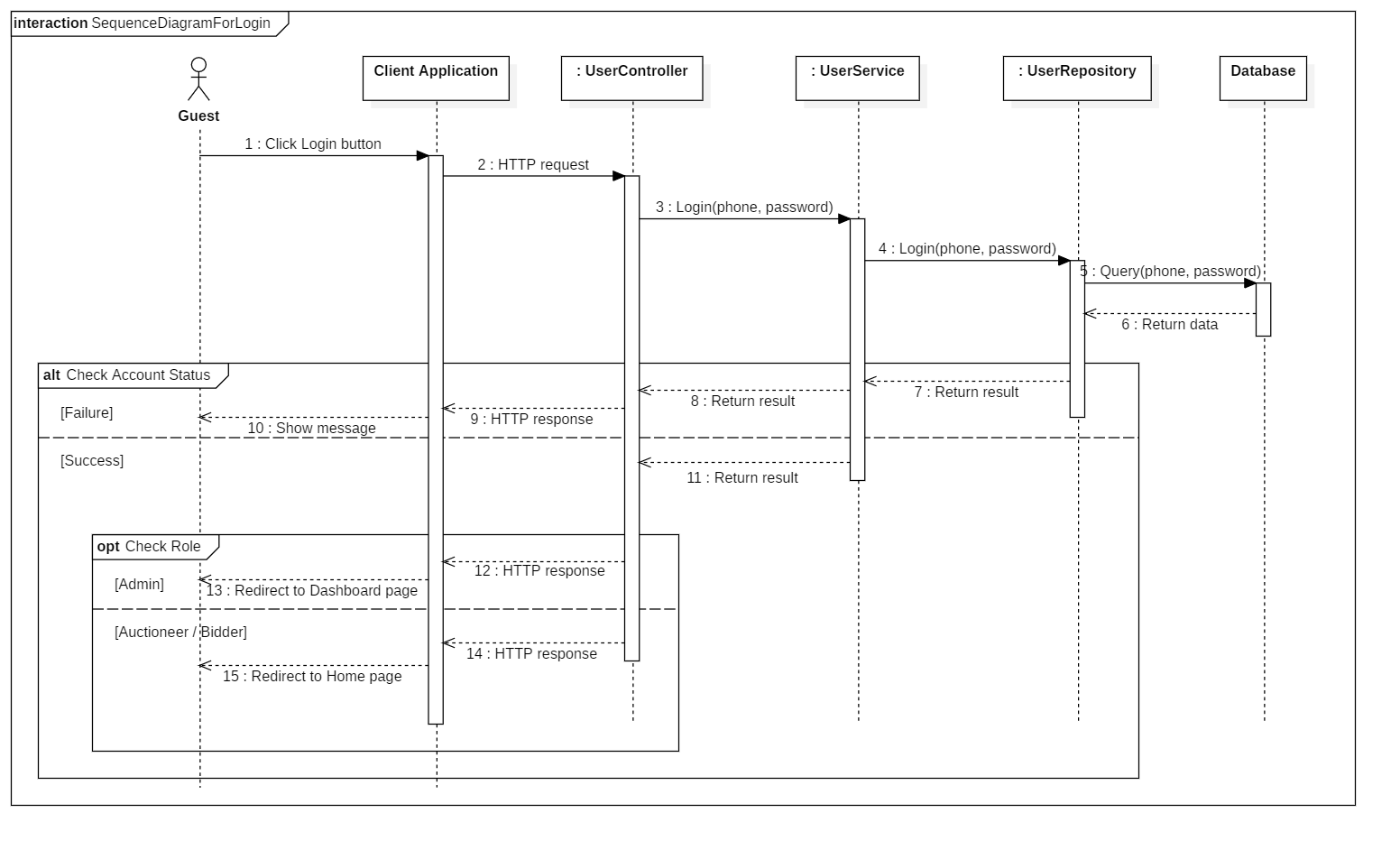
x

Figure 4 - Sequence Diagram for Login < Guest >

##### Register account

Summary: this diagram shows process for register account.

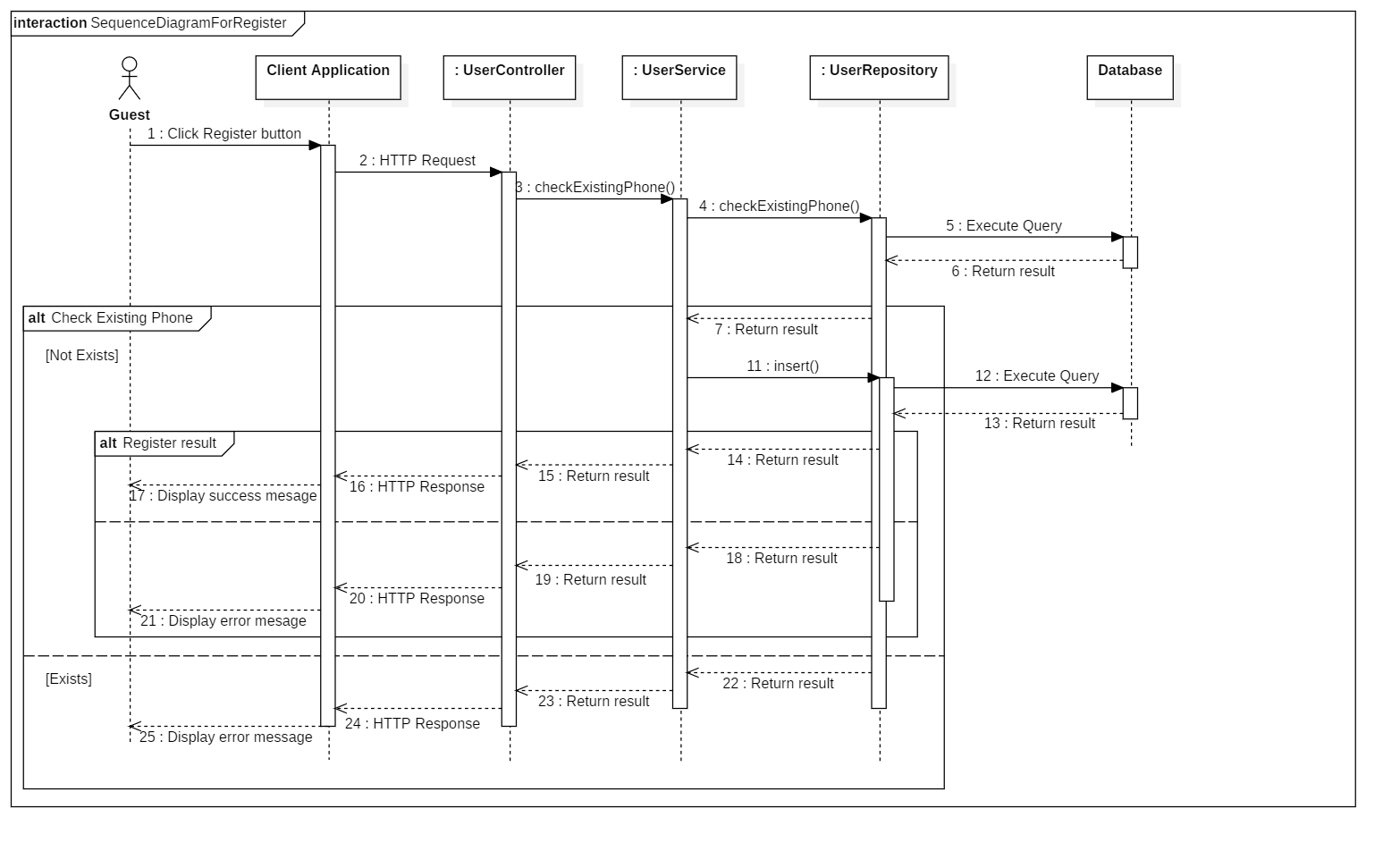


Figure 5 - Sequence Diagram for Register Account < Guest >

##### Search Auctions

Summary: this diagram shows process for search auctions (by keyword/ category).

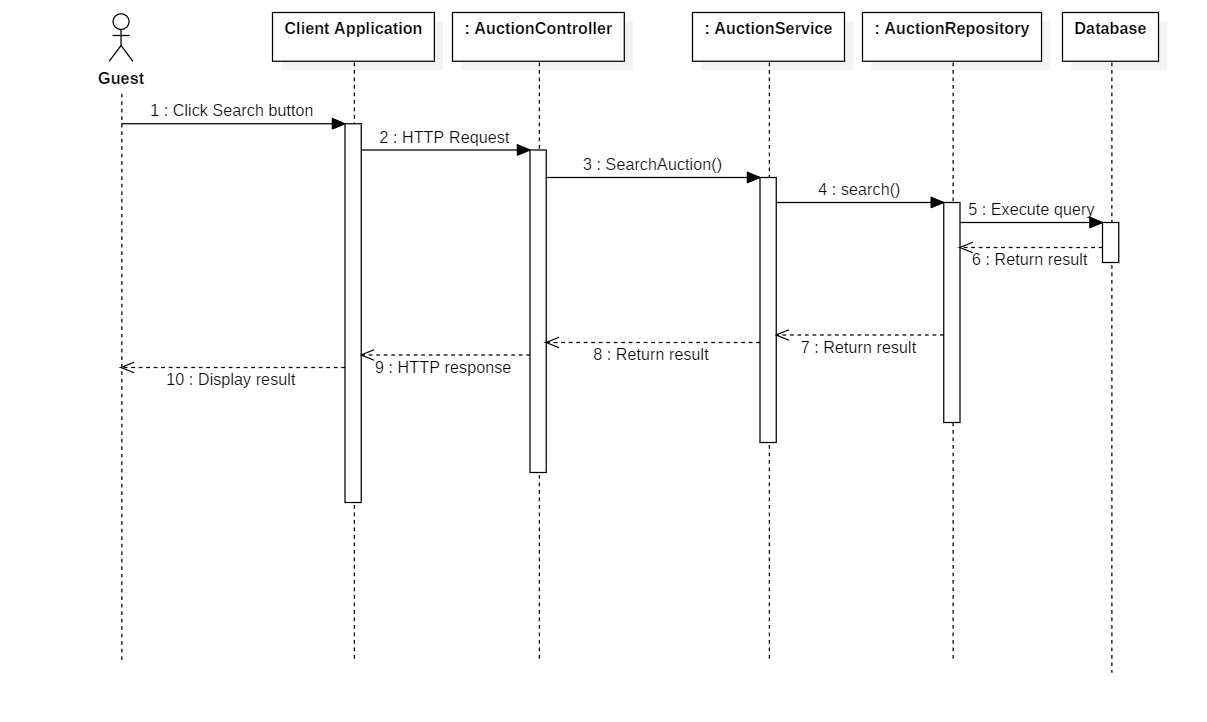


Figure 6 - Sequence Diagram for Search Auctions < Guest >

##### View Auction Details

Summary: this diagram shows process for view auction details.



Figure 7 - Sequence Diagram for View Auction Details < Guest >

##### View Suggested Auctions

Summary: this diagram shows process for view suggested auctions

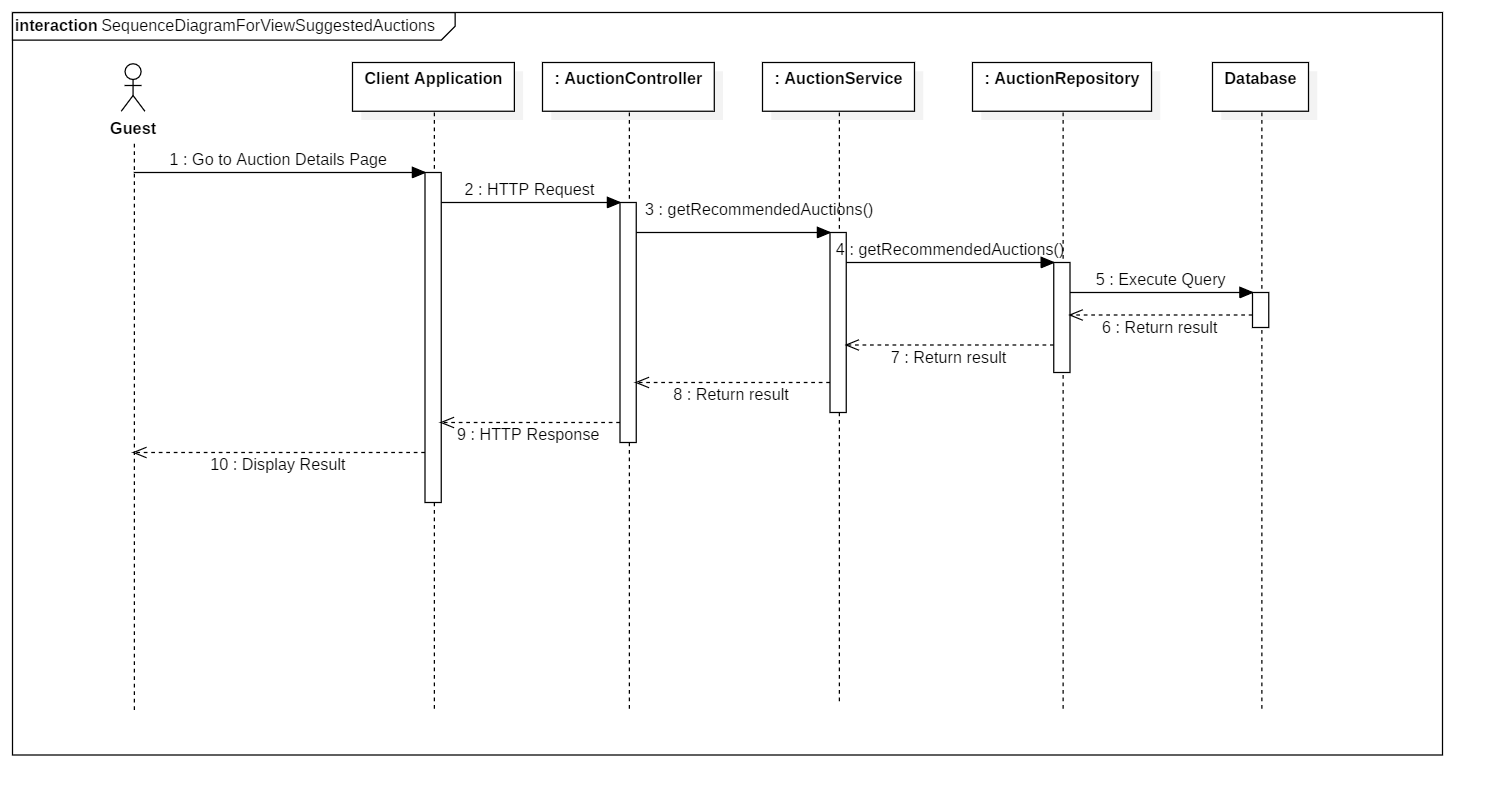


Figure 8 - Sequence Diagram for View Suggested Auctions < Guest >

#### Administrator

##### Accept Auction

Summary: this diagram shows process for accept auction.

