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Home Appliance Control System Software Requirements Specification VERSION v1.0d

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Table 1.0 Modification History

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1. Introduction

1.1 Document Purpose

This document presents the software requirements, as determined during initial analysis by creating home appliance control system (HACS) which is more helpful to provide services and control for the home appliances. Specifically, the document details the functional requirements and constraints for the system to be developed by CITTech for the Client.

This document will be subject to formal/informal review by the CITTech development team and the Client, and will form the basis for ongoing development of software, by CITTech, to meet the requirements of the Client.

This document is the main deliverable output from the Requirements Elicitation Activity. It is intended to be a baseline, to supply sufficient requirements information to the Client to provide a foundation for subsequent software assessment and approval. Further, it also provides the development team with a basis for on-going software design.

1.2 About the Project

The aim of this project is to perform the 'Requirements Elicitation and Specification' activity. All tasks associated with this activity shall be performed based on the theoretical support provided as part of 'Software Engineering/Introduction to Software Engineering' course. It is assumed that other related/required activities involved in the development of the system shall be completed under different project(s).

1.3 Document Scope

The scope of this Software Requirements Specification is to define the functional and non-functional requirements for the Home Appliance Control System (HACS). The system will enable household members to control their home appliances, schedule its operations, monitor energy usage. The system is intended for use in a Smart Home to Digital Home. The Scope excludes electricity billing.

1.4

Terminology Used

All major definitions should be explained here. Add major terms and acronyms to the table below.

| Term/Acronym | Definition/Description |
|---------------|---|
| Developers | The team responsible for the complete development of the software system. |
| Process | <i>Students to complete...</i> |
| Requirement | A condition or capability needed by a user to solve a problem or achieve an objective. |
| Specification | A document that prescribes, in a complete, precise, verifiable manner, the requirements, design, behaviours or other characteristic of a system or system components. |
| User | The person operating and/or using the software system. |
| HACS | The Complete software integrates Hardware System |
| TSL / SSL | <i>Security technologies used</i> |

Table 2.0 Definitions, acronyms and abbreviations

1.5 Related Documents

- *Requirement Elicitation ,*
- *Functional Requirements*
- *Brainstorming by CreatiCore Solutions Team*
- *Survey Report*
- *Data Flow Diagram*
- *Context diagram*

1.6 Document Overview

This document, the Software Requirements Specification (SRS), identifies the software requirements for the project *CreatiCore's Home Appliance Control System*

Introduction (Section 1) provides an overview of the entire SRS document, the project and the product being specified.

- **Product Overview** (Section 2) describes the product in overview, addressing the hardware and software requirements, user characteristics, constraints, assumptions and dependencies, expressed in natural language.
- *All other sections and appendices are added as points with a brief description of the contents in each of the sections.*

2.

Product Overview

2.1 Introduction

This section provides a high-level description of the requirements that have been identified to be essential to the software system to be developed. All the characteristics and limitations of the proposed software system have been provided below.

The HACS system is a smart-home automation solution that integrates software with dedicated hardware to provide centralized control of household appliances. The HACS hardware acts as a hub that connects appliances to the mobile application via secure communication channels. This allows users to access and control their home appliances both locally and remotely.

By offering functionalities such as authentication , appliance selection , timer scheduling and role-based access , the system enhances user convenience , improves energy efficiency and strengthens home security.

Consider a working professional who forgets to turn off the air conditioner before leaving home . Using the HACS application , they can securely log in , view the list of connected appliances and remotely switch off the air conditioner . Similarly they may schedule the water heater to turn on automatically at 6.30 AM ensuring hot water is ready without wasting energy overnight.

