

Software Requirement Specification

Functional Requirements

1. User Account Management

FR-1: User Registration

- **FR-1.1:** An unregistered user shall be able to register in the system.
- **FR-1.2:** The registration process shall require the user to provide a login credential (email address or phone number), a password, and a nickname.
- **FR-1.3:** If the chosen login credential is already in use, the system shall notify the user and request an alternative credential.
- **FR-1.4:** Upon submission of unique and valid registration information, the system shall create a new user account.

FR-2: User Login

- **FR-2.1:** A registered user shall be able to log in by entering their login credential and password.
- **FR-2.2:** If the user enters an incorrect login credential or password, the system shall display an appropriate error message and prompt re-entry.
- **FR-2.3:** When valid credentials are provided, the system shall grant access to the user.

FR-3: Password Recovery

- **FR-3.1:** The system shall provide a secure mechanism for users to reset their password if forgotten, typically via email or SMS verification.

FR-4: Profile Management

- **FR-4.1:** A registered user shall be able to update personal data (e.g., nickname, profile picture, status).
- **FR-4.2:** The system shall allow users to modify their profile settings (e.g., privacy options, notification preferences).

FR-5: Logout

- **FR-5.1:** A registered user shall be able to securely log out of the system at any time.

2. Chat and Messaging

FR-6: Chat Creation and Deletion

- **FR-6.1:** A registered user shall be able to create a new chat (private or group).

- **FR-6.2:** A registered user shall be able to delete an existing chat they have created or have admin privileges for.

FR-7: Contact Management

- **FR-7.1:** A registered user shall be able to add another user to their contacts.
- **FR-7.2:** A registered user shall be able to remove a user from their contacts.
- **FR-7.3:** The system shall allow users to search for new contacts using keywords or login credentials.

FR-8: Group Management

- **FR-8.1:** A registered user shall be able to create and manage group chats.
- **FR-8.2:** The system shall enable the assignment of administrative roles within group chats.
- **FR-8.3:** A registered user shall be able to search for and join existing groups.

FR-9: Message Transmission

- **FR-9.1:** A registered user shall be able to send text messages in both private and group chats.
- **FR-9.2:** A registered user shall be able to send multimedia messages, including audio, video, and images.
- **FR-9.3:** The system shall display timestamps for all messages.
- **FR-9.4:** The system shall support real-time message delivery with minimal latency.

FR-10: Message Management

- **FR-10.1:** A registered user shall be able to edit or delete messages they have sent.
- **FR-10.2:** The system shall provide message read receipts where applicable.
- **FR-10.3:** The system shall allow users to search within a chat for specific keywords or phrases.

FR-11: Notifications and Alerts

- **FR-11.1:** The system shall provide notifications for incoming messages and calls.
- **FR-11.2:** The system shall allow users to mute notifications on a per-chat or per-group basis.
- **FR-11.3:** The system shall support push notifications on mobile devices.

FR-12: Call Functionality

- **FR-12.1:** A registered user shall be able to initiate audio calls.
- **FR-12.2:** A registered user shall be able to initiate video calls.
- **FR-12.3:** The system shall notify users of incoming audio/video calls.

FR-13: File and Data Management

- **FR-13.1:** A registered user shall be able to send file attachments (e.g., documents, images).
- **FR-13.2:** The system shall provide file preview functionality for supported file types.
- **FR-13.3:** A registered user shall be able to export chat history in a standard format.

FR-14: Chat Settings

- **FR-14.1:** A registered user shall be able to customize chat settings (e.g., background, font size, and notification sounds).
- **FR-14.2:** The system shall allow users to pin important messages within a chat.

FR-15: Data Storage and Backup

- **FR-15.1:** The system shall allow users to locally save data on their devices.
- **FR-15.2:** The system shall automatically back up chat data at regular intervals.

3. User Interface and User Experience

FR-16: Responsive Design

- **FR-16.1:** The system shall provide a responsive user interface that works on both desktop and mobile devices.

FR-17: Customization

- **FR-17.1:** The system shall offer customizable themes and color schemes for the chat interface.
- **FR-17.2:** Users shall be able to set and update their availability status (e.g., online, offline, busy).

FR-18: Navigation and Search

- **FR-18.1:** The system shall provide a user-friendly navigation menu.
- **FR-18.2:** The system shall include robust search functionality for finding chats, contacts, and groups.

FR-19: Accessibility

- **FR-19.1:** The system shall adhere to accessibility standards, ensuring usability for people with disabilities.
- **FR-19.2:** The interface shall support screen readers and keyboard navigation.

