Software Requirements Specification

for

Image Editor

Version 1.0 approved

Prepared by
Sayyeda Fatima Masood (21L-7571)
Aatiqa Hussain (21L-5397)
Haseeb Ahmad (21L-5345)
Hammad Ali (21L-5273)
Mohsin Arif (21L-1763)

Code Crafters

23/03/2024

Table of Contents

Revision History

Name	Date	Reason For Changes	Version

1. Introduction

1.1 Purpose

This Software Requirements Specification (SRS) document outlines the requirements for the development of an advanced image editing application for Android, aimed at meeting the increasing demand for feature-rich tools on smartphones. The product covered by this document is Version 1.0 of the image editing application. The scope of this SRS encompasses the entire system of the image editing application.

1.2 Document Conventions

This document follows standard SRS conventions. Requirements are expressed using natural language and structured in a hierarchical format. Each requirement statement is accompanied by a unique identifier for reference and tracking purposes. Priorities for requirements are indicated where applicable, with higher-level priorities assumed to be inherited by detailed requirements.

1.3 Intended Audience and Reading Suggestions

The intended audience for this document includes developers, project managers, UI/UX designers, testers, and documentation writers involved in the development of the image editing application. Developers should focus on the detailed technical specifications, while project managers should pay attention to project scope, timelines, and resource allocation. UI/UX designers should refer to the user interface and design requirements. Testers should use this document as a basis for test case creation and validation. Documentation writers should use this document as a reference for user guides and technical documentation.

1.4 Product Scope

The software being specified is an advanced image editing application for Android smartphones. The purpose of the application is to provide users with comprehensive editing features, an intuitive interface, high performance, seamless social media integration, and regular updates. The application aims to empower users to enhance and manipulate their photos directly on their Android devices. The development of this application aligns with corporate goals to provide innovative solutions and meet user demands for mobile content creation tools.

1.5 References

- Emerald Insight: Journal of International Business Research
  https://www.emerald.com/insight/content/doi/10.1108/JIBR-07-2022-0177/full/html
- Medium: VSCO - A UX and Usability Case Study
  https://medium.com/@tylerameylegault/vsco-a-ux-and-usability-case-study-45244fad7027
- ResearchGate: An Overview of Pixlr Editor
  https://www.researchgate.net/publication/318136101_An_Overview_of_Pixlr_Editor
- Medium: UX Case Study: Snapseed Photography
  https://medium.com/@emily.seah03/ux-case-study-snapseed-photography-7da90f292293
- Journal of Current Research in Ayurveda and Pharmacy: Review Paper - Basic Workspace Adobe Photoshop
  https://journalcra.com/article/review-paper-basic-workspace-adobe-photoshop
- Carnegie Mellon University: Thesis - A Study of GIMP
  chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.cs.cmu.edu/~jmccann/thesis.pdf

2. Overall Description

2.1 Product Perspective

The image editing application specified in this SRS is a standalone product designed to provide comprehensive editing capabilities for Android smartphones. It is not part of an existing product family but rather a new, self-contained application aimed at meeting the increasing demand for feature-rich image editing tools on mobile devices. While it operates independently, the application may interface with external services such as social media platforms for image sharing.

2.2 Product Functions

- **Image editing:** Crop, rotate, resize, flip, undo, redo
- **Advanced editing**: Layers, masks, selection tools, blending modes
- **Filters and effects:** Preset filters, custom filters, special effects
- **Text and typography:** Text overlay, typography effects
- **Drawing and painting:** Brush tools, eraser, color picker
- **Import/export:** Import images from gallery or camera, export edited images
- **Social media integration:** Share edited images directly to social platforms
- **Customizable interface:** Customize layout, toolbars, and shortcuts
- **Offline editing:** Support offline editing capabilities
- **Batch processing:** Apply edits to multiple images simultaneously

2.3 User Classes and Characteristics

- **Casual users:** Individuals with basic to intermediate knowledge of image editing, using the application for personal use or social media content creation.
- **Photography enthusiasts:** Users with a deeper interest in photography, seeking advanced editing features and creative tools.
- **Professional photographers:** Users requiring high-quality editing capabilities on mobile devices for professional purposes, such as photo retouching or portfolio creation.

2.4 Operating Environment

The software will operate on Android smartphones and tablets running Android OS version 6.0 (Marshmallow) or later. It must coexist with other applications installed on the device and should be compatible with a variety of hardware configurations, screen sizes, and resolutions commonly found in Android devices.

2.5 Design and Implementation Constraints

- **Mobile platform constraints:** The application must adhere to Android platform guidelines and design conventions, ensuring compatibility and consistency across devices.

- **Performance limitations:** The application should optimize memory usage, processing speed, and battery consumption to provide a smooth and responsive editing experience.
- **Security considerations:** User data and privacy must be protected, following industry-standard security practices and regulations.
- **Third-party dependencies:** Integration with external APIs for social media sharing and other services may introduce dependencies that need to be managed.

2.6 User Documentation

- **User manual:** Comprehensive guide covering application features, usage instructions, and troubleshooting tips.
- **Online help:** Context-sensitive help accessible within the application.
- **Tutorials:** Step-by-step tutorials demonstrating various editing techniques and workflows. The documentation will be provided in digital formats compatible with Android devices, such as PDFs and online help systems.

2.7 Assumptions and Dependencies

- Availability of stable internet connection for social media integration features.
- Compliance with Android platform guidelines and regulations. Dependencies:
- Integration with third-party APIs for social media sharing.
- Availability of Android development tools and libraries for implementation.
- Adherence to data privacy and security regulations imposed by relevant authorities.

3. External Interface Requirements

3.1 User Interfaces

The user interface of the image editing application will be designed to provide an intuitive and seamless editing experience for users. Key characteristics include:

- **GUI standards:** Adherence to Android Material Design guidelines for consistency and familiarity.
- **Screen layout:** Flexible layout to accommodate various screen sizes and orientations.
- **Standard buttons and functions:** Common functions such as save, undo, redo, and share accessible from the toolbar.
- **Keyboard shortcuts:** Support for keyboard shortcuts where applicable for efficient editing workflows.
- **Error message display:** Clear and concise error messages displayed inline or in dialog boxes for user guidance.

