# Software Design Description

## Design Overview

* This document describes the technical and user interface design of **Information Management System of a data center**. It includes the architectural design, the detailed design of common functions and business functions.
* 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:** The overall description of the system architectural design.
* **Section 3:** Component diagrams that describe the connection and integration of the system.
* **Section 4:** Detail design description, which includes class diagram, class explanation, and sequence diagram to describe the functions.
* **Section 5:** The user interface of application.
* **Section 6:** Database design with logical diagram.
* **Section 7:** The algorithms used for academic classification, considering honor, considering upgrading.

## System Architectural Design

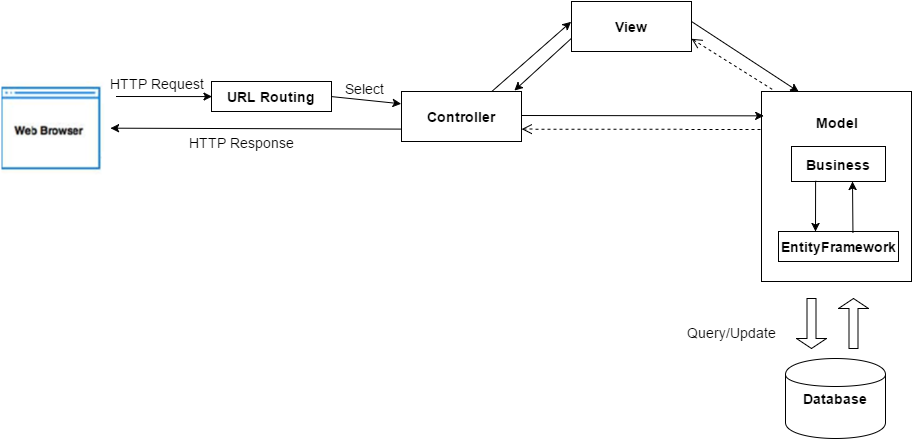


Figure 35: IMS System Architectural

We use MVC architecture style to develop IMS web. Specifically, customized it as convenient and suitable as possible to meet the customer’s requirement.

Controller: Receive requests from clients and transfers to Business to handle request then use processed result from Business to render View and return view to clients.

View: handles for display data from Model. The creation of View is under control of Controller.

Model: is generated by mapping database table by Entity Framework 6, Model is used like a data transfer object between the system and database.

Business: Handles the business logic of the system.

## Component Diagram

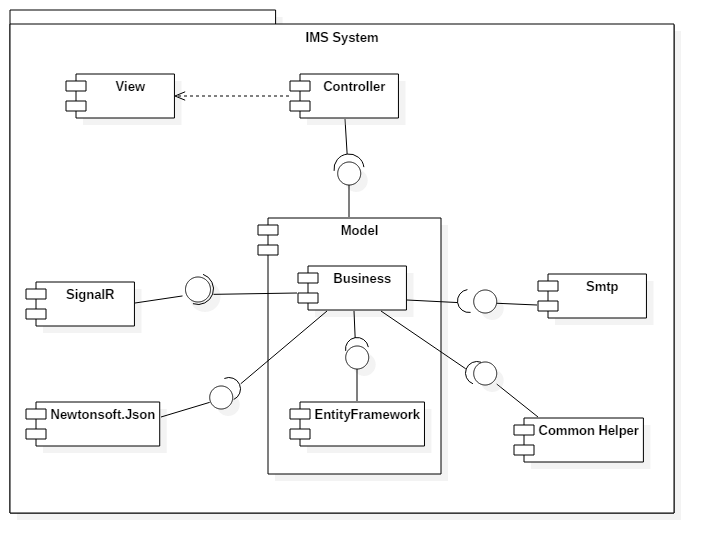


Figure 36: Component Diagram

|  |  |
| --- | --- |
| Component dictionary | |
| Component Name | Description |
| Controller | Contain all controllers in the system. |
| View | Contain all views in the system. |
| Business | Contain all business logic processing in the system. |
| Model | Entity Framework 6 mapping models. |
| Smtp | Component is used to send asynchronous emails. |
| EntityFramework | Component is used to map database table, generate Model. |
| SignalR | Library which is used to add notification, a sort of "real-time" web functionality to ASP.NET application. |
| Newtonsoft.Json | A popular high-performance JSON framework for .NET. |
| Common Helper | Contain common libraries which are used to develop the system. |

Table 38: Component Dictionary

## Detailed Description

### Class Diagram

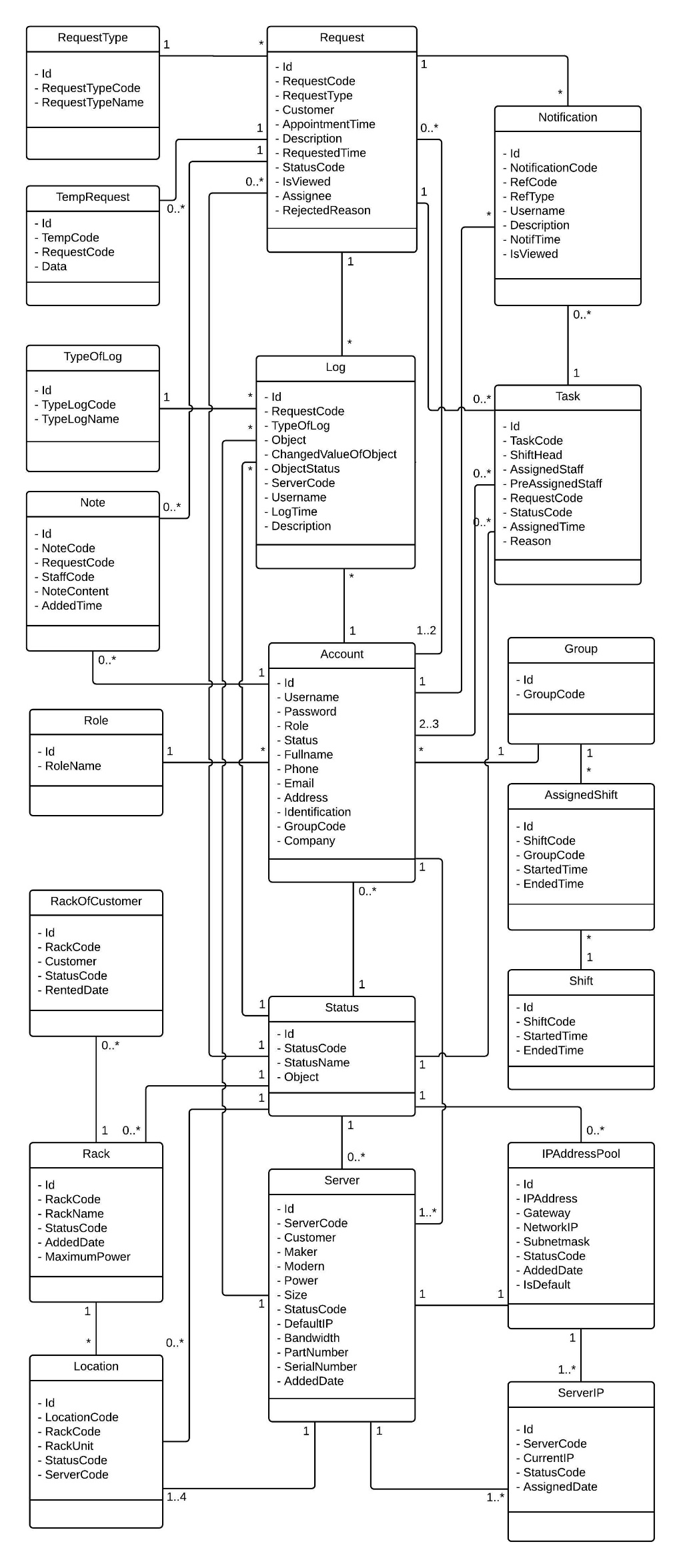


Figure 37: Class Diagram

### Class Diagram Explanation

#### Account

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of an account, auto increment. |
| Username | String | Private | Username of an account, identifier of an account |
| Password | String | Private | Password of an account |
| Role | String | Private | Role name of an account |
| Status | Boolean | Private | Current status of user |
| Fullname | String | Private | Full name of user |
| Phone | String | Private | Phone of user |
| Email | String | Private | Email address of user |
| Address | String | Private | Address of user |
| Identification | String | Private | Identification Number of user |
| GroupCode | String | Private | Group of user |
| Company | String | Private | Company of customer |

Method

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

#### AssignedShift

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id (PK) | Integer | Private | Unique identifier of AssignedShift, auto increment |
| ShiftCode | String | Private | Code of Shift |
| GroupCode | String | Private | Code of Group |
| StartedTime | Datetime | Private | The started time of shift |
| EndedTime | Datetime | Private | The ended time of shift |

Method

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

#### Group

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of group, auto increment |
| GroupCode (PK) | String | Private | Code of Group, identifier of a group |

Method

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

#### IPAddressPool

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of IP Address, auto increment. |
| IPAddress (PK) | String | Private | IP Address of data center, identifier of IP Address |
| Gateway | String | Private | Gateway of IP Address |
| Subnetmask | String | Private | Subnetmask of IP Address |
| StatusCode | String | Private | Current status of IP Address |
| NetworkIP | String | Private | NetworkIP of IP Address |
| IsDefault | Boolean | Private | The IP Address is a default IP or not |
| AddedDate | Datetime | Private | The date when IP Address was added into system |

Method

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

#### Location

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Location, auto increment |
| LocationCode (PK) | String | Private | Code of Location, identifier of a location |
| RackCode | String | Private | Code of rack |
| ServerCode | String | Private | Server which was put on location |
| RackUnit | Integer | Private | Rack Unit of each location |
| StatusCode | String | Private | Status of location |

Method

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

#### Log

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id (PK) | Integer | Private | Unique identifier of a log, auto increment. |
| RequestCode | String | Private | Code of request which was logged |
| LogTime | Datetime | Private | The time when logged |
| TypeOfLog | String | Private | The type of log |
| Object | String | Private | Object which was logged |
| ChangedValueOfObject | String | Private | The changed value of Object |
| ObjectStatus | String | Private | The status of object which was logged |
| ServerCode | String | Private | The code of server which was logged |
| Username | String | Private | The username of user who logged |
| Description | String | Private | Description of log |

Method

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

#### Note

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of note, auto increment. |
| NoteCode (PK) | String | Private | Code of note, identifier of a note |
| RequestCode | String | Private | Code of request which has note |
| StaffCode | String | Private | Code of staff who added note |
| NoteContent | String | Private | Content of note |
| AddedTime | Datetime | Private | The time when note was added |

Method

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

#### Notification

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Notification, auto increment |
| NotificationCode (PK) | String | Private | Code of notification, identifier of a notification |
| RefCode | String | Private | Code of object which has notification |
| RefType | String | Private | Type of object which has notification |
| Username | String | Private | User who will receive the notification |
| IsViewed | Boolean | Private | The notification which was viewed or not |
| NotifTime | Datetime | Private | The time which send notification |
| Description | String | Private | The description of notification |

Method

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

#### Rack

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Rack, auto increment |
| RackCode (PK) | String | Private | Code of Rack, identifier of a request |
| RackName | String | Private | Name of Rack |
| StatusCode | String | Private | Current status of Rack |
| AddedDate | Datetime | Private | The date when rack was added into data center |
| MaximumPower | Integer | Private | The power of Rack |

Method

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

#### RackOfCustomer

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id (PK) | Integer | Private | Unique identifier of RackOfCustomer, auto increment |
| RackCode | String | Private | Code of rack which customer rented |
| Customer | String | Private | Customer who rented rack |
| StatusCode | String | Private | Status of RackOfCustomer |
| RentedDate | Datetime | Private | The time when customer rented rack |

Method

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

#### Request

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Request, auto increment |
| RequestCode (PK) | String | Private | Code of Request, identifier of a request |
| RequestType | String | Private | Type of each request |
| Customer | String | Private | Customer who sent request |
| AppointmentTime | Datetime | Private | The time when customer registered to have appointment with data center |
| Description | String | Private | The description of customer in request |
| RequestedTime | Datetime | Private | The time when request was sent |
| StatusCode | String | Private | Current status of request |
| Assignee | String | Private | The staff who was assigned this request |
| RejectedReason | String | Private | Reason when request is rejected |

Method

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

#### RequestType

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Request Type, auto increment. |
| RequestTypeCode (PK) | String | Private | Code of Request Type, identifier of a request type |
| RequestTypeName | String | Private | Code of Request Type, identifier of a request type |

Method

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

#### Role

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of a role, auto increment. |
| RoleName (PK) | String | Private | Role Name, unique identifier of a role |

Method

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

#### Server

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of server, auto increment. |
| ServerCode (PK) | String | Private | Code of server, identifier of a server |
| Customer | String | Private | Customer who own this server |
| Power | Integer | Private | The power of server |
| Size | Integer | Private | The size of server: 1U, 2U or 4U |
| Bandwidth | String | Private | Bandwidth of server |
| SerialNumber | String | Private | Serial number of server |
| PartNumber | String | Private | Part number of server |
| StatusCode | String | Private | Current status of server. |
| Default IP | String | Private | Default IP of server |
| AddedDate | Datetime | Private | The date when server was registered. |

Method

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

#### ServerIP

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id (PK) | Integer | Private | Unique identifier of ServerIP, auto increment. |
| ServerCode | String | Private | Code of Server |
| CurrentIP | String | Private | Current IP of server |
| StatusCode | String | Private | Status of ServerIP |
| AssignedDate | Datetime | Private | The date when IP Address was assigned for server |

Method

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

#### Shift

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of shift, auto increment |
| ShiftCode (PK) | String | Private | Code of shift, identifier of shift |
| StartedTime | Datetime | Private | The time when shift started |
| EndedTime | Datetime | Private | The time when shift ended |

Method

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

#### Status

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Status, auto increment |
| StatusCode (PK) | String | Private | Code of Status, identifier of a status |
| Status | String | Private | Status name of each Object |
| Object | String | Private | The Object of system |

Method

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

#### Task

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of Task, auto increment |
| TaskCode (PK) | String | Private | Code of Task, identifier of a task |
| ShiftHead | String | Private | ShiftHead who assigned task |
| AssignedStaff | String | Private | The Staff who was assigned task |
| RequestCode | String | Private | The code of Request which was assigned |
| StatusCode | String | Private | The status code of Task |
| Reason | String | Private | The reason when task does not finish |
| AssignedTime | Datetime | Private | The time when task was assigned |
| PreAssignedStaff | String | Private | The Staff who was assigned previous |

Method

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

#### TypeOfLog

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of TypeOfLog, auto increment |
| TypeCode (PK) | String | Private | Code of Type of Log |
| TypeName | String | Private | Name of Type of Log |

Method

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

#### TempRequest

Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Type** | **Visibility** | **Description** |
| Id | Integer | Private | Unique identifier of TempRequest, auto increment |
| TempCode (PK) | String | Private | Code of TempRequest, identifier of a TempRequest |
| RequestCode | String | Private | Code of Request which was saved TempData |
| Data | String | Private | Data which was saved temporary for request |

