

**System Specification: Phone Book Management System**  
**Version 1.0**

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## I. Document Change Log

Date	Version	Description	Author
24/12/2025	1.0	Develop documentation	Trương Hoài Tú Hoàng Ngọc Tú Võ Huỳnh Anh Tuấn
26/12/2025	1.1	Added Use Case Diagram	Võ Huỳnh Anh Tuấn
28/12/2025	1.2	Added Functional Decomposition Diagram (FDD), Data Flow Diagram (DFD) level 0 + 1	Hoàng Ngọc Tú
29/12/2025	1.3	Added Data Flow Diagram (DFD) level 2	Trương Hoài Tú Huỳnh Hòa Tường
30/12/2025	1.4	Added Class Diagram	Dư Quốc Việt
31/12/2025	1.5	Design Database	Hoàng Ngọc Tú

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## II. Phone Book Management System

The system is designed to provide essential features for users to store, retrieve, and manage contact information effectively.

### 1. Main Functional Requirements

#### 1.1. Account Management & Synchronization

- **Registration & Login:** Allows users to create accounts using Email or Phone Number. Supports a "Forgot Password" feature via OTP (One-Time Password) verification.
- **Cloud Synchronization:** Automatically back up contact data to the server when an internet connection is available. Data is automatically synced when users log in on a new device.
- **Data Import/Export:** Supports importing and exporting contact lists in **.json** or **.xlsx** formats.

#### 1.2. Contact Management (CRUD)

- **Add New Contact:**
  - **Mandatory Fields:** Phone Number.
  - **Optional Fields:** Full Name, Avatar, Email, Address, Company, Job Title, Date of Birth, and Notes.
- **Edit Contact:** Allows updating all information fields of an existing contact.
- **Delete Contact:** Supports deleting individual contacts or performing **Bulk Delete** (deleting multiple contacts at once).
- **Categorization (Grouping):** Allows assigning contacts to specific groups (Family, Friends, Work, Favorites). A contact can belong to multiple groups.

#### 1.3. Display & Search

- **List View:** \* Displays a collapsed list (Name + Phone Number).
  - Default sorting in alphabetical order (A-Z).
  - Supports a **Fast Scrollbar** (Alphabetical scroll) on the side of the screen for quick navigation.
- **Detailed View:** Displays all stored information and integrates **Quick Action Buttons** (Call, Text/SMS, Send Email).
- **Search:** Smart search by Name, Phone Number, Nickname, or Initial characters with **Real-time search** results (updates as the user types).