3.2 Hardware Interfaces

The software product will interface with the hardware components of Android smartphones and tablets. Characteristics include:

- **Supported devices:** Compatibility with a wide range of Android devices running version 6.0 (Marshmallow) or later.
- **Data and control interactions:** Interaction with device hardware such as camera for image capture and storage for saving edited images.
- **Communication protocols:** Utilization of standard Android APIs for hardware interaction, such as Camera2 API for camera access.

3.3 Software Interfaces

The image editing application may interact with various software components, including:

- **Operating system:** Android OS version 6.0 (Marshmallow) or later.
- **Libraries:** Utilization of Android Support Libraries for UI components and functionality.
- **Third-party APIs:** Integration with social media APIs for sharing edited images to platforms like Instagram and Facebook.
- **Databases:** Utilization of SQLite database for storing application settings and metadata.

3.4 Communications Interfaces

- **Social media sharing:** Integration with APIs of popular social media platforms for sharing edited images.
- **Web browser:** Ability to open web links within the application for online tutorials or help resources.
- **Network server communications protocols:** Use of standard HTTP/HTTPS protocols for communication with external servers.
- **Communication security:** Implementation of HTTPS for secure data transfer, ensuring encryption of sensitive information during communication.
- **Data transfer rates:** Optimize data transfer rates for efficient uploading and downloading of images to and from external servers.
- **Synchronization mechanisms:** Utilization of asynchronous communication methods to prevent blocking the user interface during network operations.

4. System Features

The basic features are as follows:

4.1 Editing

4.1.1 Description and Priority

This feature enables users to perform various editing operations on images, such as cropping, rotating, applying filters, and adjusting brightness/contrast.
Priority: High

4.1.2 Stimulus/Response Sequences

- User selects an image to edit.
- System displays the image in the editing interface.
- User selects the desired editing operation.
- System applies the selected operation to the image.
- System displays the edited image to the user.

4.1.3 Functional Requirements

- REQ-1: The system shall provide tools for cropping images, allowing users to select a specific area of the image to keep.
- REQ-2: The system shall provide options for rotating images clockwise and counterclockwise by 90-degree increments.
- REQ-3: The system shall include a variety of filters, such as grayscale, sepia, vintage, and blur, which users can apply to images.
- REQ-4: The system shall allow users to adjust the brightness and contrast of images using sliders.
- REQ-5: The system shall provide real-time preview of the applied editing effects.
- REQ-6: Error Handling: If an invalid input is provided, such as attempting to rotate an image that is not loaded, the system shall display an error message prompting the user to take appropriate action.
- REQ-7: Undo/Redo: The system shall allow users to undo and redo editing actions to revert or reapply changes as needed.

4.2 Collaboration

4.2.1 Description and Priority

This feature facilitates collaborative editing, allowing multiple users to work on the same image simultaneously.
Priority: High.

4.2.2 Stimulus/Response Sequences

- User selects an image for collaborative editing.
- System generates a unique collaboration link for the image.
- User shares the collaboration link with other collaborators.
- Collaborators access the link and join the editing session.
- System synchronizes changes made by all collaborators in real-time.

- System updates the shared image view for all collaborators.

4.2.3 Functional Requirements

- REQ-8: The system shall generate a unique collaboration link for each image available for collaborative editing.
- REQ-9: Collaborators accessing the link shall be able to edit the image simultaneously.
- REQ-10: Changes made by one collaborator shall be immediately visible to all other collaborators.
- REQ-11: The system shall provide tools for collaborative annotation, allowing users to add comments, highlights, or drawings to the shared image.
- REQ-12: The system shall support collaborative layer management, enabling collaborators to add, remove, or adjust layers in real-time.

4.3 Merging

4.3.1 Description and Priority:

This feature allows users to merge different images into a single composite image. It provides options for arranging, blending, and aligning the selected images to create a cohesive and visually appealing composition.
Priority: Medium.

4.3.2 Stimulus/Response Sequences:

- User selects the option to merge images.
- System prompts the user to select multiple images for merging.
- User selects the images to be merged from the device storage or cloud storage.
- System displays the selected images in the merge interface.
- User arranges the images in the desired order for merging.
- System provides options for blending modes (e.g., overlay, multiply) and alignment tools for the merged images.
- User selects the blending mode and adjusts alignment if necessary.
- System merges the selected images based on the user's settings.
- System displays the merged image to the user for preview.
- Users can further adjust the merged image using editing tools if needed.
- User saves the merged image to the device storage or cloud storage.

- System prompts the user to choose the destination folder or location for saving the merged image.
- System saves the merged image in the specified location with the applied merging settings.
- Users can share or export the merged image using the export feature described earlier in the sequence diagram.

4.3.3 Functional Requirements:

- REQ-13: The system shall allow users to select multiple images from device storage or cloud storage for merging.
- REQ-14: The system shall provide a merge interface where users can arrange and adjust the selected images.
- REQ-15: The system shall offer blending modes (e.g., overlay, multiply) for merging images with different visual effects.
- REQ-16: Users shall be able to align and position the images within the merge interface for precise merging.
- REQ-17: The system shall display a preview of the merged image to the user before finalizing the merge operation.
- REQ-18: Users shall have the option to adjust blending modes and alignment settings during the merging process.
- REQ-19: The system shall save the merged image with the applied settings in the user-specified location.
- REQ-20: Error Handling: If there are compatibility issues or errors during the merging process, the system shall notify the user and provide options to resolve the issue or retry the merge operation.

4.4 Export

4.4.1 Description and Priority

This enables users to export edited images in various formats and share them on external platforms. Priority: Medium.

4.4.2 Stimulus/Response Sequences

- User selects the option to export the edited image.
- System presents a list of available export formats (e.g., JPEG, PNG).
- User selects the desired format for exporting.
- System saves the edited image in the selected format.
- User chooses the option to share the exported image.

- System provides sharing options for external platforms (e.g., social media, messaging apps).

4.4.3 Functional Requirements

- REQ-21: The system shall support exporting edited images in popular formats such as JPEG and PNG.
- REQ-22: The system shall provide options for adjusting image quality and compression settings before exporting.
- REQ-23: The system shall integrate with external platforms (e.g., Instagram, Facebook, Twitter) for seamless sharing of exported images.
- REQ-24: Error Handling: If the export process fails due to insufficient storage space or network issues, the system shall prompt the user to retry or choose an alternative export method.