Method

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

### Interaction Diagram

#### <Customer> Add server

**Summary:** This diagram shows how the customer add new server into data center.

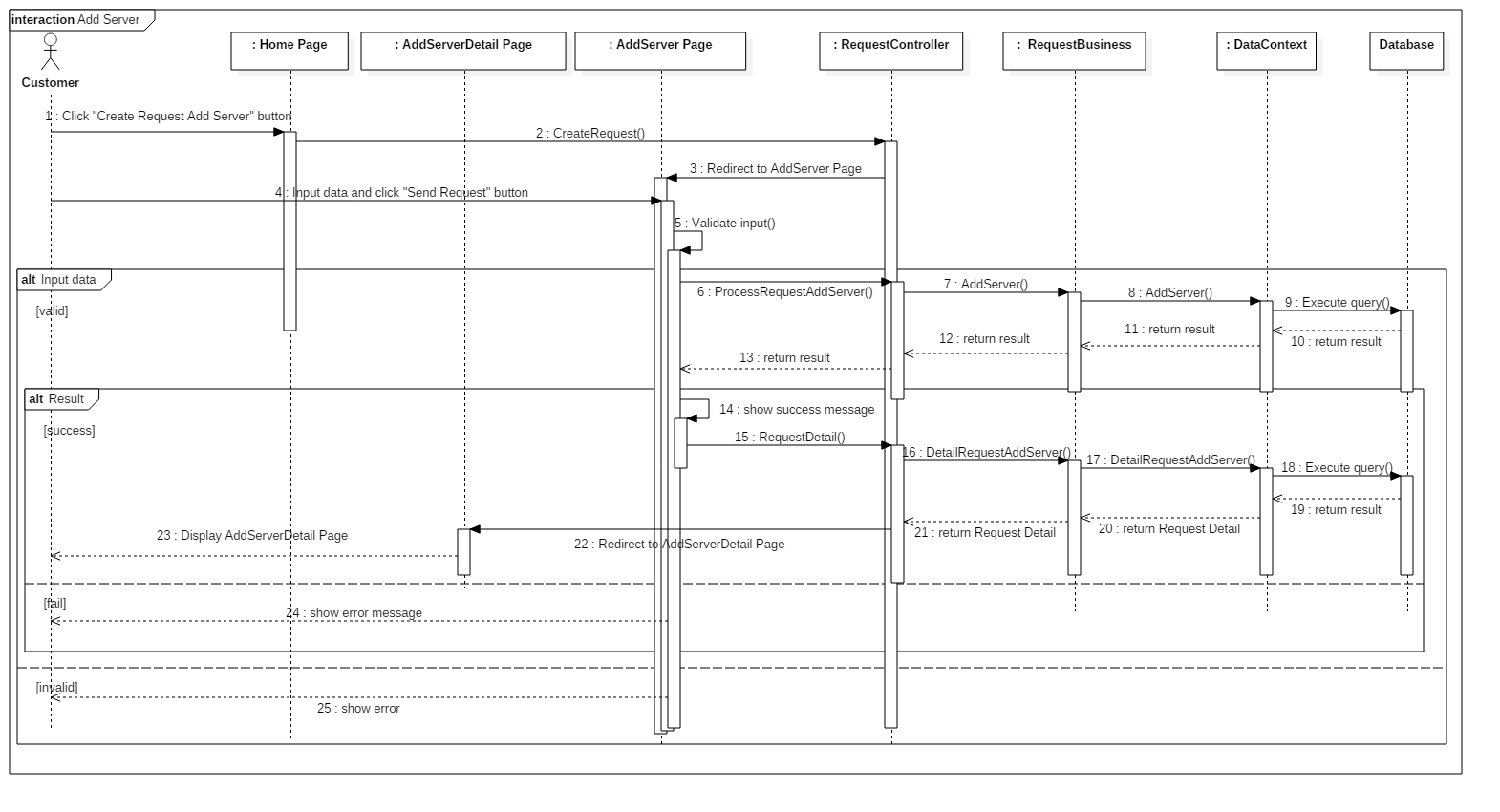


Figure 38: Sequence Diagram <Customer> Add server

#### <Customer> Cancel request Add New Server

**Summary:** This diagram shows how customer cancel request Add New Server.

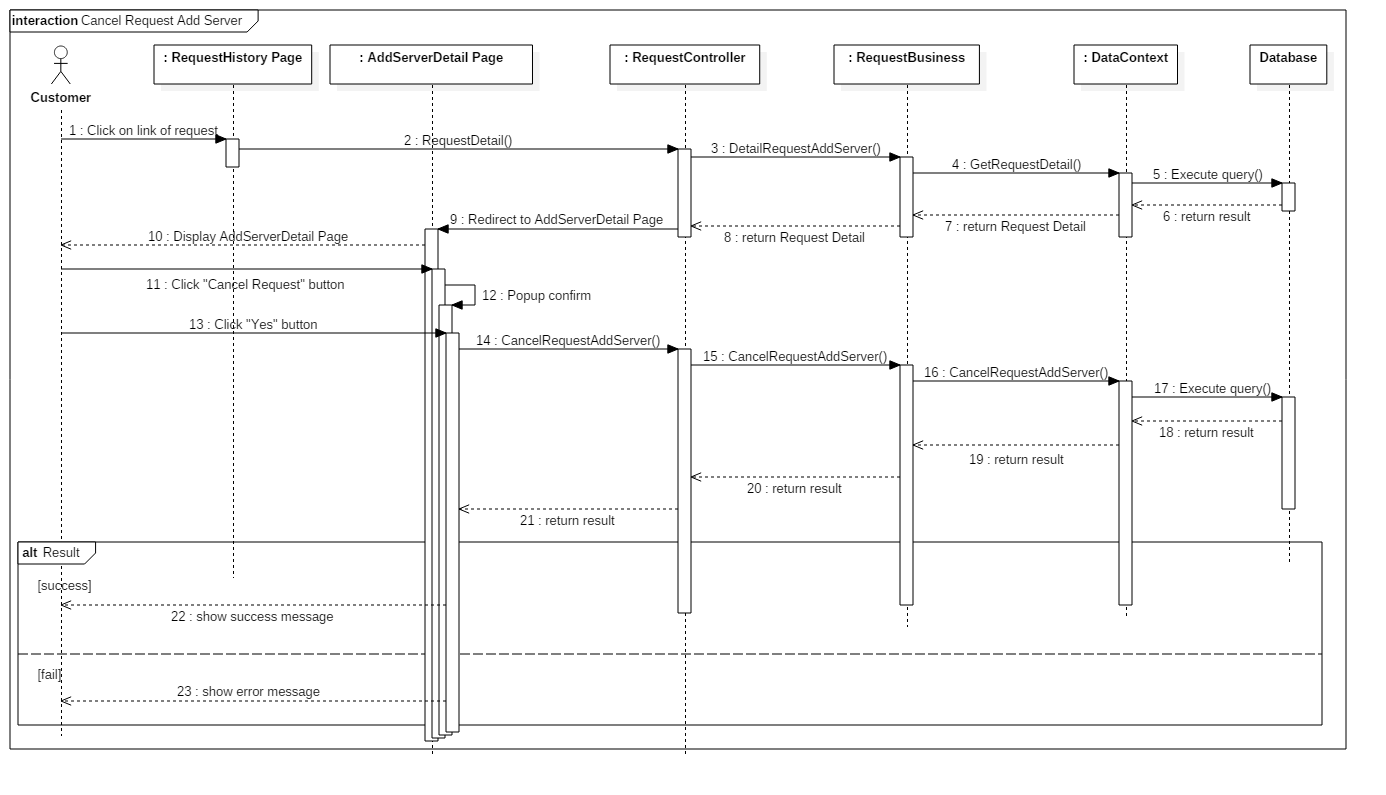


Figure 40: Sequence Diagram <Customer> Cancel request Add New Server

#### <Customer> Return IP

**Summary:** This diagram shows how customer return IP Address to data center.

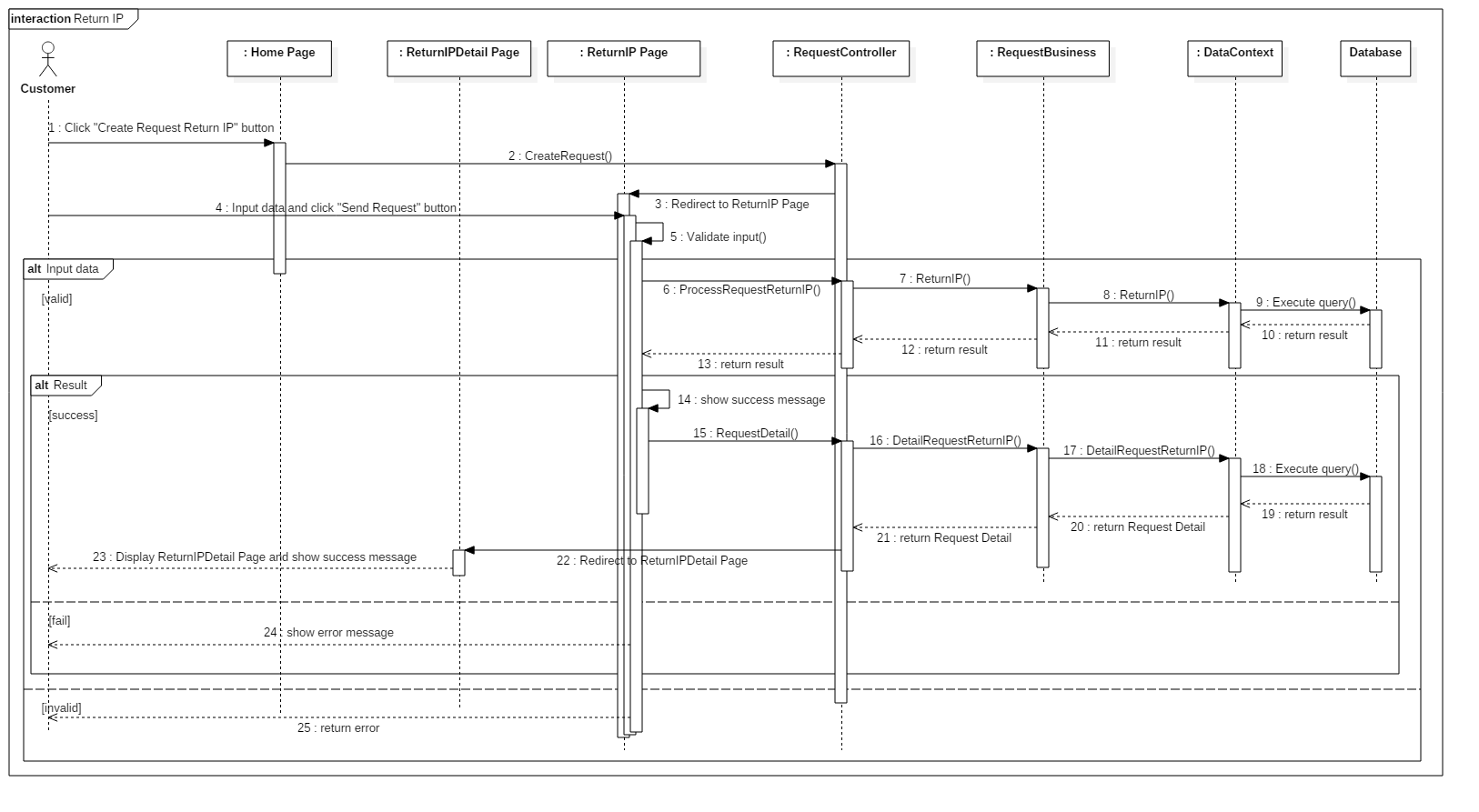


Figure 41: Sequence Diagram <Customer> Return IP

#### <Customer> Rent rack

**Summary:** This diagram shows how to Customer rent rack from data center.

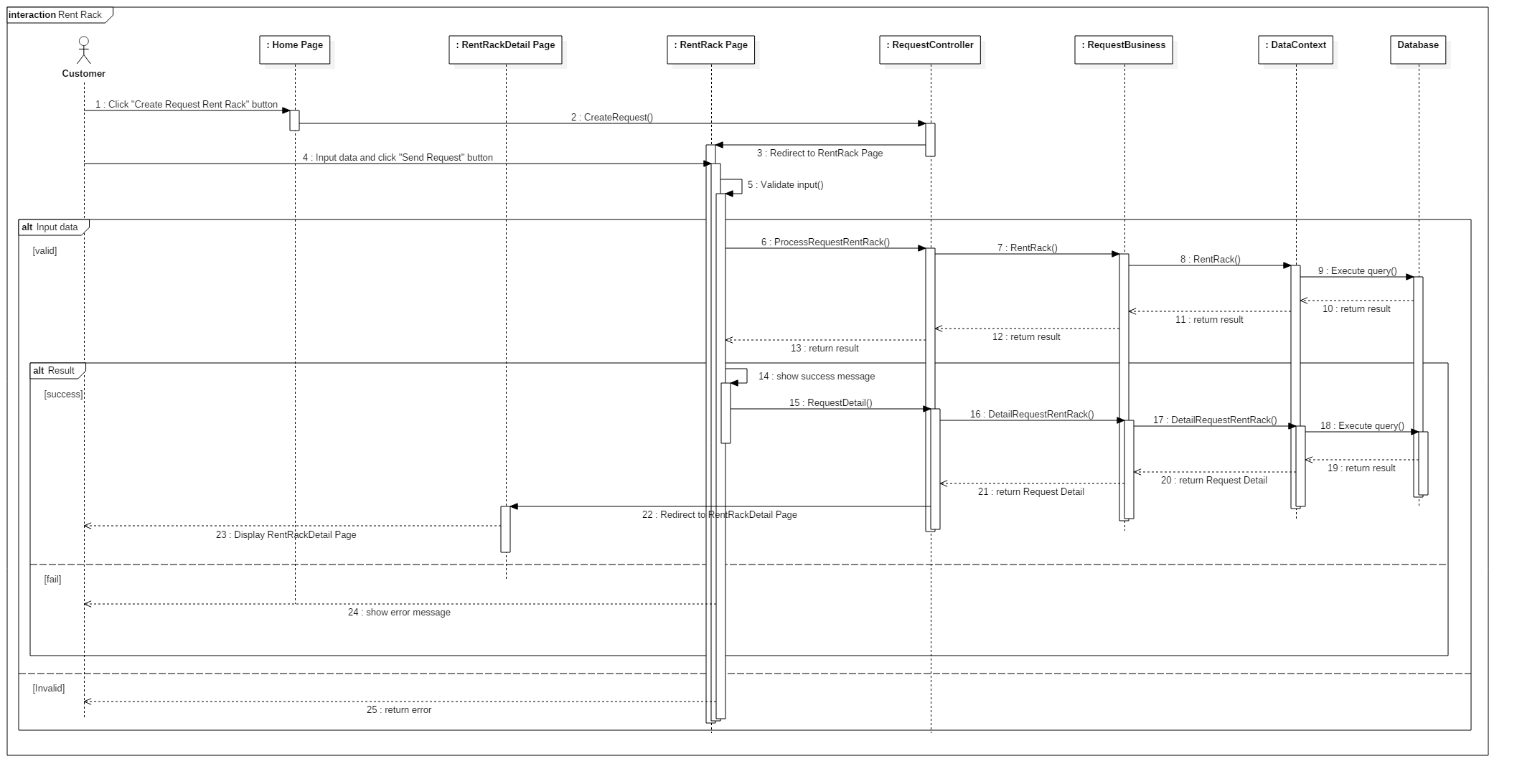


Figure 42: Sequence Diagram <Customer> Rent rack

#### <Shift Head> Approve request Assign IP

**Summary:** This diagram shows how Shift Head approve request Assign IP Address to server.

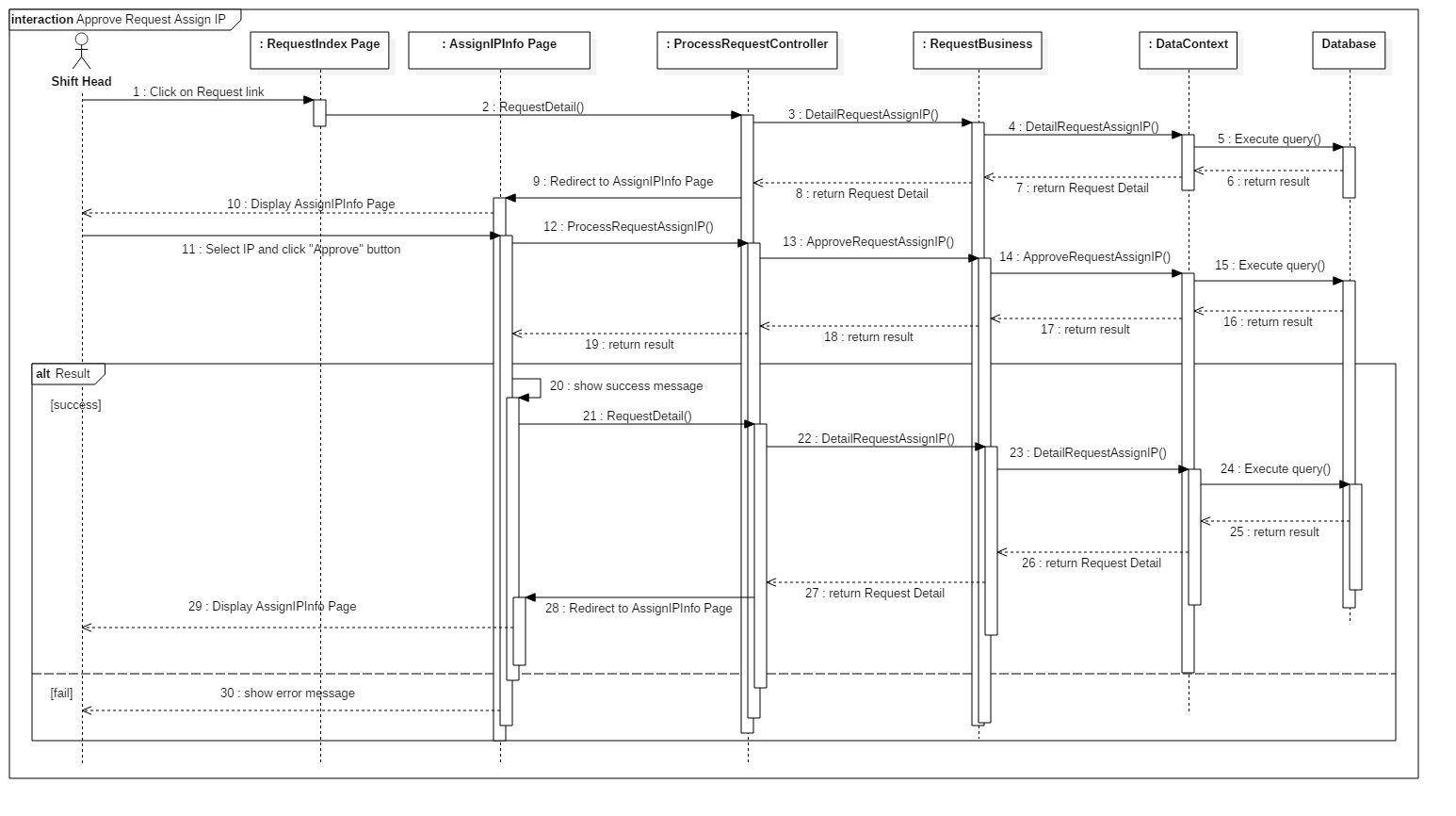


Figure 42: Sequence Diagram <Shift Head> Approve request Assign IP

#### <Shift Head> Approve request Add New Server

**Summary:** This diagram shows how Shift Head approve the request Add New Server

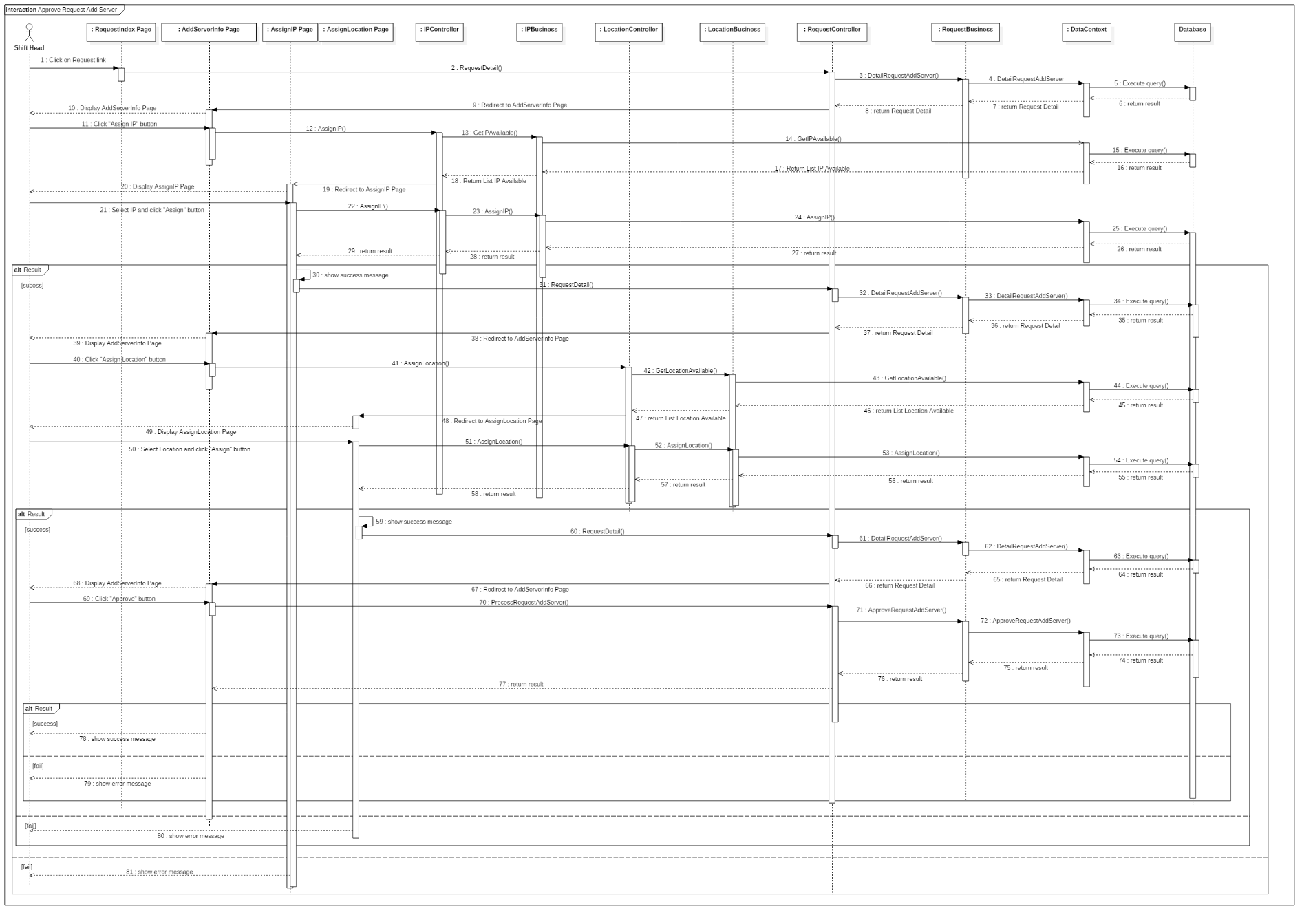


Figure 43: Sequence Diagram<Shift Head> Approve request Add New Server

#### <Shift Head> Approve request Change IP

**Summary:** This diagram shows how Shift Head approve request Change IP Address.

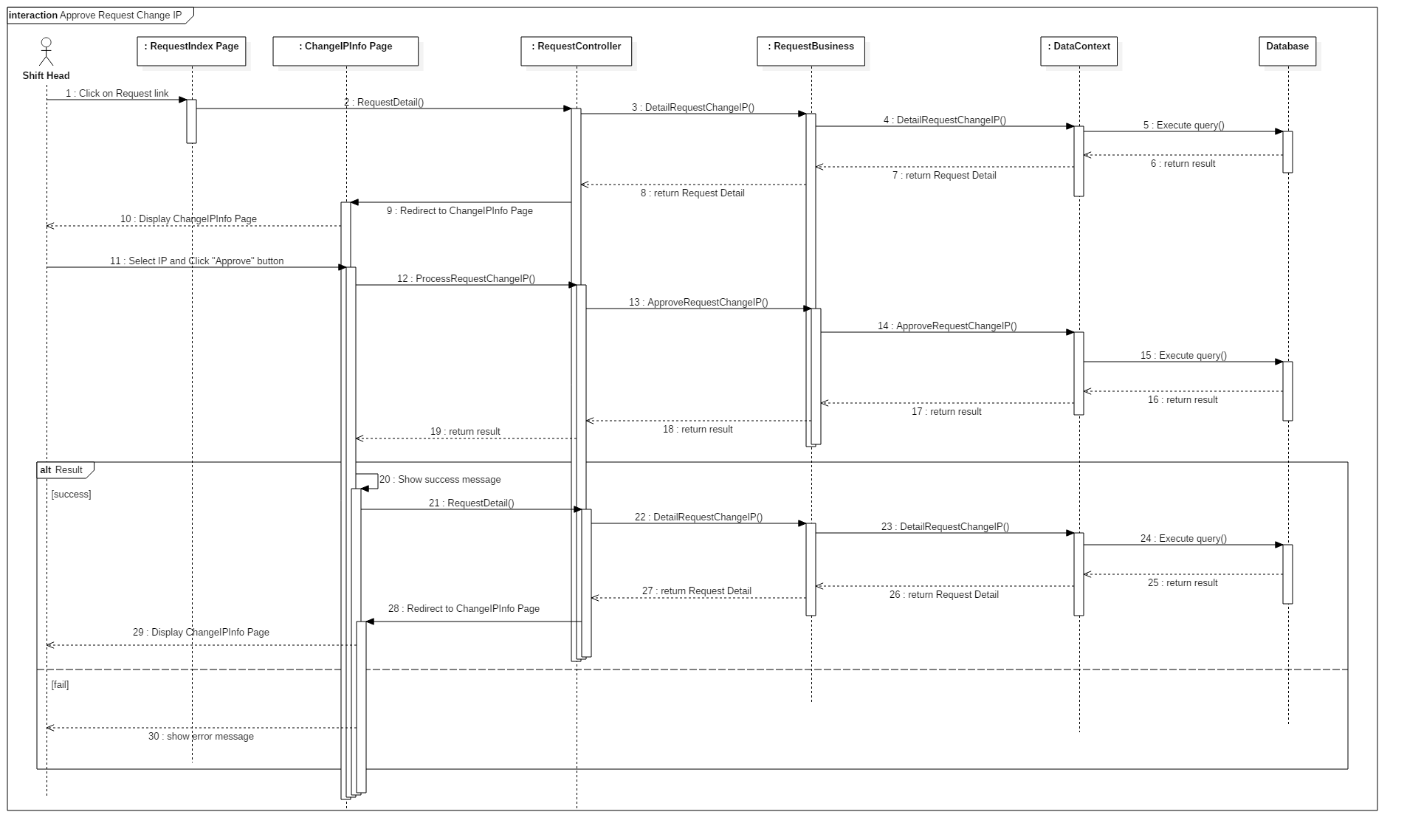