2.2 Business Services Supported

The system shall provide software support for the following operations:

1. Authentication- Secure login/Signup
2. Appliance list – Display all available appliances
3. Appliance Selection – Select a particular appliance
4. Operation Selection -Select a appliance's operation to work on
5. Timer Control-Manage/Schedule appliances
6. Appliance switch over – Switch appliances
7. Different levels of access-Provides multiple user roles
8. Energy Consumption Monitoring – Tracking energy usage , monitor usage
9. Group Control-Control Multiple appliance together
10. Remote Access-Enables control from outside the home
11. Notification and Alerts – Notify users on appliance's stage
12. Cybersecurity Add ons – End to end Encryption

2.3 Product Characteristics

The software system HACS integrates with IoT-enabled hardware components that control and manage home appliances. The software provides an interface to select and control appliances. When a user selects an appliance from a mobile device or palmtop, the command is sent to the hardware, which then activates and operates the corresponding appliance.

2.3.1 User Interface

The User Interface (UI) of the Home Appliance Control System (HACS) is designed as a comprehensive mobile application that provides users with seamless interaction between their mobile device/PC and the home automation hardware . It is to be structured simple , intuitive and accessible for both technical and non technical users.

Home Dashboard – The central screen displays a welcome note along with a real-time connectivity status indicator (green for connected , red for disconnected). The dashboard gives an overview of all rooms and appliances showing their ON/OFF or active/inactive state.

Room-based Navigation – Users can navigate room by room (Living room , Kitchen, Bedroom etc) to see appliances mapped to each space. This provides a familiar home-like structure , making it easier to locate and manage appliances.

Kid Mode Interface – If a child is the active user , the app automatically switches to a limited control interface . Only pre-approved appliances appear (e.g lights , TV , fan).High-risk appliances (microwave ,stove , geyser , smart locks) are hidden or inaccessible.

Appliance Control Panel – Each Appliance has a dedicated control screen where users can turn devices ON/OFF , adjust modes , set timer , access LIDAR . Status updates are shown instantly after a command is executed .

Energy Monitoring System – A visual reporting interface that shows energy consumption patterns with charts and graphs . Users can view data daily , weekly or monthly , compare usage between appliances/rooms , and receive suggestions for energy savings .

Scheduling and Automation – An interface for setting up automated schedule , The design ensures no conflicts between manual and automated operations. (Eg. Lights ON at 7pm , geyser OFF at 7.30 am).

Security and Alerts – The app includes CCTV surveillance integration , alarm notifications and system alerts . Users receive push notifications for unusual events such as devices being left ON too long or suspicious activity detected .

Settings and User Profile – A simple settings interface where users can manage account details , authentication preferences (password , OTP , biometrics) , notification preferences , and linked devices.

2.3.2 Operating Environment

The deployment platform requirements are a PC equipped with a Pentium-800Mhz (equivalent or above) CPU with 256Mb of RAM and 150 Mb of free disk space, running Windows 2000 Operating System. PC must be running at all times to control the device. However, the system specified in this document shall also run efficiently on any operating environment (including the hardware and operating system) that supports the Java Virtual Machine.

2.3.3 Hardware Interfaces

USB Interface - For effective operation the software system will need: USB Interface that connects to a USB port on your computer, 1 plug-in lamp module or appliance module, and handheld wireless controller.

Wireless Communication – WiFi / Bluetooth module integrated into the HACS to control appliances wirelessly. Ensures that even remote commands (from outside the home) can reach the appliances via the internet.

Cloud/Internet Gateway – Enables remote access when the user is away from home , The HACS hardware connects to the cloud server , and the mobile app interacts with it over the internet .

2.4

User Characteristics

This section shall describe the various types of users that are expected to use this system and what the minimum requirements are in terms of their knowledge and skills.