4.5 Undo/Redo

4.5.1 Description and Priority

This feature allows users to undo and redo their editing actions, providing flexibility and control over the editing process.
Priority: High.

4.5.2 Stimulus/Response Sequences

- User performs editing actions on the image.
- User selects the undo option.
- System reverses the last editing action.
- User selects the redo option.
- System reapplies the undone editing action.

4.5.3 Functional Requirements

- REQ-25: The system shall maintain a history of editing actions to support undo and redo functionality.
- REQ-26: Users shall be able to undo multiple editing actions sequentially.
- REQ-27: Users shall be able to redo editing actions that have been undone.
- REQ-28: The system shall provide visual cues or a history panel to indicate the available undo and redo actions.
- REQ-29: The undo/redo functionality shall be accessible through both menu options and keyboard shortcuts for efficiency.

4.6 Batch Processing

4.6.1 Description and Priority

This feature enables users to apply editing actions to multiple images simultaneously, streamlining the editing workflow.
Priority: Medium.

4.6.2 Stimulus/Response Sequences

- User selects multiple images for batch processing.
- User applies editing actions or filters to the selected images.
- System processes the editing actions for each image in the batch.
- System saves the edited images with the applied changes.

4.6.3 Functional Requirements

- REQ-30: The system shall provide an interface for selecting multiple images for batch processing.
- REQ-31: Users shall be able to apply common editing actions or filters to all images in the batch.
- REQ-32: The system shall display progress indicators or status messages during batch processing to inform the user of the process's status.
- REQ-33: Users shall have the option to customize editing actions for individual images within the batch.
- REQ-34: Error Handling: If an error occurs during batch processing (e.g., file format compatibility issues), the system shall provide options to skip or resolve the error for each affected image.

4.7 Integration with cloud Storage

4.7.1 Description and Priority

This feature allows users to import and save images directly from and to cloud storage services, enhancing accessibility and data management. Priority: Medium.

4.7.2 Stimulus/Response Sequences

- User selects the option to import images from cloud storage.
- System presents a list of available cloud storage services (e.g., Google Drive, Dropbox).
- User selects a cloud storage service and logs in.

- System retrieves the user's image files from the selected cloud storage.
- User selects an image for editing.
- After editing, user selects the option to save the edited image to cloud storage.
- System presents a list of available cloud storage services.
- User selects a cloud storage service and logs in.
- System saves the edited image to the selected cloud storage location.

4.7.3 Functional Requirements

- REQ-35: The system shall integrate with popular cloud storage services to enable importing and exporting of images.
- REQ-36: Users shall be able to browse and select image files stored in their linked cloud storage accounts.
- REQ-37: The system shall provide secure authentication mechanisms for linking and accessing cloud storage accounts.
- REQ-38: The system shall support uploading edited images back to the user's preferred cloud storage location with options for selecting destination folders and file formats.
- REQ-39: Error Handling: If there are connectivity issues or authentication failures during cloud storage operations, the system shall provide appropriate error messages and options for retrying or troubleshooting the issue.

4.8 Template and Preset Feature

4.8.1 Description and Priority

This feature provides users with pre-designed templates and presets for quickly applying common editing styles or effects to their images. Priority: Low.

4.8.2 Stimulus/Response Sequences

- User selects the template or preset option from the menu.
- System presents a library of available templates and presets categorized by style or effect.
- User previews and selects a template or preset.
- System applies the selected template or preset to the image.
- User can further customize the applied template or preset if desired.

4.8.3 Functional Requirements

- REQ-40: The system shall offer a variety of pre-designed templates and presets, including styles like vintage, modern, retro, and artistic effects like sepia, black and white, and color splash.
- REQ-41: Users shall have the option to preview templates and presets before applying them to their images.
- REQ-42: The system shall provide tools for adjusting the intensity or strength of applied templates and presets.
- REQ-43: Users shall be able to create and save custom templates or presets for future use.
- REQ-44: The system shall allow users to remove or revert applied templates and presets without affecting other editing actions.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

5.1.1 Image Processing Performance

- The application shall process image editing operations, such as cropping, filtering, and resizing, within 3 seconds for real-time feedback.
- Batch resizing of images shall be completed at a rate of 10 images per second on average, with a maximum processing time of 5 seconds per image.

5.1.2 Load Time Efficiency

- The application shall load within 2 seconds of user initiation on devices with average hardware specifications.
- Subsequent loading of image editing tools and functionalities shall not exceed 1 second to maintain user engagement.

5.2 Safety Requirements

5.2.1 User Data Protection

- The application shall encrypt sensitive user data, including login credentials and edited image files, to prevent unauthorized access.
- In case of unexpected errors or crashes, the application shall implement safeguards to prevent loss or corruption of user data.

5.2.2 Error Handling

- The application shall provide informative error messages and graceful error recovery mechanisms to guide users in resolving issues.
- Error logs shall be generated and stored securely for diagnostic purposes and continuous improvement of the application.

5.3 Security Requirements

5.3.1 User Authentication

- The application shall require user authentication for accessing premium features and collaborative editing functionalities.
- User authentication mechanisms shall comply with industry-standard protocols (e.g., OAuth 2.0) to ensure secure login procedures.

5.3.2 Data Privacy

- The application shall adhere to strict data privacy guidelines, ensuring that user data is not shared with third parties without explicit consent.
- Data encryption techniques shall be employed during data transmission and storage to mitigate risks of unauthorized access or data breaches.

5.4 Software Quality Attributes

5.4.1 Usability

- The application shall prioritize ease of use by providing intuitive user interfaces and clear navigation pathways.
- Usability testing shall be conducted regularly to identify and address any usability issues, aiming for a minimum user satisfaction score of 85% in user feedback surveys.

5.4.2 Reliability

- The application shall be highly reliable, with a maximum downtime of 0.1% per month for scheduled maintenance and updates.
- Automated monitoring systems shall be implemented to detect and resolve performance issues or system failures promptly.

5.5 Business Rules

5.5.1 Subscription Management

- Users with premium subscriptions shall have access to advanced features such as collaboration and batch processing.
- Free users shall have limited access to certain functionalities and may be prompted to upgrade to a premium subscription for full access.

6. Other Requirements

6.1 Database Requirements (functional)

- The application shall use a relational database management system (RDBMS) to store user account information, image metadata, and collaboration data.
- Database operations shall be optimized for performance and scalability to accommodate a large user base and extensive image collections.