Figure 44: Sequence Diagram <Shift Head> Approve request Change IP

#### <Shift Head> Approve request Rent Rack

**Summary:** This diagram shows how Shift Head approve request Rent Rack.

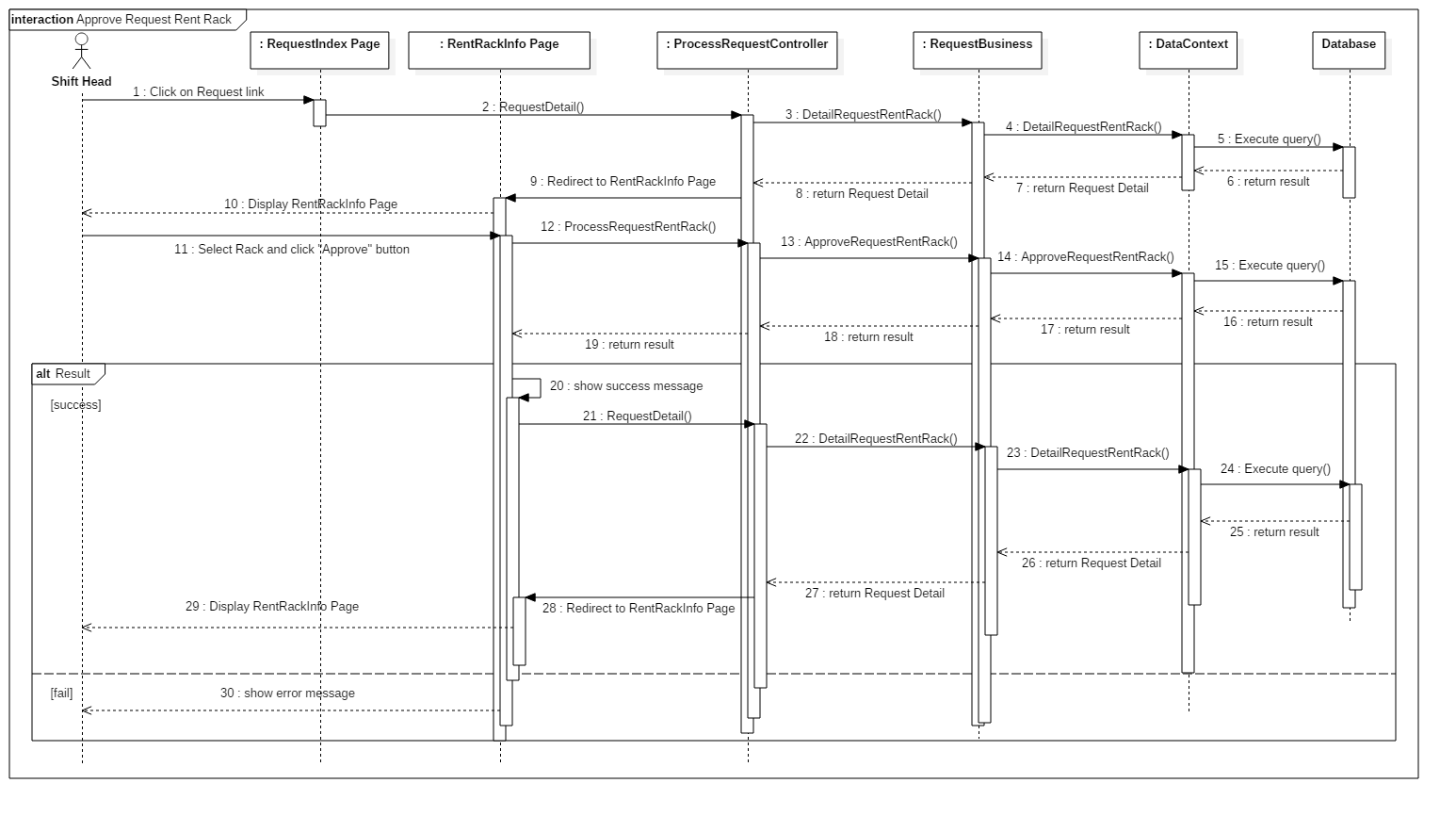


Figure 45: Sequence Diagram <Shift Head> Approve request Change IP

#### <Shift Head> Reject Request Assign IP

**Summary:** This diagram shows how Shift Head reject request Assign IP Address

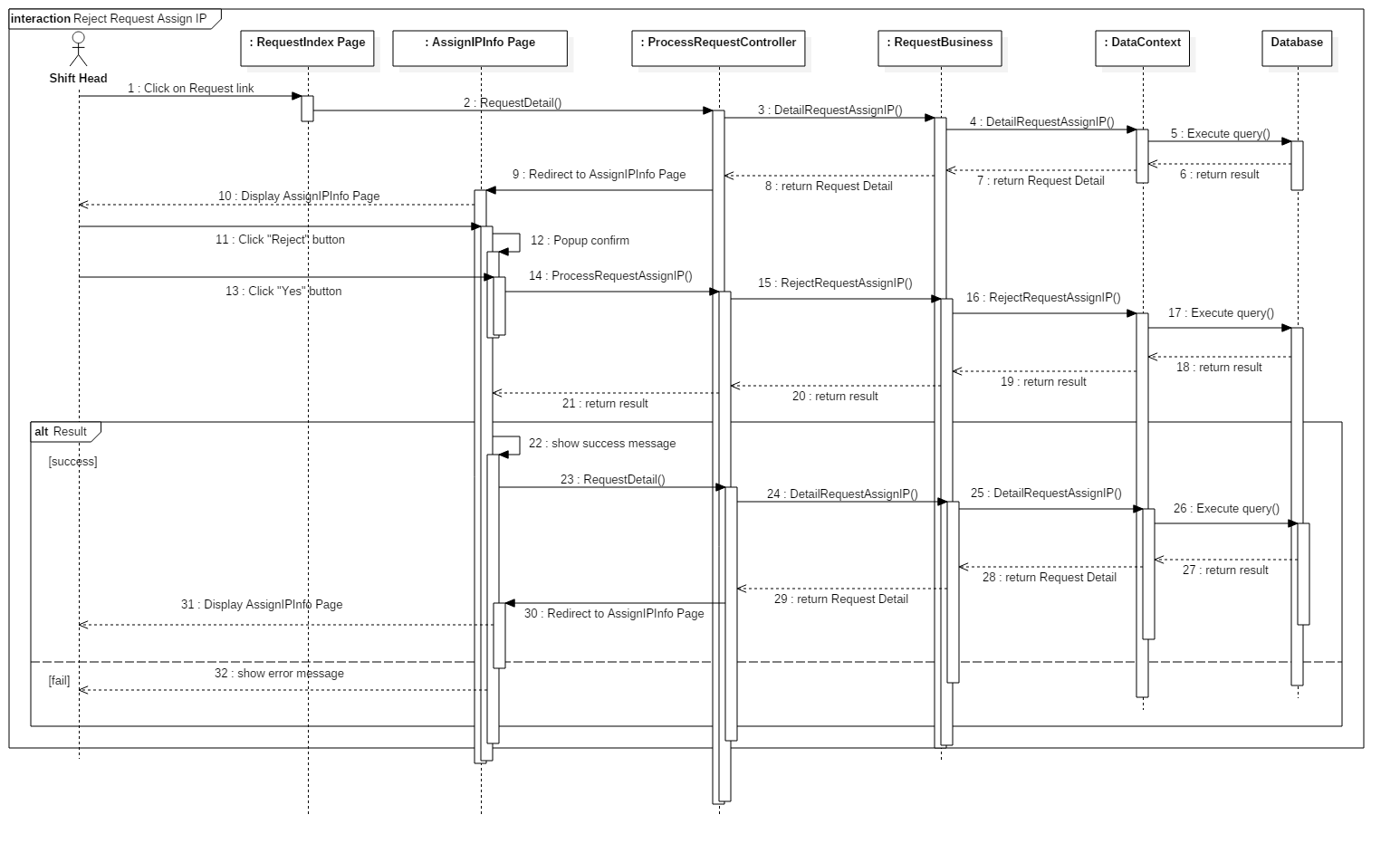


Figure 46: Sequence Diagram <Shift Head> Reject request Assign IP

#### <Shift Head> Reject request Add Server

**Summary:** This diagram shows how Shift Head reject request Add New Server.

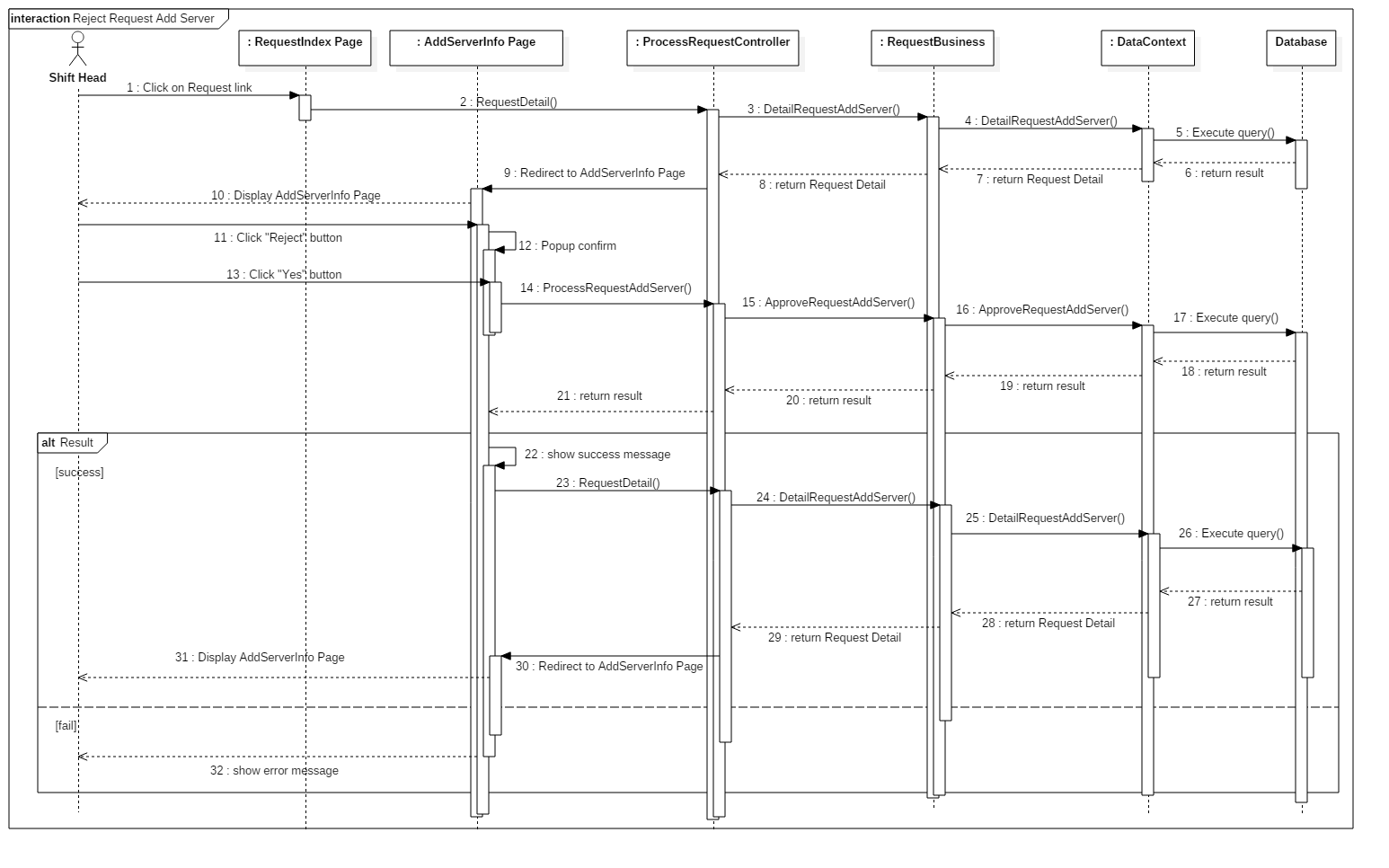


Figure 47: Sequence Diagram <Shift Head> Reject request Add Server

#### <Shift Head> Assign Task

**Summary:** This diagram shows how Shift Head assign task for Staff

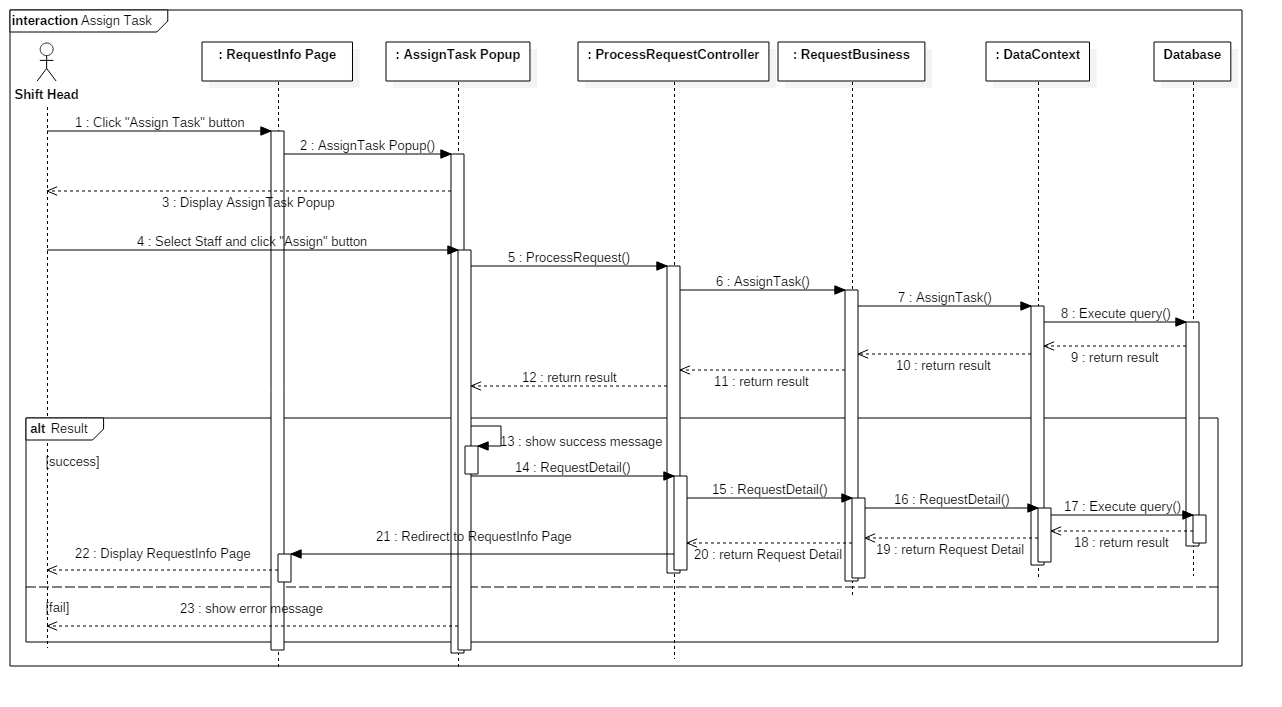


Figure 48: Sequence Diagram <Shift Head> Assign Task

#### <Shift Head> Write note

**Summary:** This diagram shows how Shift Head write note for the next shift.

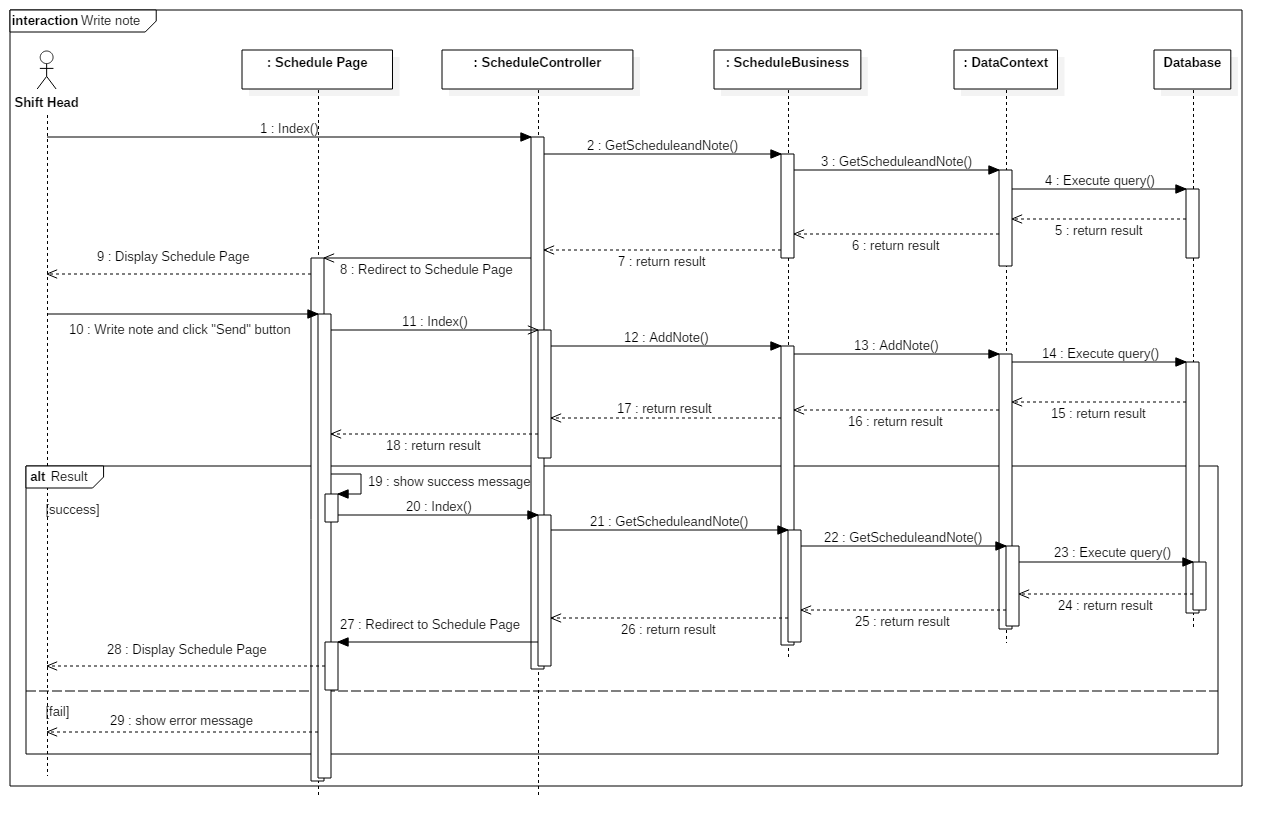


Figure 49: Sequence Diagram <Shift Head> Write note

#### <Shift Head> Add New IP

**Summary:** This diagram shows how Shift Head add new IP into data center

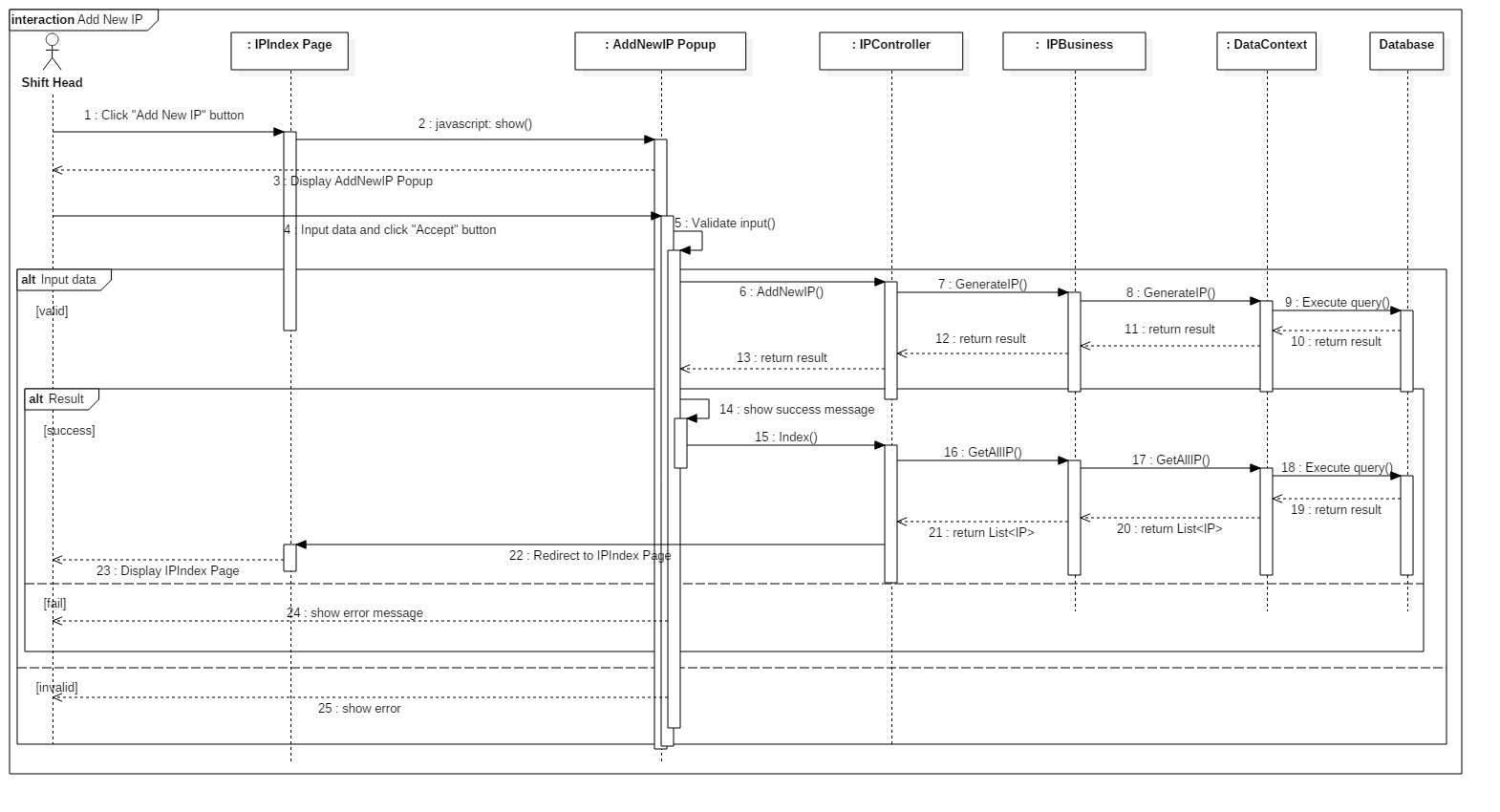


Figure 50: Sequence Diagram <Shift Head> Add New IP

#### <Shift Head> Add New Rack

**Summary:** This diagram shows how Shift Head add new rack into data center

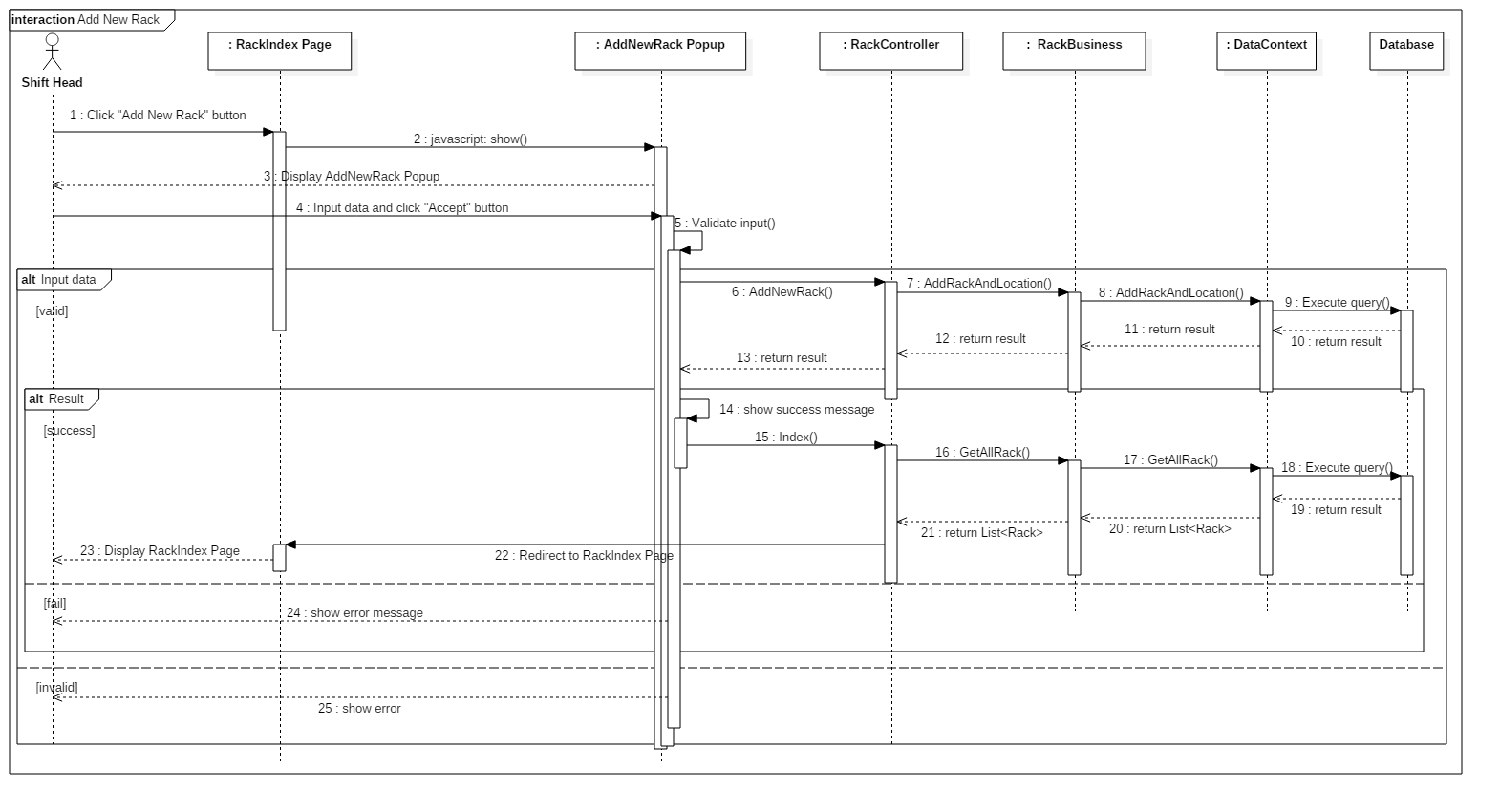


Figure 51: Sequence Diagram <Shift Head> Add New Rack