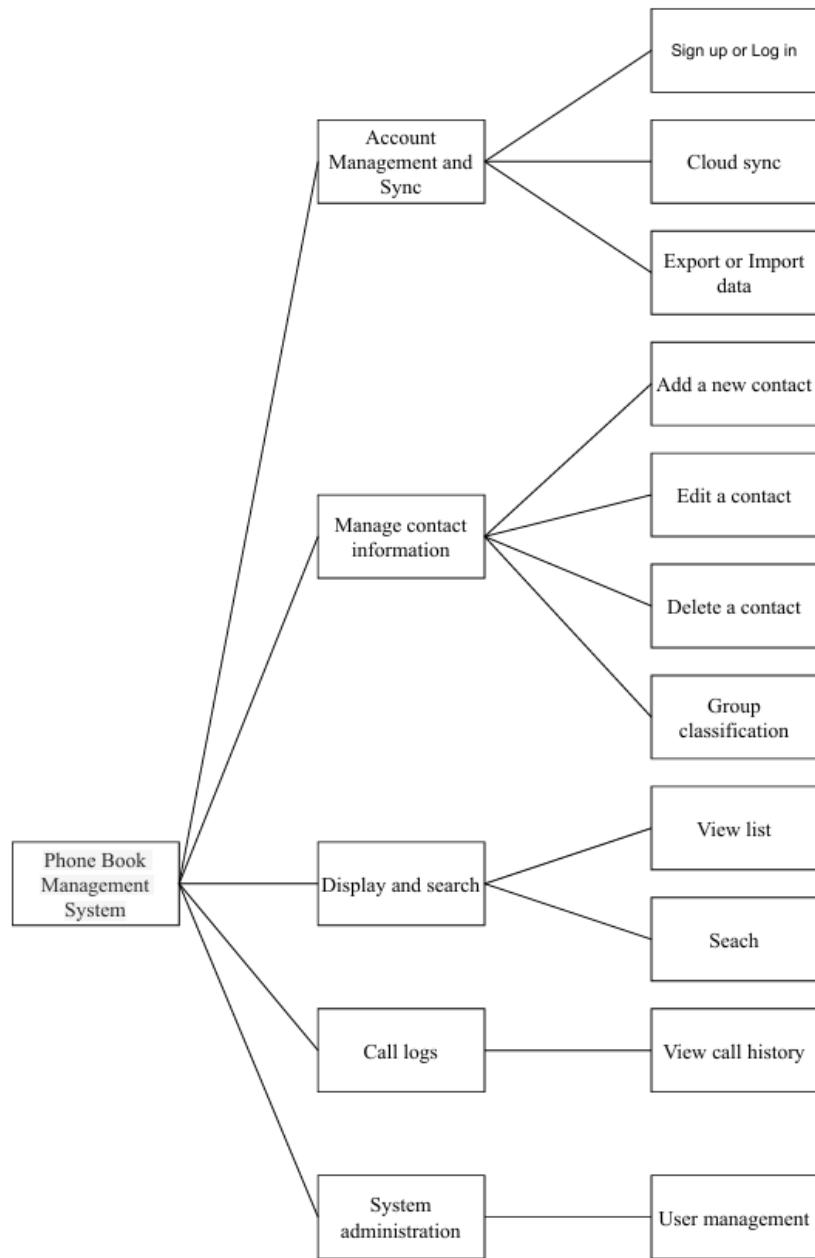
#### 1.4. Call Logs

- **Classification:** Categorizes call history into three types: **Incoming, Outgoing, and Missed calls.**
- **Detailed Information:** Logs the date, time, duration, name (if available in the phone book), and phone number.
- **Visual Indicators:** Missed calls must be highlighted in **red** for easy recognition.

#### 1.5. System Administration (Admin Role)

- **User Management:** Allows administrators to view the list of user accounts, monitor activity status, and perform **Lock/Unlock (Suspend/Activate)** actions on accounts when necessary.

## 2. Functional Decomposition Diagram (FDD)



## 3. Non-Functional Requirements

### 3.1. Usability

- **Responsive Interface:** The system must display optimally across various screen sizes (Mobile, Tablet, and Desktop).
- **User Experience (UX):** Critical operations (e.g., Adding a contact, Searching) must be completed within a maximum of **2 clicks**.

### **3.2. Reliability**

- Availability: The system must operate stably with a minimum uptime of 90%.
- Backup: Cloud data must be backed up periodically every 24 hours to ensure no data loss for users.

### **3.3. Performance**

- Response Time: Search operations and contact retrieval must be completed within a maximum of 5 seconds.
- Concurrency: The system must support a minimum of 1,000 concurrent users without experiencing lag or performance degradation.
- Data Scalability: The system should stably manage up to 100,000 contact records without reducing processing speed.

### **3.4. Supportability**

- Modular Architecture: The system must be developed using a Modular Design (e.g., Call Module, Contact Module, Auth Module) to facilitate easy integration of future features such as Video Calls or Social Media connectivity.

### **3.5. Security**

- Encryption: User passwords must be protected using strong hashing algorithms (e.g., BCrypt or Argon2).
- Privacy (Data Isolation): The system must guarantee strict Data Isolation — User A must never be able to access or view User B's contact list.
- Authentication: Support Two-Factor Authentication for login attempts from unrecognized devices.

### **3.6. Design Constraints**

- Platform: Web-based (HTML5, CSS3, Python, SQLite)
- Operating System: Works on Windows, Linux
- Framework: May use Flask or Django for backend logic

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### III. Use Case Diagram

#### 1. Context Diagram



#### 1.1. List of Actors

STT	Actor	Significance
1	User	A user who has successfully registered and signed into the system

2	Admin	The person responsible for managing and maintaining the system
3	OTP Server	The system that supports security protocols and identity verification
4	Cloud Server	The system responsible for data persistence and storage

## 1.2. List of Use-case

STT	Use-case	Significance	Notes (Group)
1	Register	Allows users to create a new account using an Email or Phone Number.	1
2	Login	Verifies user identity to grant access to the system.	1
3	Sync Data	Automatically backs up contact data to the server or downloads it to the device.	1
4	Forgot Password	Assists users in resetting their password if it is forgotten.	1
5	Verify OTP	Verifies a one-time passcode sent via phone or email for security.	1
6	Send OTP Request	Triggers the system to send a verification code to the user's device/email.	1
6	Import/Export Data	Converts contact data to .json or .xlsx formats and vice versa.	2
7	Add/Delete Contacts	Allows adding a new contact or removing contacts that are no longer needed.	2
8	Edit Contacts	Updates information (Name, Photo, Email, Address, etc.) for existing contacts.	2
9	Manage Groups	Assigns contacts to groups such as Family, Friends, Work, or Favorites.	2
10	View Contact List	The primary interface for browsing all saved contacts.	3

11	Search Contact	An optional action to find specific contacts quickly within the list.	3
12	Call/Message/ Email	Provides rapid-access buttons to perform calls, send messages, or compose emails.	4
13	View Call Logs	Displays a log of all incoming, outgoing, and missed calls.	4
14	Filter Logs	Filters the call history list by call type (Missed, Incoming, Outgoing).	4
15	Manage Users	Views the list and active status of all user accounts.	5
16	Lock/Unlock Account	Performs actions to lock or restore access for a specific customer account.	5

## 2. Use-case: Register

### 2.1. Brief Description:

This use case allows users to create a new account using their Email or Phone Number.

### 2.2. Flow of Events:

#### 2.2.1. Main Flow:

1. User enters registration information (Email/Phone number and password).
2. The system validates the data.
3. The system connects to the Cloud Server to store account information.
4. The system notifies the user of successful registration.

