CHAPTER 3

REQUIREMENTS

3.1. FUNCTIONAL REQUIREMENTS:

The functional requirements outline the specific features and functionalities that the Callify video conferencing application must provide to meet user needs effectively. Below is a detailed breakdown of these requirements:

3.1.1. User Authentication:

- **Account Creation**: Users must be able to create an account using email/password or social media integration (e.g., Google, Facebook).
- **Login/Logout**: Users should be able to log in and log out securely.
- **Password Recovery**: Users must have the option to recover their passwords through email verification.

3.1.2. Meeting Management:

- **Start New Meeting**: Users can initiate a new meeting with customizable settings for video and audio.
- **Schedule Meetings**: Users should be able to schedule future meetings, specifying date, time, and participants.
- **Join Meeting**: Users can join meetings using a unique meeting link or ID.
- **Meeting History**: Users should have access to a list of past meetings, including details such as date, time, and participants.

3.1.3. Meeting Controls:

- **Audio/Video Controls**: Participants can toggle their audio and video on/off during meetings.
- **Screen Sharing**: Users must be able to share their screens with other participants.
- **Recording**: Users should have the option to record meetings, with recordings stored securely.
- **Chat Functionality**: A chat feature must be available for participants to send messages and share files during meetings.
- **Participant Management**: Hosts can manage participants by muting, removing, or promoting them to co-hosts.

3.1.4. User Interface:

- **Dashboard**: A user-friendly dashboard displaying upcoming meetings, past meetings, and options to create or join meetings.
- **Meeting Interface**: An intuitive layout during meetings, providing easy access to controls (mute, video on/off, screen share, chat).
- **Notifications**: Users should receive notifications for upcoming meetings and important updates.

3.1.5. Personal Room Feature

- **Unique Meeting Links**: Each user should have a personal meeting room with a unique link for instant meetings.
- **Room Customization**: Users can customize their meeting room settings, such as background and participant permissions.

3.1.6. Security Features:

- **Data Encryption**: All data transmitted during meetings must be encrypted to ensure user privacy.
- **Access Control**: Role-based access control to manage permissions for different participants (e.g., host, co-host, attendee).
- **Secure Session Management**: Use of secure tokens for session management to prevent unauthorized access.

3.1.7. Real-time Functionality:

- **Low Latency**: The application must support real-time audio and video communication with minimal latency.
- **Real-time Updates**: Changes made during meetings (e.g., participant status, chat messages) should be updated in real-time for all users.

3.1.8. Accessibility Features:

- **Transcription Services**: Provide real-time transcription of meetings for users with hearing impairments.
- **Keyboard Navigation**: Ensure that all functionalities are accessible via keyboard shortcuts for users with disabilities.

3.1.9. Feedback and Support

- **User Feedback**: Users should be able to provide feedback on their experience and report issues.
- **Help and Support**: Access to help documentation and support channels for troubleshooting.

3.2. NON-FUNCTIONAL REQUIREMENTS:

Non-functional requirements (NFRs) define the quality attributes and operational constraints of the Callify Meet application. These requirements are crucial for ensuring that the system performs effectively and meets user expectations. Below is a detailed breakdown of the non-functional requirements for Callify Meet:

3.2.1. Performance:

- **Response Time**: The application should respond to user actions (e.g., joining a meeting, sending a message) within 2 seconds under normal load conditions.
- **Throughput**: The system must support a minimum of 1,000 concurrent users without degradation in performance.

- **Latency**: Audio and video communication should have a latency of less than 200 milliseconds to ensure a smooth user experience.

3.2.2. Scalability:

- **User Load**: The system must be able to scale to accommodate up to 10,000 simultaneous users during peak usage times, such as webinars or large meetings.
- **Data Handling**: The application should efficiently handle an increase in data volume, such as chat messages and shared files, without performance loss.

3.2.3. Reliability:

- **Uptime**: The application must maintain an uptime of 99.9% to ensure availability for users.
- **Error Rate**: The system should have a critical failure rate of less than 1% during normal operation.
- **Recovery**: In the event of a failure, the system should be able to recover within 5 minutes, ensuring minimal disruption to users.

3.2.4. Security:

- **Data Encryption**: All data transmitted during meetings must be encrypted using industry-standard protocols (e.g., AES-256).
- **Authentication**: The application must implement multi-factor authentication (MFA) for user accounts to enhance security.
- **Compliance**: The system must comply with relevant regulations such as GDPR and HIPAA, ensuring user data privacy and protection.

3.2.5. Usability:

- **User Interface**: The application should have an intuitive and user-friendly interface, allowing users to navigate easily without extensive training.
- **Accessibility**: The system must comply with WCAG 2.1 standards to ensure accessibility for users with disabilities, including screen reader support and keyboard navigation.
- **User Satisfaction**: User satisfaction ratings should be above 85% based on feedback collected through surveys.

3.2.6. Maintainability:

- **Code Modularity**: The application should be designed with modular components to facilitate easier updates and maintenance.
- **Documentation**: Comprehensive documentation must be provided for both users and developers to ensure ease of use and support.
- **Mean Time to Repair (MTTR)**: The average time to resolve issues should not exceed 30 minutes during operational hours.