#### <Shift Head> Export Procedure

**Summary:** This diagram shows how Shift Head export procedure for customer

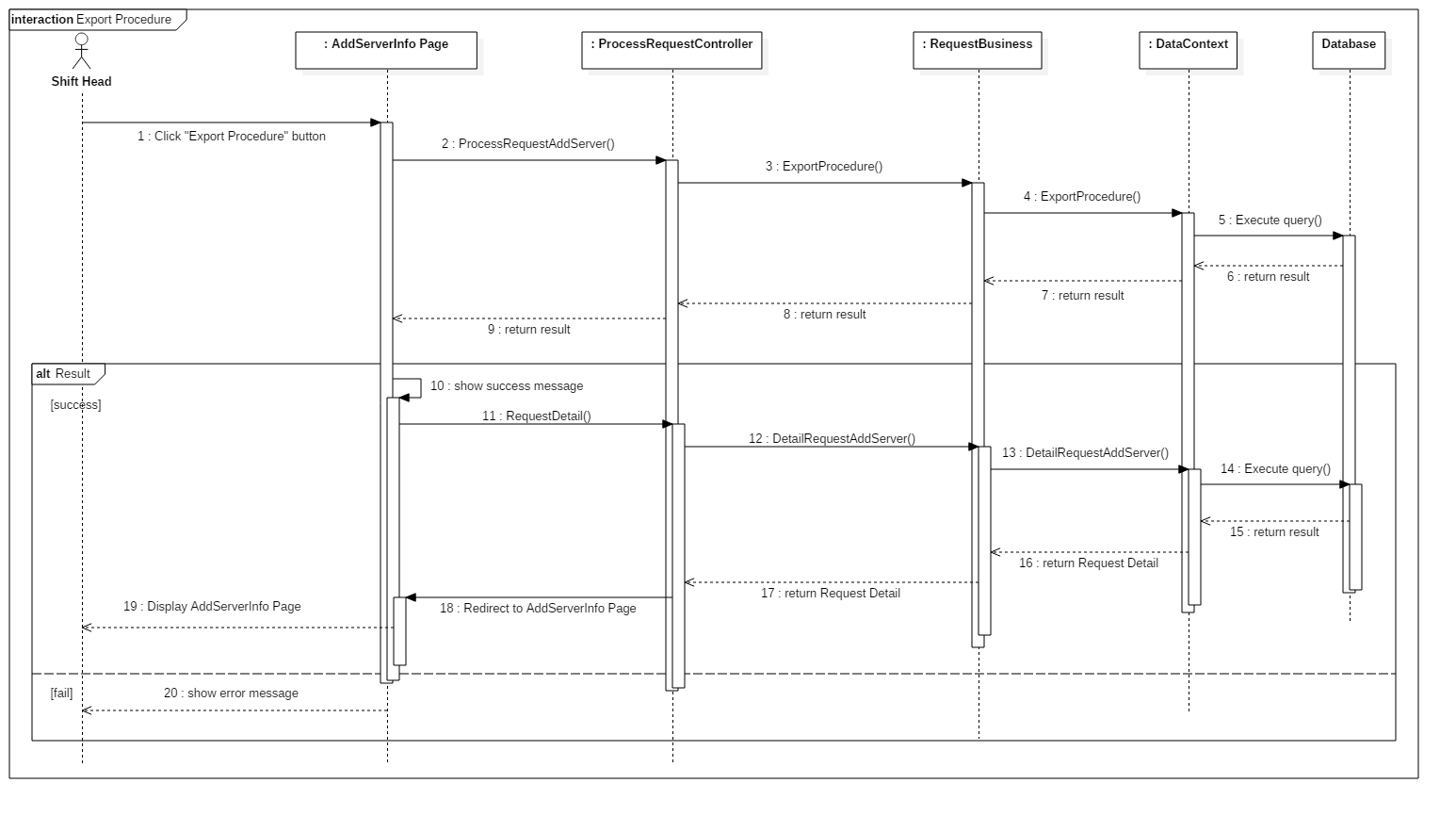


Figure 51: Sequence Diagram <Shift Head> Export Procedure

#### 5.3.16 <Shift Head> Block IP

**Summary:** This diagram shows how Shift Head Block IP

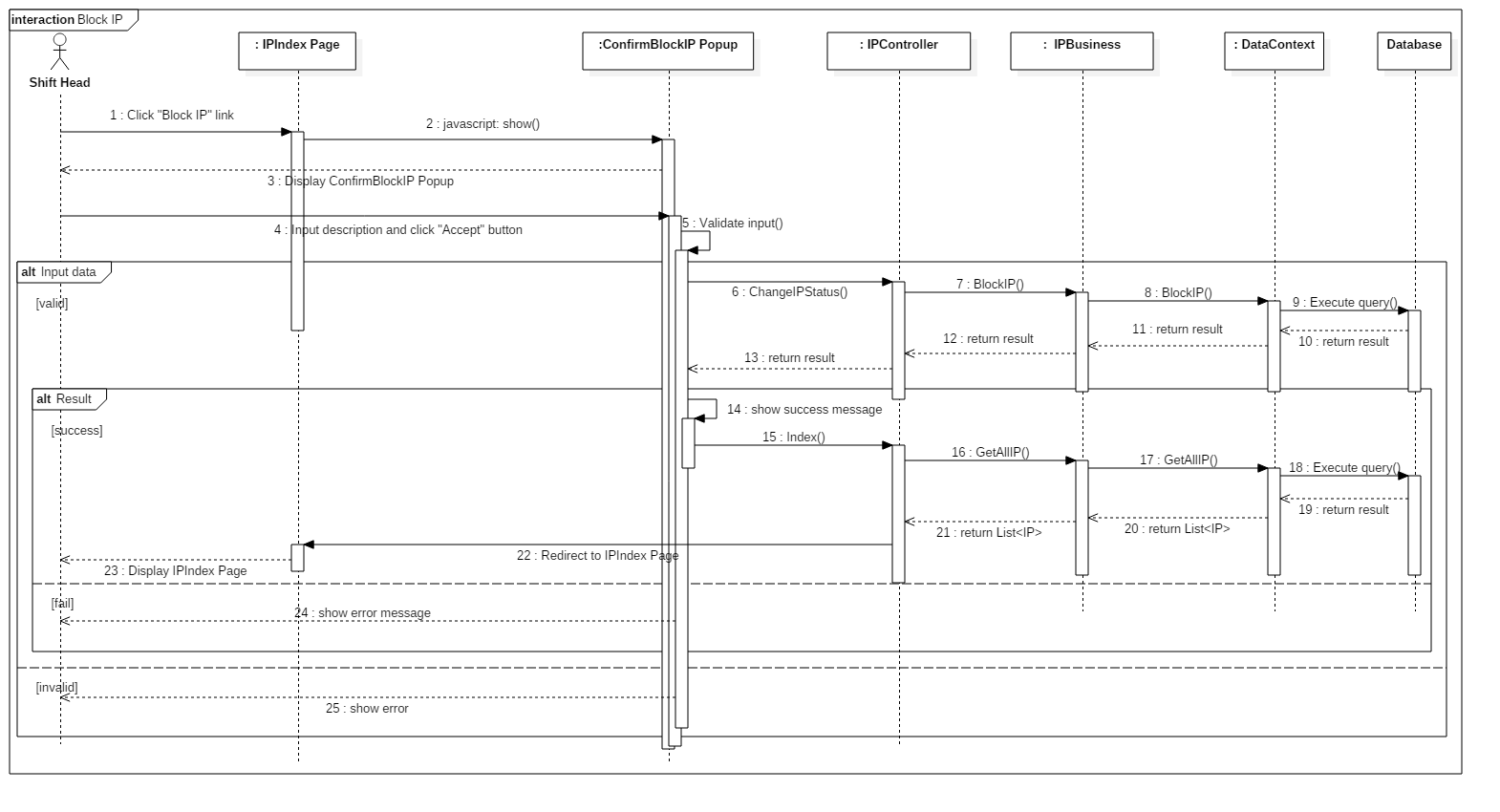


Figure 52: Sequence Diagram <Shift Head> Block IP

#### 5.3.17 <Shift Head> Deactivate IP Range

**Summary:** This diagram shows how Shift Head deactivate IP Range

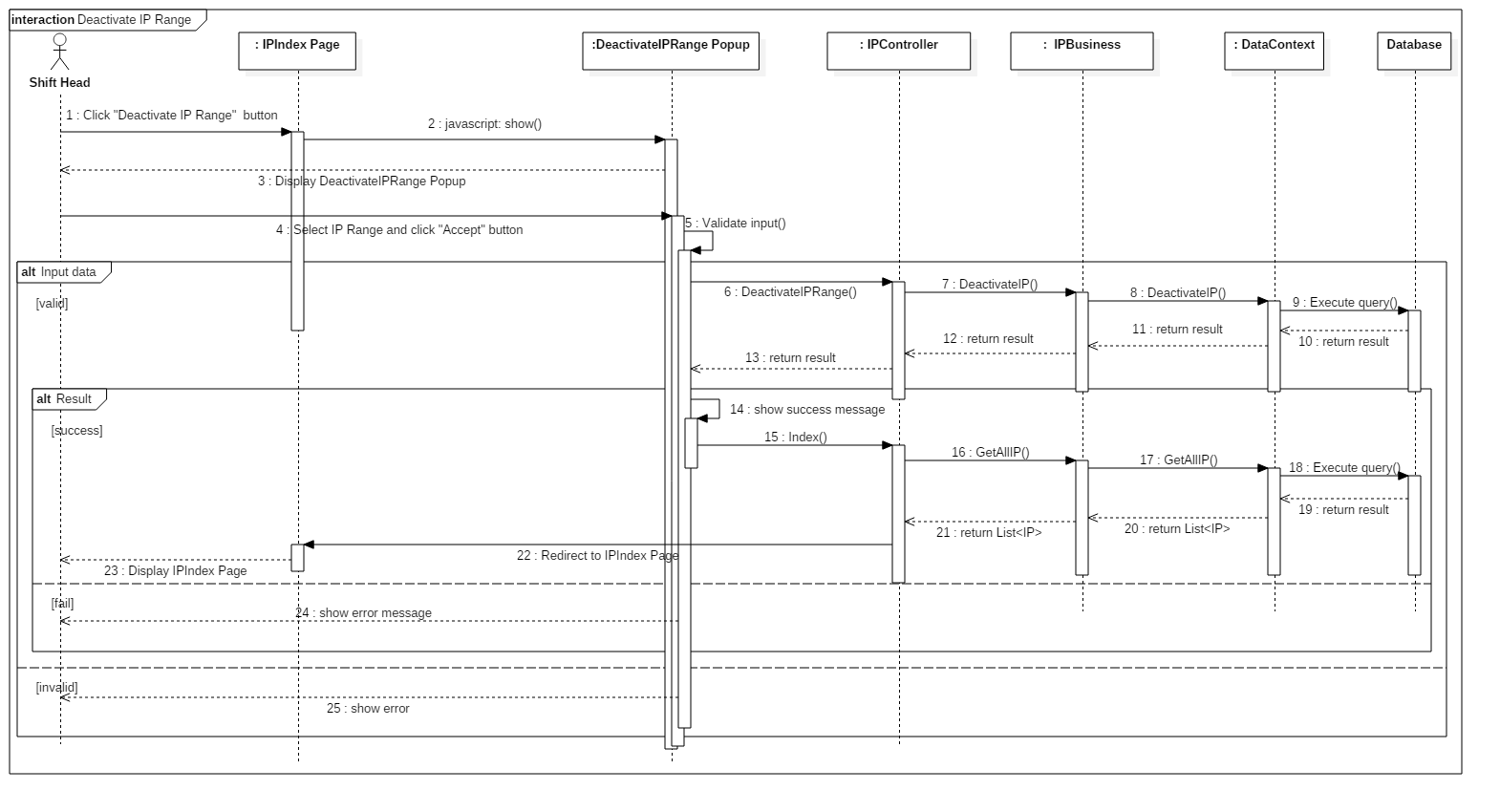


Figure 53: Sequence Diagram <Shift Head> Deactivate IP Range

#### 5.3.18 <Shift Manager> Add New Staff

**Summary:** This diagram shows how Shift Manager add new Staff for data center

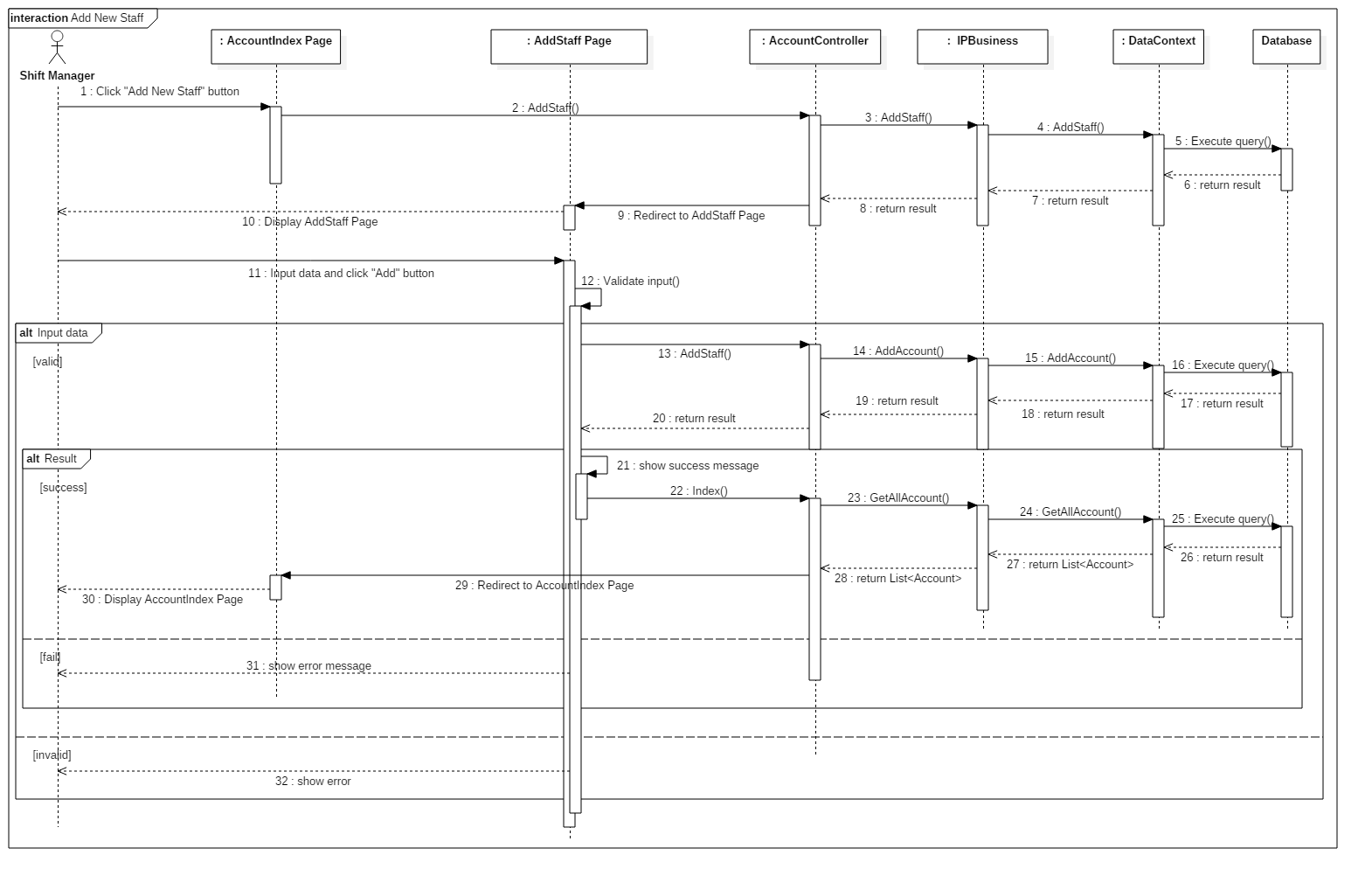


Figure 54: Sequence Diagram <Shift Manager> Add New Staff

#### 5.3.19 <Shift Manager> Deactivate Account

**Summary:** This diagram shows how Shift Manager deactivate an Account

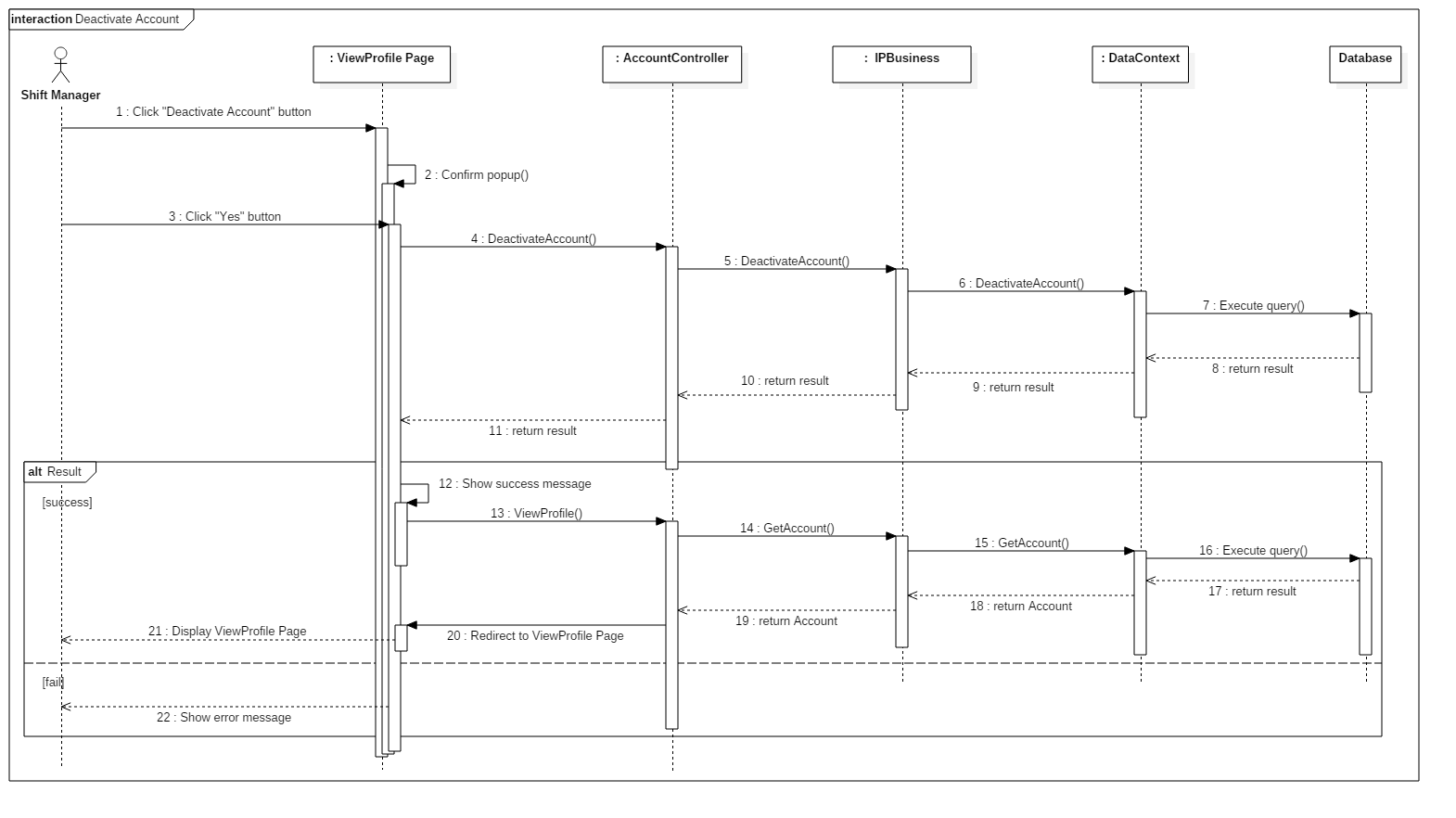


Figure 55: Sequence Diagram <Shift Manager> Deactivate Account

#### 5.3.20 <Shift Manager> Edit Staff Profile

**Summary:** This diagram shows how Shift Manager edit Profile of Staff

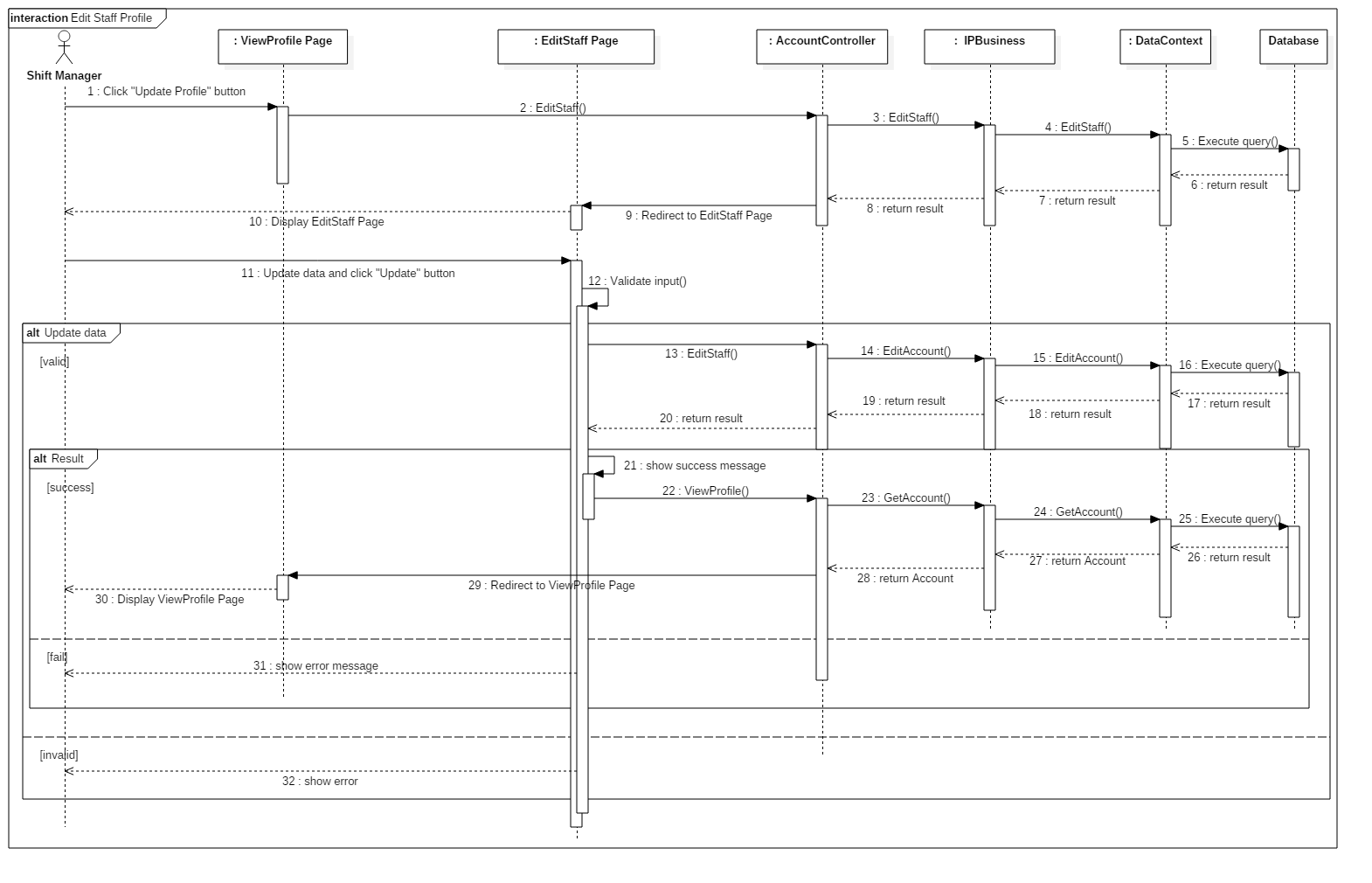
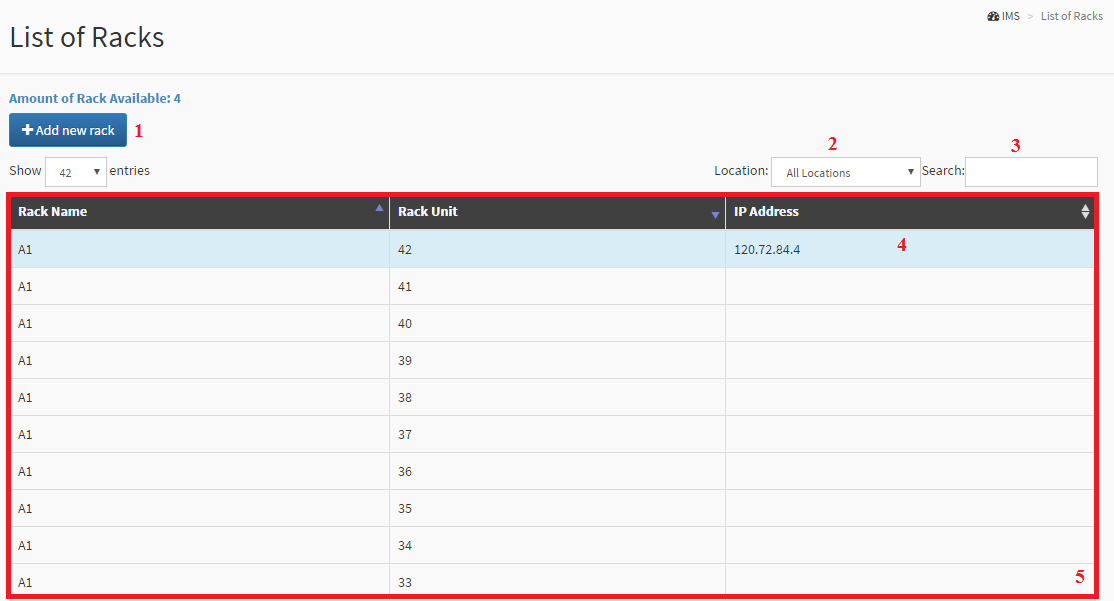


Figure 56: Sequence Diagram <Shift Manager> Edit Staff Profile

## User Interface Design

### User Login

### View List Racks and Locations



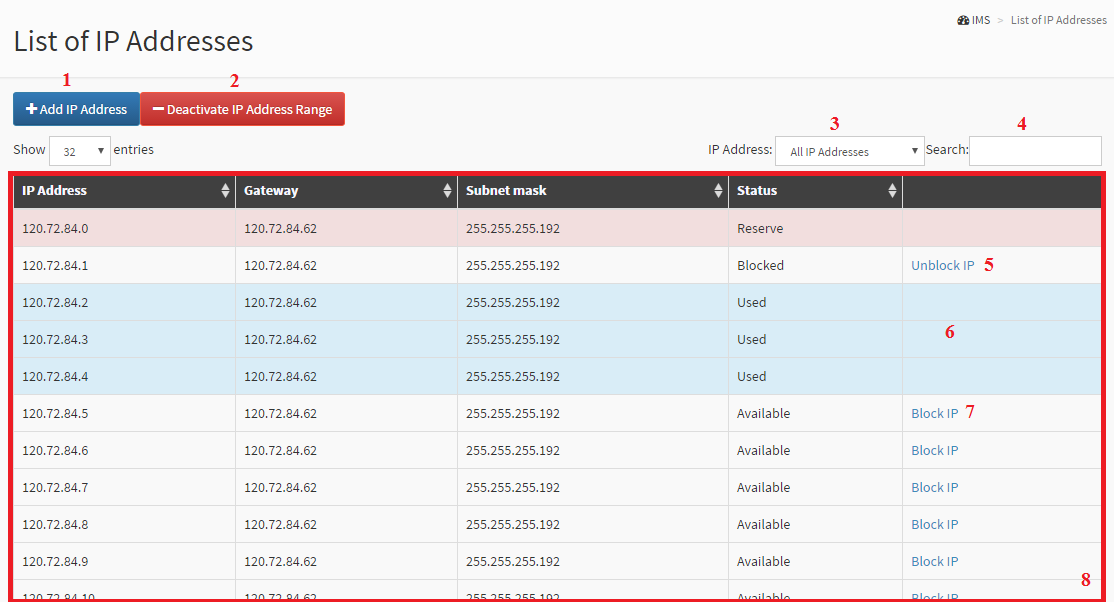