The users of this system shall be:

- Primary Users – Homeowners / Adults
- Secondary Users – Kids

2.4.1 General User Characteristics

All users can be assumed to have the following characteristics:

- Ability to read and understand English.
- Basic to advanced computer/mobile literacy
- Familiar with smartphones
- Familiar with technical knowledge

2.4.2 Admin Characteristics

- Can configure , control, and monitor all appliances
- *Responsible for system configuration , maintenance, troubleshooting and updates*

2.4.3 Secondary User Characteristics

- Require limited technical knowledge
- *Interaction only through parental/guardian supervision or restricted child mode*

2.5 General Constraints

General design/implementation constraints include:

- The software system will be developed on and run under Windows 2000/Linux OS/Mac OS .
- All code shall be developed to run on a Java Virtual Machine supporting Java 1.3.1 or above.
- Plain text files/JSON files shall be used for all text-based data storage and reports.
- The documentation and code shall be in accord with relevant CITtech documentation and style standards.
- The system will support require a stable internet connection or WiFi connection for remote access and monitoring.
- The system shall support a maximum of 5 concurrent users per household.
- The software system will allow data recovery
- All the communications will be encrypted using TLS/SSL for security .

3. Functional Requirements

The generic guidelines that are applicable for all the various functions specified in this document are:

- Users shall be informed of all Format and Rule Validation failures with an appropriate message, which shall not be documented in the Exceptions section.
- In case of Format or Rule Validation failures with system generated data, system shall abort, whilst in case of failures with user-input data, system shall allow user to retry.
- It shall be assumed that exceptions shall include any failure of a pre-condition and/or a business rule.
- The description of each of the functions shall describe the normal processing procedure, not the exceptional event flows.
- The data that is to be manipulated by a particular functional requirement shall be described by
 - A unique name
 - Whether the data is input or output to that requirement or provided by the system (eg date or time).
 - Whether the data is alphanumeric, numeric or of another format
 - Any validation rules, such as maximum size or specific ranges of values
 - How many times the data occurs (eg once or multiple times)
 - Whether the data is optional or not
- ***For the purposes of the assignment, the graphical design of the user interface is beyond the scope of this document.***

3.1 HACS Authentication System

The system shall support for logging information's

Function Name: User Authentication (Login/Sign up)

3.1.1 Trigger

User opens the app and attempts to log in or sign up.

3.1.2 Pre-Conditions

- User has installed the application
- Internet / Data Base Connection is available
- For Signup : User must provide valid details (username,password,email/phone).

3.1.3 Post-Conditions

- A session is established for the authenticated user.
- Valid Login – User redirected to Home Page
- Invalid Login – User receives error message

3.1.4 Business Rules Applicable

- Logging can be made at anytime
- Single accounts can be created
- Password must meet security requirements.
- Duplicate username not allowed
- Only registered users can access appliances

3.1.5 Data Manipulated

| Type | Name | Format | Validation Rules |
|--------|-------------|--------------|--|
| Input | Start Time | hh:mm | 24 hours |
| Input | Duration | Numeric | Allowed values 1,2 3 hours |
| Input | Login ID | Alphanumeric | Maximum 8 characters |
| Input | Password | Alphanumeric | Maximum 8 characters |
| System | System Date | Dd/mm/yyyy | Must be valid date |
| System | System Time | hh:mm | Must be a valid time (24 hour format) |

Table 3.1.5

3.1.6 Normal Processing Procedure

- User enters to CreatiCore's HACS software system
- User enters credentials
- System checks database for matching record
- System validates login information
- If validated , establishes a session and go to homepage
- If not found show error
- System displays appliance menu to the users
- User selects one of the appliance from the menu
- User start operating the appliance
- System exits or cancel while operation is completed

3.1.7 Variations

- Login via Google/Gmail Authentication.
- Login via Biometric Authentication

3.1.8 Exceptions

| Exception | Error Message (Displayed/Generated/Logged) |
|---|---|
| Entering wrong username and password | Re-enter your user name and password, Try again message |
| Entering non existing Username and password | Suggesting for a sign up |
| Forgotten Password | Redirect to Forgot Password flow |

Table 3.1.8 Exceptions during HACS_Login

3.2 HACS Appliance Controller - General

Function Name: Appliance Control (On/Off/Mode/Schedule)

3.2.1 Trigger

- User selects an appliance from Home page

3.2.2 Pre-Condition

- User must be logged in
- Device must be connected to controller

3.2.3 Post-Condition

- Appliance state updated (ON/OFF or Mode Changed)
- System logs the action in history