3.2.7. Compatibility:

- **Cross-Platform Support**: The application must be compatible with major operating systems (Windows, macOS, Linux) and mobile platforms (iOS, Android).
- **Browser Compatibility**: The web application should function seamlessly across all major browsers (Chrome, Firefox, Safari, Edge) and their latest versions.

3.2.8. Availability:

- **Service Availability**: The application should be available 24/7, with scheduled maintenance communicated to users in advance.
- **Failover Mechanism**: The system must have a failover mechanism in place to ensure continuous service in case of server failure.

3.2.9. Compliance and Regulatory Requirements:

- **Industry Standards**: The application must adhere to industry standards for video conferencing and data protection, including ISO 27001 for information security management.
- **Audit Trails**: The system should maintain audit trails for user activities to ensure accountability and compliance with regulatory requirements.

3.3. SOFTWARE REQUIREMENTS:

Software requirements refer to the specifications of the software components, libraries, and platforms needed to develop, deploy, and maintain the system. These requirements ensure the application performs optimally, meets project goals, and complies with user expectations. For a video conferencing app like Callify, incorporating Clerk, Get Stream, and Next.js, the software requirements must be carefully chosen to support functionality, scalability, and user experience.

3.3.1. Operating System:

- **For Development**:
  - Windows 10/11, macOS Ventura (or higher), or Linux (Ubuntu 20.04+).
  - These systems provide compatibility with modern development tools and offer a stable development environment.
- **For Deployment**:
  - Cloud-based environments such as AWS, Azure, or Google Cloud for hosting the application.
  - These platforms offer scalability, global accessibility, and secure infrastructure.

3.3.2 Programming Language and Frameworks:

- **Next.js (Frontend Framework):**
  - Chosen for its server-side rendering (SSR) and static site generation (SSG) features, which improve performance and SEO.
  - Allows seamless integration with Clerk for authentication and Get Stream for chat functionalities.
- **Node.js (Backend Runtime):**
  - Facilitates API development, real-time communication, and WebSocket management.
  - Compatible with WebRTC for video conferencing functionalities.

3.3.3. Authentication and User Management:

- **Clerk API**:
  - A modern authentication library providing two-step verification, secure session handling, and SSO capabilities.
  - Reduces development time by offering pre-built modules for user management.

3.3.4. Communication APIs:

- **Get Stream Chat SDK**:
  - Enables real-time messaging and activity feeds with low latency and high concurrency.
  - Provides pre-built UI components for seamless chat integration.
- **WebRTC**:
  - Used for peer-to-peer video and audio communication, ensuring high-quality streaming and low-latency interactions.

3.4. HARDWARE REQUIREMENTS:

The hardware requirements for Callify Meet are essential to ensure optimal performance and user experience during video conferencing sessions. Below is a detailed breakdown of the necessary hardware components.

3.4.1. Computer Requirements:

- **Processor (CPU)**
  - Minimum: Dual-core processor (e.g., Intel i3 or equivalent).
  - Recommended: Quad-core processor (e.g., Intel i5 or higher) for better performance.
- **Memory (RAM)**
  - Minimum: 4 GB RAM.
  - Recommended: 8 GB RAM or more for smoother multitasking during meetings.
- **Storage**
  - Minimum: 500 MB of free disk space for installation.
  - Recommended: SSD for faster load times and better performance.
- **Graphics Card (GPU)**
  - Minimum: Integrated graphics (e.g., Intel HD Graphics).
  - Recommended: Dedicated graphics card (e.g., NVIDIA GeForce or AMD Radeon) for enhanced video processing.

3.4.2. Camera Requirements:

- **Webcam**
  - Minimum: 720p HD webcam.
  - Recommended: 1080p HD webcam for clearer video quality.
  - Features: Autofocus, wide-angle lens, and low-light performance are beneficial.

3.4.3. Audio Requirements:

- **Microphone**
  - Minimum: Built-in microphone or external USB microphone.
  - Recommended: High-quality USB microphone or headset with noise-cancellation features for clearer audio.

- **Speakers**
    - Minimum: Built-in speakers or external speakers.
    - Recommended: High-fidelity speakers for better sound quality during meetings.

3.4.4. Network Requirements:

- **Internet Connection**
    - Minimum: 1 Mbps upload and download speed for standard video quality.
    - Recommended: 3 Mbps or higher for HD video quality.
    - Type: Wired Ethernet connection is preferred for stability; Wi-Fi can be used but may be less reliable.

3.4.5. Display Requirements:

- **Monitor**
    - Minimum: 15-inch monitor with a resolution of at least 1366x768.
    - Recommended: 24-inch or larger monitor with Full HD (1920x1080) resolution for better visibility of participants and shared content.

3.4.6. Additional Hardware:

- **Codec Unit**
    - Required for compressing and decompressing audio and video streams, especially in larger setups.
- **Video Display**
    - High-definition display (LCD, LED, or projector) for larger meeting rooms to ensure all participants can see the content clearly.
- **Peripheral Devices**
    - USB extension cables for connecting cameras and microphones if needed.
    - Optional: Interactive whiteboards or smart displays for enhanced collaboration.