**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 1 | Add new rack | User press “Add new rack” when want to add new rack for data center | N/A | Show popup Add new rack |
| 2 | Filter | User filter by Rack Name on DropDownList when user want to view Location of that rack | N/A | Show the location of selected Rack Name |
| 4 | View Server Detail | User click on row which have IP Address when user want to view server detail | N/A | Navigate to Server Detail Page |
| 5 | Location Index | List all locations in data center | N/A | List all locations in data center |

**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 3 | Search | User enters content that want to search | No | No | textbox | string | N/A |

### View List IP Addresses



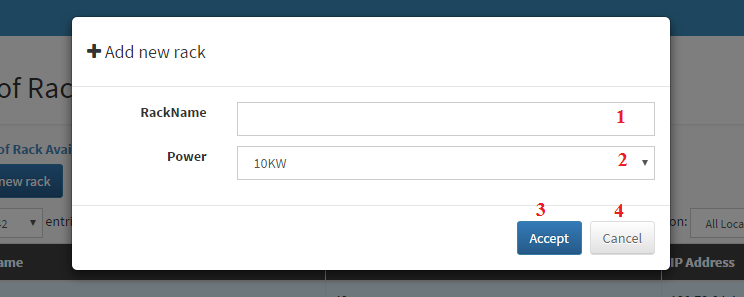
**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 4 | Search | User enters content that want to search | No | No | textbox | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 1 | Add IP Address | User press “Add IP Address” button when want to add new IP Address Range for data center | N/A | Show popup Add IP Address |
| 2 | Deactivate IP Address Range | User press “Deactivate IP Address Range” button when want to deactivate IP Address Range | N/A | Show popup Deactivate IP Address Range |
| 3 | Filter | User filter by Network IP on DropDownList when want to view IP of that Network | N/A | Show the IP Address of selected Network IP |
| 5 | Unblock IP | User click on “Unblock IP” link when want to unblock IP | N/A | Show popup Unblock IP |
| 6 | View Server Detail | User click on row which have Status “Used” when want to view server detail | N/A | Navigate to Server Detail Page |