#### 2.2.2. Alternative Flows:

Invalid Information: The system requests the user to re-enter the data.

### 2.3. Special Requirements:

None.

### 2.4. Pre-conditions:

The user does not have an account yet.

### 2.5. Post-conditions:

A new account is created on the server.

2.6. Extension Points:

None.

3. Use-case: Login

3.1. Brief Description:

Authenticates the user's identity to grant access to system features.

3.2. Flow of Events:

**3.2.1. Main Flow:**

1. User enters login credentials.
2. The system authenticates the identity with the server.
3. The system performs the Sync Data step (include).
4. The system redirects the user to the main interface.

**3.2.2. Alternative Flows:**

Incorrect Credentials: The system displays an error message and requests re-entry.

3.3. Special Requirements:

Requires an internet connection for synchronization.

3.4. Pre-conditions:

The user already has an account.

3.5. Post-conditions:

User logs in successfully; data is synchronized.

3.6. Extension Points:

None.

4. Use-case: Sync Data

4.1. Brief Description:

Automatically backs up or downloads contact data between the server and the user's device.

4.2. Flow of Events:

**4.2.1. Main Flow:**

1. The system checks the network connection.
2. The system compares data between the device and the server.
3. The system uploads or downloads the latest changes.

#### **4.2.2. Alternative Flows:**

No Internet: The system pauses and waits for a reconnection.

#### 4.3. Special Requirements:

Operates when connected to the internet or when logging into a new device.

#### 4.4. Pre-conditions:

Data has changed or a new login has occurred.

#### 4.5. Post-conditions:

Data on the device and server are synchronized.

#### 4.6. Extension Points:

None.

### 5. Use-case: Forgot Password

#### 5.1. Brief Description:

Supports users in regaining account access when they forget their password.

#### 5.2. Flow of Events:

##### **5.2.1. Main Flow:**

1. User requests password recovery via Email/Phone number.
2. The system includes the Verify OTP step.
3. User sets a new password.
4. The system updates the password on the server.

##### 5.2.2. Alternative Flows:

Invalid OTP: The system requests re-entry or a resend of the code.

#### 5.3. Special Requirements:

Connection to the OTP Server is required.

#### 5.4. Pre-conditions:

User cannot log in due to a forgotten password.

#### 5.5. Post-conditions:

A new password is successfully set.

#### 5.6. Extension Points:

None.

## 6. Use-case: Verify OTP

### 6.1. Brief Description:

Validates the One-Time Password (OTP) sent via phone or email to ensure security.

### 6.2. Flow of Events:

#### 6.2.1. Main Flow:

1. The system sends an OTP to the user's contact information.
2. User enters the OTP into the system.
3. The system interacts with the OTP Server to verify accuracy.
4. The system confirms the code is valid.

#### 6.2.2. Alternative Flows:

Expired Code: The user requests a new code.

### 6.3. Special Requirements:

Direct interaction with the OTP Server.

### 6.4. Pre-conditions:

The system requires security authentication.

### 6.5. Post-conditions:

Authentication successful.

### 6.6. Extension Points:

None.

## 7. Use-case: Send OTP request

### 7.1. Brief Description:

Generates and sends a One-Time Password (OTP) to the user's registered email or phone number for identity verification.

### 7.2. Flow of Events:

#### 7.2.1. Main Flow:

1. User enters their registered identifier (Email or Phone Number) in the Forgot Password interface.
2. User clicks the "Send OTP" button.
3. The system validates the identifier's existence in the database.
4. The system generates a unique OTP and sets an expiration time.

5. The system triggers the OTP Server/Mail Server to deliver the code.
6. The system notifies the user that the code has been sent.

#### 7.2.2. Alternative Flows:

- Invalid/Non-existent Identifier: The system displays an error message stating the account was not found.
- Server Connection Failure: The system notifies the user that the delivery service is temporarily unavailable.
- Request Throttling: If the user requests codes too frequently, the system prompts the user to wait for a specific duration.

#### 7.3. Special Requirements:

The OTP must be encrypted in the database and must expire within a short period (e.g., 5 minutes) for security purposes.

#### 7.4. Pre-conditions:

The user must have an existing account and be on the password recovery screen.

#### 7.5. Post-conditions:

An OTP is sent to the user, and the system proceeds to the verification stage.

#### 7.6. Extension Points:

**Resend OTP:** Allows the user to request a new code after a cooldown period.

### 8. Use-case: Import/Export Data

#### 8.1. Brief Description:

Converts contact data to .json or .xlsx formats and vice versa.

#### 8.2. Flow of Events:

##### 8.2.1. Main Flow:

1. User selects either Import or Export function.
2. If Export: The system extracts contacts into a .json/.csv file.
3. If Import: User selects a file; the system loads data into the phone book.

##### 8.2.2. Alternative Flows:

Invalid File Format: The system displays an error message.

#### 8.3. Special Requirements:

Used for offline storage or application migration.

#### 8.4. Pre-conditions:

None.

#### 8.5. Post-conditions:

Data is successfully exported to a file or imported into the system.

#### 8.6. Extension Points:

None.

### 9. Use-case: Add/Delete Contacts

#### 9.1. Brief Description:

Adds a new contact or removes contacts that are no longer needed.

