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| amblem | **ÇANKAYA UNIVERSITY**  **Software Engineering Department**  **Computer Engineering Department** | **A circular logo with colorful arrows  Description automatically generated** |

**SENG 491 – 492 Graduation Project**

**Software Requirements**

**Specification**

**<<Apphasia >>**

**Mesude GÖKPINAR**

**Emre Buğrahan Yaşar**

**Hikmetcan ALTAŞ**

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**Version <<1.3>>**

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# Introduction

## Purpose

The purpose of this Software Requirement Specification (SRS) document is to define the functional and non-functional requirements for the development of a mobile application tailored for individuals with aphasia. This application “Apphasia” will enable users to express themselves effectively and efficiently, addressing their specific communication needs in a Turkish-language environment. The document serves as a guideline for stakeholders involved in the design, development, and deployment of the application, ensuring a clear understanding of the project objectives.

## Scope

The software product to be developed is a mobile application for individuals with aphasia, named *"Apphasia"*. This application is designed to enable users to express themselves through a user-friendly interface featuring pre-configured phrases, images, and gestures. It allows customization of frequently used expressions, ensuring faster and more effective communication. Additionally, it provides features for managing user profiles and preferences.

The primary goal of this application is to address the communication challenges faced by Turkish-speaking aphasia patients, empowering them to convey their needs, emotions, and thoughts independently.

This scope aligns with the broader objective of creating accessible and practical assistive technology solutions for individuals with speech impairments, ensuring consistency with any higher-level project requirements or specifications. The application aims to provide intuitive, and reliable communication tool, particularly beneficial in environments with limited or no internet connectivity.

## Definitions, acronyms, and abbreviations

This section provides the definitions of terms, acronyms, and abbreviations used within this SRS document to ensure clarity and proper interpretation.

* **Aphasia**: A language disorder caused by brain damage that affects a person's ability to communicate.
* **Offline Mode**: The capability of the application to function without requiring an active internet connection.

## References

1. **"Aphasia and Communication Disorders: An Overview,"** National Institute on Deafness and Other Communication Disorders (NIDCD), 2022. Available: [https://www.nidcd.nih.gov](https://www.nidcd.nih.gov/).
2. **"ISO/IEC 25010:2011 - Systems and Software Quality Requirements and Evaluation (SQuaRE),"**International Organization for Standardization (ISO), March 2011. Available: [https://www.iso.org](https://www.iso.org/).
3. **"User Experience Design for Accessibility: Best Practices,"** Interaction Design Foundation, 2021. Available: [https://www.interaction-design.org](https://www.interaction-design.org/).
4. **"Existing Aphasia Communication Tools - Comparative Analysis,"** Aphasia Access Organization, 2020. Available: [https://www.aphasiaaccess.org](https://www.aphasiaaccess.org/).
5. **"Android Accessibility Features: Development Guidelines,"** Google Developers, 2023. Available: [https://developer.android.com](https://developer.android.com/).

All referenced documents are publicly available online and can be accessed through the provided links or through their respective publishing organizations.

## Overview

This SRS document provides a comprehensive outline of the requirements and constraints for the project.

* **Section 1** introduces the purpose, scope, and key definitions relevant to the project.
* **Section 2** provides an overview of the broader context and background of the software product.
* **Section 3** details the precise functionalities and constraints of the application, including all necessary specifications for software development.
* **Section 4** lists references and appendices, including supporting materials and additional references for further clarification.

## Version History

Provide a table of table of changes to this document.

|  |  |  |
| --- | --- | --- |
| **Version No** | **Description of change** | **Date** |
| 1.0 | Initial Release | 15.10.2024 |
| 1.1 | Adding Mockups and Related Diagrams | 30.10.2024 |
| 1.2 | Revision | 01.12.2024 |
| 1.3 | Control | 02.12.2024 |

# Overall (General) Description

## Product Perspective

The "Apphasia" mobile application is a standalone product, fully self-contained and designed specifically for individuals with aphasia to facilitate their communication needs in a Turkish-language environment. The application is independent and does not rely on any external systems, ensuring its utility even in offline scenarios. However, its design incorporates for accessibility and user experience.

The application operates within the following constraints:

### System interfaces

The application does not require integration with external systems but can export user data for backups if desired by the user.

### User interfaces

Logical Characteristics:

The interface is structured to support users with limited technical skills. It includes:

* A highly visual layout with customizable sets of pre-configured phrases, images, and gestures.
* Large, clear buttons and icons for improved usability.
* Support for left-handed users with customizable layout options.

Usability Considerations:

* Accessible navigation with voice output in Turkish for textual elements.
* Simple navigation paths ensuring ease of use for individuals with cognitive or motor impairments.