| 7 | Block IP | User click on “Block IP” link when want to block IP | N/A | Show popup Block IP |
| 8 | IP Index | List all IP Addresses of data center | N/A | List all IP Addresses of data center |

### Add new rack



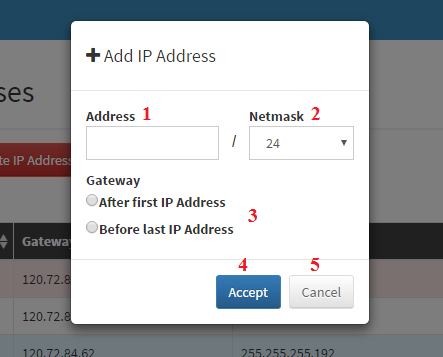
**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | RackName | User enters name of rack which want to add | No | Yes | textbox | string | N/A |
| 2 | Power | User selects power of rack | No | Yes | Dropdownlist | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 3 | Accept | User press “Accept” when accept to add new rack for data center | N/A | Return to List of Racks page with new rack was added |
| 4 | Cancel | User press “Cancel” when want to cancel this popup | N/A | Return to List of Racks page |

### Add IP Address



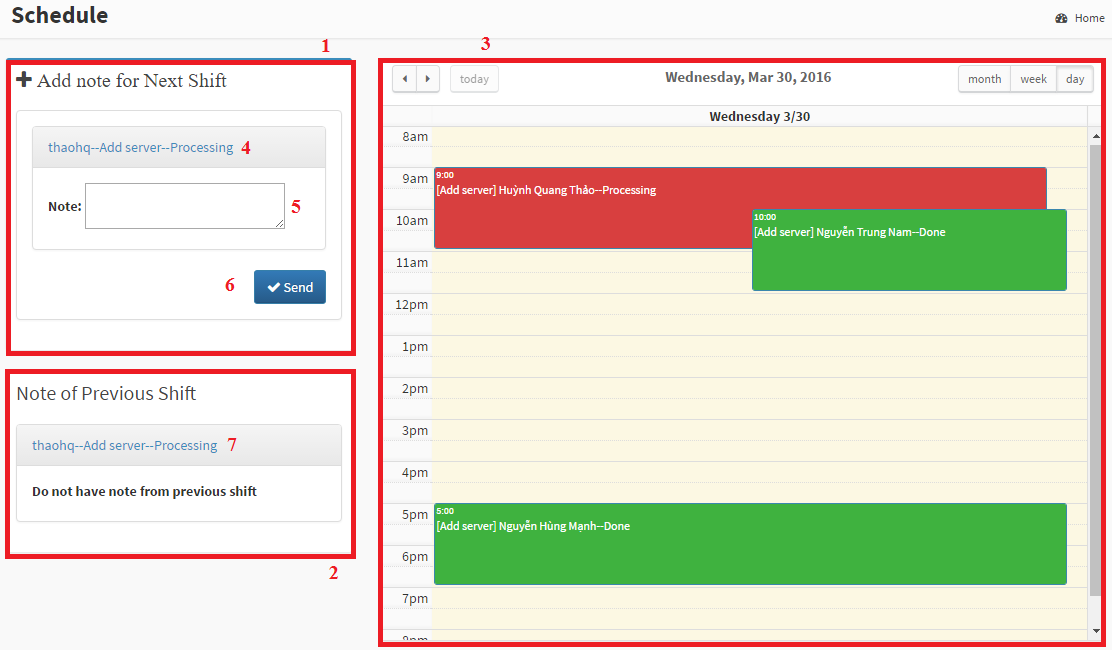
**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | Address | User enters IP Address in Range which want to add | No | Yes | textbox | string | N/A |
| 2 | Netmask | User selects netmask of IP Address range | No | Yes | Dropdownlist | int | N/A |
| 3 | Type of Gateway | User select type of Gateway: after the first IP Address or before the last IP Address in Range | No | Yes | Radio button | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 3 | Accept | User press “Accept” when accept to add new IP Address Range for data center | N/A | Return to List IP Addresses page with new IP Addresses were added |
| 4 | Cancel | User press “Cancel” when want to cancel this popup | N/A | Return to List IP Addresses page |