3.2.4 Business Rules Applicable

- One user action at a time for each appliance
- Scheduling cannot overlap with manual ON/OFF

3.2.5 Data Manipulated

| Type | Name | Format | Validation Rules |
|--------|-------------------------|---------------------|---|
| Input | Appliance Id | Alphanumeric / Code | Must exist in the user registered appliances list |
| Input | Mode selection | Enumerated (ON,OFF) | Must be of the specified Modes |
| System | System Date/Time | Dd/mm/yyyy , hh:mm | Auto generated , used for scheduling / logging |
| Output | Appliance Status | Enumerated | Reflects current state after action |
| Output | Energy Consumption Logs | Joules | Reflects How much Energy usage |

Table 3.2.5 Inputs required for HACS_ Appliance

3.2.6 Normal Processing Procedure

- User selects appliance
- System fetches current Status
- User choose operation
- Device sends command to the hardware controller
- Controller sends command to appliances
- Appliance Status updated in Database

3.2.7 Variations

- Group Control (turn off all appliances in a room)
- Voice command execution (future enhancement).

3.2.8 Reports Generated

Requirement elicitation report v1.0

3.2.9 Exceptions

| Exception | Error Message (Displayed/Generated/Logged) |
|-------------------------|--|
| Appliance not connected | Device Offline message |
| Wrong Command Format | Reject and prompt again |

Table 3.2.9 Exceptions for appliance controller

3.3 Energy consumption Monitoring

Function Name: Energy usage report

3.3.1 Trigger

- User opens energy report from Home Page

3.3.2 Pre-Condition

- At least one appliance has logged usage data
- Device must be connected to controller

3.3.3 Post-Condition

- Report displayed with time and units consumed

3.3.4 Business Rules Applicable

- Data stored for last 30 days by default . Reports can be exported.

3.3.5 Data Manipulated

| Type | Name | Format | Validation Rules |
|--------|---------------------------------|---------------------|---|
| Input | Appliance Id | Alphanumeric / Code | Must exist in the user registered appliances list |
| System | Power Usage | Numeric (kWh) | >0 from sensors or power report |
| System | Measurement interval | Minutes / Hours | Configurable (every 1 min or required cycles) |
| System | System Date/ Time | dd/mm/yyyy hh:mm | Auto generated for each logged reading |
| Output | Consumption and Cost Estimation | Joules/Numeric | Summed Value per interval |
| Output | Usage Report | Graphical/Tabular | Visualisation of energy usage |

Table 3.3.5 Inputs/Outputs required for HACS_ Appliance

3.3.6 Normal Processing Procedure

- User selects “Energy Report” option
- System fetches consumption data from Database
- Display usage chart (daily/weekly/monthly)

3.3.7 Variations

- Compare usage between rooms
- Suggestions for energy saving

3.3.8 Exceptions

| Exception | Error Message (Displayed/Generated/Logged) |
|---------------------------|--|
| Appliance not connected | Device Offline message |
| No Data / Appliances Used | No usage detected |

Table 3.2.8 Exceptions for energy usage report

4.

User Interface Requirements

The Home Appliance Control System (HACS) requires to ensure ease of use and accessibility for all types of users , including those with limited technical knowledge. The primary purpose of the interface is to allow users to control , monitor and manage their home appliances in a simple , intuitive and reliable manner.

The design will prioritize : Clarity , Consistency , Reduced Complexity , Responsiveness , Accessibility