FR-20: In-App Help and Support

- **FR-20.1:** The system shall include an in-app help section and FAQs.
- **FR-20.2:** The system shall provide a mechanism for users to contact technical support.

4. Security and Privacy

FR-21: Data Encryption

- **FR-21.1:** The system shall implement end-to-end encryption for all messages in transit and at rest.

FR-22: Password Security

- **FR-22.1:** The system shall enforce password complexity requirements during registration and password changes.
- **FR-22.2:** The system shall securely store passwords using industry-standard hashing algorithms.

FR-23: Session Management

- **FR-23.1:** The system shall automatically log out inactive users after a configurable period.
- **FR-23.2:** The system shall maintain a log of user login activities.

FR-24: Privacy Settings

- **FR-24.1:** The system shall allow users to control who can view their profile and contact them.
- **FR-24.2:** Users shall be able to block other users.
- **FR-24.3:** The system shall provide users with options to hide their online status.

FR-25: Security Against Attacks

- **FR-25.1:** The system shall implement measures to prevent brute force login attempts through rate limiting.
- **FR-25.2:** The system shall detect and mitigate common security threats, such as SQL injection and cross-site scripting (XSS).

FR-26: API Security

- **FR-26.1:** The system shall provide a secure API for third-party integrations, enforcing proper authentication and authorization.

5. Performance and Scalability

FR-27: Real-Time Performance

- **FR-27.1:** The system shall deliver real-time messaging with minimal latency.

- **FR-27.2:** The system shall ensure message synchronization across multiple devices.

FR-28: Scalability

- **FR-28.1:** The system shall be scalable to support a growing number of concurrent users.
- **FR-28.2:** The system architecture shall support horizontal scaling of services.

FR-29: Load Balancing

- **FR-29.1:** The system shall implement load balancing mechanisms to distribute user traffic evenly across servers.

FR-30: Performance Monitoring

- **FR-30.1:** The system shall include tools for monitoring performance metrics, such as response times and server load.

6. Integration and Extensibility

FR-31: Third-Party Integrations

- **FR-31.1:** The system shall provide integration with external APIs for additional features (e.g., calendar integration for scheduling calls).
- **FR-31.2:** The system shall support integration with contact management services.

FR-32: Developer API

- **FR-32.1:** The system shall expose a developer API to allow third-party developers to build extensions and integrations.
- **FR-32.2:** The developer API shall be documented and secured with proper authentication.

FR-33: Event and Calendar Integration

- **FR-33.1:** The system shall enable users to create and manage events within group chats.
- **FR-33.2:** The system shall integrate with popular calendar applications for scheduling purposes.

7. Additional Functionality

FR-34: Custom Status Messages

- **FR-34.1:** Users shall be able to set custom status messages visible to their contacts.

FR-35: Message Favoriting

- **FR-35.1:** Users shall be able to mark messages as favorites for quick reference.

FR-36: Chat History Management

- **FR-36.1:** The system shall allow users to search, filter, and view historical messages.
- **FR-36.2:** Users shall have the option to archive old chats.

FR-37: Data Export

- **FR-37.1:** Users shall be able to export their chat history and personal data in standard formats (e.g., JSON, CSV).

FR-38: Multimedia Handling

- **FR-38.1:** The system shall support the sending and receiving of high-quality multimedia files with file size limits specified in the configuration.

FR-39: Message Reactions and Emojis

- **FR-39.1:** Users shall be able to react to messages using a variety of emojis.
- **FR-39.2:** The system shall display the count and type of reactions on each message.

FR-40: Typing Indicators

- **FR-40.1:** The system shall show real-time typing indicators when a contact is composing a message.

FR-41: Read Receipts and Delivery Status

- **FR-41.1:** The system shall display delivery status for each message (sent, delivered, read).

FR-42: Multi-Language Support

- **FR-42.1:** The system shall support multiple languages, allowing users to select their preferred language.

FR-43: In-App Updates

- **FR-43.1:** The system shall notify users of available application updates.
- **FR-43.2:** Users shall be able to view a changelog of recent updates.

FR-44: Chat Archiving and Deletion

- **FR-44.1:** The system shall allow users to archive chats for long-term storage.

- **FR-44.2:** The system shall provide a mechanism for permanently deleting archived chats.

FR-45: System Help and Documentation

- **FR-45.1:** The system shall include an in-app help section with documentation on how to use various features.

FR-46: Abuse Reporting

- **FR-46.1:** Users shall be able to report abusive or inappropriate content within chats.
- **FR-46.2:** The system shall log abuse reports for administrative review.