### View Schedule



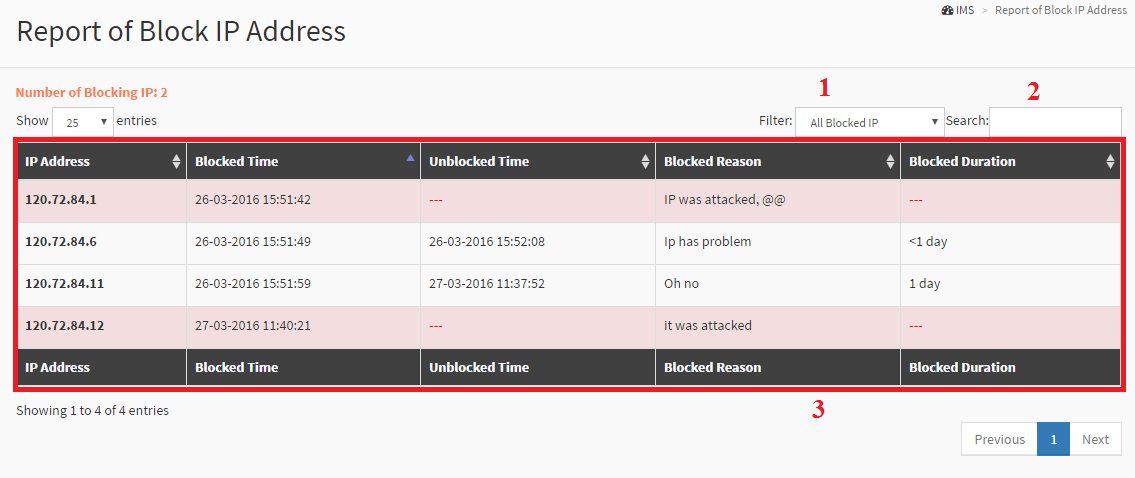
**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 5 | Note | User enters content of note which want to send for next shift | No | No | textbox | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 1 | Add Note form | Allow user add note here | N/A | Add note for the next shit |
| 2 | Note of Previous Shift form | Allow user view the note of previous shift | N/A | Note of previous shift |
| 3 | Schedule | Allow user view the schedule by day, week, month | N/A | Schedule with the time when customer will come data center |
| 6 | Send Note | User press “Send” when want to send note to Next Shift | N/A | The note will be saved |
| 4,7 | View Request Detail | User press request link to view Request Detail | N/A | Navigate to Request Detail Page |

### View Report Block IP



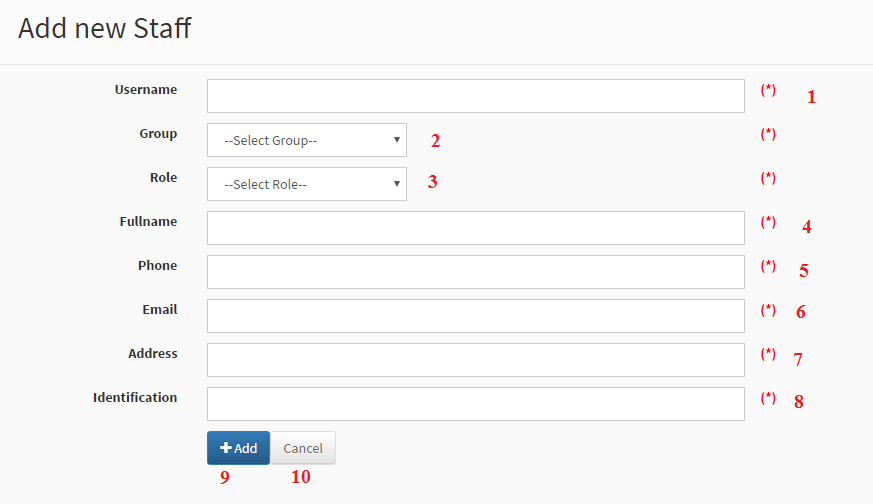
**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | Search | User enters content which want to search | No | No | textbox | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 2 | Filter | User filter by blocked duration of IP Address on DropDownList | N/A | Show the IP Address following the selected condition |
| 3 | Blocked IP Index | List all of blocking and blocked IP Address in data center | N/A | List all of blocking and blocked IP Address in data center |

### Add New Staff



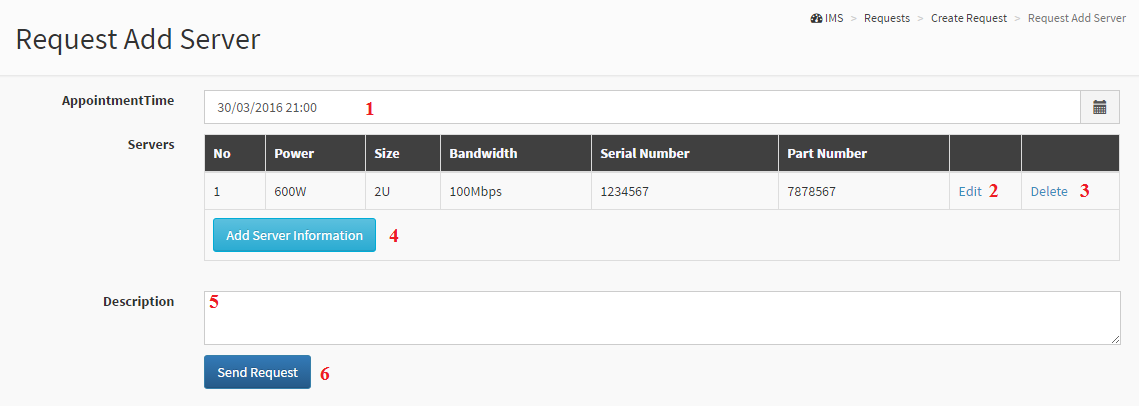
**Field:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | Username | Staff’s username | No | Yes | textbox | string | N/A |
| 2 | Group | Staff’s group | No | Yes | dropdownlist | string | N/A |
| 3 | Role | Staff’s role | No | Yes | dropdownlist | string | N/A |
| 4 | Fullname | Staff’s fullname | No | Yes | textbox | string | N/A |
| 5 | Phone | Staff’s phone number | No | Yes | textbox | string | N/A |
| 6 | Email | Staff’s email address | No | Yes | textbox | email | N/A |
| 7 | Address | Staff’s address | No | Yes | textbox | string | N/A |
| 8 | Identification | Staff’s identification number | No | Yes | textbox | string | N/A |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 9 | Add staff | User press “Add” when want to add new staff into data center | N/A | Return to List of Accounts page with new staff was added |
| 10 | Cancel | User press “Cancel” when want to cancel this page | N/A | Return to List Accounts page |

### Request Add Server



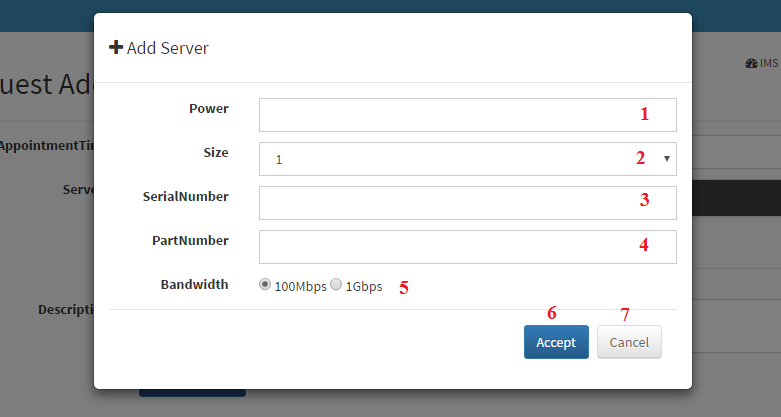
**Field:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | AppointmentTime | The time when customer will bring server to data center | No | Yes | textbox | datetime | N/A |
| 5 | Description | Customer’s description about this request | No | No | textarea | string | N/A |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 2 | Edit server information | User press “Edit” link when want to edit server information | N/A | Show Edit Server Information popup |
| 3 | Delete server | User press “Delete” link when want to delete server | N/A | Show confirm popup |
| 4 | Add Server Information | User press “Add Server Information” when want to add information of new server | N/A | Show Add Server Information popup |
| 6 | Send Request | User press “Send Request” when want to send this request | N/A | Navigate to Request Add Server Detail Page |

### Add Server Information



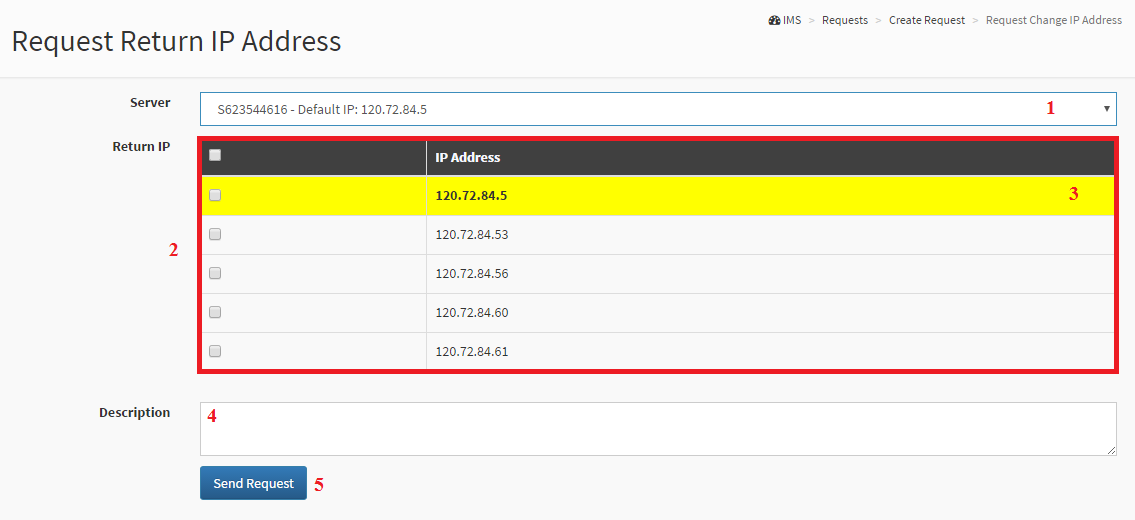
**Field:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | Power | Server’s power | No | Yes | textbox | int | N/A |
| 2 | Size | Server’s size (1U, 2U, 4U) | No | Yes | dropdownlist | int | N/A |
| 3 | SerialNumber | Server’s serial number | No | No | textbox | string | N/A |
| 4 | PartNumber | Server’s part number | No | No | textbox | string | N/A |
| 5 | Bandwidth | Server’s bandwidth | No | Yes | radio button | string | N/A |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 9 | Accept | User press “Accept” when want to add server information into request Add Server | N/A | Return to Create Request Add Server Page with server was added |
| 10 | Cancel | User press “Cancel” when want to cancel this popup | N/A | Return to Create Request Add Server Page |

### Request Return IP



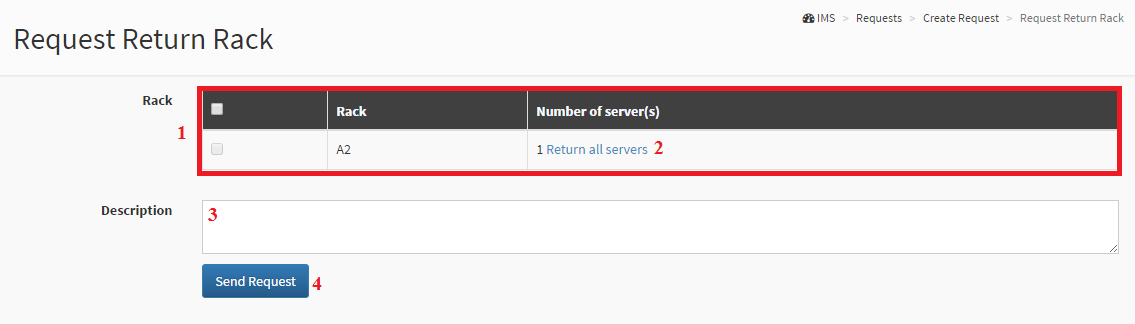
**Field:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 1 | Select Server | List of server of this customer | No | Yes | dropdownlist | string | N/A |
| 4 | Description | Customer’s description about this request | No | No | textarea | string | N/A |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 2 | List of IP Address | List of IP Addresses of above selected server | N/A | List of IP Addresses of above selected server |
| 3 | Default IP Address | User check on check box of Default IP to return all IP of selected server | N/A | All of IP Addresses of server will be checked automatically |
| 5 | Send Request | User press “Send Request” when want to send this request | N/A | Navigate to Request Return IP Detail Page |

### Request Return Rack



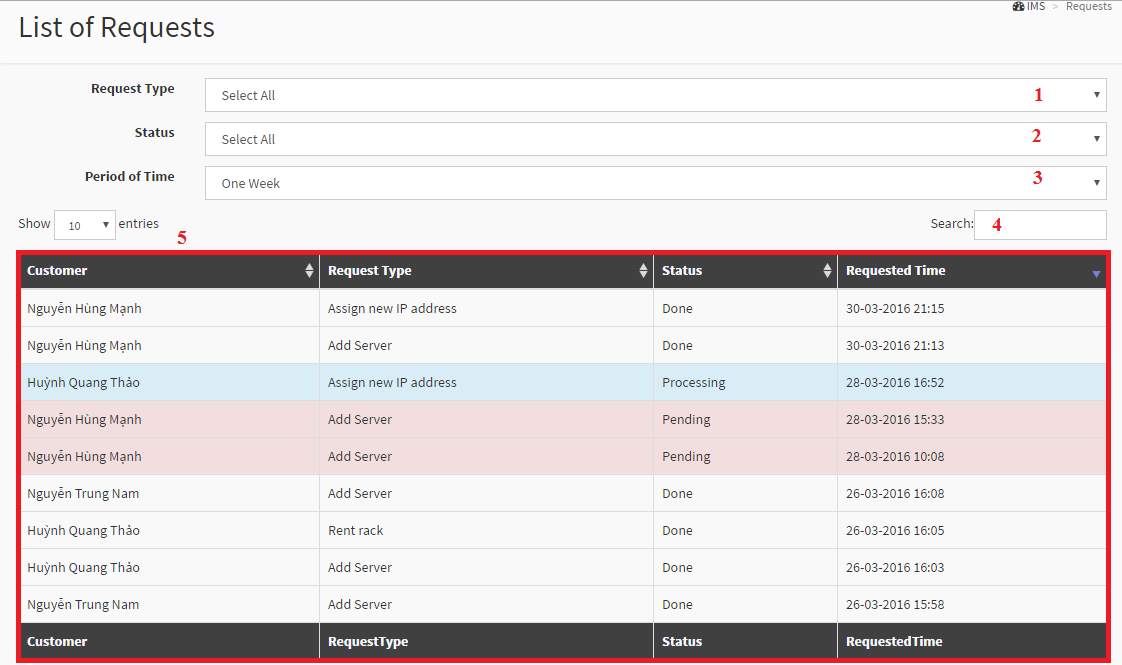
**Field:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 3 | Description | Customer’s description about this request | No | No | textarea | string | N/A |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 1 | List of Rented Rack | List of rack which this customer rented | N/A | List of rack which this customer rented |
| 2 | Return all server of this rack | User press “Return all servers” link to create request return all server of this rack | N/A | Navigate to Create Request Bring Server Away Page |
| 4 | Send Request | User press “Send Request” when want to send this request | N/A | Navigate to Request Return Rack Detail Page |

### View List Requests



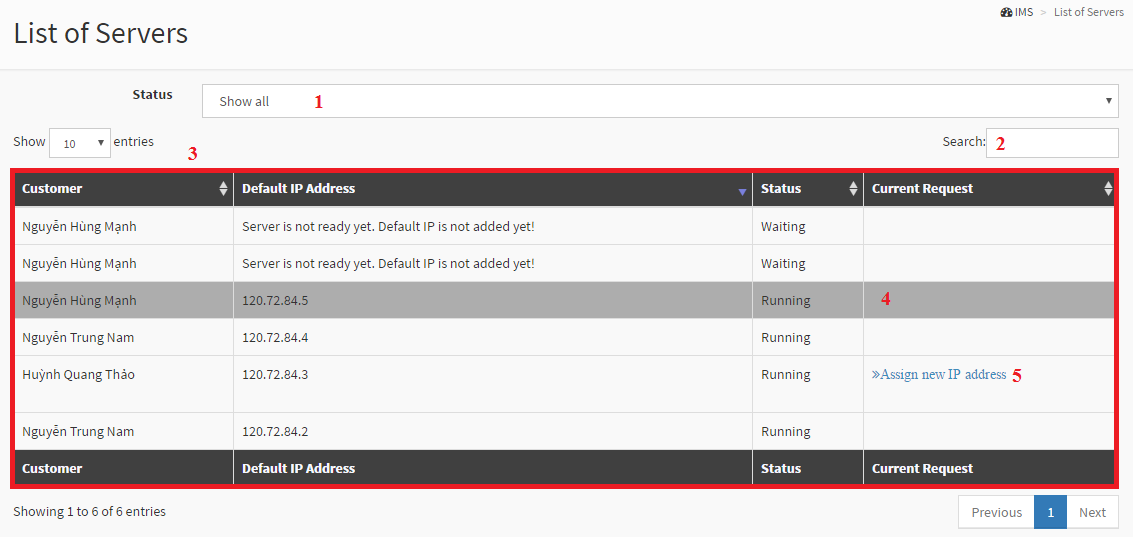
**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 4 | Search | User enters content that want to search | No | No | textbox | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 1 | Filter by Request Type | User filter by Request Type on DropDownList when want to view requests of that Type | N/A | Show list of requests of selected type |
| 2 | Filter by Status | User filter by Status on DropDownList when want to view requests of that status | N/A | Show list of requests of selected status |
| 3 | Filter by Period of Time | User filter by Period of Time on DropDownList when want to view requests of that period time | N/A | Show list of requests of selected period time |
| 5 | Request Index | List all requests which were sent to data center | N/A | List all requests which were sent to data center |