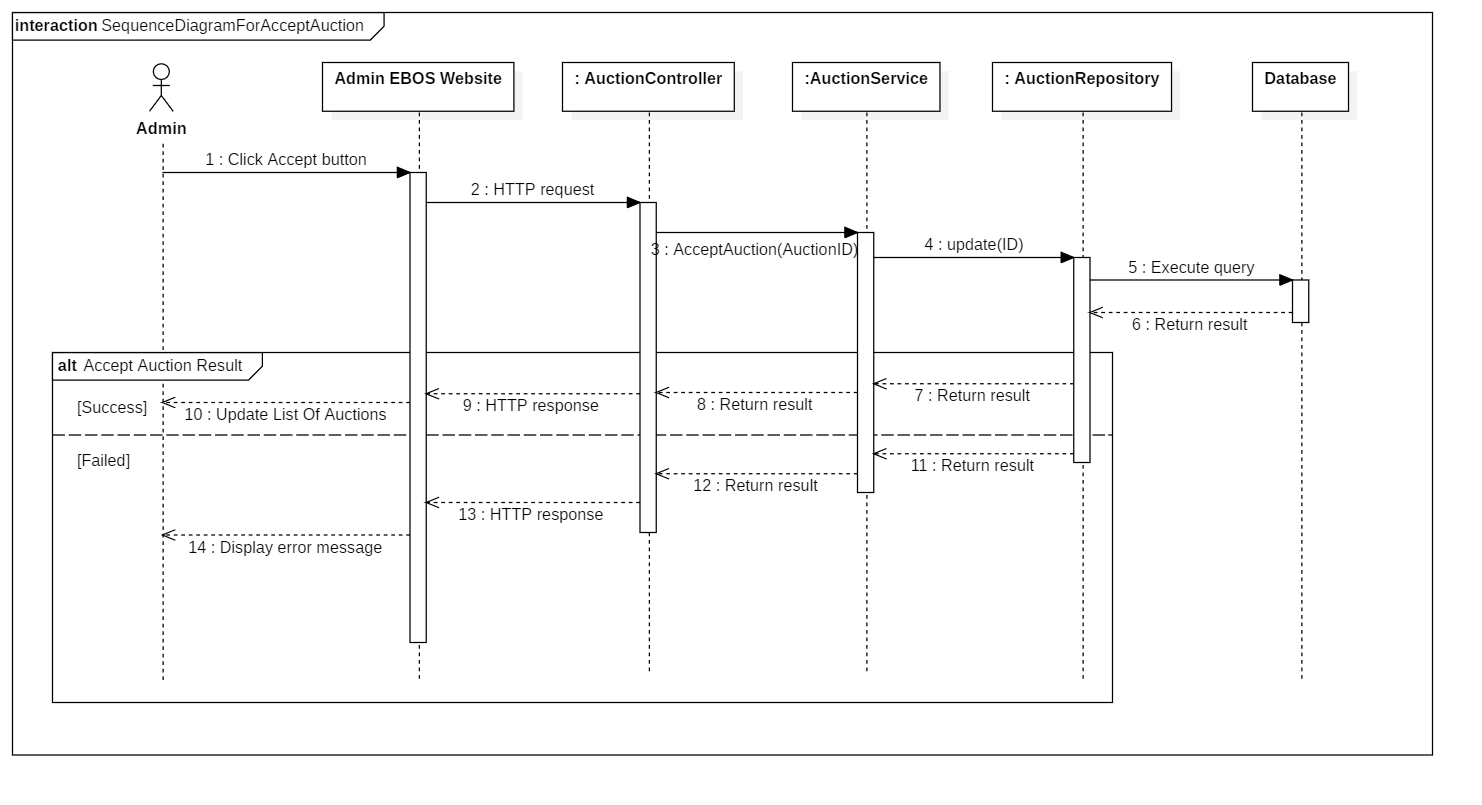


Figure 9 - Sequence Diagram for Accept Auction < Administrator >

##### Reject Auction

Summary: this diagram shows process for reject auction.

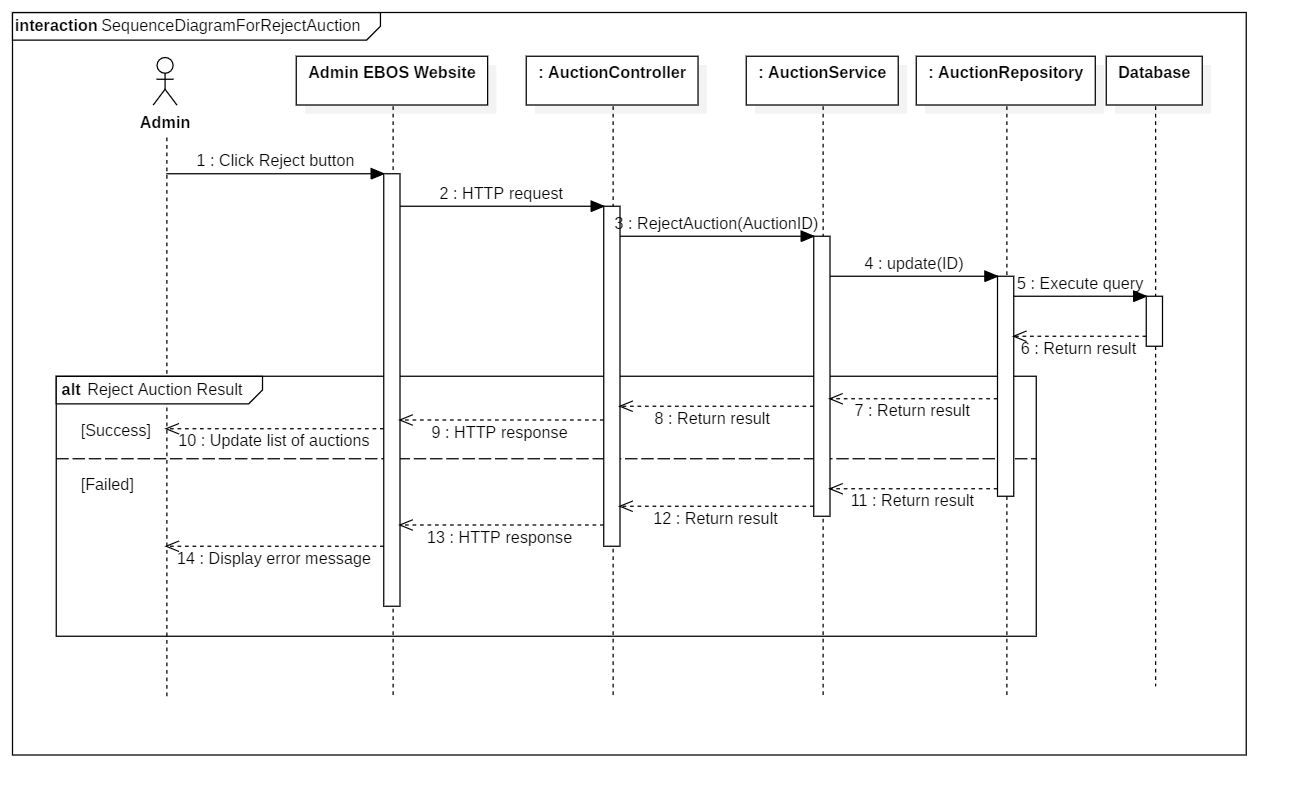


Figure 10 - Sequence Diagram for Reject Auction < Administrator >

##### Search Users

Summary: this diagram shows process for search users.

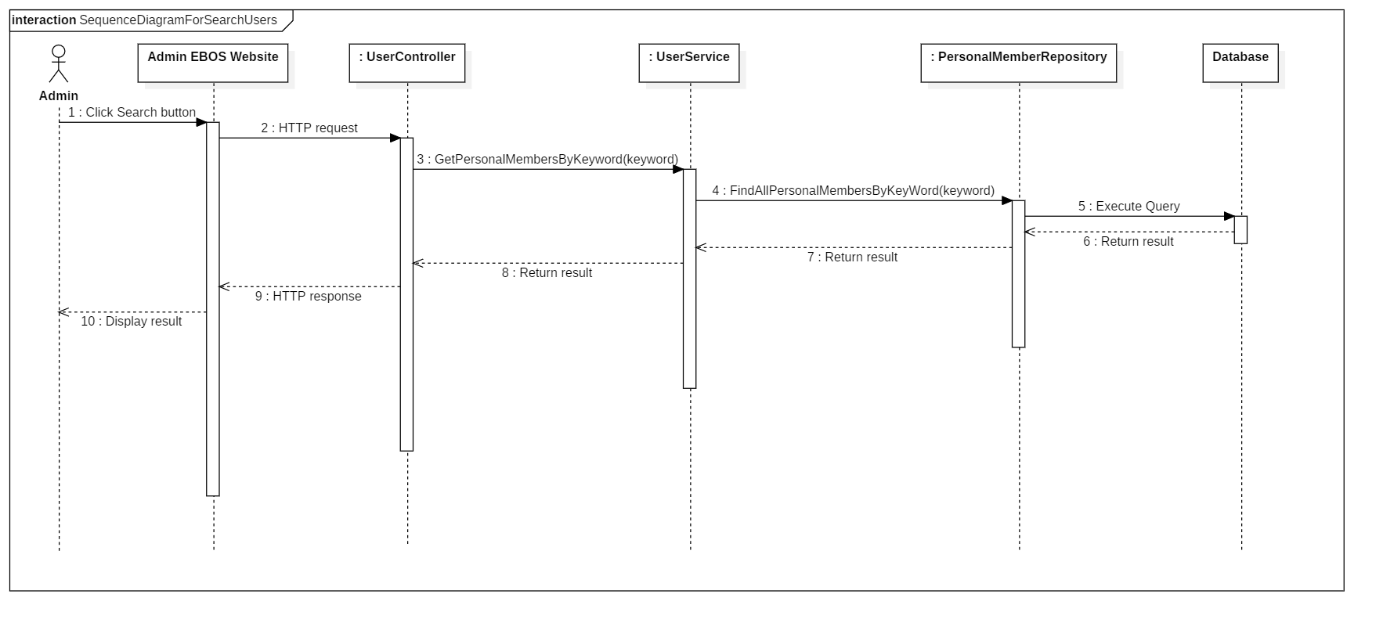


Figure 11 - Sequence Diagram for Search Users < Administrator >

##### Activate User

Summary: this diagram shows process for activate user.

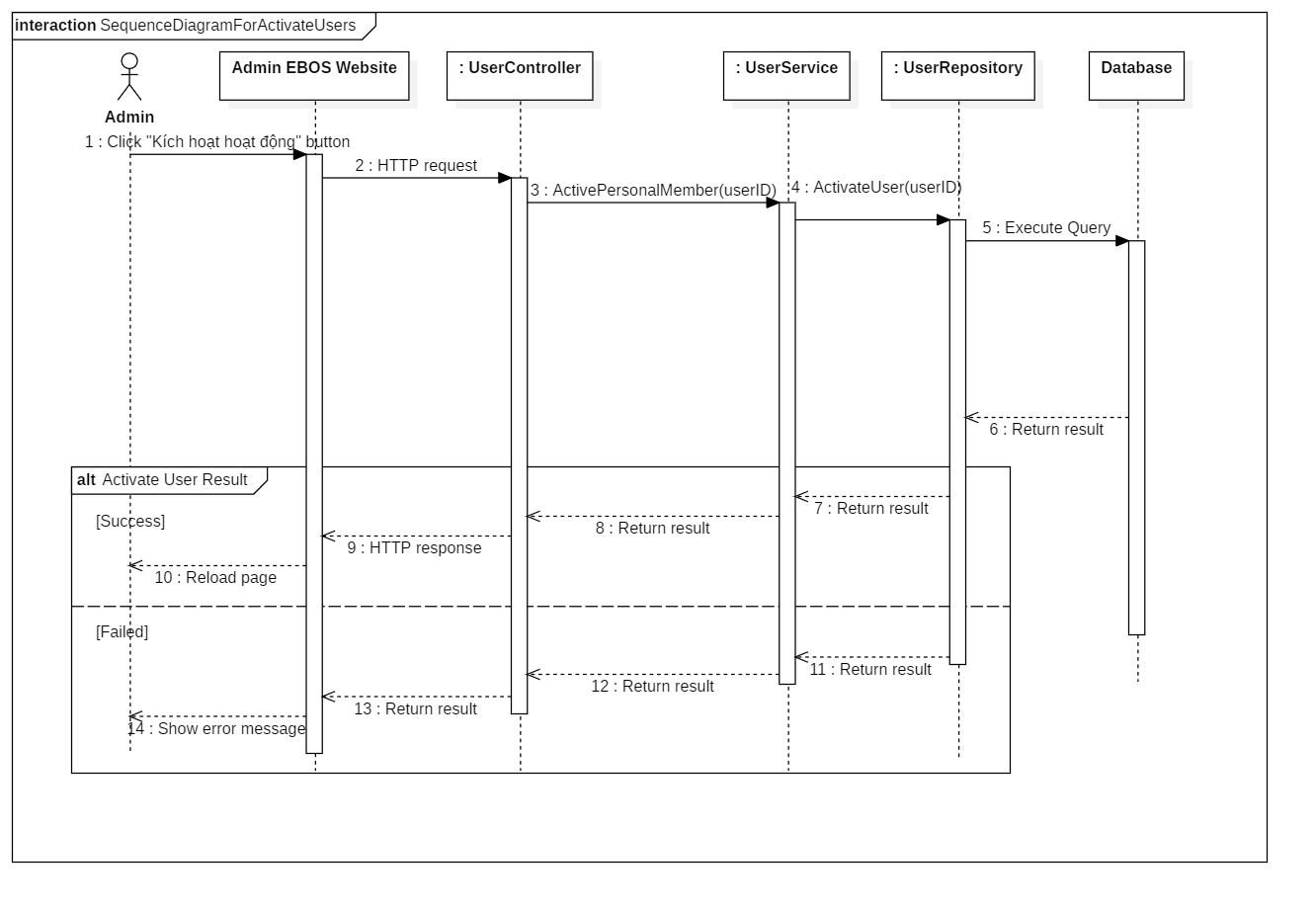


Figure 12 - Sequence Diagram for Activate User < Administrator >

##### Restrict User

Summary: this diagram shows process for restrict user.

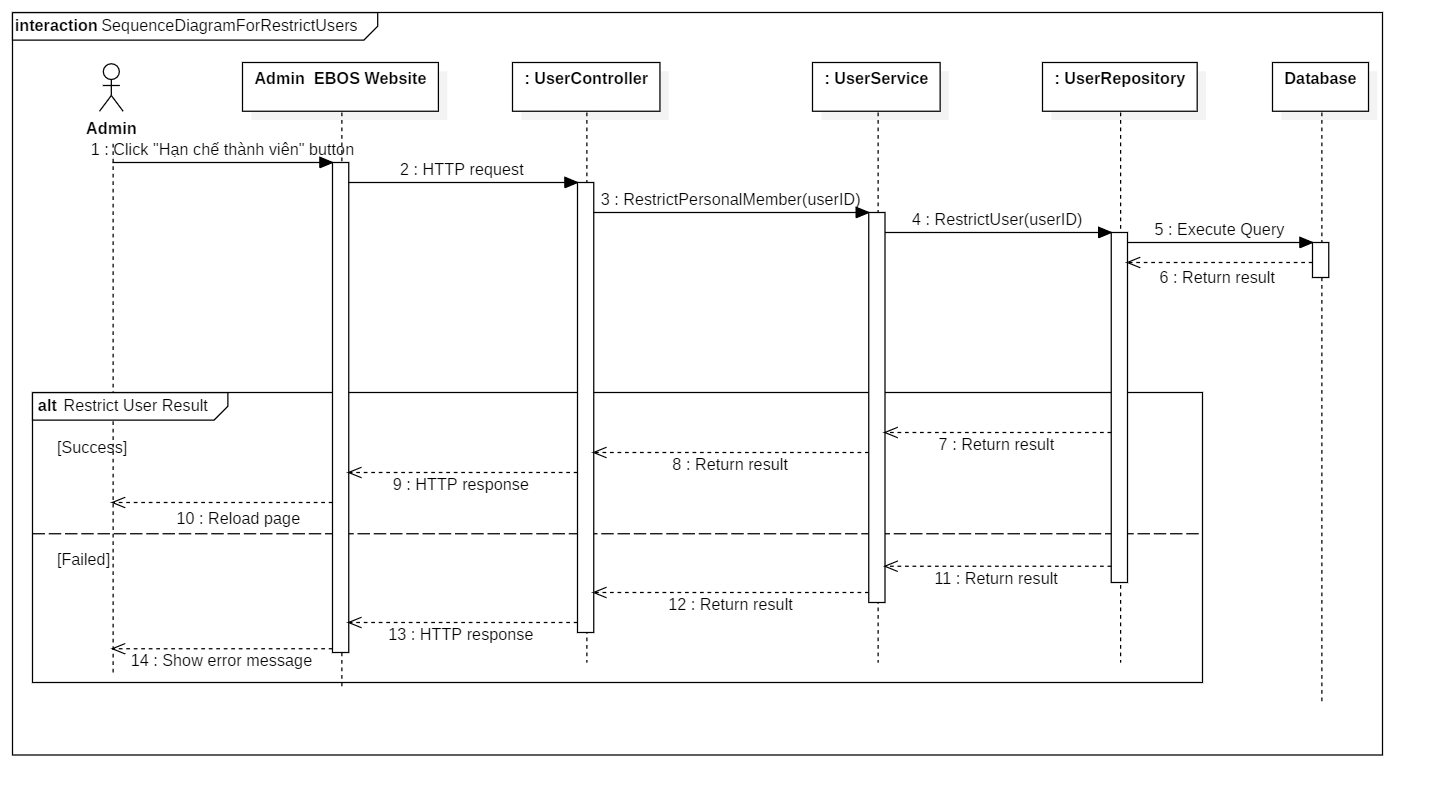


Figure 13 - Sequence Diagram for Restrict User < Administrator >

#### Auctioneer

##### Submit Auction

Summary: this diagram shows process for submit auction.