6.2 Legal Requirements (functional)

- The application shall comply with relevant data protection regulations, such as the General Data Protection Regulation (GDPR) in the European Union and the California Consumer Privacy Act (CCPA) in the United States.
- Copyright infringement detection mechanisms shall be implemented to prevent unauthorized use of copyrighted images and content.

6.3 Reuse Objectives (non-functional)

- The application shall leverage open-source libraries and frameworks where appropriate to promote code reuse and accelerate development.
- Reusable components and modules shall be documented and organized in a repository for future reuse in similar projects.

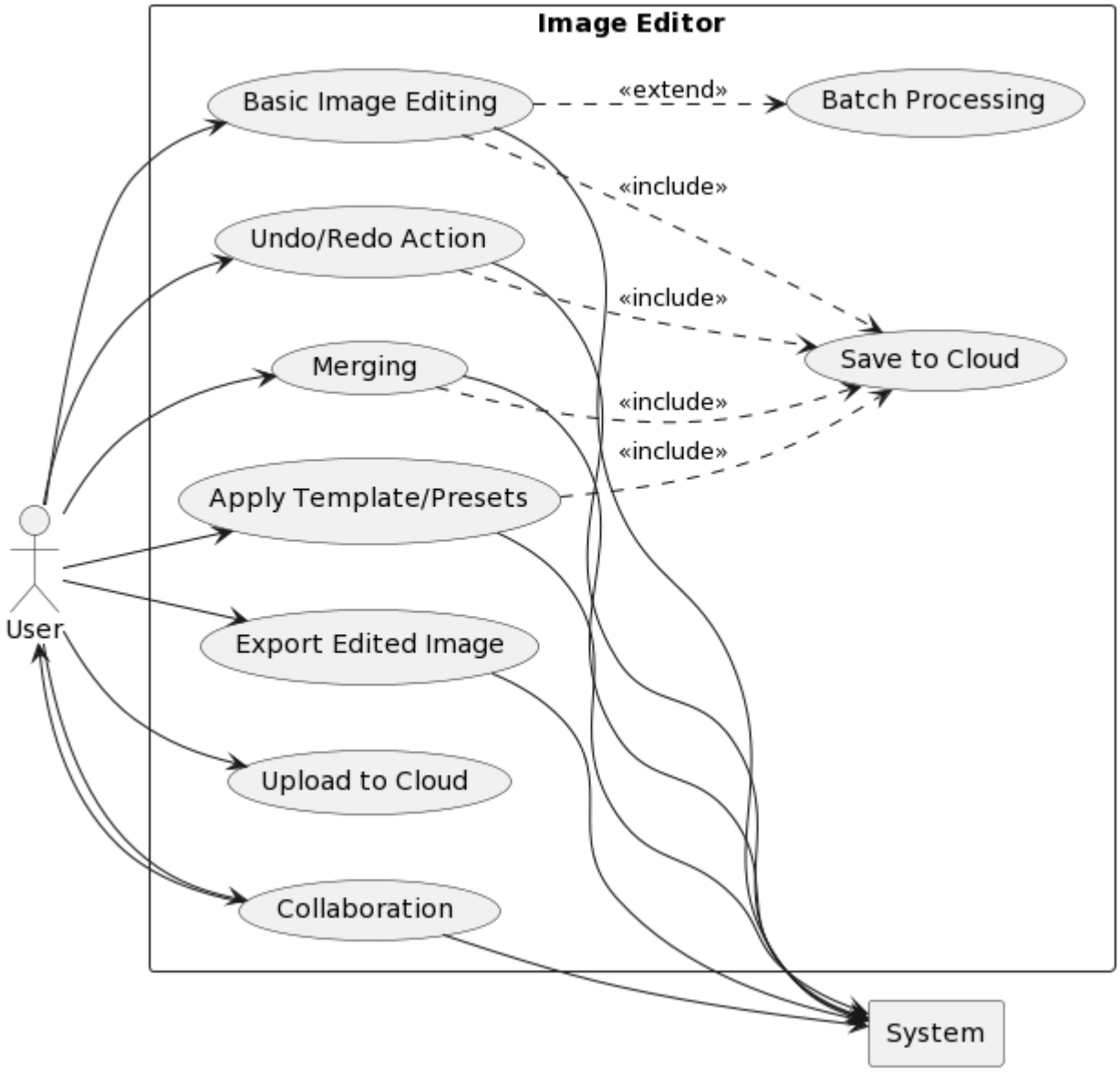
Appendix A: Glossary

1. ***SRS:*** *Software Requirements Specification - A document that describes the intended behavior and functionality of a software product.*
2. ***GUI:*** *Graphical User Interface - A visual way of interacting with a computer program using graphical elements such as windows, icons, and buttons.*
3. ***API:*** *Application Programming Interface - A set of rules and protocols that allows different software applications to communicate with each other.*
4. ***RDBMS:*** *Relational Database Management System - A type of database management system that stores data in tables and allows for the implementation of a relational model.*
5. ***OAuth:*** *Open Authorization - An open standard for access delegation commonly used for user authentication and authorization.*

6. ***GDPR:*** *General Data Protection Regulation - A regulation in EU law on data protection and privacy in the European Union and the European Economic Area.*
7. ***CCPA:*** *California Consumer Privacy Act - A state statute intended to enhance privacy rights and consumer protection for residents of California, United States.*
8. ***CRUD:*** *Create, Read, Update, Delete - Basic operations for persistent storage in a database or file system.*
9. ***UI:*** *User Interface - The point of interaction between the user and a digital device or software application.*
10. ***UX:*** *User Experience - The overall experience of a person using a product, especially in terms of how easy or pleasing it is to use.*
11. ***API Rate Limits:*** *The maximum number of API requests that can be made within a specific timeframe, typically enforced by service providers to prevent abuse or overload.*
12. ***SQL Injection:*** *A code injection technique that exploits vulnerabilities in a database query to execute malicious SQL statements.*
13. ***XSS:*** *Cross-Site Scripting - A type of security vulnerability typically found in web applications that enables attackers to inject malicious scripts into web pages viewed by other users.*
14. ***CDN:*** *Content Delivery Network - A geographically distributed network of servers and data centers designed to deliver web content and assets more efficiently to users based on their location.*
15. ***MVP:*** *Minimum Viable Product - A version of a product with the minimum features required to satisfy early customers and gather feedback for future development.*
16. ***QA:*** *Quality Assurance - The process of ensuring that a product meets specified requirements and quality standards through testing and validation.*
17. ***API Key:*** *A unique identifier used to authenticate requests made to an API, typically provided by the service provider upon registration.*
18. ***SDK:*** *Software Development Kit - A set of tools and libraries that developers use to create applications for specific platforms or systems.*
19. ***OSS:*** *Open-Source Software - Software with its source code made available for use or modification by anyone under licenses that comply with the Open Source Definition.*
20. ***HTTPS:*** *Hypertext Transfer Protocol Secure - An extension of HTTP that encrypts data sent between the browser and the web server to ensure privacy and security.*