### View List Servers



**Fields**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Field name | Description | Read only | Mandatory | Control type | Data type | Length |
| 2 | Search | User enters content that want to search | No | No | textbox | string | N/A |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Function | Description | Validation | Outcome |
| 1 | Filter by Status | User filter by Status on DropDownList when want to view servers of that status | N/A | Show list of servers of selected status |
| 3 | Server Index | List all servers which are put at data center | N/A | List all servers which are put at data center |
| 4 | View Server Detail | User click on each row when want to view server detail | N/A | Navigate to Server Detail Page |
| 5 | Request Link | User click on request link when want to view request detail of this server | N/A | Show corresponding Request Detail Page |

## Database Design

### Logical Diagram

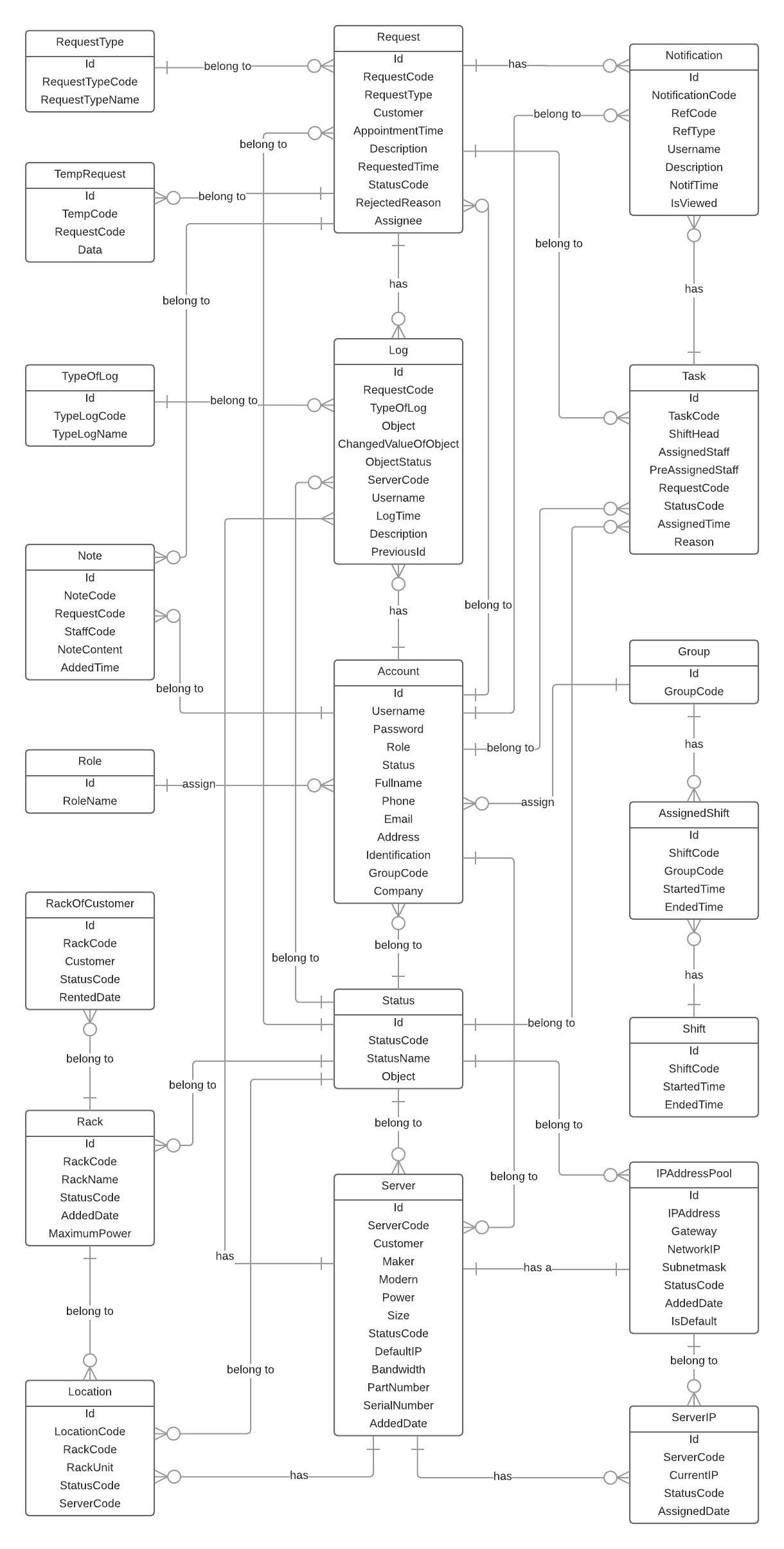


Figure 68: Logical Diagram

### Data Dictionary

|  |  |
| --- | --- |
| **Entity data dictionary** | |
| **Entity Name** | Description |
| Server | Describe all server information in data center. |
| Status | Describe all of statuses of objects in data center. |
| Location | Describe all location information in data center. |
| Rack | Describe all racks information which are putting in data center. |
| Log | Describe all logs about object’s changes in data center. |
| Role | Describe all roles in the system. |
| ServerIP | Describe all of current IP Addresses of server. |
| Request | Describe all request content which was sent by customer. |
| Account | Describe all user information in the system. |
| Note | Describe all note which was wrote by previous shift for the next shift. |
| TempRequest | Describe temporary detail of all requests. |
| IPAddressPool | Describe all IP Addresses information which data center is keeping. |
| RequestType | Describe all types of request. |
| TypeOfLog | Describe all types of log. |
| Group | Describe all groups of data center. |
| AssignedShift | Describe which group is in which shift each day. |
| Shift | Describe started time and ended time of each shift group. |
| RackOfCustomer | Describe all racks which was rent by customer. |
| Notification | Describe all notification information. |
| Task | Describe all contents of each task. |

*Table 9: Entity Data Dictionary*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Entity name** | **Attributes** | **Description** | **Domain** | **Null** |
| Role | Id | Unique identifier of a role, auto increment. | int | No |
| RoleName{PK} | Role Name, unique identifier of a role | varchar(10) | No |
| Account | Id | Unique identifier of an account, auto increment. | int | No |
| Username{PK} | Username of an account, identifier of an account | varchar(30) | No |
| Password | Password of an account | varchar(20) | No |
| Role{FK} | Role name of an account | varchar(10) | No |
| Email | Email address of user | varchar(50) | No |
| Fullname | Full name of user | nvarchar(150) | No |
| Phone | Phone of user | varchar(50) | No |
| GroupCode{FK} | Group of user | nvarchar(50) | No |
| Company | Company of customer | nvarchar(MAX) | Yes |
| Address | Address of user | nvarchar(150) | No |
| Identification | Identification Number of user | varchar(50) | No |
| Status{FK} | Current status of user | bit | No |
| Server | Id | Unique identifier of server, auto increment. | int | No |
| ServerCode{PK} | Code of server, identifier of a server | nvarchar(50) | No |
| Customer{FK} | Customer who own this server | nvarchar(50) | No |
| Maker | The maker of server | nvarchar(50) | No |
| Model | The modern of server | nvarchar(50) | No |
| Power | The power of server | int | No |
| Size | The size of server: 1U, 2U or 4U | int | No |
| StatusCode{FK} | Current status of server. | varchar(50) | No |
| Bandwidth | Bandwidth of server | varchar(50) | No |
| DefaultIP{FK} | Default IP of server | int | Yes |
| AddedDate | The date when server was registered. | datetime | No |
| SerialNumber | Serial number of server | nvarchar(MAX) | Yes |
| PartNumber | Part number of server | nvarchar(MAX) | Yes |
| Note | Id | Unique identifier of note, auto increment. | int | No |
| NoteCode{PK} | Code of note, identifier of a note | nvarchar(50) | No |
| RequestCode{FK} | Code of request which has note | nvarchar(50) | No |
| StaffCode{FK} | Code of staff who added note | nvarchar(50) | No |
| NoteContent | Content of note | nvarchar(MAX) | No |
| AddedTime | The time when note was added | datetime | No |
| Log | Id | Unique identifier of a log, auto increment. | int | No |
| RequestCode{FK} | Code of request which was logged | nvarchar(50) | Yes |
| TypeOfLog{FK} | The type of log | nvarchar(50) | No |
| Object | Object which was logged | nvarchar(50) | No |
| LogTime | The time when logged | datetime | No |
| ObjectStatus{FK} | The status of object which was logged | nvarchar(50) | No |
| ServerCode{FK} | The code of server which was logged | nvarchar(50) | Yes |
| Username{FK} | The username of user who logged | nvarchar(50) | No |
| Description | Description of log | nvarchar(MAX) | Yes |
| PreviousId | Id of previous log involved | int | Yes |
| ChangedValueOfObject | The changed value of Object | nvarchar(50) | No |
| ServerIP | Id | Unique identifier of ServerIP, auto increment. | int | No |
| ServerCode{FK} | Code of Server | nvarchar(50) | No |
| CurrentIP{FK} | Current IP of server | nvarchar(50) | No |
| StatusCode{FK} | Status of ServerIP | nvarchar(50) | No |
| AssignedDate | The date when IP Address was assigned for server | datetime | No |
| IPAddressPool | Id | Unique identifier of IP Address, auto increment. | int | No |
| IPAddress{PK} | IP Address of data center, identifier of IP Address | nvarchar(50) | No |
| StatusCode{FK} | Current status of IP Address | nvarchar(50) | No |
| Gateway | Gateway of IP Address | nvarchar(50) | No |
| NetworkIP | NetworkIP of IP Address | nvarchar(50) | No |
| Subnetmask | Subnetmask of IP Address | nvarchar(50) | No |
| IsDefault | The IP Address is a default IP or not | bit | No |
| AddedDate | The date when IP Address was added into system | datetime | No |
| RequestType | Id | Unique identifier of Request Type, auto increment. | int | No |
| RequestTypeCode{PK} | Code of Request Type, identifier of a request type | nvarchar(50) | No |
| RequestTypeName | Name of Request Type | nvarchar(50) | No |
| RackOfCustomer | Id | Unique identifier of RackOfCustomer, auto increment | int | No |
| RackCode{FK} | Code of rack which customer rented | nvarchar(50) | No |
| Customer{FK} | Customer who rented rack | nvarchar(50) | No |
| StatusCode{FK} | Status of RackOfCustomer | nvarchar(50) | No |
| RentedDate | The time when customer rented rack | datetime | No |
| Notification | Id | Unique identifier of Notification, auto increment | int | No |
| NotificationCode{PK} | Code of notification, identifier of a notification | nvarchar(50) | No |
| RefCode{FK} | Code of object which has notification | nvarchar(50) | No |
| RefType | Type of object which has notification | nvarchar(50) | No |
| Username{FK} | User who will receive the notification | nvarchar(50) | No |
| IsViewed | The notification which was viewed or not | bit | No |
| NotifTime | The time which send notification | datetime | No |
| Description | The description of notification | nvarchar(MAX) | No |
| TempRequest | Id | Unique identifier of TempRequest, auto increment | int | No |
| TempCode{PK} | Code of TempRequest, identifier of a TempRequest | nvarchar(50) | No |
| RequestCode{FK} | Code of Request which was saved TempData | nvarchar(50) | No |
| Data | Data which was saved temporary for request | nvarchar(MAX) | No |
| Location | Id | Unique identifier of Location, auto increment | int | No |
| LocationCode{PK} | Code of Location, identifier of a location | nvarchar(50) | No |
| RackCode{FK} | Code of rack | nvarchar(50) | No |
| StatusCode{FK} | Status of location | nvarchar(50) | No |
| ServerCode{FK} | Server which was put on location | nvarchar(50) | Yes |
| RackUnit | Rack Unit of each location | int | No |
| Status | Id | Unique identifier of Status, auto increment | int | No |
| StatusCode{PK} | Code of Status, identifier of a status | nvarchar(50) | No |
| StatusName | Status name of each Object | nvarchar(50) | No |
| Object | The Object of system | nvarchar(50) | No |
| Request | Id | Unique identifier of Request, auto increment | int | No |
| RequestCode{PK} | Code of Request, identifier of a request | nvarchar(50) | No |
| RequestType{FK} | Type of each request | nvarchar(50) | No |
| Customer{FK} | Customer who sent request | nvarchar(50) | No |
| AppointmentTime | The time when customer registered to have appointment with data center | datetime | Yes |
| Description | The description of customer in request | nvarchar(MAX) | Yes |
| StatusCode{FK} | Current status of request | nvarchar(50) | No |
| Assignee{FK} | The staff who was assigned this request | nvarchar(50) | No |
| RejectedReason | Reason when request is rejected | nvarchar(MAX) | Yes |
| RequestedTime | The time when request was sent | datetime | No |
| Rack | Id | Unique identifier of Rack, auto increment | int | No |
| RackCode{PK} | Code of Rack, identifier of a request | nvarchar(50) | No |
| RackName | Name of Rack | nvarchar(50) | No |
| StatusCode{FK} | Current status of Rack | nvarchar(50) | No |
| AddedDate | The date when rack was added into data center | datetime | No |
| MaximumPower | The power of Rack | int | No |
| Task | Id | Unique identifier of Task, auto increment | int | No |
| TaskCode{PK} | Code of Task, identifier of a task | nvarchar(50) | No |
| ShiftHead{FK} | ShiftHead who assigned task | nvarchar(50) | No |
| AssignedStaff{FK} | The Staff who was assigned task | nvarchar(50) | No |
| RequestCode{FK} | The code of Request which was assigned | nvarchar(50) | No |
| StatusCode{FK} | The current code of Task | nvarchar(50) | No |
| Reason | The reason when task does not finish | nvarchar(MAX) | Yes |
| AssignedTime | The time when task was assigned | datetime | No |
| PreAssignedStaff{FK} | The Staff who was assigned previous | nvarchar(50) | Yes |
| AssignedShift | Id | Unique identifier of AssignedShift, auto increment | int | No |
| ShiftCode{FK} | Code of Shift | nvarchar(50) | No |
| GroupCode{FK} | Code of Group | nvarchar(50) | No |
| StartedTime | The started time of shift | datetime | No |
| EndedTime | The ended time of shift | datetime | No |
| Group | Id | Unique identifier of group, auto increment | int | No |
| GroupCode{PK} | Code of Group, identifier of a group | nvarchar(50) | No |
| Shift | Id | Unique identifier of shift, auto increment | int | No |
| ShiftCode{PK} | Code of shift, identifier of shift | nvarchar(50) | No |
| StartedTime | The time when shift started | datetime | No |
| EndedTime | The time when shift ended | datetime | No |
| TypeOfLog | Id | Unique identifier of TypeOfLog, auto increment | int | No |
| TypeCode{PK} | Code of Type of Log | nvarchar(50) | No |
| TypeName | Name of Type of Log | nvarchar(50) | No |

*Table 10: Detail Data Dictionary*

## Algorithms

### Academic classification

Figure 69: Academic classification main flow

Figure 70: Academic classification sub-flow 1, 2, 3, 5

Figure 71: Academic classification sub-flow 4, 6

### Consider of honor

Figure 72: Consider Honor

### Consider of upgrading

Figure 73: Consider Upgrading

### State Machine Diagram for Request Status

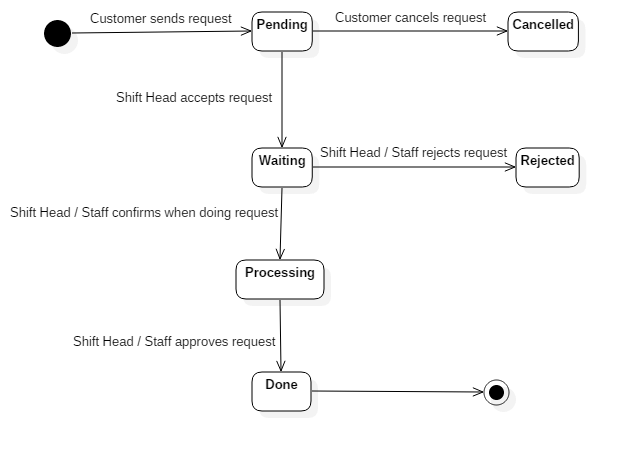


Figure 74: State Machine Diagram for Request Status

### State Machine Diagram for Task Status

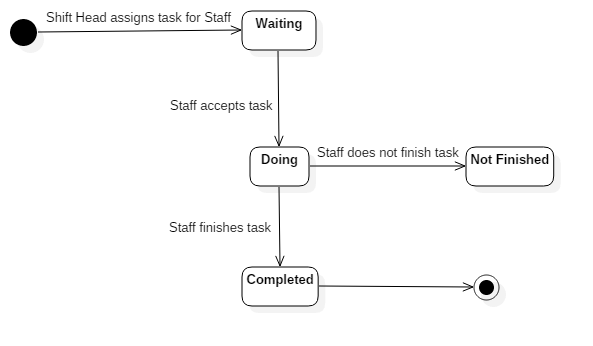
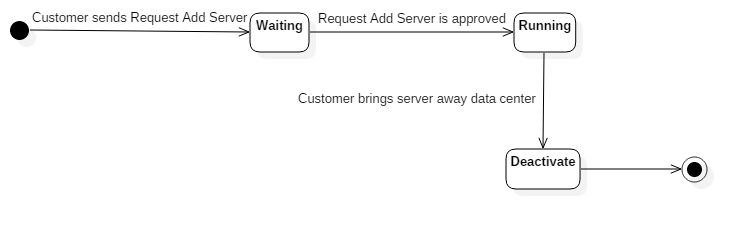


Figure 75: State Machine Diagram for Staff Status

### State Machine Diagram for Server Status



**Figure 75: State Machine Diagram for Server Status**