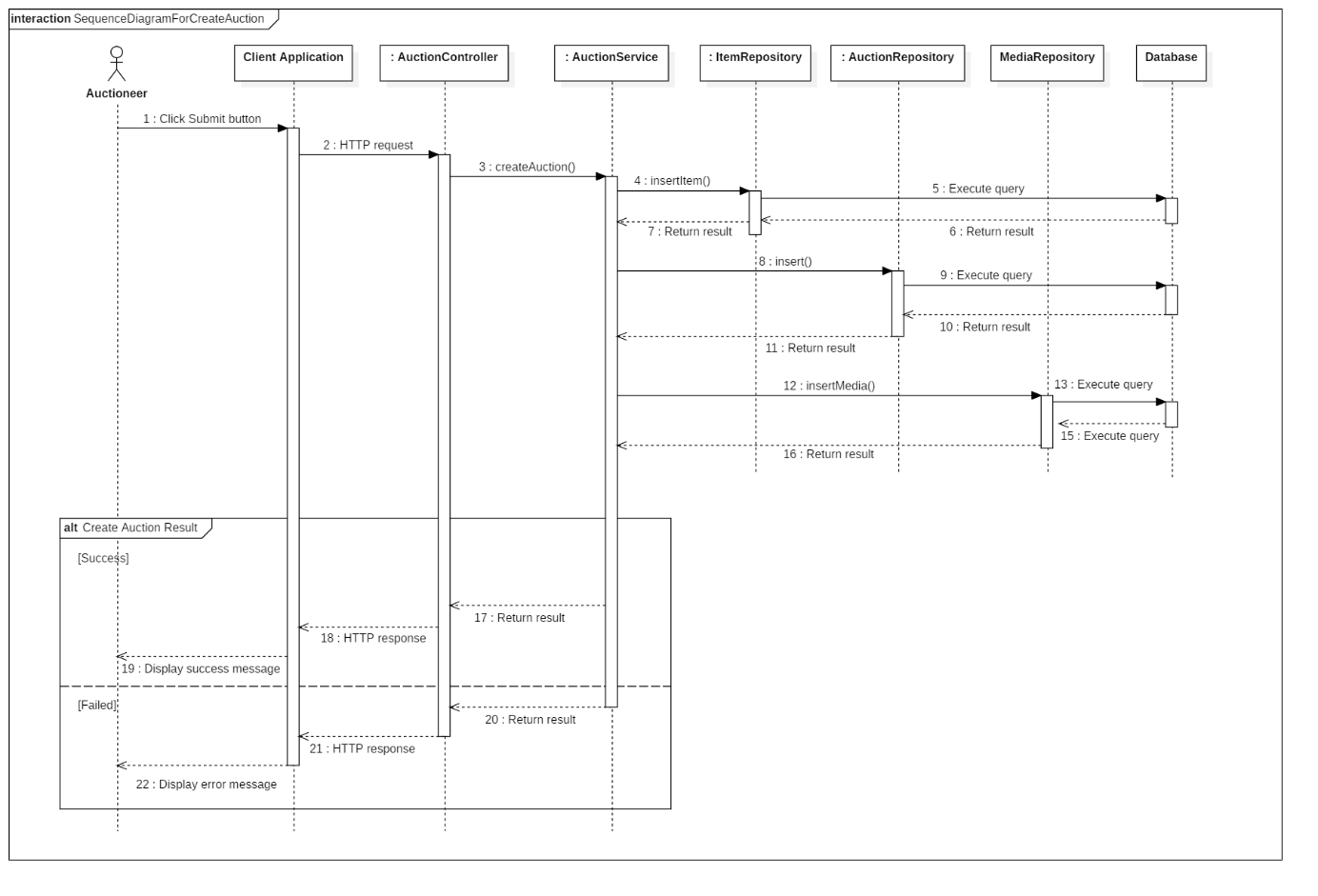


Figure 14 - Sequence Diagram for Submit Auction < Auctioneer >

#### Bidder

##### Place Bid

Summary: this diagram shows process for place bid.

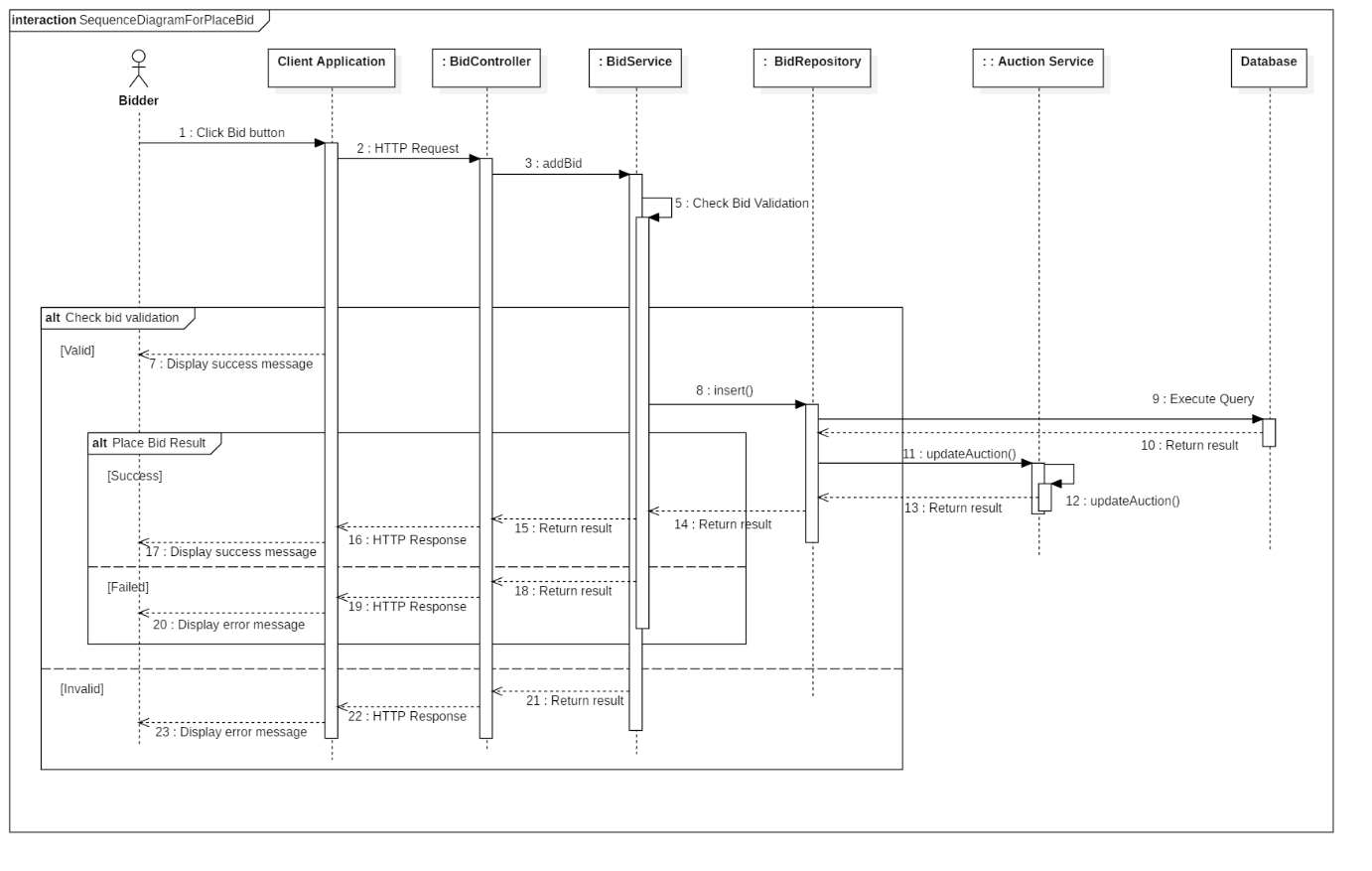


Figure 15 - Sequence Diagram for Place Bid < Bidder >

#### Auctioneer & Bidder

##### View Auction History

Summary: this diagram shows process for view auction history.



Figure 16 - Sequence Diagram for View Auction History < Auctioneer/Bidder >

##### Register address

Summary: this diagram shows process for register address.

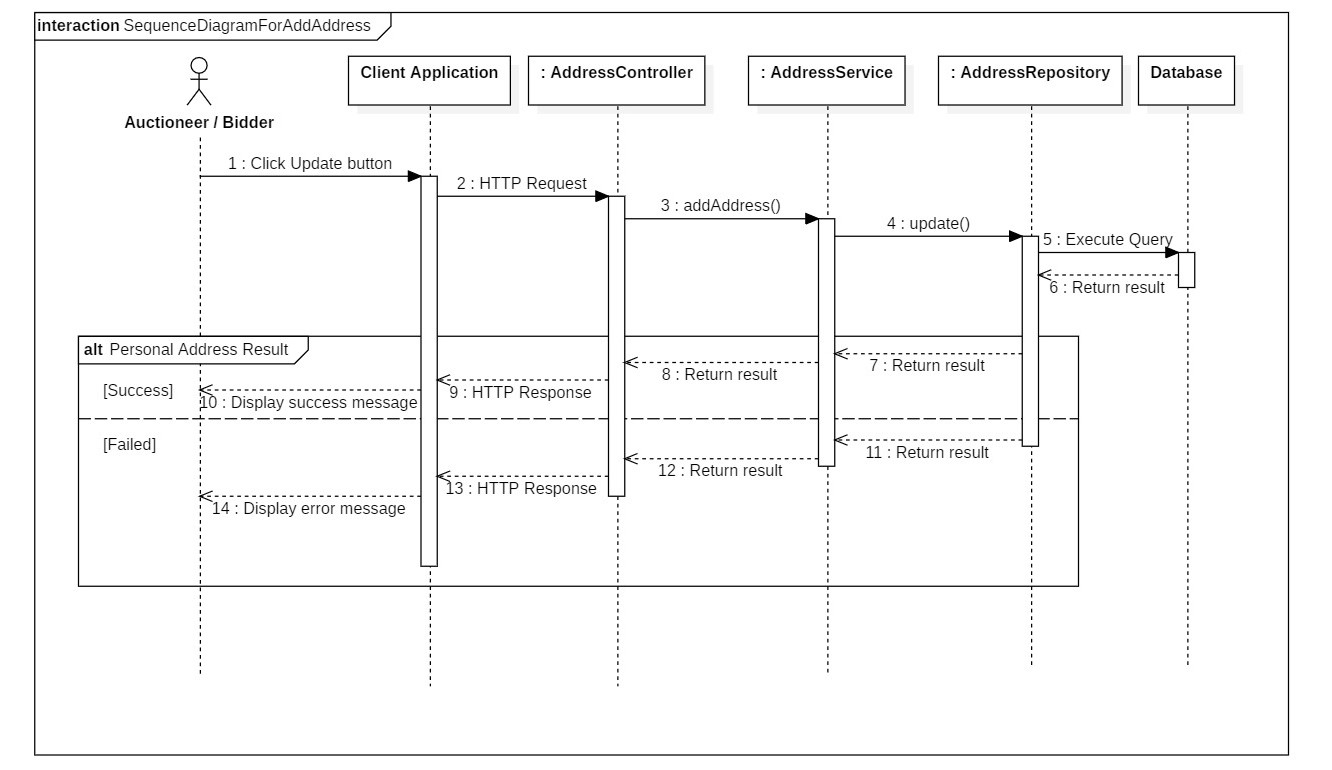


Figure 17 - Sequence Diagram for Register Address < Auctioneer/Bidder >

##### View Contact Information

Summary: this diagram shows process for view contact information of:

* winner of auction for seller
* seller of won auction for bidder

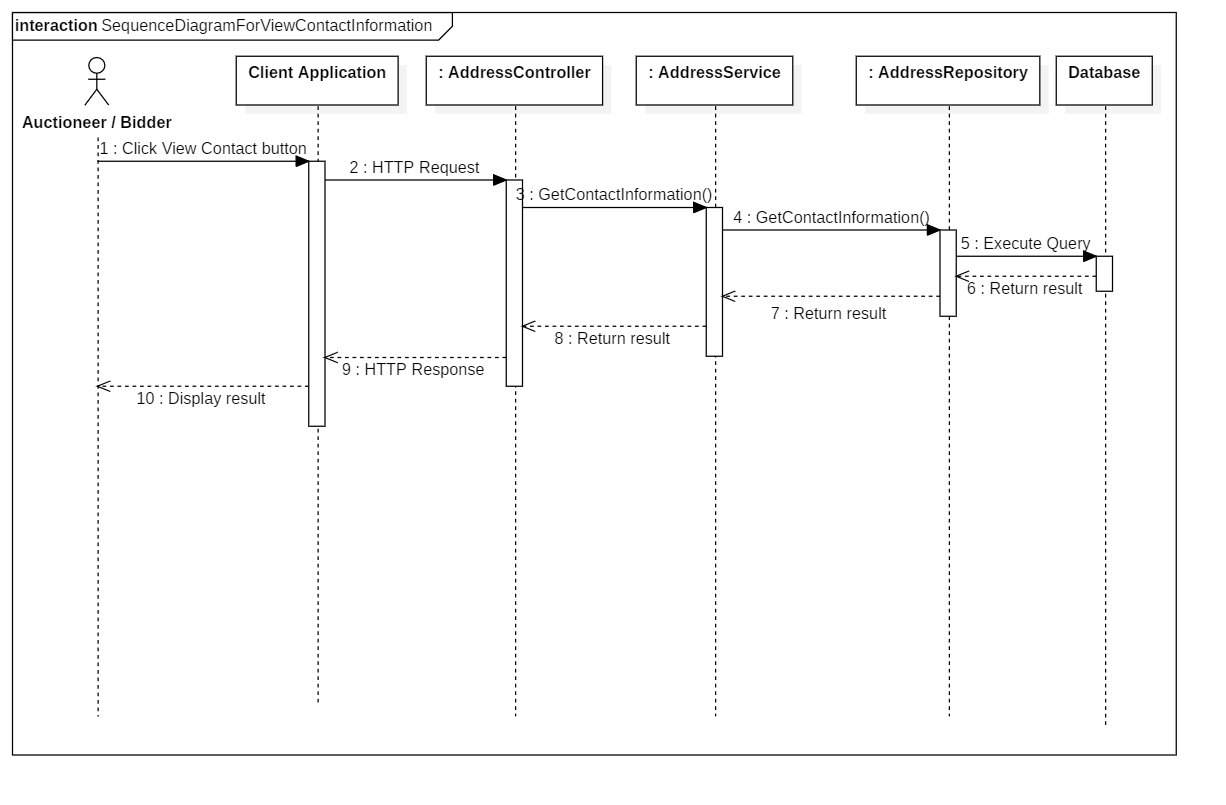


Figure 18 - Sequence Diagram for View Contact Information` < Auctioneer/Bidder >

### State Machine Diagram

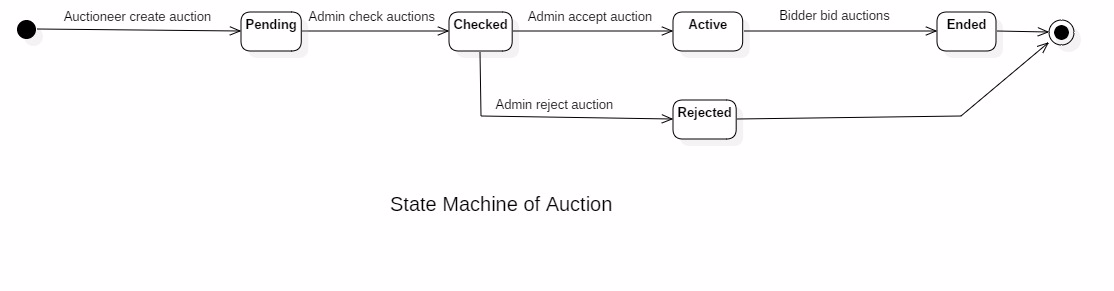


Figure 19 - State Machine Diagram of Auction

## **User Interface Design**

### Web admin application user interface

#### Login

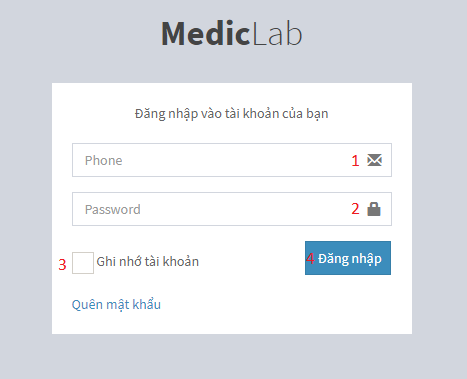


Figure 20 - Web Interface <Login>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Phone | Phone to login | No | Yes | Textbox | String |  |
| 2 | Password | Password to login | No | Yes | Textbox | String | 8-255 |
| 3 | Remember me | Auto log in | No | No | Checkbox | Boolean |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 4 | Sign In | Login into system | Validate all required fields | Navigate to Admin page |