4.1 Look and Feel Requirements

- Every screen shall display the HACS slogan on the top-right corner for branding consistency.
- The top-left corner of every page shall contain the team name along with its logo, displayed in low opacity (watermark style) to avoid distraction while maintaining identity.
- A link symbol shall be shown in the top-right corner of every page to indicate connection status:
 - Green link → Connection established between device and HACS hardware controller.
 - Red link with a cross overlay → Connection lost or unavailable.
- The bottom navigation bar shall be consistently present across all screens, containing three options:
 - Home (center): Returns user to the home page/dashboard.
 - Appliances (left): Opens appliance control section, which is further divided into:
 - Interior appliances: Rooms and indoor devices.
 - Exterior appliances: Outdoor devices such as garden, garage, or exterior lighting.
 - Energy Report (right): Provides energy consumption statistics and monitoring.
- The layout shall remain consistent across pages, ensuring users can easily navigate without confusion.
- Text and icons shall be clear, minimalistic, and easily readable on both mobile and desktop screens.
- Critical actions (e.g., switching OFF all appliances) shall be highlighted with distinct colors or warning prompts for user awareness.
- The interface shall maintain a modern, simple, and intuitive appearance, avoiding unnecessary clutter.

4.2 Usability Requirements

- The software system shall allow at least 90% of first-time users to perform basic operations (e.g., turning a device on/off) within 2 minutes without external help.
- The software system should provide a Quick Start Guide that introduces users to the main modules of the application, ensuring easy onboarding and navigation.
- The software system shall enable common tasks (such as checking energy consumption or switching devices) in no more than 3 user interactions.
- The software system shall ensure that fewer than 5% of user interactions result in errors requiring corrective action.
- The software system shall provide consistent icons, navigation, and terminology across all screens.
- The software system shall display feedback (e.g., confirmation of an action) within 1 second of user input.

- The software system shall provide clear error messages and guidance within 2 seconds when an invalid action is performed.
- The software system shall use standard readable fonts and sufficient colour contrast to ensure accessibility for users with basic digital literacy.

5. Non-Functional requirements

5.1 Performance requirements

- The system should respond to user actions (like turning a light or fan ON/OFF) within 2 seconds in normal conditions.
- The system should smoothly handle at least 5 appliance control requests per minute without slowing down.
- At least 5 people should be able to use the system at the same time without issues.
- Sensor data, like power usage or appliance status, should update in less than 1 second.
- The system shall update energy consumption reports within 5 seconds of request.

5.2 Reliability requirements

- The system should work completely of the time each month (excluding planned maintenance).
- If there's a hardware or network failure, the system should automatically switch to a backup option.
- Usage logs and system settings should be backed up every 24 hours.
- If the system crashes, it should be back to normal within 5 minutes.
- The system shall automatically reconnect to the hardware controller within 10 seconds if the connection is lost.
- The system shall log all appliance control activities for reliability tracking.

5.3 Security requirements

- Users must log in with a strong password (minimum 8 characters, with at least one uppercase letter, one number, and one special character).
- Admins can only manage appliances, while normal users can only control them.
- Sensitive information (like passwords) should be encrypted with strong methods
- All communication between users and the system should use secure channels (like HTTPS).
- If someone tries to log in incorrectly 3 times in a row, their account should be locked, and the attempt logged.
- The system shall require user authentication before accessing appliance controls.

- The system shall allow role-based access, restricting children's access to limited appliance control.

5.4 Maintainability requirements

- The system should be built in separate modules (Authentication, Appliance Control, Monitoring) so updates are easier.
- Each part of the system should come with full design details, API references, and troubleshooting steps.
- Instead of confusing codes, users should see simple messages like *"Device not connected"* rather than *"Error 404."*
- Bug fixes and updates should not take more than 10 minutes of downtime.
- The system shall allow software updates to be installed without requiring a complete reinstall.

5.5 Portability requirements

- The system shall be installable on PCs with a minimum of Pentium 800 MHz CPU, 256 MB RAM, and 150 MB disk space.
- The system shall run on any operating system that supports the Java Virtual Machine (JVM).

5.6 Interface Requirements

- Buttons, icons, and menus should be intuitive, consistent, and well-labeled.
- The system should work on Windows, Linux, and Android with minimal setup.
- It should support up to 500 appliances without needing a complete redesign.
- The system should integrate with popular smart home platforms (like Alexa and Google Home) using standard protocols (MQTT, REST APIs).

5.7 Compliance Requirements

- The system should follow IEEE 830/29148 standards for software requirement documents.
- The system should fix in the theoretical implementation of lectures from Software Engineering Principles and Practices
- Must follow data privacy laws to keep user info safe.