#### 9.2. Flow of Events:

##### **9.2.1. Main Flow:**

1. User selects Add New or Delete contact.
2. If Add: User enters information (Phone number is mandatory).
3. If Delete: User selects one or multiple contacts for bulk deletion.
4. The system updates the contact list.

##### **9.2.2. Alternative Flows:**

None.

#### 9.3. Special Requirements:

Supports single or bulk deletion.

#### 9.4. Pre-conditions:

None.

#### 9.5. Post-conditions:

The phone book is updated (contacts added or removed).

#### 9.6. Extension Points:

None.

### 10. Use-case: Edit Contacts

#### 10.1. Brief Description:

Updates detailed information for an existing contact in the phone book.

#### 10.2. Flow of Events:

##### **10.2.1. Main Flow:**

1. User selects the contact to edit.
2. User modifies fields (Name, Photo, Email, Address, etc.).
3. The system saves the changes.

#### **10.2.2. Alternative Flows:**

None.

#### 10.3. Special Requirements:

All information fields can be edited.

#### 10.4. Pre-conditions:

The contact must already exist.

#### 10.5. Post-conditions:

Contact information is updated.

#### 10.6. Extension Points:

None.

### 11. Use-case: Manage Groups

#### 11.1. Brief Description:

Assigns contacts to groups such as Family, Friends, Work, or Favorites for easier management.

#### 11.2. Flow of Events:

##### **11.2.1. Main Flow:**

1. User selects a contact.
2. User selects the group to assign.
3. The system saves the grouping status of the contact.

##### **11.2.2. Alternative Flows:**

None.

#### 11.3. Special Requirements:

A contact can belong to multiple groups.

#### 11.4. Pre-conditions:

Contact list and default groups already exist.

#### 11.5. Post-conditions:

The contact is correctly categorized into groups.

11.6. Extension Points:

None.

## 12. Use-case: View Contact List

12.1. Brief Description:

Allows users to perform smart searches and displays the list of contacts.

### 12.2. Flow of Events:

#### 12.2.1. Main Flow:

1. User opens the contact list.
2. User enters search keywords (Name, Phone number, or Nickname).
3. The system displays real-time results.

#### 12.2.2. Alternative Flows:

No Results Found: The system displays an empty list message.

12.3. Special Requirements:

None.

12.4. Pre-conditions:

None.

12.5. Post-conditions:

User finds the desired contact.

12.6. Extension Points:

Search Contact Details (if the user selects to view details of a result).

## 13. Use-case: Call/Message/Email

13.1. Brief Description:

Performs quick actions to call, text, or email a contact.

13.2. Flow of Events:

#### 13.2.1. Main Flow:

1. From the contact details screen, the user selects Call, Message, or Email.
2. The system triggers the corresponding application on the device to perform the task.

#### 13.2.2. Alternative Flows:

No Supporting App: The system displays an error message.

### 13.3. Special Requirements:

None.

### 13.4. Pre-conditions:

User is viewing contact details.

### 13.5. Post-conditions:

The call/message/email is initiated.

### 13.6. Extension Points:

This is an extend from the View Contact Details screen.

## 14. Use-case: View Call Logs

### 14.1. Brief Description:

Displays the history of incoming, outgoing, and missed calls.

### 14.2. Flow of Events:

#### **14.2.1. Main Flow:**

1. User selects the Call Logs tab.
2. The system displays the log list including date, time, and duration.
3. The system uses colors to distinguish between call types.

#### **14.2.2. Alternative Flows:**

None.

### 14.3. Special Requirements:

Must display detailed date/time, duration, and color-coded types.

### 14.4. Pre-conditions:

None.

### 14.5. Post-conditions:

None.

### 14.6. Extension Points:

Filter Logs (if the user selects to filter the list).

## 15. Use-case: Filter Logs

### 15.1. Brief Description:

Filters the call history by type (Missed, Incoming, Outgoing) to narrow the search scope.

### 15.2. Flow of Events:

#### **15.2.1. Main Flow:**

1. On the Call Logs screen, the user selects the filter option.
2. User selects the call type to view.
3. The system updates the list based on the selected filter.

#### **15.2.2. Alternative Flows:**

None.

### 15.3. Special Requirements:

None.

### 15.4. Pre-conditions:

User is on the View Call Logs screen.

### 15.5. Post-conditions:

The log list is narrowed according to the request.

### 15.6. Extension Points:

This is an extend from View Call Logs.

## 16. Use-case: Manage Users (Admin Only)

### 16.1. Brief Description:

Allows the Admin to view the list and activity status of other user accounts.

### 16.2. Flow of Events:

#### **16.2.1. Main Flow:**

1. Admin accesses the User Management section.
2. The system displays a list of customer accounts.
3. The system displays the activity status of each account.

#### **16.2.2. Alternative Flows:**

None.

### 16.3. Special Requirements:

Restricted to Admin accounts only.

16.4. Pre-conditions:

Logged in with Admin privileges.

16.5. Post-conditions:

Admin gains an overview of user statuses.

16.6. Extension Points:

Includes the Lock/Unlock Account action.