#### View Hospital Receptionist Page

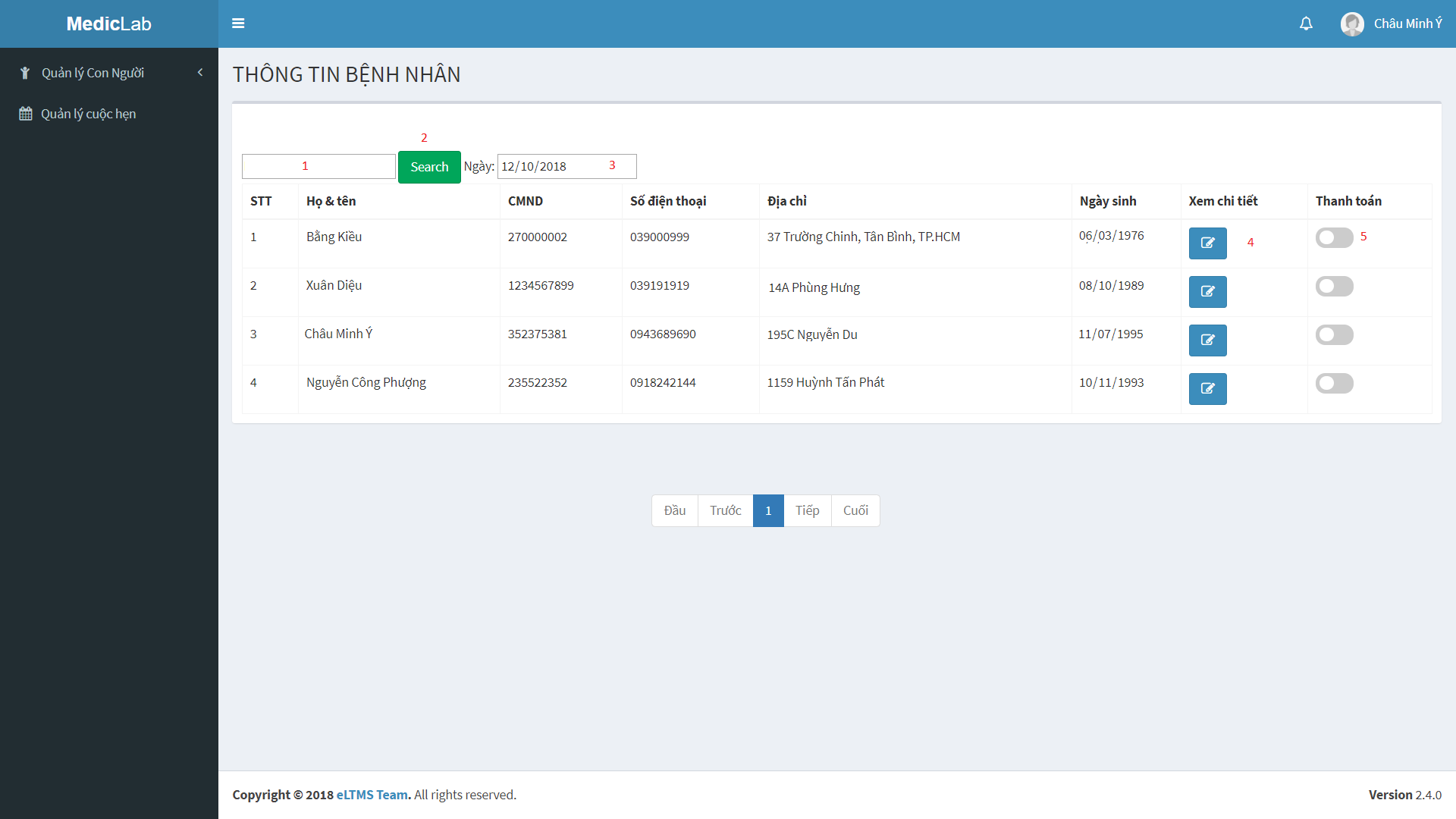


Figure 21 - Admin Web Interface <View Hospital Receptionist>

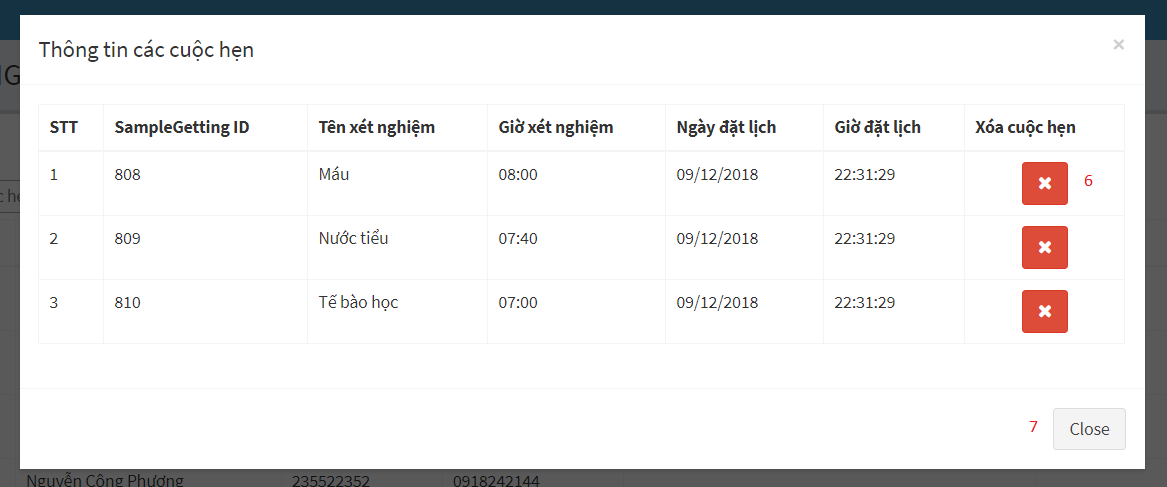


Figure 22 - Admin Web Interface <View Hospital Receptionist>



Figure 23 - Admin Web Interface <View Hospital Receptionist>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Keyword | Fill keyword to search | No | Yes | Text | String |  |
| 3 | Select Date | Select Date to show Patient | No | Yes | Date | Date |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 2 | Search | Search after getting keywork | N/A | Show list of patients by keywork |
| 4 | Show details appointment | Show list of appointments | N/A | Show list of appointments |
| 5 | Change status | Show popup for admin to check hospital fee for patient and pay it | N/A | Show list of price and confirm Y/N to change status |
| 6 | Delete sampleGetting | Delete sampleGetting after getting request | N/A | SampleGetting is deleted |
| 7 | Close popup | Close popup details appointment | N/A | Popup is closed |
| 8 | Cancel paying | Confirm payment | N/A | Status is not changed |
| 9 | Accept paying | Confirm payment | N/A | Status is changed |

#### View Department Receptionist Page

# 

Figure 24 - Admin Web Interface <View Department Receptionist>

# 

Figure 25 - Admin Web Interface <View Department Receptionist>



Figure 26 - Admin Web Interface <View Department Receptionist>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 2 | Keyword | Fill keyword to search | No | Yes | Text | String |  |
| 4 | Select sample | Select sample to show appointment | No | Yes | Dropdown list | String |  |
| 5 | Select Date | Select date to show appointment | No | Yes | Date | Date |  |
| 7 | Họ và Tên | Patient’s information | No | Yes | Textbox | String |  |
| 8 | CMND | Patient’s information | No | Yes | Textbox | String |  |
| 9 | Ngày sinh | Patient’s information | No | Yes | Date | Date |  |
| 10 | Số điện thoại | Patient’s information | No | Yes | Textbox | String |  |
| 11 | Địa chỉ | Patient’s information | No | Yes | Textbox | String |  |
| 12 | Loại xét nghiệm | Choose labtest | No | Yes | Checkbox | Boolean |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Create appointment | Create appointment for patient | N/A | Show popup appointment’s information |
| 3 | Search | Search after getting keywork | N/A | Show list of appointments by keywork |
| 6 | Change status | Show popup for admin to check hospital fee for patient and pay it | N/A | Show list of price and confirm Y/N to change status |
| 13 | Add a new appointment | Add a new appointment | N/A | A new appointment is created |
| 14 | Close popup | Close popup details appointment | N/A | Popup is closed |
| 15 | Cancel paying | Confirm payment | N/A | Status is not changed |
| 16 | Accept paying | Confirm payment | N/A | Status is changed |

#### View Nurse Page

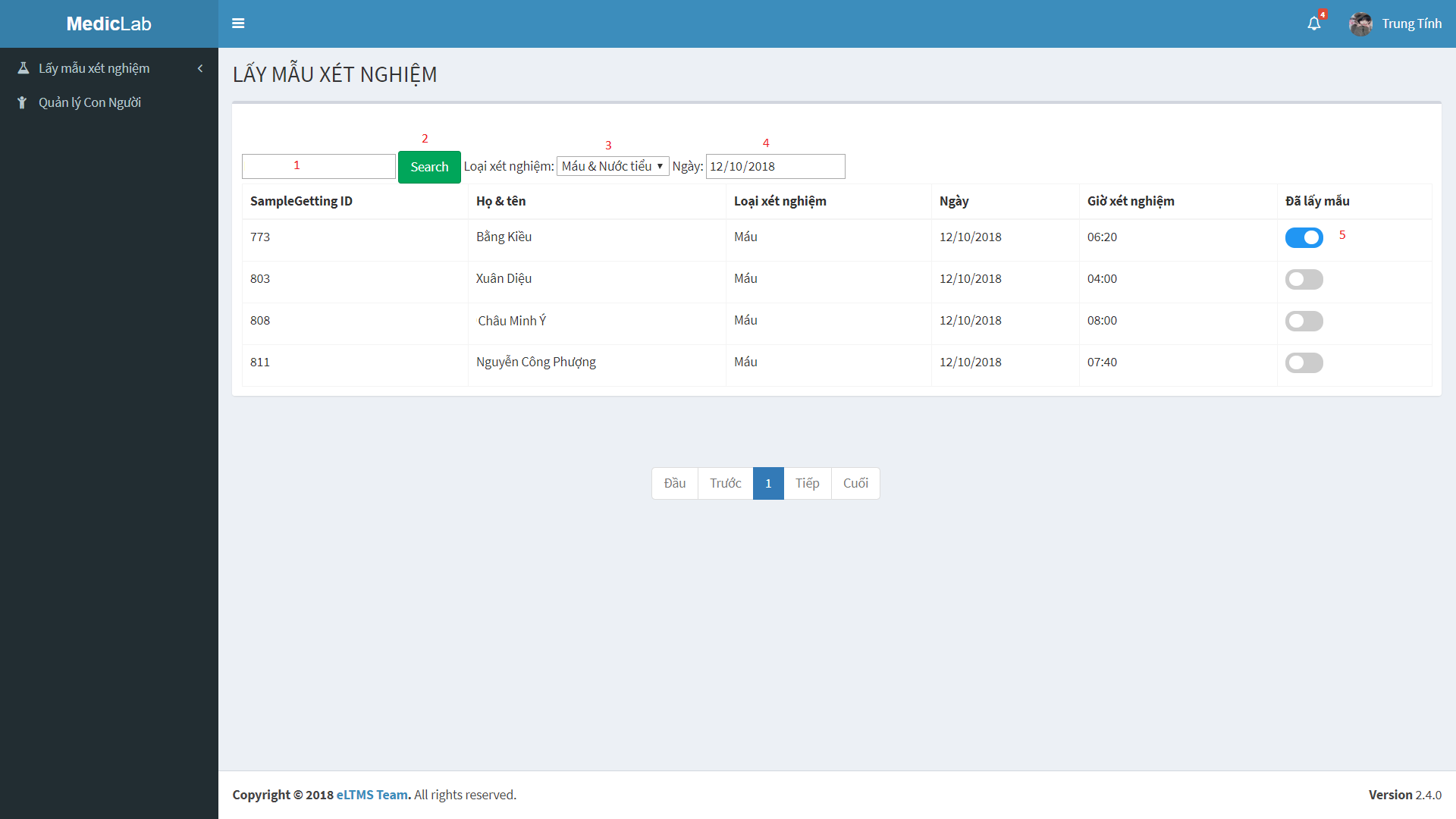


Figure 27 - Admin Web Interface <View Nurse>

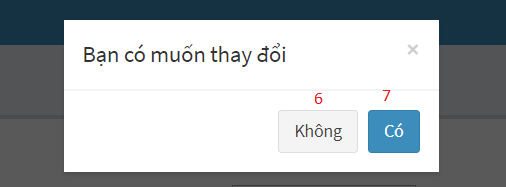


Figure 28 - Admin Web Interface <View Nurse>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Keyword | Fill Keyword to seach | No | Yes | Text | String |  |
| 3 | Select sample | Select sample to show appointment | No | Yes | Dropdown list | String |  |
| 4 | Select Date | Select date to show appointment | No | Yes | Date | Date |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 2 | Search | Search after getting keywork | N/A | Show list of appointment by keywork |
| 5 | Change status | Show popup for admin to confirm and change status | N/A | Show options to choose Y/N |
| 6 | Cancel action | Choose No | N/A | Status is not changed |
| 7 | Accept action | Choose Yes | N/A | Status is changed |