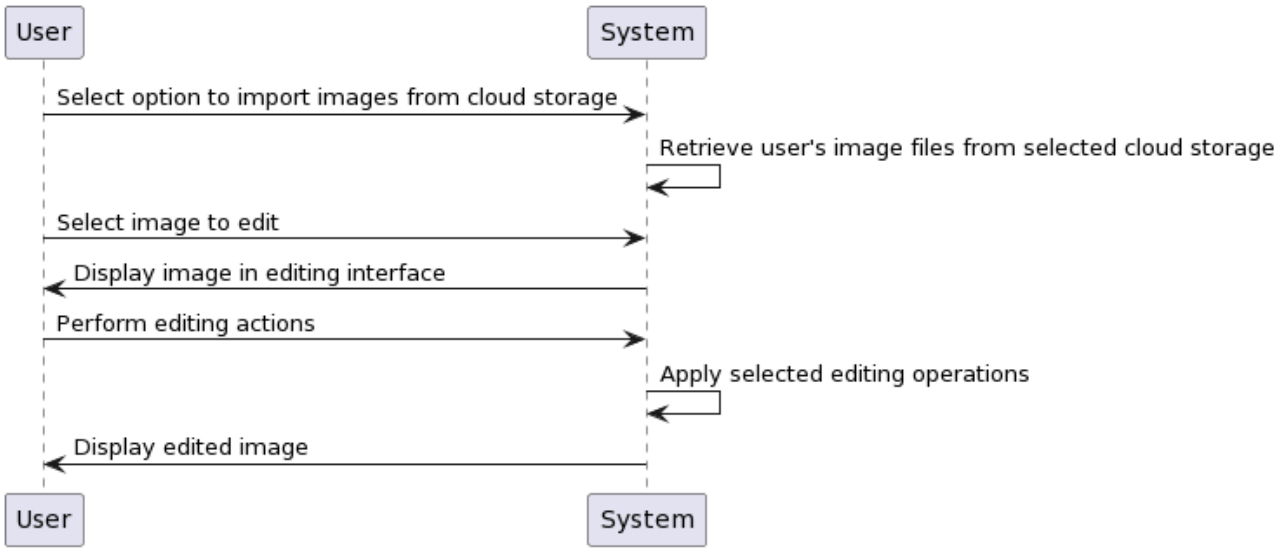
Appendix B: Analysis Models

1.1. Use Case Diagram

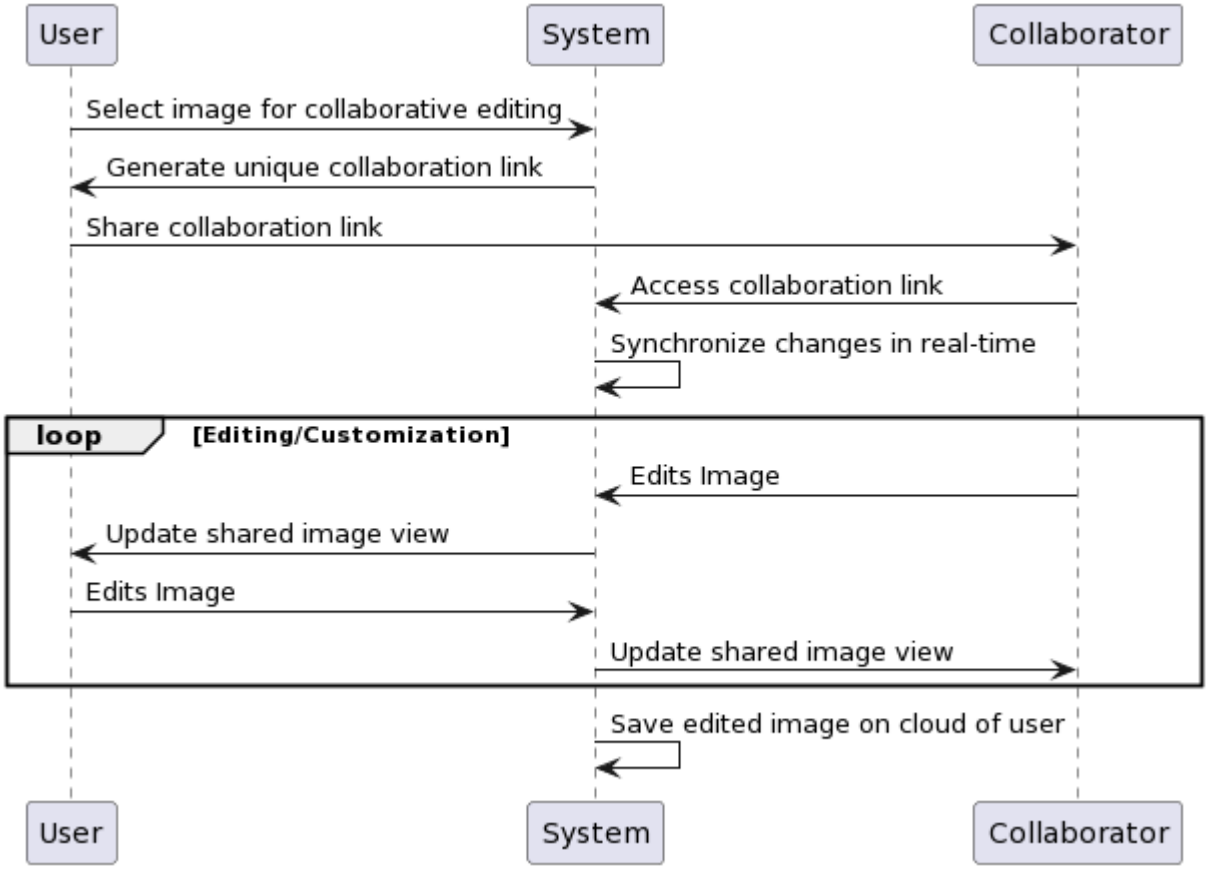


1.2. Sequence Diagram

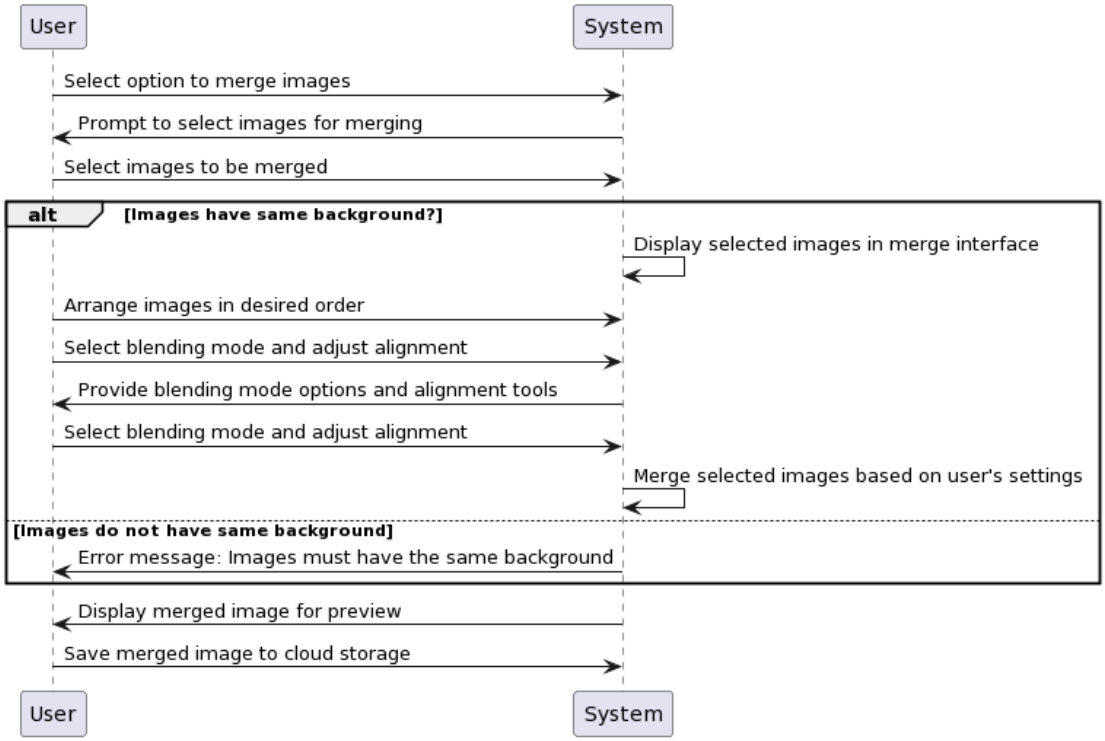
1.2.1. Basic Editing



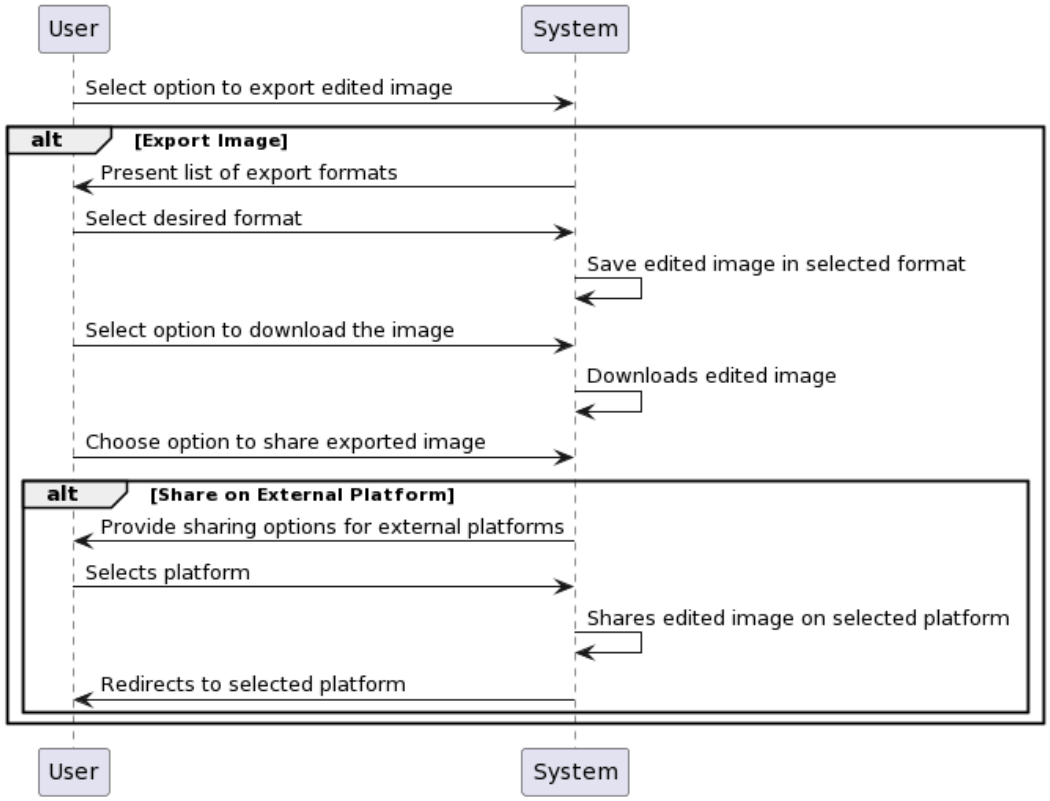
1.2.2. Collaboration



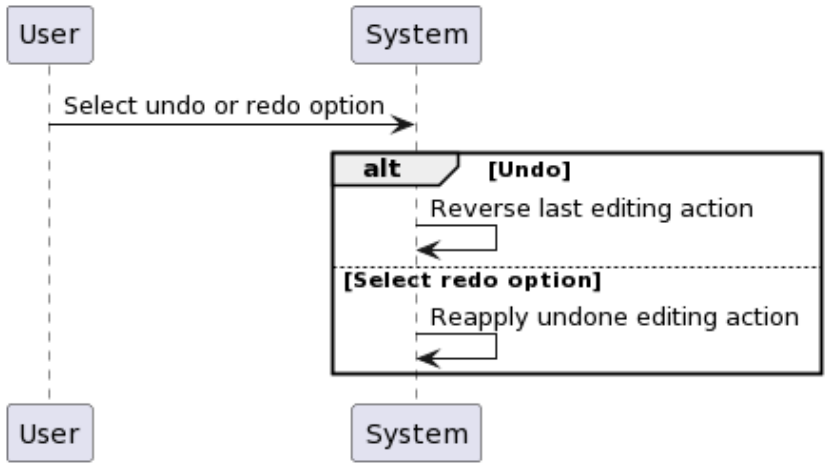
1.2.3. Merging



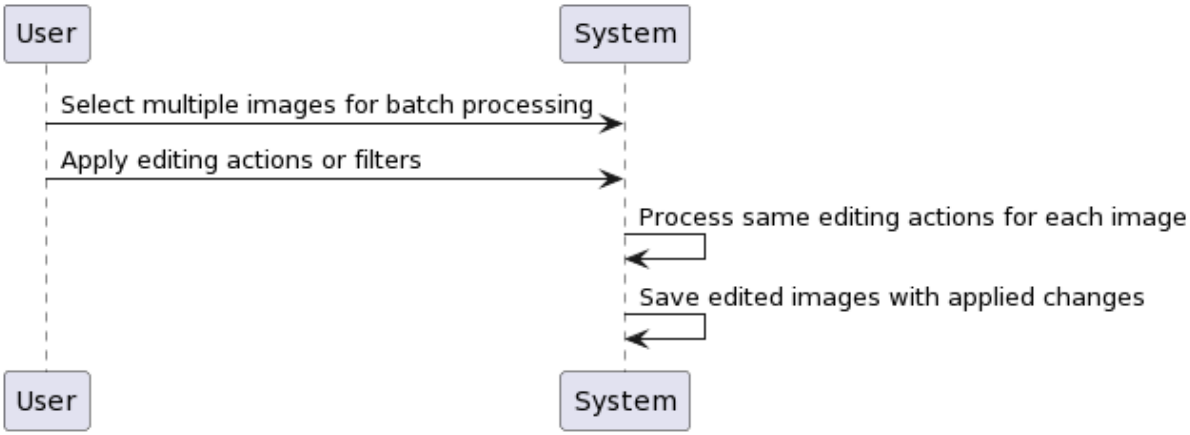
1.2.4. Export