FR-47: Custom Notification Settings

- **FR-47.1:** Users shall be able to customize notification settings, including sound and vibration preferences.

FR-48: Chat Session Persistence

- **FR-48.1:** The system shall preserve ongoing chat sessions across device switches and app restarts.

FR-49: Offline Mode

- **FR-49.1:** The system shall provide limited offline capabilities, allowing users to view recent messages when a network connection is unavailable.

FR-50: Scheduled Messaging

- **FR-50.1:** Users shall be able to schedule messages to be sent at a later time.

FR-51: User Activity Status

- **FR-51.1:** The system shall display user activity statuses (e.g., last seen, active now).

FR-52: Privacy for Group Chats

- **FR-52.1:** The system shall allow group admins to set privacy settings (public or invite-only groups).

FR-53: Data Retention Policies

- **FR-53.1:** The system shall support configurable data retention policies for chat histories and attachments.

FR-54: Session Encryption Refresh

- **FR-54.1:** The system shall periodically refresh encryption keys during long sessions to enhance security.

FR-55: User Onboarding Tour

- **FR-55.1:** New users shall be offered an optional onboarding tour to introduce key features of the platform.

FR-56: API Rate Limiting

- **FR-56.1:** The system shall enforce rate limiting on its API to prevent abuse and ensure fair usage.

FR-57: Logging and Audit Trails

- **FR-57.1:** The system shall maintain audit trails for critical actions (e.g., login attempts, message deletions) for security reviews.

FR-58: Customizable User Interface Layout

- **FR-58.1:** The system shall allow users to customize the layout of their chat interface (e.g., repositioning chat windows, resizing panels).

FR-59: Integration with Social Media

- **FR-59.1:** The system shall provide optional integration with social media platforms to enable sharing of content from chats.

FR-60: End-to-End Backup and Restore

- **FR-60.1:** Users shall have the ability to back up their chat data and restore it on another device.

FR-61: Multi-Device Synchronization

- **FR-61.1:** The system shall ensure that messages and settings are synchronized across all devices logged into the same account.

FR-62: Session Timeout Warning

- **FR-62.1:** The system shall display a warning before an inactive session is terminated.

Non-functional Requirements

Performance Requirements

- **High Throughput and Responsiveness:**
The application shall support a high volume of concurrent users and ensure fast, reliable communication between clients and servers. Failing to meet these performance targets may lead to a poor user experience and potential user attrition.
- **Real-Time Communication:**
The system shall maintain minimal latency for message delivery, even during peak usage.

Safety and Content Moderation Requirements

- **Child Protection:**
Considering the diverse age range of potential users, the platform shall incorporate robust content moderation features to safeguard children from inappropriate content.
 - Administrators of groups and channels must have tools to monitor and control content.
 - A dedicated “children mode” should be provided to automatically filter and hide unsuitable content.
- **User Reporting Mechanism:**
The system shall allow users to report unsafe or inappropriate content, prompting administrative review and necessary actions.

Security Requirements

- **Data Protection and Encryption:**
All sensitive data—including passwords, credit card details, and personal user information—must be encrypted both in transit and at rest using industry-standard cryptographic protocols.
- **Access Control and Authentication:**
Strict authentication and authorization policies must be enforced to prevent unauthorized access to user accounts and sensitive databases.
- **Anonymity and Data Leakage Prevention:**
For users opting for anonymous mode, the system shall ensure that no sensitive information is exposed. Additionally, the use of insecure communication channels is strictly prohibited.
- **Regular Security Updates:**
The application shall undergo continuous security audits and receive timely updates to mitigate vulnerabilities and counter emerging threats.

Software Quality Attributes

- **Security:**
The platform must provide robust, end-to-end security to ensure user data and messages remain protected from unauthorized access.
- **Multi-Platform Compatibility:**
The application must function consistently across various operating systems and hardware configurations, offering a uniform user experience on desktop, mobile, and web platforms.
- **Maintainability and Continuous Support:**
The system should be designed with maintainability in mind, receiving regular updates and prompt fixes for any bugs or security vulnerabilities.
- **Availability and Usability:**
The platform must be offered free of charge in its standard version, providing complete core functionality. Any premium features should serve only as enhancements and must not detract from the experience of free users.

Scalability Requirements

- **Concurrent Active Chats:**
The messaging system must support simultaneous operation of up to 20 active chats without significant performance degradation.
- **User Scalability:**
The system should be engineered to handle a large number of concurrent active users, with the capability to scale horizontally as needed to maintain performance.
- **Future Growth:**
The system's architecture should facilitate the expansion of features and user base without necessitating a complete overhaul.

Use-Case Diagrams