#### View Laboratory Technician Page

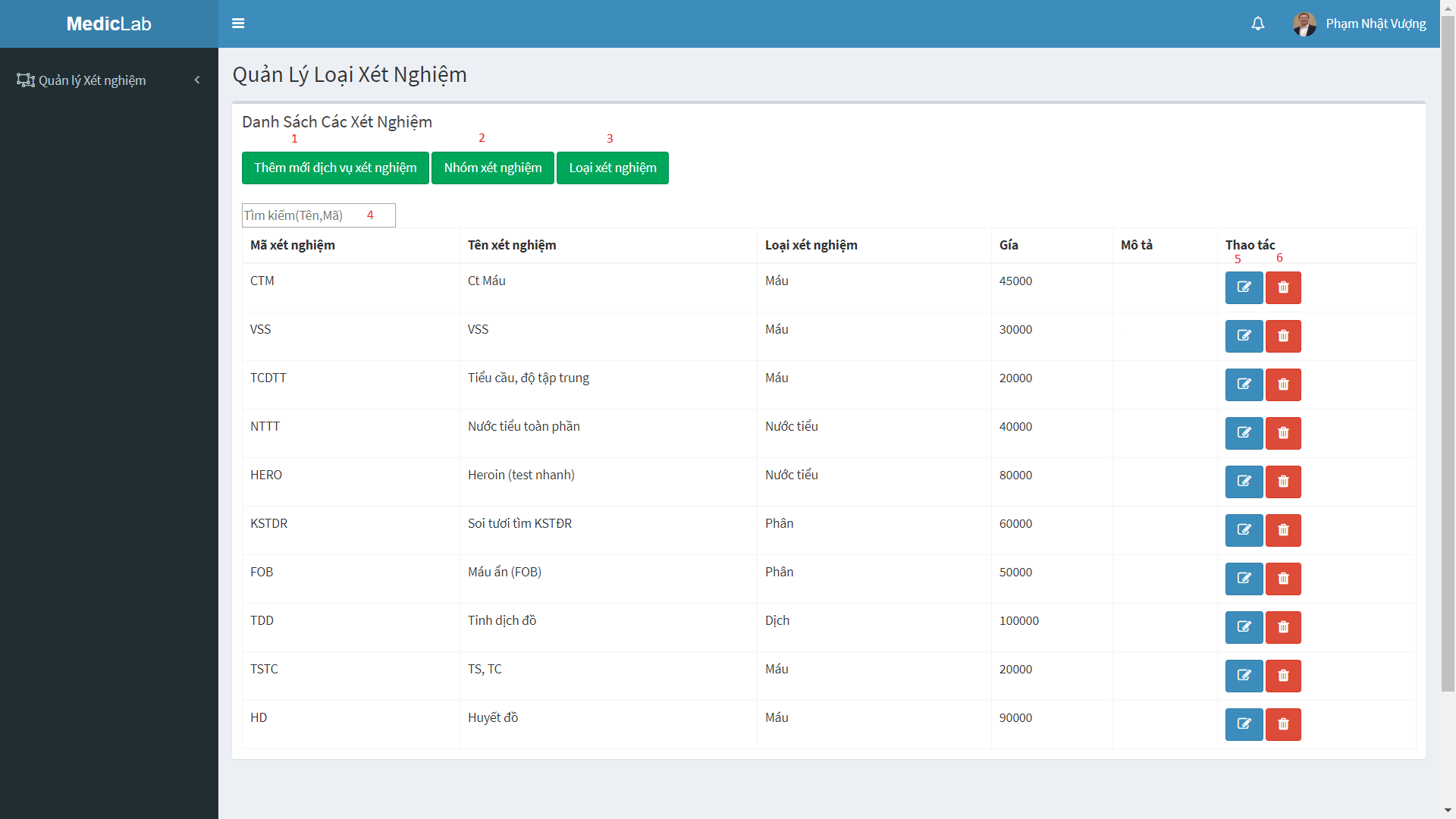


Figure 29 - Admin Web Interface <View Laboratory Technician>

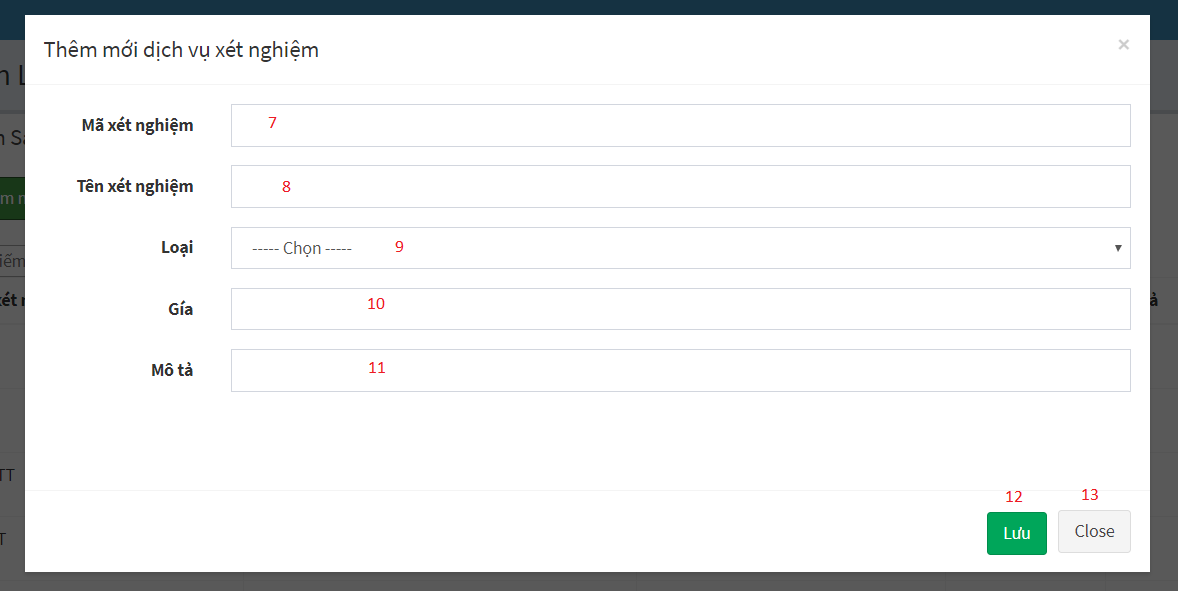


Figure 30 - Admin Web Interface <View Laboratory Technician-Add Labtest>



Figure 31 - Admin Web Interface <View Laboratory Technician-Add Sample group>

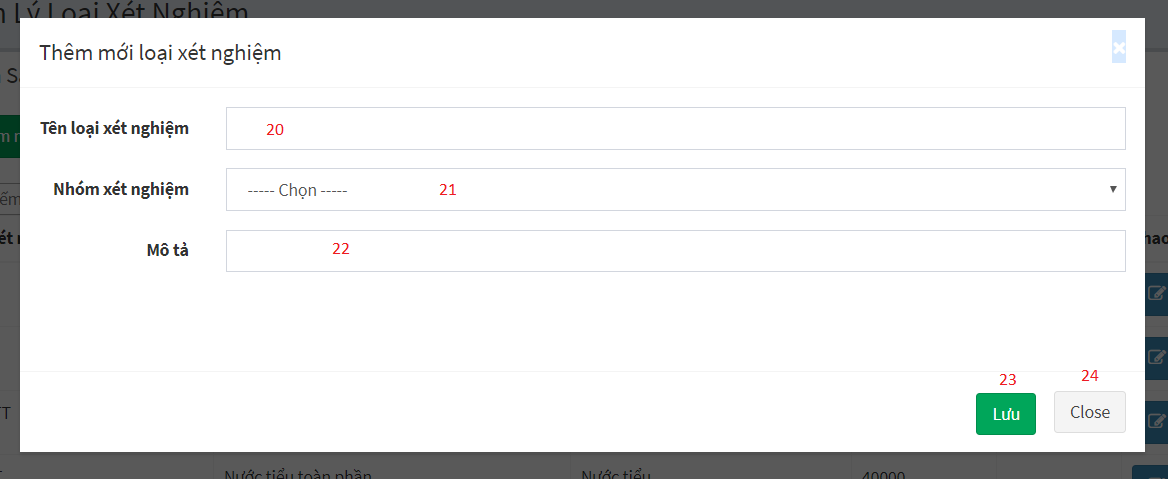


Figure 32 - Admin Web Interface <View Laboratory Technician-Add Sample>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 4 | Keyword | Fill keyword to seach | No | Yes | Text | String |  |
| 7 | Mã xét nghiệm | Labtest’s information | No | Yes | Textbox | String |  |
| 8 | Tên xét nghiệm | Labtest’s information | No | Yes | Textbox | String |  |
| 9 | Loại | Labtest’s information | No | Yes | Dropdown list | String |  |
| 10 | Giá | Labtest’s information | No | Yes | Textbox | String |  |
| 11 | Mô tả | Labtest’s information | No | Yes | Textbox | String |  |
| 14 | Tên nhóm xét nghiệm | Sample group’s information | No | Yes | Textbox | String |  |
| 15 | Thời gian tiến hành | Sample group’s information | No | Yes | Textbox | String |  |
| 16 | Bắt đầu | Sample group’s information | No | Yes | Textbox | String |  |
| 17 | Kết thúc | Sample group’s information | No | Yes | Textbox | String |  |
| 20 | Tên loại xét nghiệm | Sample’s information | No | Yes | Textbox | String |  |
| 21 | Nhóm xét nghiệm | Sample’s information | No | Yes | Dropdown list | String |  |
| 22 | Mô tả | Sample’s information | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Add new labtest | Add new labtest | N/A | Show popup to fill information of labtest |
| 2 | Add new sample group | Add new sample group | N/A | Show popup to fill information of sample group |
| 3 | Add new sample | Add new sample | N/A | Show popup to fill information of sample |
| 5 | Edit labtest | Edit information of labtest | N/A | Edit information of labtest |
| 6 | Delete labtest | Delete labtest after getting request | N/A | Labtest is deleted |
| 12 | Add a new labtest | Add a new labtest | N/A | A new labtest is created |
| 13 | Close popup | Close popup | N/A | Popup is closed |
| 18 | Add a new sample group | Add a new sample group | N/A | A new sample group is created |
| 19 | Close popup | Close popup | N/A | Popup is closed |
| 23 | Add a new sample | Add a new sample | N/A | A new sample is created |
| 24 | Close popup | Close popup | N/A | Popup is closed |

#### View Doctor Page

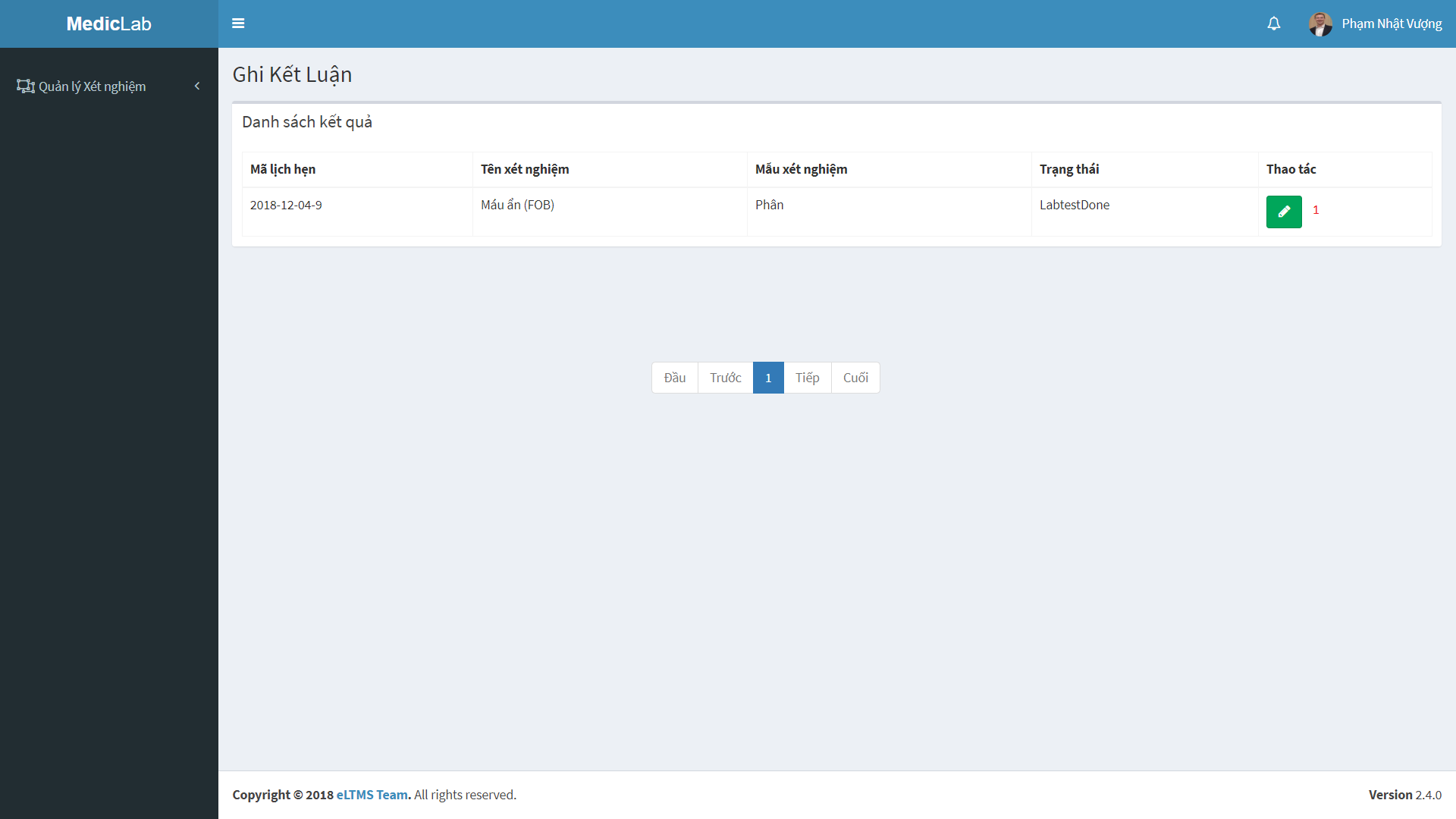


Figure 33 - Admin Web Interface <View Doctor>

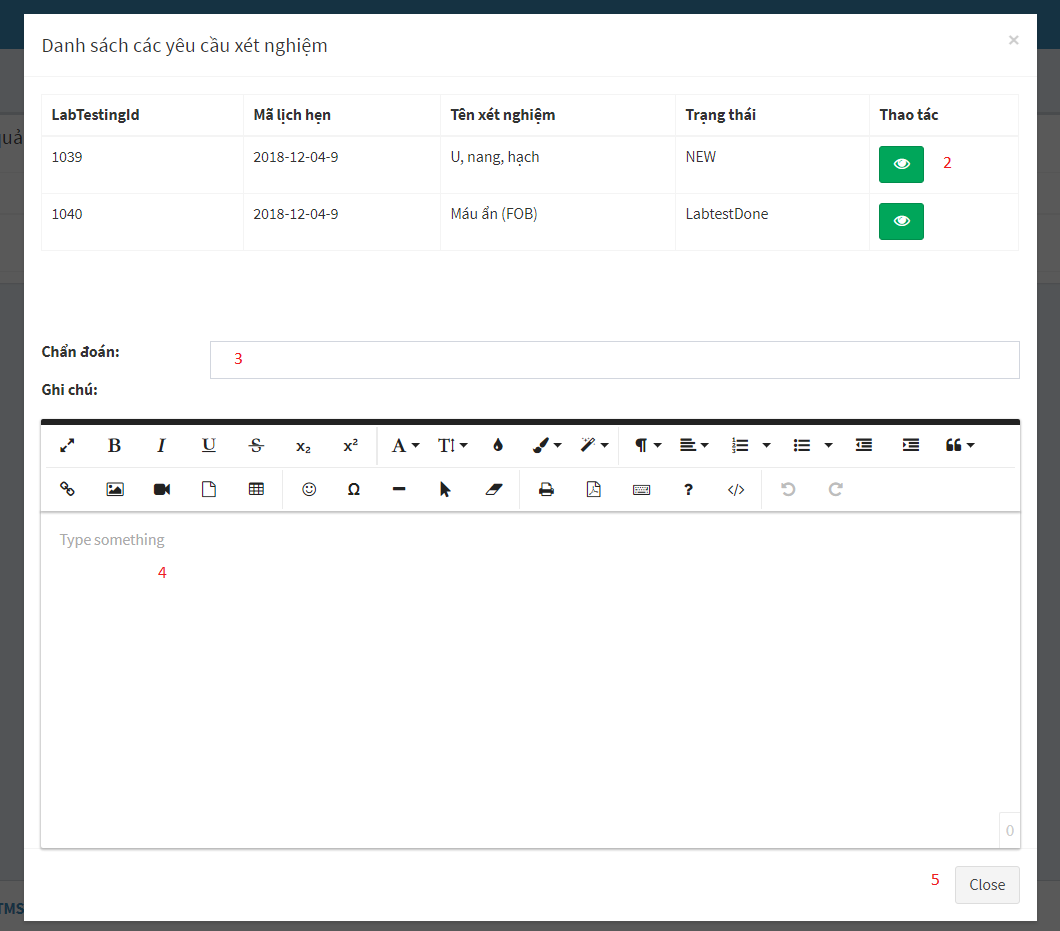


Figure 34 - Admin Web Interface <View Doctor>



Figure 35 - Admin Web Interface <View Doctor>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 3 | Chẩn đoán | Conclusion of doctor | No | Yes | Textbox | String |  |
| 4 | Ghi chú | Note of doctor | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Check for disease | View testing result, write note and conclusion | N/A | Show popup with testing result, space to write note and conclusion |
| 2 | View testing result | View testing result | N/A | Show popup with the details of testing result |
| 5 | Close popup | Close popup | N/A | Popup is closed |
| 6 | Request re-testing | Request re-testing when doctor see something wrong about testing result | N/A | Send request re-testing to patient |