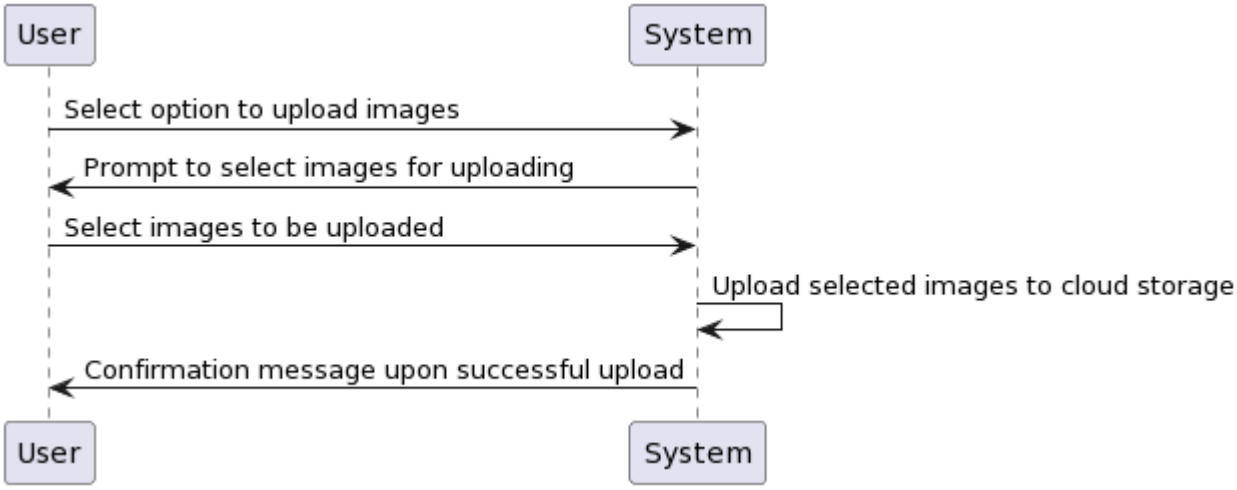
1.2.5. Undo/Redo



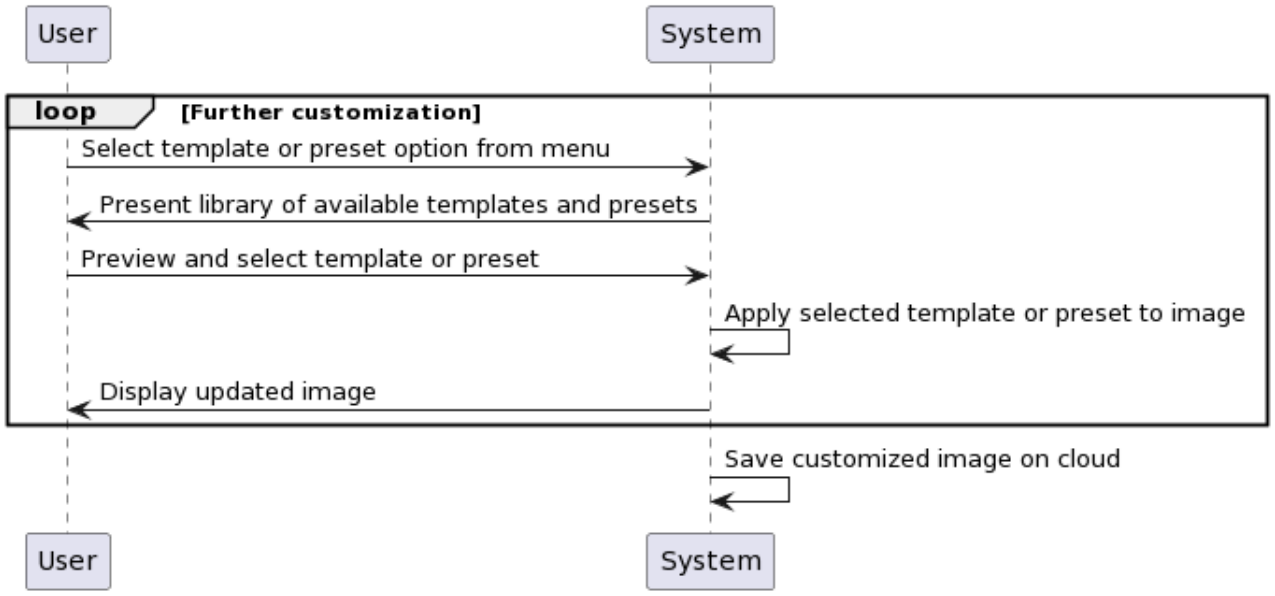
1.2.6. Batch Processing



1.2.7. Upload Image to Cloud

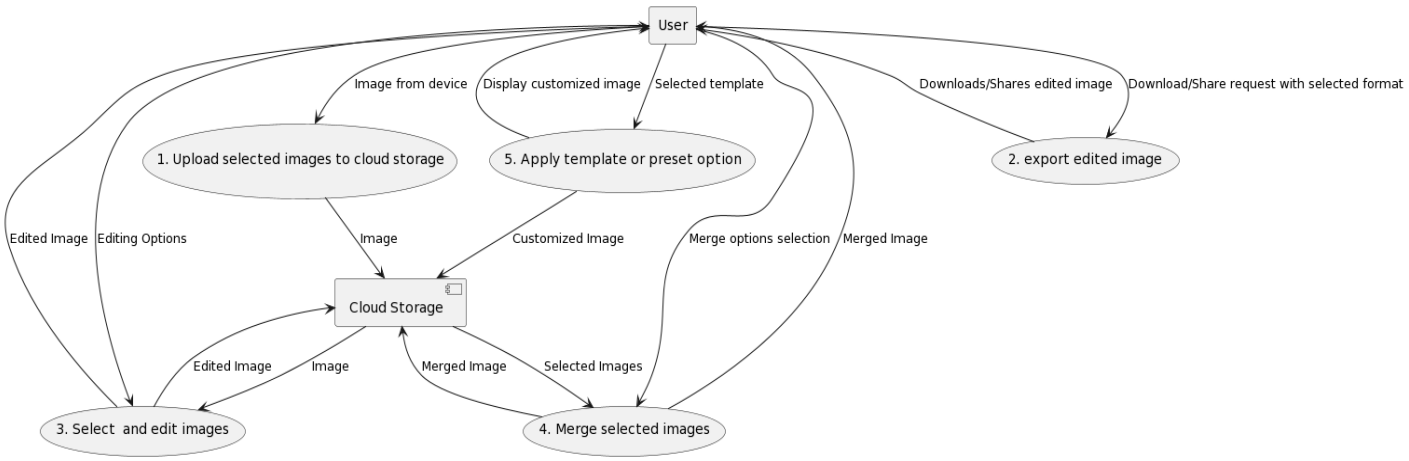


1.2.8. Template and Preset

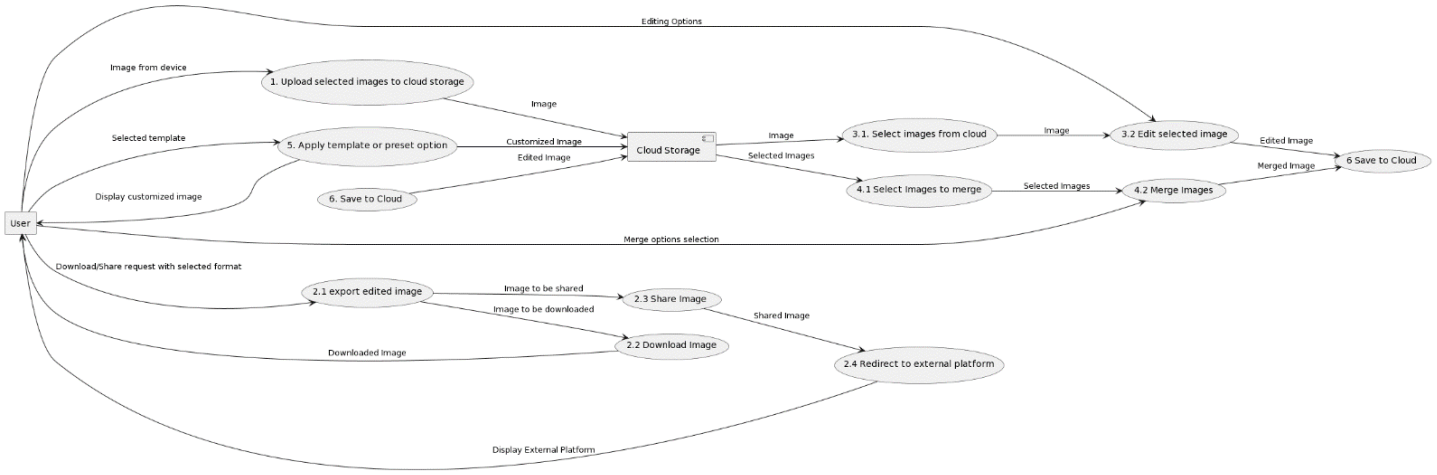


1.3. Data Flow Diagram

1.3.1. Level 1:



1.3.2. Level 2:



Appendix C: To Be Determined List

1. *Performance requirements for real-time feedback on filter application process.*
2. *Safety certifications required for the application.*
3. *Security certifications that must be satisfied.*
4. *Specific quantitative quality attributes for the software product.*
5. *Business rules regarding user roles and functions under specific circumstances.*
6. *Additional requirements related to internationalization and localization support.*
7. *Legal requirements, if any, applicable to the software product.*
8. *Reuse objectives for the project, including any plans for utilizing existing components or modules.*
9. *Database requirements, including the choice of database management system (DBMS) and data storage solutions.*
10. *Any other requirements not covered elsewhere in the SRS, such as regulatory compliance or industry standards.*