### Hardware interfaces

The application supports Android and iOS devices and requires basic hardware capabilities. These capabilities are touchscreen, microphone, and speakers, for effective interaction.

### Software interfaces

The application does not rely on third-party software libraries or external frameworks. Instead, it utilizes the built-in accessibility features provided by Android and iOS platforms to enhance usability for individuals with aphasia. Below are the details of the software interfaces:

1. **Android Accessibility Suite**
   * **Purpose**:  
     The Android Accessibility Suite provides essential features like voice feedback (TalkBack), magnification gestures, and customizable text size. These features ensure that users with speech impairments can navigate and use the application efficiently.
2. **iOS Accessibility Framework**
   * **Purpose**:  
     The iOS Accessibility Framework provides assistive features such as VoiceOver, dynamic text resizing, and switch control. These features enhance the app's usability for individuals with limited communication capabilities.

### Communications interfaces

The application operates offline by default, ensuring continuous functionality without an active internet connection. However, certain optional features, data sharing, updates, and backup, require network connectivity. Supported communication protocols include:

* **Wi-Fi**: Utilized for high-speed data exchange when the device is connected to a wireless network.
* **Mobile Data**: Provides on-the-go synchronization and updates, ensuring users can maintain data consistency without being reliant on Wi-Fi.

### Memory constraints

The application is optimized to run efficiently on devices with limited resources, ensuring compatibility with older or lower-spec devices:

* **Primary Memory (RAM)**: Requires less than 150 MB of RAM during operation, minimizing the app's impact on device performance.
* **Secondary Memory (Storage)**: The app's installation footprint is under 50 MB, designed to conserve storage space and reduce clutter on devices.

### Operations

The application is designed to function in user-initiated mode, with the following key operations:

* **Interactive Operations**: Users engage directly with the application by selecting pre-configured phrases or accessing voice output, all through simple, intuitive interactions.
* **Backup and Recovery**: Backup operations are handled locally, allowing users to save and restore profiles, customizations, and preferences. This is done without relying on cloud services, ensuring that data remains secure and accessible even in offline mode.

### Site adaptation requirements

The application allows customization based on regional and cultural preferences, including:

* **Dialects:** Support for regional variations in Turkish.
* **Culturally Relevant Symbols:** Images and gestures tailored to local norms.

## Product functions

This subsection outlines the major functionalities of the mobile application for individuals with aphasia. The following features are designed to ensure that the application addresses the unique communication needs of the target audience. The functions are organized logically for clarity and accessibility:

2.2.1 User Registration and Authentication

The app will provide a secure user registration system for individuals with aphasia. During registration, users are expected to register with an apple account or google account. Registered accounts will provide secure access and functionality personalised to user needs.

2.2.2 Login

Users will log in to the app with their apple or google account. Successful authentication will provide access to personalised features of the application and stored user data.

2.2.3 Customisable Emoticon Library

The application allows users can add and delete images in daily routine to improve comprehension and usability.

2.2.4 Phrase Selection and Communication

The application provides a library of pre-configured phrases organised according to common communication categories. Selected phrases are displayed in a large, readable format to facilitate communication.

2.2.5 Offline Functionality

The application is designed to work without an internet connection, ensuring reliability in environments with limited or no connectivity.

2.2.6 Accessibility Features

The app includes left-handed navigation, simplified controls to cater for users with physical or cognitive limitations.

2.2.7 Exercise Management

The application provides exercises aimed at developing communication skills. The exercises are organised level by level according to difficulty level and type. (e.g. matching pictures).

2.2.8 Routine Scheduling

Users can create daily routines, including reminders for therapy exercises, meals, and other activities.

2.2.9 Drawing and Symbol Based Communication

The application has a drawing interface where users can create visual representations or symbols for communication.

## User characteristics

The primary users of the mobile application are individuals with aphasia, a condition that significantly impairs their ability to communicate verbally. The following characteristics of the target user group guide the application design:

1. **Diverse Educational Backgrounds**  
   Users may range from primary to higher education levels. The application must be accessible and intuitive regardless of educational background.
2. **Cognitive and Physical Challenges**  
   Users may face difficulty understanding complex instructions or have limited dexterity. These challenges necessitate a straightforward and adaptive interface.
3. **Minimal Technical Expertise**  
   Most users are expected to have little to no familiarity with advanced technological tools. The application must provide a simple and easy-to-navigate interface.