### Web application user interface

#### Login

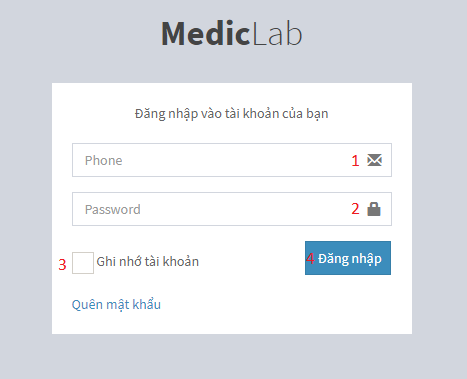


Figure 36 - Web Interface <Login>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Phone | Phone to login | No | Yes | Textbox | String |  |
| 2 | Password | Password to login | No | Yes | Textbox | String |  |
| 3 | Remember me | Auto log in | No | No | Checkbox | Boolean |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 4 | Sign In | Login into system | Validate all required fields | Navigate to User page |

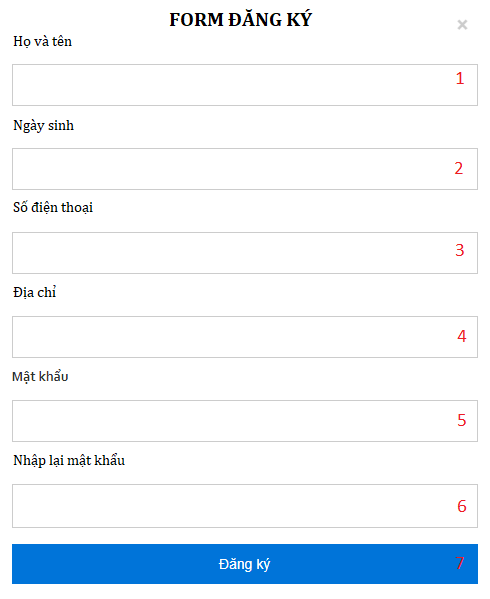


Figure 27 - Web Interface <Register account>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Username | Patient’s information | No | Yes | Text | String |  |
| 2 | DateOfBirth | Patient’s information | No | Yes | Date | Date |  |
| 3 | Phone | Patient’s information | No | Yes | Text | String |  |
| 4 | Address | Patient’s information | No | Yes | Text | String |  |
| 5 | Password | Patient’s information | No | Yes | Password | String |  |
| 6 | PasswordConfirm | Patient’s information | No | Yes | Password | String |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 7 | Register | Click to register | N/A | Navigate to Home page |

#### Nav Bar

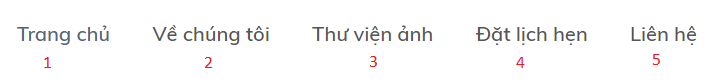


Figure 38 - Web Interface <Menu bar and Categories>

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Navigate to Home Page | N/A | N/A | Navigate to Home Page |
| 2 | Navigate to Introduction Page | Show list of categories as a drop down list | N/A | Navigate to Introduction Page |
| 3 | Navigate to Photo Library Page | N/A | N/A | Navigate to Photo Library Page |
| 4 | Navigate to Book Appointment Page | N/A | N/A | Navigate to Book Appointment Page |
| 5 | Navigate to Contact us | N/A | N/A | Navigate to Contact us |