## 17. Use-case: Lock/Unlock Account

17.1. Brief Description:

Locks or unlocks the access rights of a customer account.

17.2. Flow of Events:

### **17.2.1. Main Flow:**

1. Admin selects an account from the management list.
2. Admin selects the Lock or Unlock command.
3. The system updates the access status of that account.

### **17.2.2. Alternative Flows:**

None.

17.3. Special Requirements:

Mandatory action when Admin performs user management.

17.4. Pre-conditions:

Admin is on the Manage Users screen.

17.5. Post-conditions:

The account is successfully locked or unlocked.

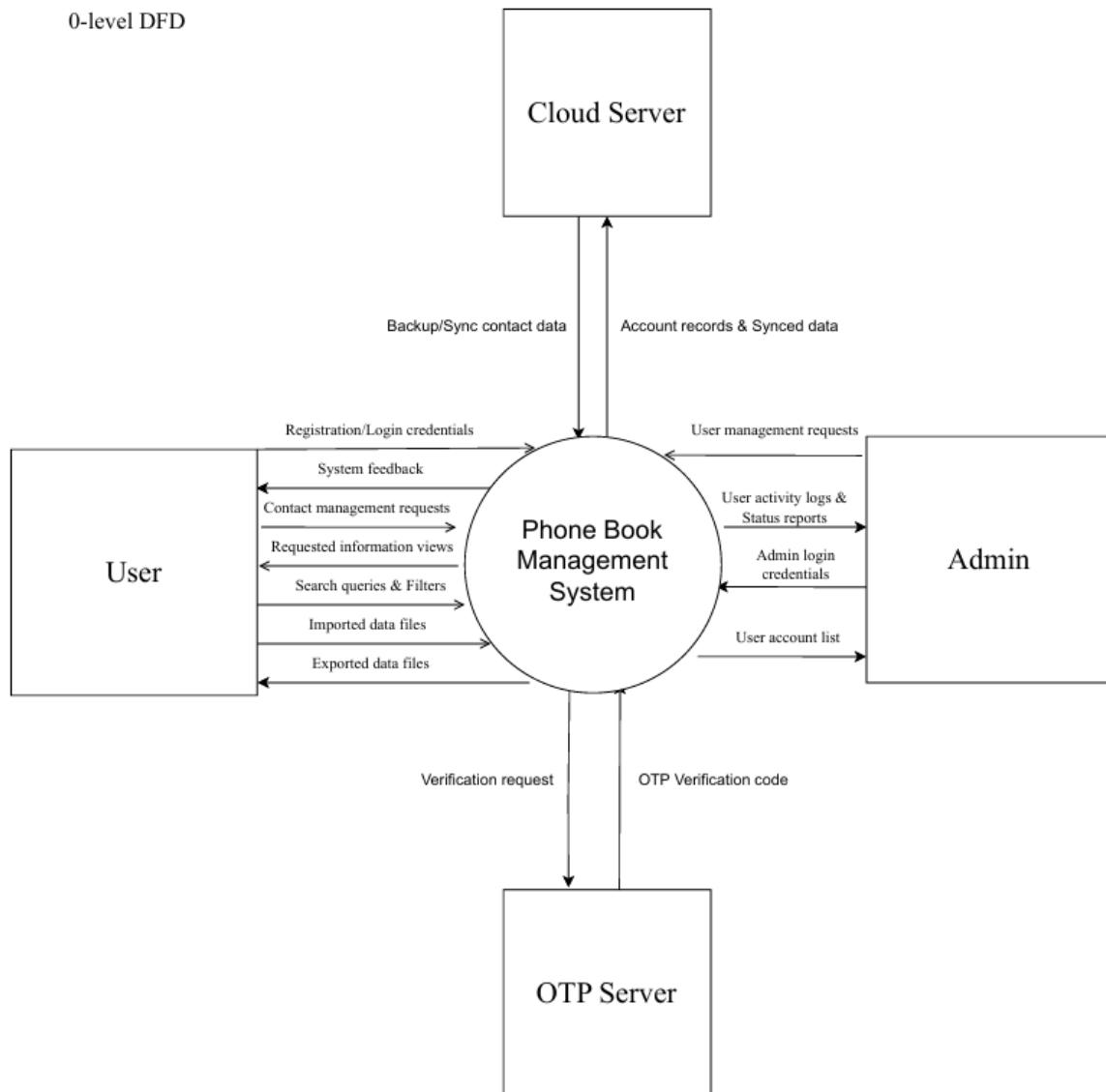
17.6. Extension Points:

None.