## General Constraints

The development of the application is subject to the following constraints, which impact the design and implementation:

* 1. This product is a new and self-contained product designed as a mobile and tablet application for individuals with aphasia, emphasizing simplicity and ease of use.
  2. Since sensitive user data will be handled, all data transmission must be encrypted when shared via optional features, adhering to **HTTPS** protocols.
  3. The application must be optimized for devices with limited hardware resources, including low-cost Android and iOS devices with **2GB RAM** and **16GB storage**.
  4. The application will primarily support **Turkish** as the default language.
  5. The system should handle up to **5000 user interactions per hour**, ensuring smooth operation even during peak usage.
  6. The application will be designed for **offline use**; however, any shared content (e.g., optional backups) must be securely stored for a maximum of **24 hours**. After this duration, shared data must be automatically deleted from the system.
  7. Content types will include pre-defined **phrases** and **symbols**, with potential expansion to include user-customized content .
  8. Controls will be optimized for users with limited dexterity, including a specific focus on **left-handed usability** and larger, accessible UI components.

## Assumptions and Dependencies

The following assumptions and dependencies may impact the application’s requirements and must be considered during development:

1. **Operating System Availability**  
   Assumes support for Android (8.0 and above) and iOS (13 and above). Updates to these systems may necessitate adjustments.
2. **Device Specifications**  
   Assumes devices have at least 2GB of RAM, 16GB of storage, and a touchscreen. Performance optimizations may be required for lower-spec devices.
3. **Language Support**  
   Focused on Turkish as the primary language.
4. **Third-Party Tools and Libraries**  
   Relies on the availability of framework. Changes in their support or licensing could affect development.
5. **User Demographics**  
   Designed primarily for individuals with aphasia. Shifts in target demographics could influence feature priorities.

## Apportioning of Requirements

The following features are not critical for the initial release but may be included in future versions:

1. **Integration with Wearables**  
   Supporting devices like smartwatches for quick phrase access.

# Specific Requirements

This section details the specific requirements for the aphasia mobile application, ensuring a comprehensive understanding of its functionalities, inputs, outputs, and behaviors. The requirements are organized for clarity and align with the principles of being externally perceivable, uniquely identifiable, and readable.

## External Interface Requirements

This section details all inputs and outputs of the system, including their content and format. Each interface is described in terms of its purpose, source or destination, valid ranges, timing, relationships, and other relevant parameters.

### User Interfaces

This section describes the user interfaces of the mobile application for individuals with aphasia, detailing the purpose and functionality of each page. The design focuses on accessibility, simplicity, and ease of navigation, ensuring a seamless experience for users with communication difficulties.

#### Landing Page

The landing page is the entry point of the application, welcoming users and providing access to registration. It features a user-friendly design with large buttons and text for easy navigation. The page briefly describes the app's purpose: assisting individuals with aphasia in communication. For first-time users, the registration option is emphasized. Image 1 is the mockup design of the page.

#### User Page

The user page provides personalized information and serves as the user’s profile section. It displays details like the user’s name. Also, users can add the photo. Image 2 is the mockup design of the page.

#### Main Page

The main page acts as the central hub of the application, providing access to all primary features. Users can select from options: Patient routine ,drawing buttons, and exercises. Users can also access the user page. Image 3 is the mockup design of the page.

#### Patient’s Routine Page

The patient’s routine page helps users control their daily activities. The interface presents tasks. Each task is displayed with icons and brief descriptions to support easy comprehension. Additionally, when the user clicks of the any routine in this page, this button turns the green color. Image 4 is the mockup design of the page.

#### Add/ Delete Page

The add/delete page enables users to manage the app’s routine activities. The interface is divided into two sections: one for adding new items and another for deleting existing ones. The design includes clear prompts and confirmation dialogs to avoid errors, ensuring user-friendly interactions. Image 5 is the mockup design of the page.

#### Drawing Page

The drawing page provides a creative and interactive space for users to express themselves visually. It includes a simple drawing canvas with tools like color selection, brush, and eraser options. Image 6 is the mockup design of the page.

#### Exercise Page

The exercise page offers personalized activities to support rehabilitation and communication skill development. Exercises include matching symbols. The interface provides immediate feedback and progress tracking, motivating users to engage consistently. The layout emphasizes simplicity, ensuring that users can focus on tasks without unnecessary distractions. Image 7 is the mockup design of the page.

#### Picture Matching Exercise Page

On the picture matching exercise page, we have a tiny game as shown in the figure. this game, which will strengthen hand functionality and memory, will be a useful exercise for users. Image 8 is the mockup design of the page.

### Hardware interfaces

The aphasia mobile application interacts with various hardware components of the device to enhance usability and ensure accessibility. These interfaces are designed to work seamlessly across a range of mobile devices, including smartphones and tablets.