#### Home Page

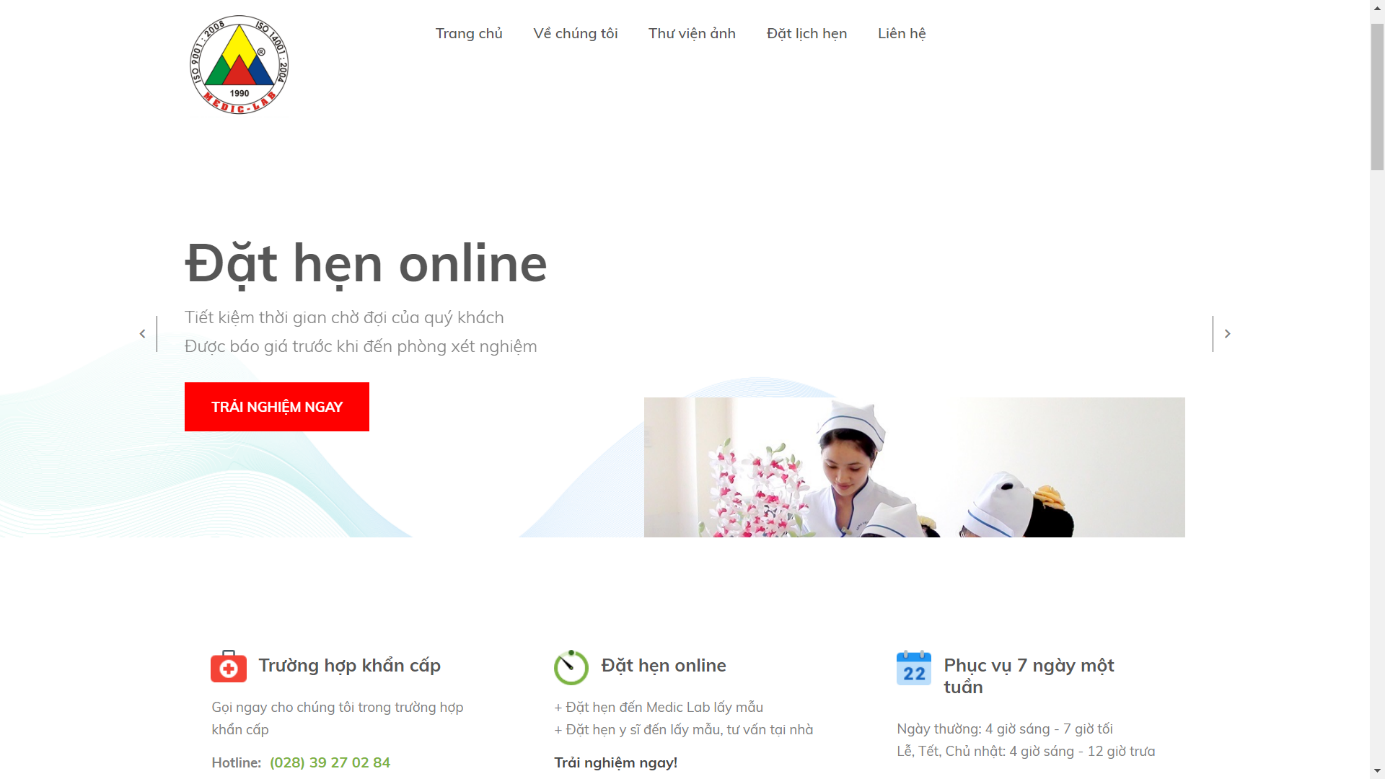


Figure 39 - Web Interface <Home page>



Figure 40 - Web Interface <Home page – Our partner>

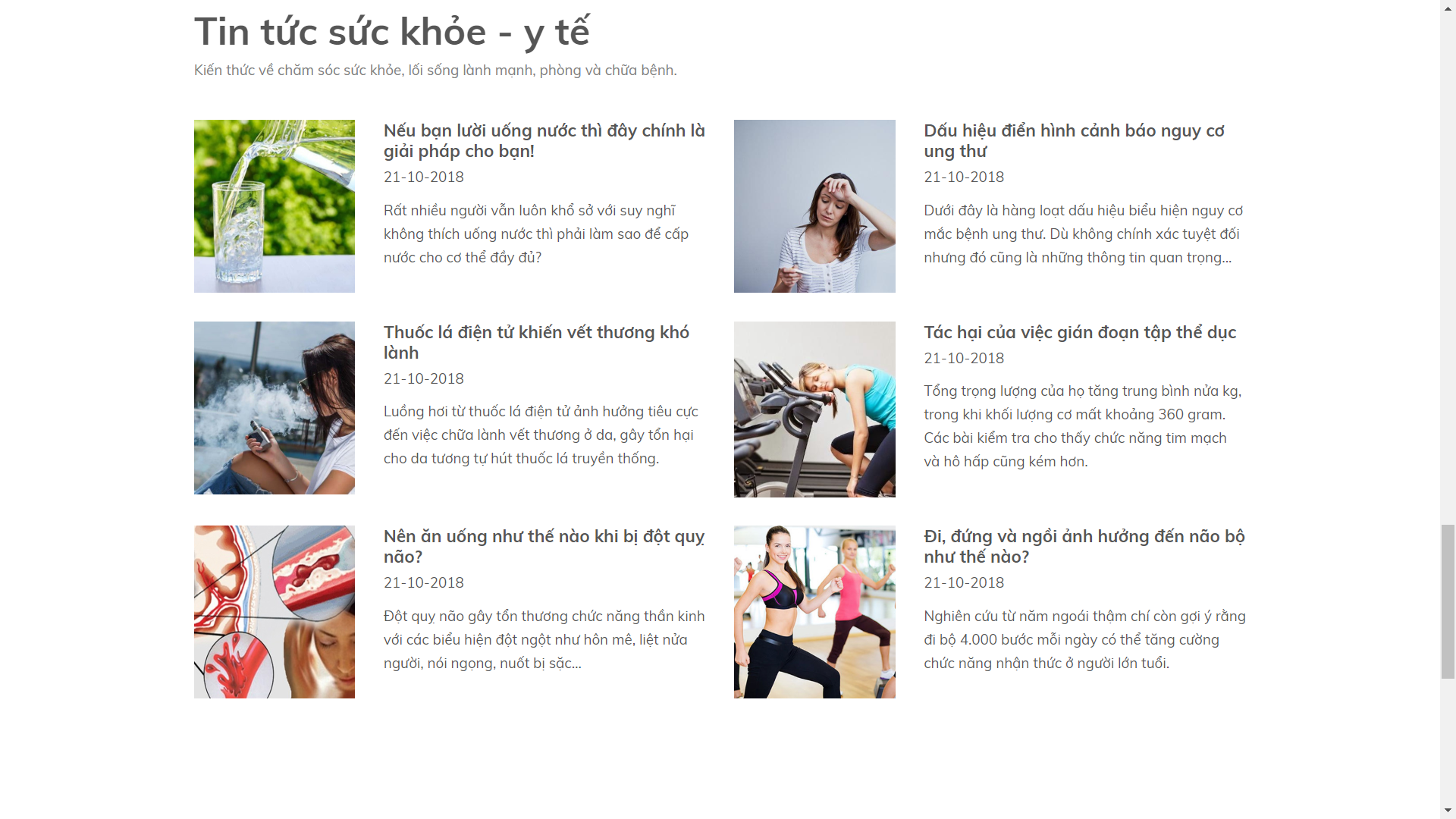


Figure 41 - Web Interface <Home page - News>

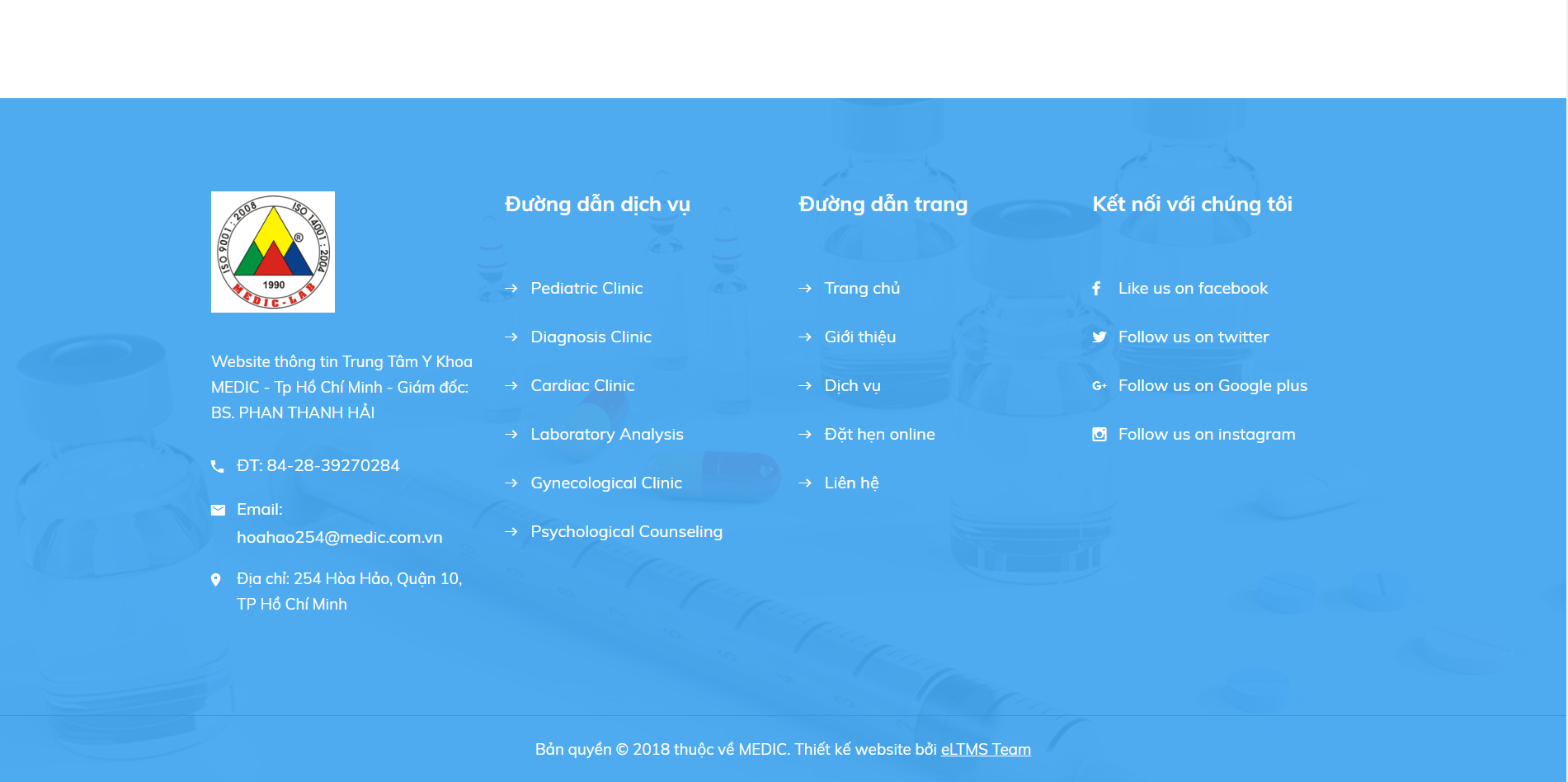


Figure 42 - Web Interface <Home page – Contact us >

#### Book Appointment

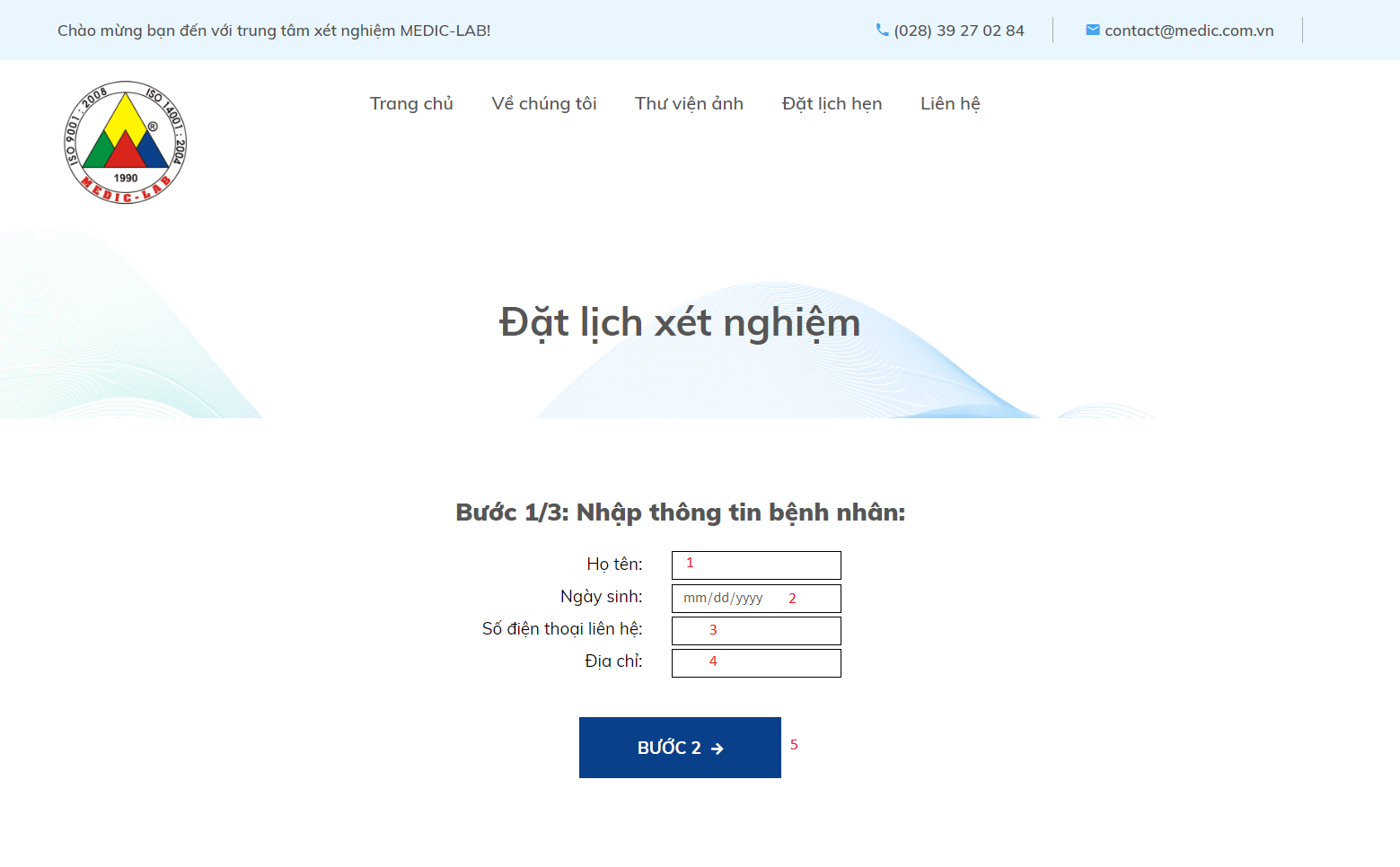


Figure 43 - Web Interface <Book Appointment>

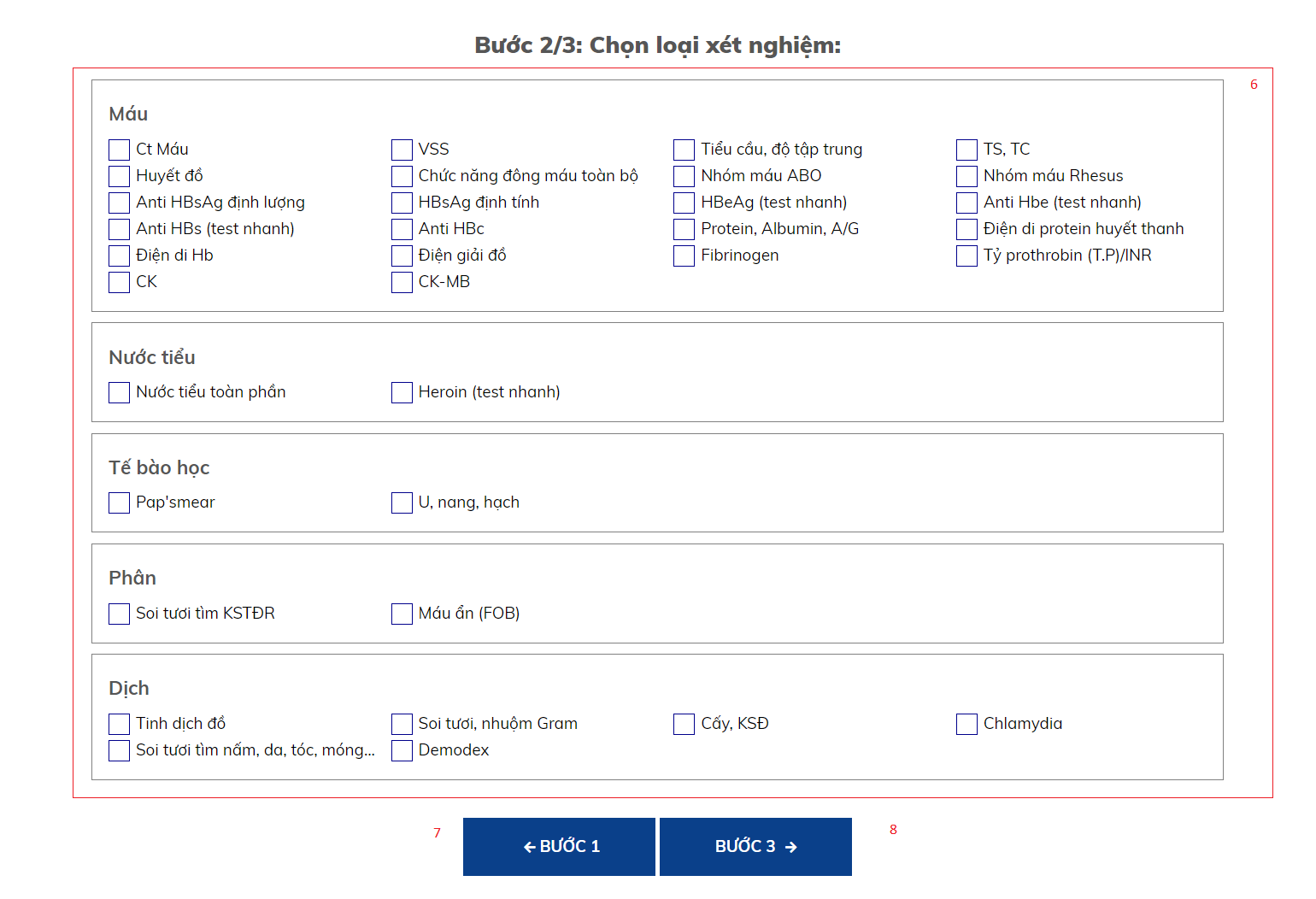


Figure 44 - Web Interface <Book Appointment>



Figure 45 - Web Interface <Book Appointment>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Họ và Tên | Patient’s information | No | Yes | Textbox | String |  |
| 2 | Ngày sinh | Patient’s information | No | Yes | Date | Date |  |
| 3 | Số điện thoại | Patient’s information | No | Yes | Textbox | String |  |
| 4 | Địa chỉ | Patient’s information | No | Yes | Textbox | String |  |
| 6 | Loại xét nghiệm | Choose labtest | No | Yes | Checkbox | Boolean |  |
| 9 | Ngày | Choose approriate time to test | No | Yes | Dropdown list | String |  |
| 10 | Giờ | Choose approriate time to test | No | Yes | Dropdown list | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 5 | Go to step 2 | Click “Bước 2” to go to step 2 | Validate all required fields | Go to step 2 |
| 7 | Go back to step 1 | Click “Bước 1” to go back to step 1 | N/A | Go back to step 1 |
| 8 | Go to step 3 | Click “Bước 3” to go to step 3 | Choose a least one labtest | Go to step 3 |
| 11 | Go back to step 2 | Click “Bước 2” to go back to step 2 | N/A | Go back to step 2 |
| 12 | Submit | Complete booking a new appointment | Validate all required fields | Booking successfully |

#### View list of Booked Appoinments

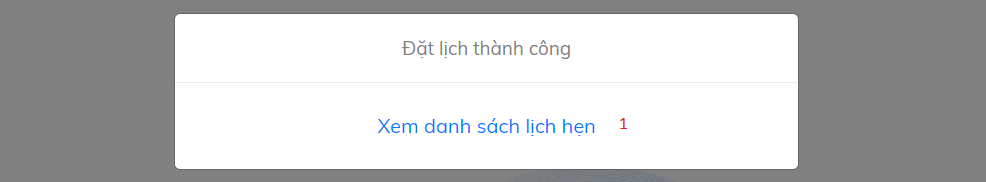


Figure 46 - Web Interface <View list of booked Appointments>

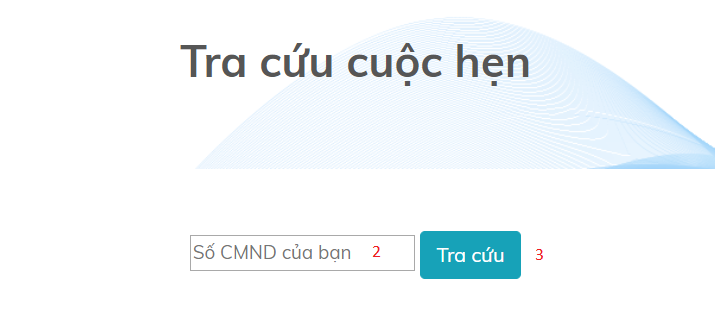


Figure 47 - Web Interface <View list of booked Appointments>

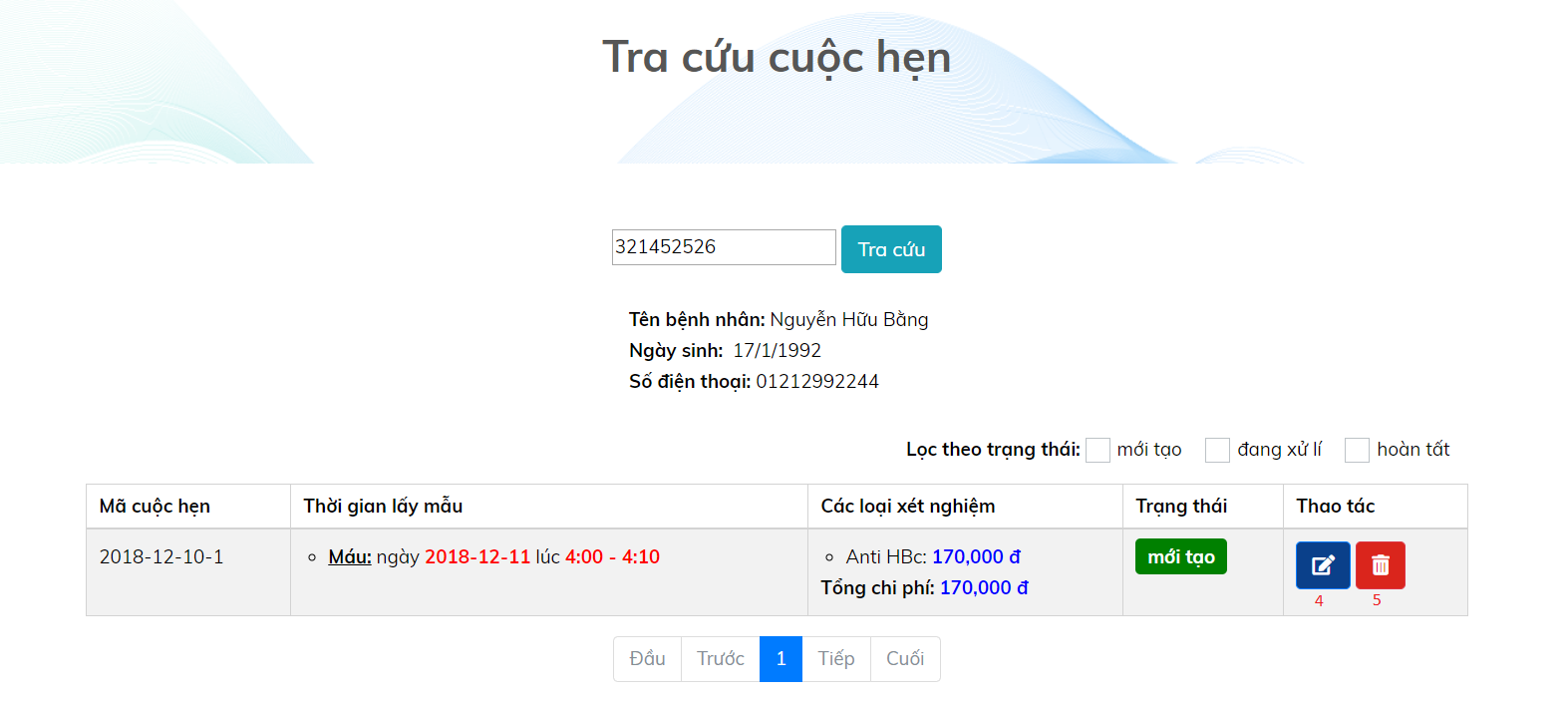


Figure 48 - Web Interface <View list of booked Appointments>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 2 | CMND | Input id into textbox area | No | No | Text | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Navigate to Auctions by View Appointment Page | When user clicks on the link, navigate to a page showing textbox to fill id | N/A | Navigate to a page show textbox to fill id of patient |
| 3 | Search | Click “Tra cứu” to get result from system | N/A | Go to View Appointment Page |
| 4 | Edit appointment | Edit time, sample, labtest for appointment | N/A | Patient’s appointment will be updated |
| 5 | Delete appointment | Delete appointment | N/A | Appointment is deleted |