System Specification: Phone Book Management System	Version: 1.2
System Specification	28/12/2025

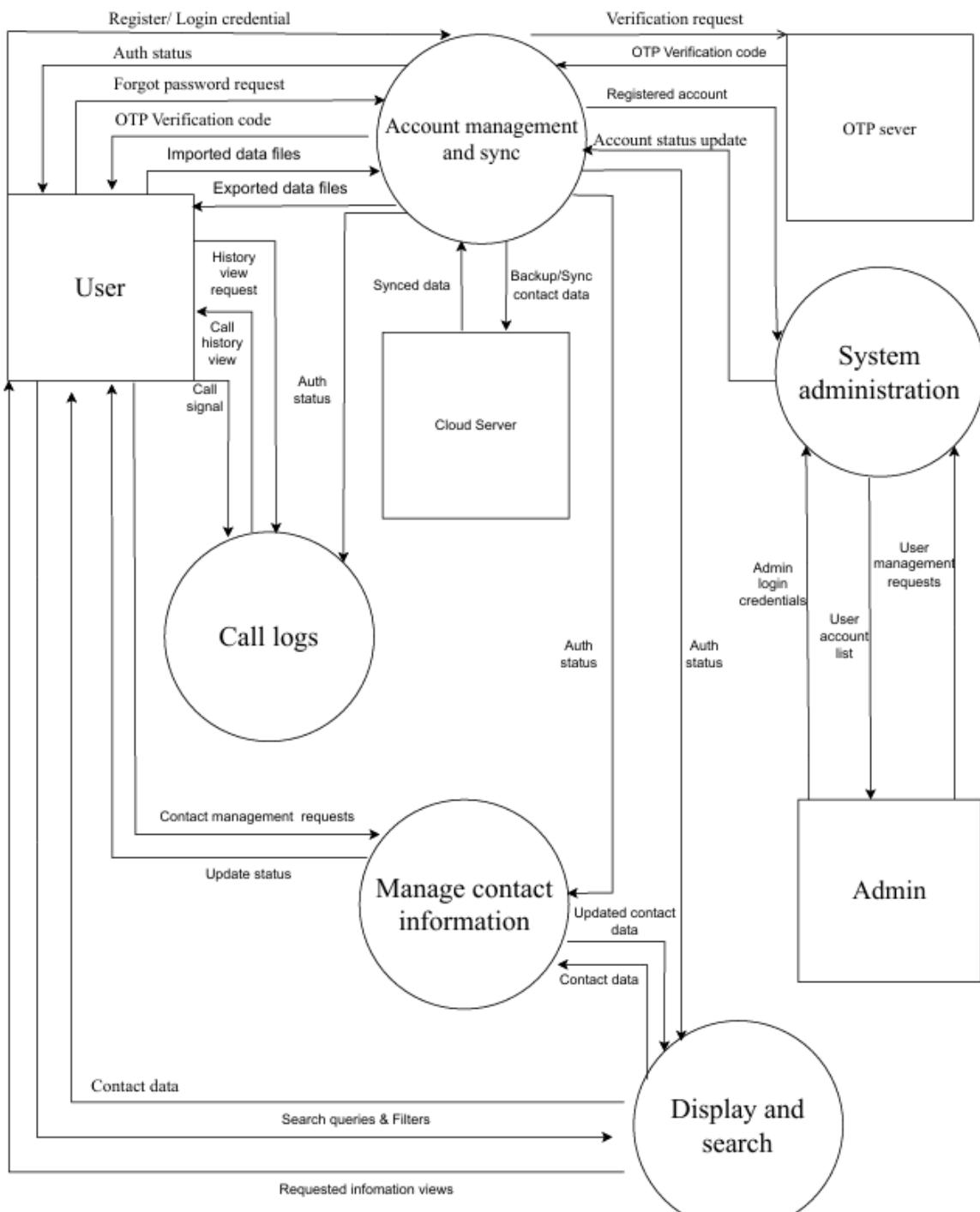
## V. Data Flow Diagram

### 1. Context Diagram Level 0



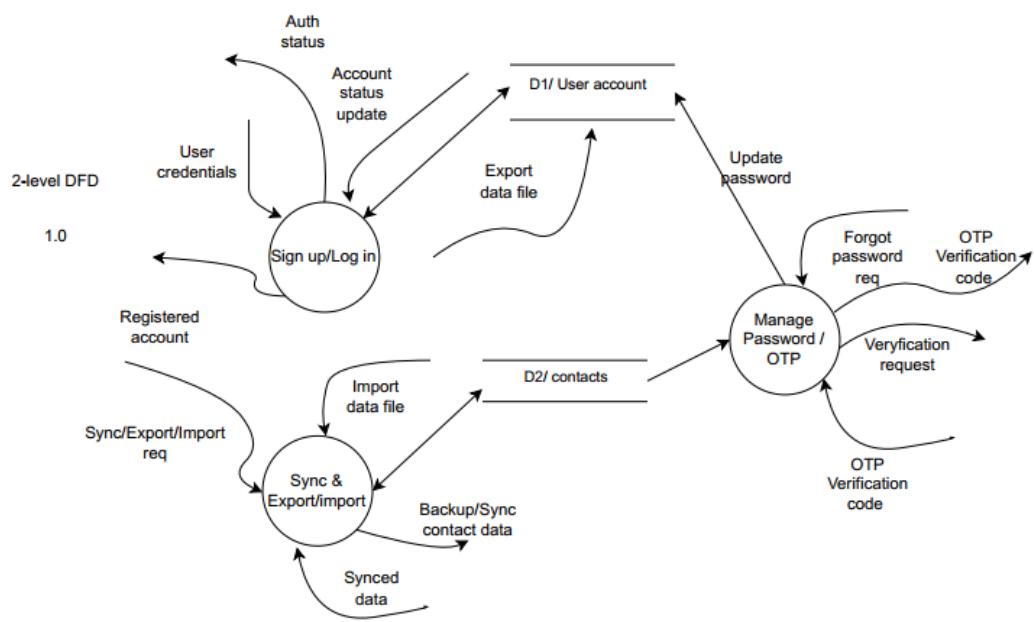
## 2. Context Diagram Level 1

1-level DFD

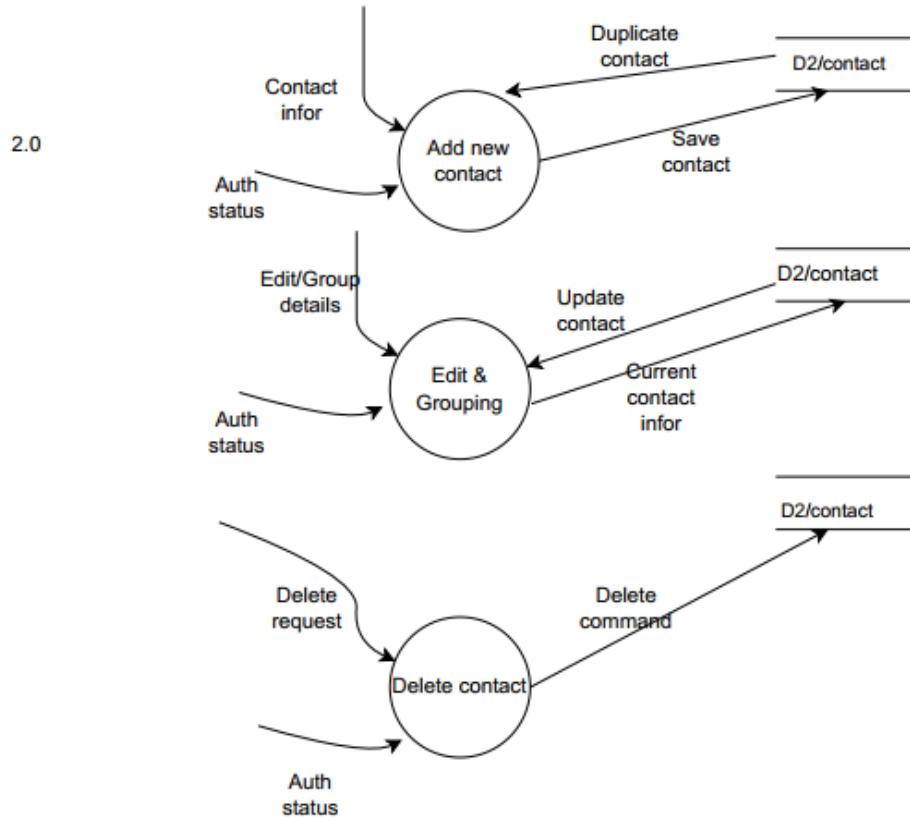