### Software interfaces

The aphasia application interacts with several software components and services to ensure smooth operation and functionality. These interfaces allow the application to integrate with the mobile operating system and external APIs effectively.

Mobile Operating System (iOS/Android)

Cloud Storage API

### Communications interfaces

* **Wi-Fi**: Utilized for high-speed data exchange when the device is connected to a wireless network.
* **Mobile Data**: Provides on-the-go synchronization and updates, ensuring users can maintain data consistency without being reliant on Wi-Fi.

## Functional Requirements

metin, diyagram, ekran görüntüsü, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Use-Case Diagram

diyagram, taslak, teknik çizim, plan içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Activity Diagram

Figure Data Model

metin, diyagram, ekran görüntüsü, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu

#### 3.2.1 Landing Page

**Description and Priority:** The landing page serves as the entry point of the application, providing a welcoming experience for users. It ensures easy navigation to the registration and login features, particularly emphasizing first-time users. This page is critical for user onboarding and navigation.

**Stimulus/Response Sequences:**

1. **User**: Launches the application.  
   **System**: Displays the landing page with large buttons for easy access to "Login with Apple Account" and "Login with Google Account."
2. **User**: Clicks "Login with Apple Account" or "Login with Google Account."  
   **System**: Navigates to the corresponding page.

**Functional Requirements:**

1. The system must display a welcoming interface with clear navigation to "Login with Apple Account" and "Login with Google Account" options.
2. Buttons and text must be large and accessible for users with cognitive or physical impairments.
3. The footer must not appear on this page to prevent distractions during the login process.

metin, ekran görüntüsü, yazı tipi, flaş bellek içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Landing Page

#### 3.2.2 User Page

**Description and Priority:** The user page provides a personalized experience, displaying profile information and allowing updates such as adding a profile photo. This page has medium priority but is essential for personal customization.

**Stimulus/Response Sequences:**

1. **User**: Navigates to the user page.  
   **System**: Displays the user's name, profile details, and a profile photo.
2. **User**: Updates personal information or profile photo.  
   **System**: Saves changes and displays confirmation.

**Functional Requirements:**

1. The system must display the user's name and profile details.
2. Users must be able to update personal information and add a profile photo.
3. Changes must be saved securely, with feedback provided to the user.
4. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.

metin, ekran görüntüsü, mobil telefon, logo içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure User Page

When the user click on the “Bakıcı Çağır” button, anyone screen shows the this feedback message. This feedback usefull for users understand and feel confident.

metin, ekran görüntüsü, mobil telefon, küçük alet içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure feedback message

#### 3.2.3 Main Page

**Description and Priority:** The main page acts as the central hub, providing access to key functionalities (routines, exercises, and drawing). It is highly prioritized as it facilitates seamless navigation to core features.

**Stimulus/Response Sequences:**

1. **User**: Opens the main page.  
   **System**: Displays buttons for "Patient Routine," "Drawing," "Exercises," and "User Page."
2. **User**: Selects a feature.  
   **System**: Navigates to the respective page.

**Functional Requirements:**

1. The system must display buttons for all primary features.
2. Navigation should be smooth and intuitive.
3. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.

metin, ekran görüntüsü, yazı tipi, mobil telefon içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Main Page

#### 3.2.4 Patient’s Routine Page

**Description and Priority:** This page enables users to manage daily routines effectively. Each task is visually represented, enhancing comprehension. This page is essential for organizing daily activities.

**Stimulus/Response Sequences:**

1. **User**: Views daily tasks.  
   **System**: Displays tasks with icons and descriptions.
2. **User**: Marks a task as complete.  
   **System**: Changes the task's color to green.

**Functional Requirements:**

1. The system must list tasks with clear visual cues.
2. Users must be able to mark tasks as complete.
3. The system should update the task status in real time.
4. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.

metin, ekran görüntüsü, mobil telefon, tasarım içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Patient's Routine Page

#### 3.2.5 Add/Delete Page

**Description and Priority:** This page allows users to add or remove routine items, ensuring flexibility and customization. It has medium priority but is critical for routine management.

**Stimulus/Response Sequences:**

1. **User**: Adds a new task.  
   **System**: Saves the task and updates the list.
2. **User**: Deletes an existing task.  
   **System**: Confirms deletion and updates the list.

**Functional Requirements:**

1. The system must support adding new tasks.
2. Users must be able to delete existing tasks with confirmation.
3. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.



Figure Add/Delete Page

#### 3.2.6 Drawing Page

**Description and Priority:** The drawing page provides a creative space for users to communicate visually. It is a medium-priority feature with a significant impact on usability.