Figure 36 - Web Interface < Categories bar and sort>

#### View Testing Result



Figure 49 - Web Interface <View Testing Result>

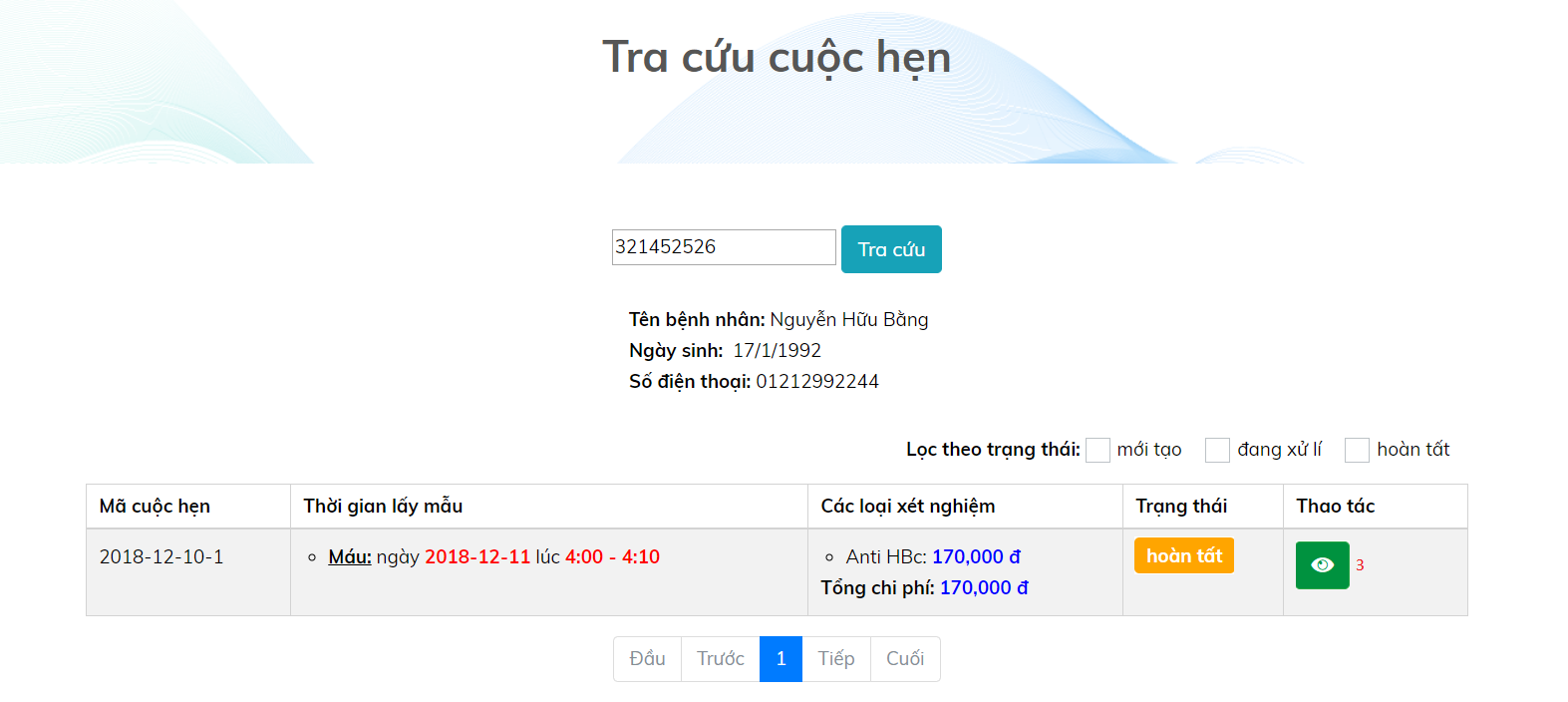


Figure 50 - Web Interface <View Testing Result>

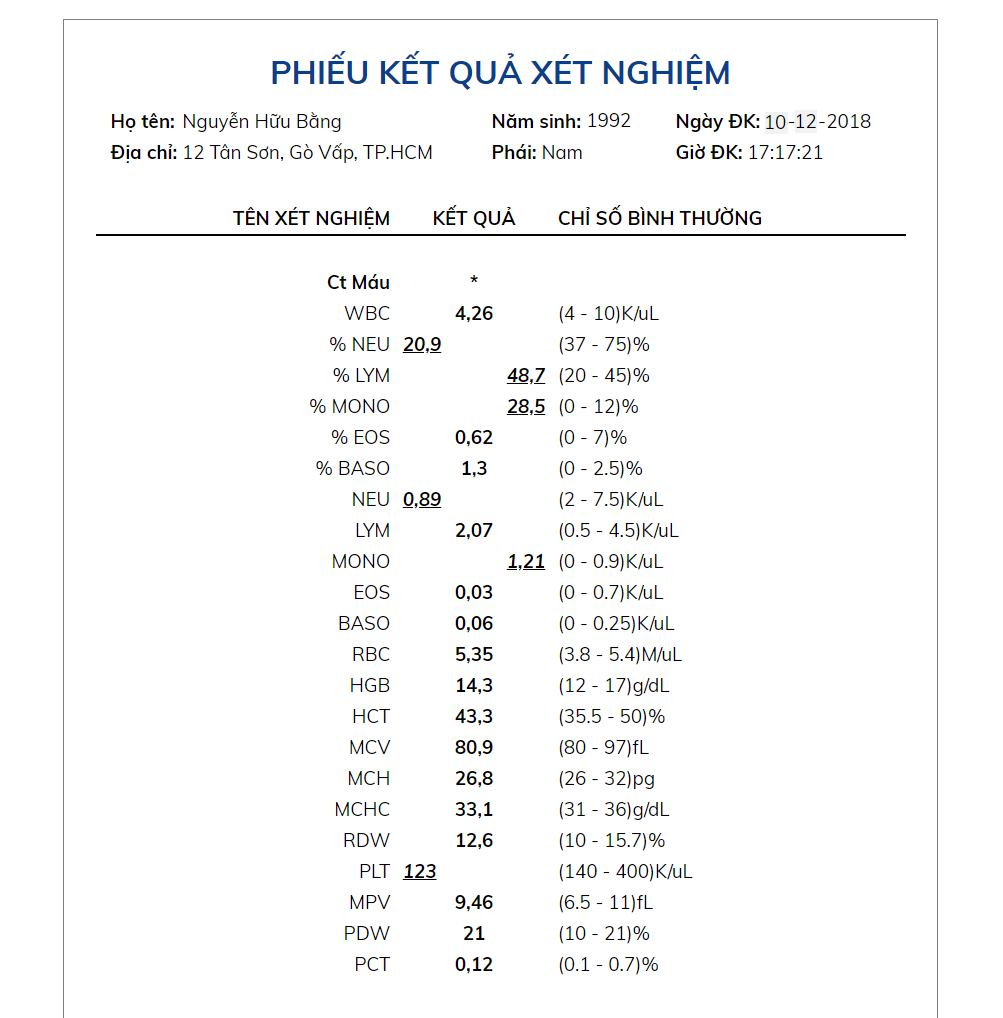


Figure 51 - Web Interface <View Testing Result>

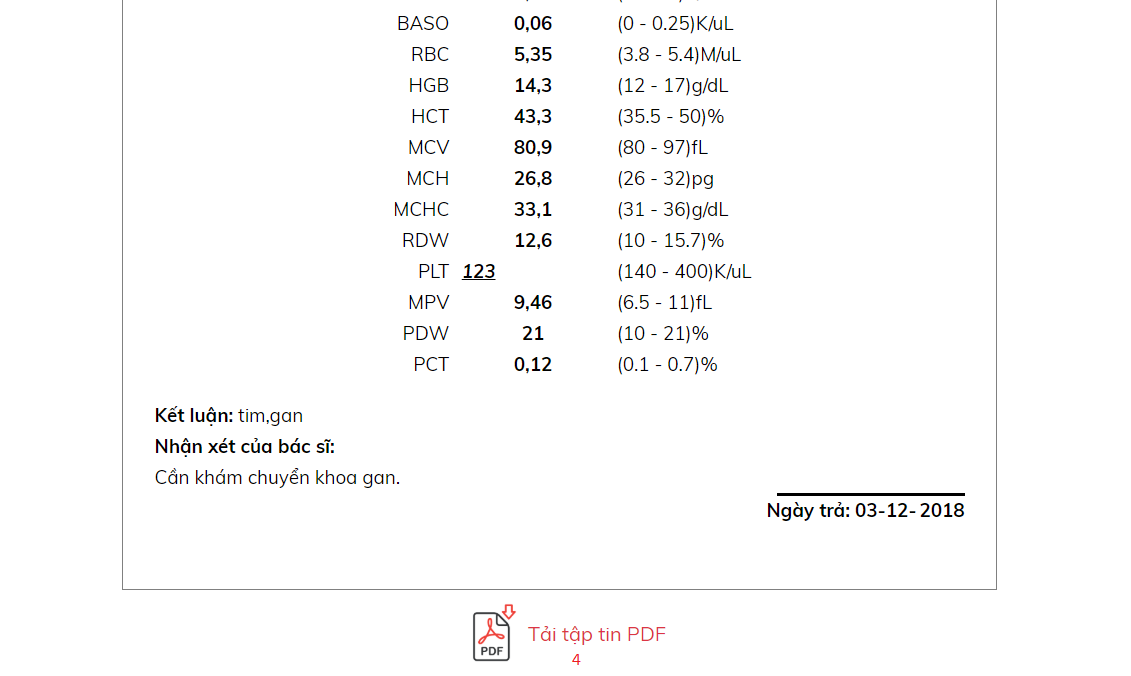


Figure 52 - Web Interface <View Testing Result>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | CMND | Input id into textbox area | No | No | Text | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 2 | Search | Click “Tra cứu” to get result from system | N/A | Go to View Appointment Page |
| 3 | View testing result | View testing result | N/A | Go to Result Appointment Page |
| 4 | Download testing result | User can download testing result file as pdf file | N/A | Testing result file will be downloaded |

### Mobile application user interface

#### Login page



Figure 53 - Mobile Interface <Login>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Phone | Phone to login | No | Yes | Textbox | String |  |
| 2 | Password | Password to login | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 3 | Sign In | Login into system | Validate all required fields | Navigate to Home page |
| 4 | Navigate to Register Page | N/A | N/A | Navigate to Register Page |

#### Register Account page

Figure 55 - Mobile Interface <Register account>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Username | Username to register | No | Yes | Textbox | String |  |
| 2 | Phone | Phone to register | No | Yes | Textbox | String |  |
| 3 | Email | Email to register | No | Yes | Textbox | String |  |
| 4 | Full name | Fullname to register | No | Yes | Textbox | String |  |
| 5 | Date of Birth | D.O.B to register | No | Yes | Datepicker | Date |  |
| 6 | Password | Password to register | No | Yes | Textbox | String |  |
| 7 | Re-Password | Re-Password to confirm password | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 8 | Register | Register into system | Validate all required fields | Navigate to Phone verify page, then navigate to Login Page |
| 9 | Navigate to Login Page | N/A | N/A | Navigate to Login Page |

## **Database Design**

### Entity relationship diagram (ERD)

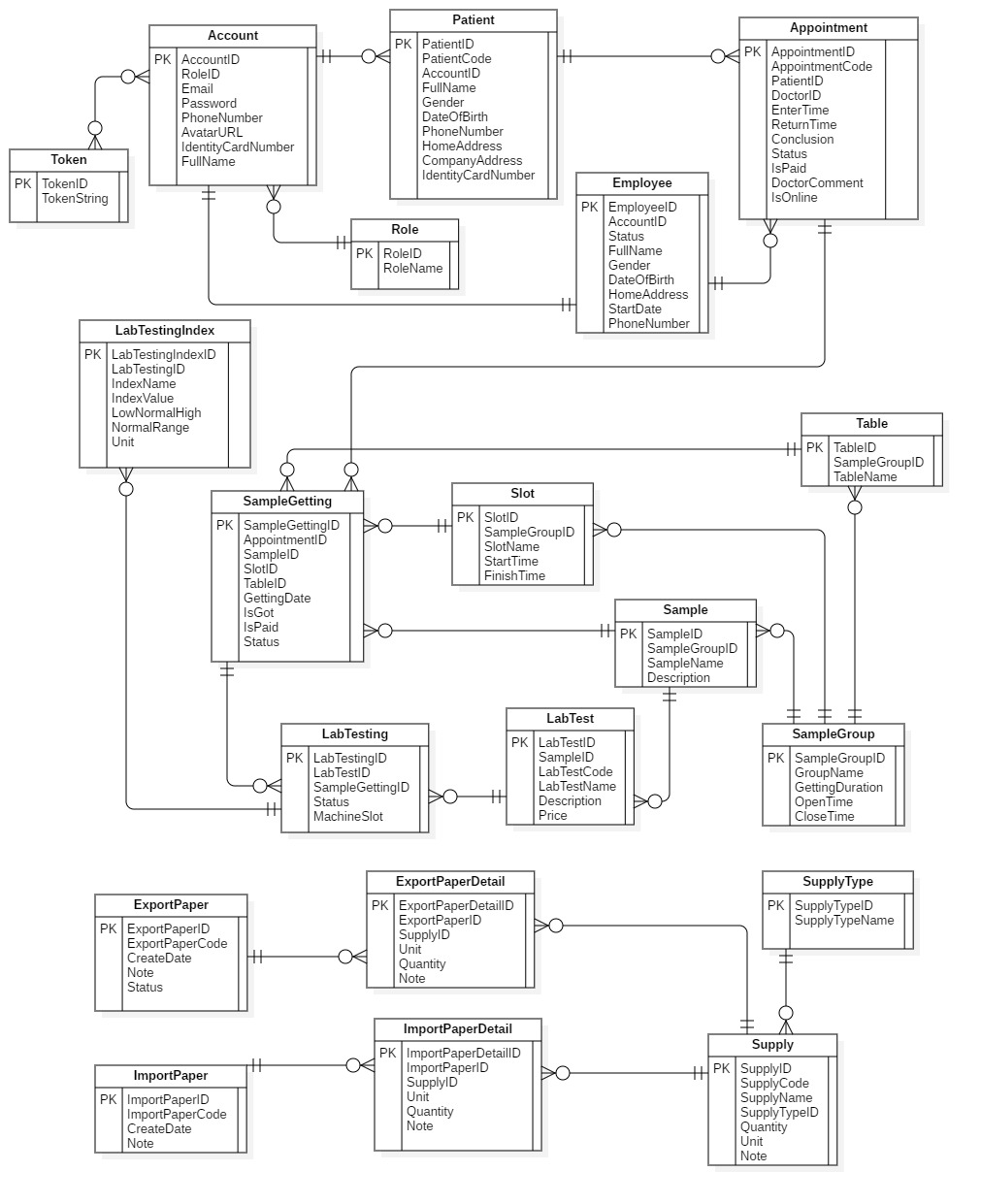


Figure 67 - Entity relationship diagram (ERD)

### Entity dictionary

|  |  |
| --- | --- |
| Entity Data Dictionary: describe content of all entities | |
| **Entity name** | **Description** |
| User | Contains the user information |
| Admin | Contains the admin information |
| Personal Member | Contains the personal member (auctioneer, bidder) information |
| Role | Contains the role information |
| UserRole | Contain the user’s roles information |
| Address | Contain the address roles information |
| Item | Contains the item information |
| Auction | Contains the auction information |
| Category | Contains the category information |
| Media | Contains the media information |
| Bid | Contains the bid information |
| MinIncrementRule | Contains the minimum increment rule information (for calculating minimum bid that bidder has to place on an item). |

Table 14 - Entity dictionary

## **Algorithms**

### Slot Suggestion

#### Definition

Generate the set of samples getting slots which has minimum total time.

#### Define problem

- When create a new appointment, user often have to spend a lot of effort to choose the suitable slots. Then, there is a need for an automatic solution using algorithms.

- There are N sample-gettings that the patient needs to perform. (blood getting, urine getting, are sample-gettings)

- Each room has a set of slots which have the same durations. Different sample getting rooms can have different slot durations.

- Assume that patients need to do all sample-gettings that they chosed in ONE day, so that the total time is minimum.

#### Solution

We use permutation recursive permutation and dynamic programming (DP) to solve this problem. We follow 2 steps:

* Step 1: Consider each permutation of N sample getting rooms in order, we use DP to calculate the optimized set of slots in the order of sample-gettings.
* Step 2: DP Formula:
* Assume that T[i][j].StartTime: the start time of the j-slot in the i-th slot set. (the i-th slot set belongs to the i-th sample getting).
* Assume that T[i][j].FinishTime: the finish time.
* Assume that dp[i][j] is the minimum waiting time (between slots of sample gettings) if the last sample-getting is the i-th one and the it’s chosed slot is the j-th slot. i is from 0 to N-1, j is from 0 to Length of i-th slot set – 1. Because the sample-gettings’ duration is fixed, the order, which has the minimum waiting time, has the minimum total time.
* dp[i][j] = min {dp[i-1][k] + (T[i-1][k].StartTime – T[i][j].FinishTime) | T[i-1][k].StartTime – T[i][j].FinishTime > 0}.
* Base: dp[0][j] = T[0][j] – comingTime. (comingTime: the time that the patient arrives at the hospital).
* The result of problem is min {dp[n-1][j]}.
* Step 3: Trace to get the optimized order of slots.

#### Complexity

The complexity of this algorithm is **O(N! \* N3). In which, N is the number of selected Samples of a patient on a day.**

#### C:\Users\Duc\AppData\Local\Microsoft\Windows\INetCache\Content.Word\eLTMS-DP.PNGFlowchart