System Specification: Phone Book Management System	Version: 1.3
System Specification	29/12/2025

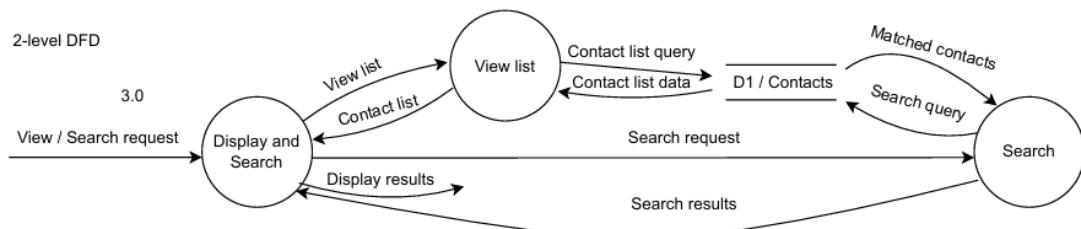
### 3. Context Diagram Level 2: 1.0 Account Management and Sync



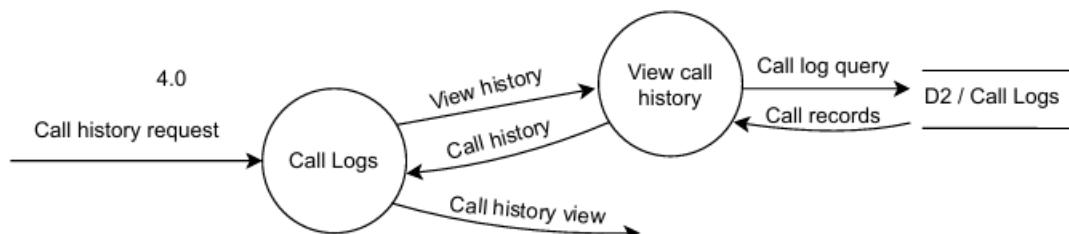
#### 4. Context Diagram Level 2: 2.0 Manage contact information