**Stimulus/Response Sequences:**

1. **User**: Opens the drawing page.  
   **System**: Displays a canvas with drawing tools.
2. **User**: Draws or erases content.  
   **System**: Updates the canvas in real time.

**Functional Requirements:**

1. The system must provide drawing tools, including color selection and erasers.
2. Users must be able to save or clear the canvas.
3. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.

metin, ekran görüntüsü, küçük alet, mobil telefon içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Drawing Page

#### 3.2.7 Exercise Page

**Description and Priority:** This page supports rehabilitation through personalized exercises. It is a high-priority feature that encourages skill development.

**Stimulus/Response Sequences:**

1. **User**: Opens the exercise page.  
   **System**: Displays a list of exercises.
2. **User**: Selects an exercise.  
   **System**: Starts the exercise and tracks progress.

**Functional Requirements:**

1. The system must offer a variety of exercises with immediate feedback.
2. Progress tracking must be clear and accessible.
3. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.

metin, ekran görüntüsü, mobil telefon, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Exercise Page

#### 3.2.8 Picture Matching Exercise Page

**Description and Priority:** This page features a game to enhance memory and hand functionality. It has medium priority but is engaging and therapeutic.

**Stimulus/Response Sequences:**

1. **User**: Opens the page and starts the game.  
   **System**: Displays matching pairs for the user to select.
2. **User**: Completes the game.  
   **System**: Displays feedback and progress.

**Functional Requirements:**

1. The system must present an interactive matching game.
2. Feedback on performance must be immediate and informative.
3. The footer must display the following icons:
   * **Home Icon**: For returning to the main page.
   * **Pencil Icon**: For navigating to the Drawing Page.
   * **Dumbbell Icon**: For navigating to the Exercise Page.
   * **User Icon**: For accessing the User Page.
   * **Caregiver Call Button**: For emergency contact functionality.

ekran görüntüsü, uzaktan kumanda içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure Picture Matching Exercise Page

## Performance requirements

Performance requirements specify both the static and dynamic numerical criteria for the software system and its interaction with users.

#### Static Numerical Requirements

* The system shall support up to **5000 user interactions per hour** without degradation in performance.
* The system shall operate efficiently on devices with a minimum of **2GB RAM** and **16GB storage**.

#### Dynamic Numerical Requirements

* **Response Time:**
  + 95% of user actions shall receive a system response within **500 milliseconds**.
  + Data updates, such as adding a new phrase, shall complete within **2 seconds**.
* **Offline Operations:**
  + The application shall maintain full functionality without an internet connection for up to **30 days** after installation.
* **Synchronization:**
  + Optional data backup and synchronization features shall occur within **10 seconds** when network connectivity is available.
* **Peak Load Handling:**
  + During peak usage, the system shall maintain a response time of less than **1 second** for critical operations.

## Logical database requirements

This section defines the logical requirements for the data that the application manages.

* **Types of Information Used by Functions:**
  + Pre-configured phrases, categorized by scenarios .
  + User-customized phrases, including associated images/icons.
  + User profiles, containing personal details : name, aphasia level, and preferences.
* **Integrity Constraints:**
  + Each phrase must have a unique identifier.
  + Profile updates must pass validation checks to ensure data completeness.
* **Data Retention:**
  + User profiles and associated data shall be retained locally on the device indefinitely.
  + Optional synchronized backups shall be automatically deleted from cloud storage after **24 hours**.

## Design constraints

Design constraints outline external limitations that influence the system's design and implementation.

### Standards compliance

* The system shall adhere to **ISO/IEC 25010** standards for software quality, emphasizing usability and accessibility.
* All data transmissions for optional backup features shall use encrypted protocols, such as **HTTPS**.
* The application shall comply with **Android Accessibility Suite** and **iOS Accessibility Framework** guidelines to ensure inclusivity.

## Software system attributes

This section specifies the attributes required for reliability, availability, security, maintainability, and portability.

### Reliability

* The application shall maintain **99.9% uptime** during offline usage.
* Recovery mechanisms shall ensure no data loss during unexpected shutdowns.

### Availability

* The system shall be available for use **24/7**, irrespective of internet connectivity.
* Backup and synchronization features shall function only when network connectivity is stable.

### Security

* The system shall encrypt sensitive user data using **AES-256 encryption**.
* The system shall prevent unauthorized access through secure authentication mechanisms.

### Maintainability

* The codebase shall follow modular design principles to facilitate maintenance and updates.
* The system shall include error logs to aid in debugging and support.

### Portability

The system shall be built using portable programming languages.

# References

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