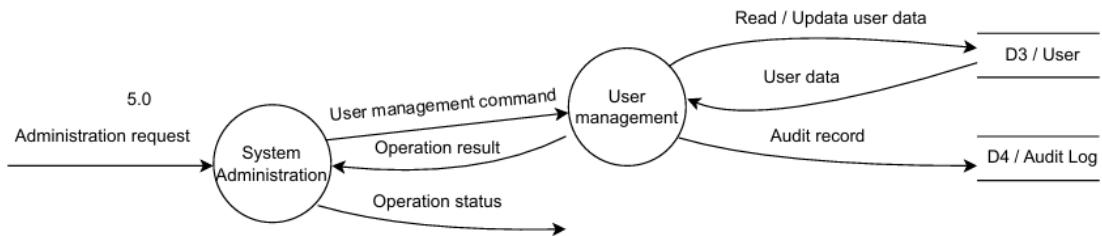
#### 5. Context Diagram Level 2: 3.0 Display and search



#### 6. Context Diagram Level 2: 4.0 Call logs



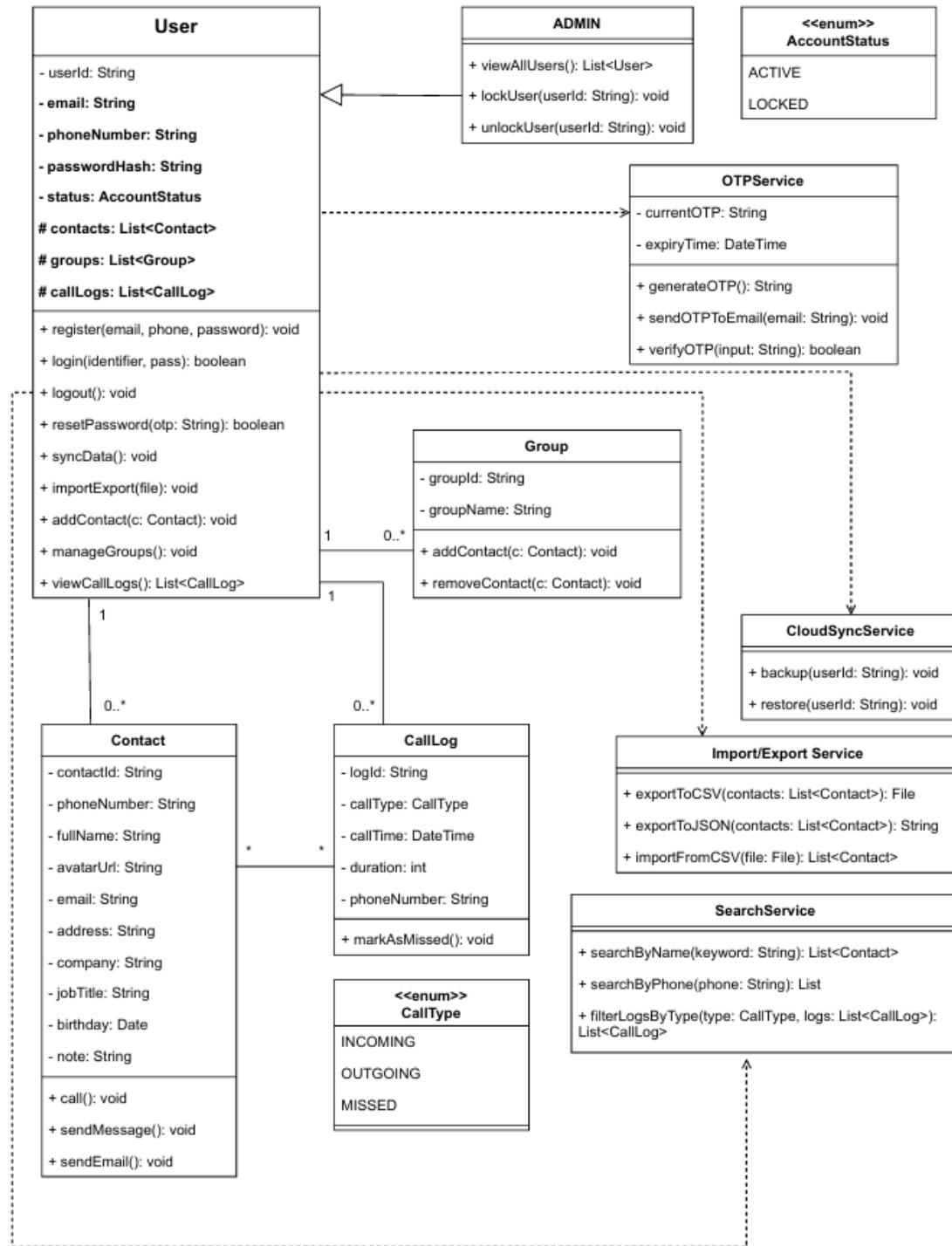
## 7. Context Diagram Level 2: 5.0 System administration



System Specification: Phone Book Management System	Version: 1.4
System Specification	30/12/2025

## VI. Class Diagram

### 1. Context Diagram



System Specification: Phone Book Management System	Version: 1.5
System Specification	31/12/2025

## VII. Database

### 1. Database Scheme