6.

Operating Environment

The system specified shall operate on the hardware, software requirements outlined in this section.

6.1 Hardware

The system is expected to have the following minimum configuration:

- Pentium-800MHz (equivalent or above).
- 256 MB RAM.
- 150 MB free hard disk space.
- VGA Monitor.
- Microphone
- IoT Integration

6.2 Software

The basic software required for effective operation shall be:

- Windows 2000 operating system / Linux OS / Mac OS
- Java Virtual Machine capable of running Java v1.3.1 applications or above.

6.3 Printer

The printer must be compatible with the computer system and must be capable of printing text files.

6.4 External Data Storage

All data that needs to be stored on external storage devices for security and protection reasons shall be clearly identified. Descriptions of all data files and methods of access to archive these data items shall be provided as part of the User Manual. It is expected that the technical operator of this system shall have the required expertise to transfer all relevant data files on to an external archive (e.g. Floppy Disk, DAT, CD and/or ZIP disk).

The Home Appliance Control System shall utilize secure external cloud storage to maintain user authentication details, appliance status logs, and energy consumption records. All data generated by the system will be synchronized in real-time with the cloud to ensure accessibility from remote locations. The cloud storage shall provide reliable backup, ensuring that data is not lost in case of local system failures. Additionally, the storage mechanism will support scalability to handle multiple users and appliances while ensuring security and privacy of sensitive information.

7. Acceptance Criteria

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Glossary

- **HACS (Home Appliance Control System):** *The main system described in this document, designed to control and monitor home appliances using software and hardware.*
- **IoT (Internet of Things):** *A network of physical devices (like fans, lights, or ACs) connected to the internet, allowing them to be monitored and controlled remotely.*
- **Requirement:** *A specific condition, function, or capability the system must satisfy to be useful to the user.*
- **Functional Requirement:** *A description of what the system should do (for example, login, turn on an appliance, generate energy reports).*
- **Non-Functional Requirement:** *A description of system qualities or constraints (for example, speed, security, reliability, portability).*
- **Authentication:** *The process of verifying the identity of a user (using a password, OTP, or biometrics).*
- **Authorization:** *Granting specific permissions to users depending on their role (for example, admin vs. child access).*

- **Encryption:** A security process that hides sensitive information by converting it into unreadable code unless you have the right key.
- **TLS/SSL:** Security technologies used to protect communication between the system and users (commonly seen in HTTPS websites).
- **Cloud Gateway:** The part of the system that links home appliances with the internet, allowing users to control devices from outside their home.
- **Context Diagram:** A simple diagram showing how the system interacts with users, devices, and external systems.
- **Use Case:** A description of a user action and system response (for example, “The user logs in and controls an appliance”).
- **Scheduling:** The ability to set appliances to switch on or off automatically at a chosen time.
- **Energy Monitoring:** The feature that tracks how much electricity appliances use, helping users reduce costs and save power.
- **Graphical User Interface (GUI):** The visual part of the system that users interact with (buttons, menus, icons, screens).
- **Role-Based Access Control (RBAC):** A security method that restricts what users can do based on their role (admin, parent, or child).
- **Biometric Authentication:** A login method using physical features like fingerprints, face recognition, or voice.
- **Cybersecurity Add-ons:** Extra protective features such as secure encryption, alarms, or intrusion detection.
- **Data Flow Diagram (DFD):** A visual representation of how information moves through the system.
- **Exception Handling:** How the system reacts when something goes wrong (for example, showing an error message if the password is wrong).
- **External Storage:** Saving data on external devices or services such as a USB drive, cloud server, or external hard disk.
- **Compliance:** Following official standards, rules, or legal requirements (for example, IEEE standards, data privacy laws).
- **Smart Home:** A house where appliances are automated and connected to a central control system for easy management.
- **User Roles:** Different categories of users (Admin, Adult, Child) with different levels of access to system features.

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Appendix A: External Context Model

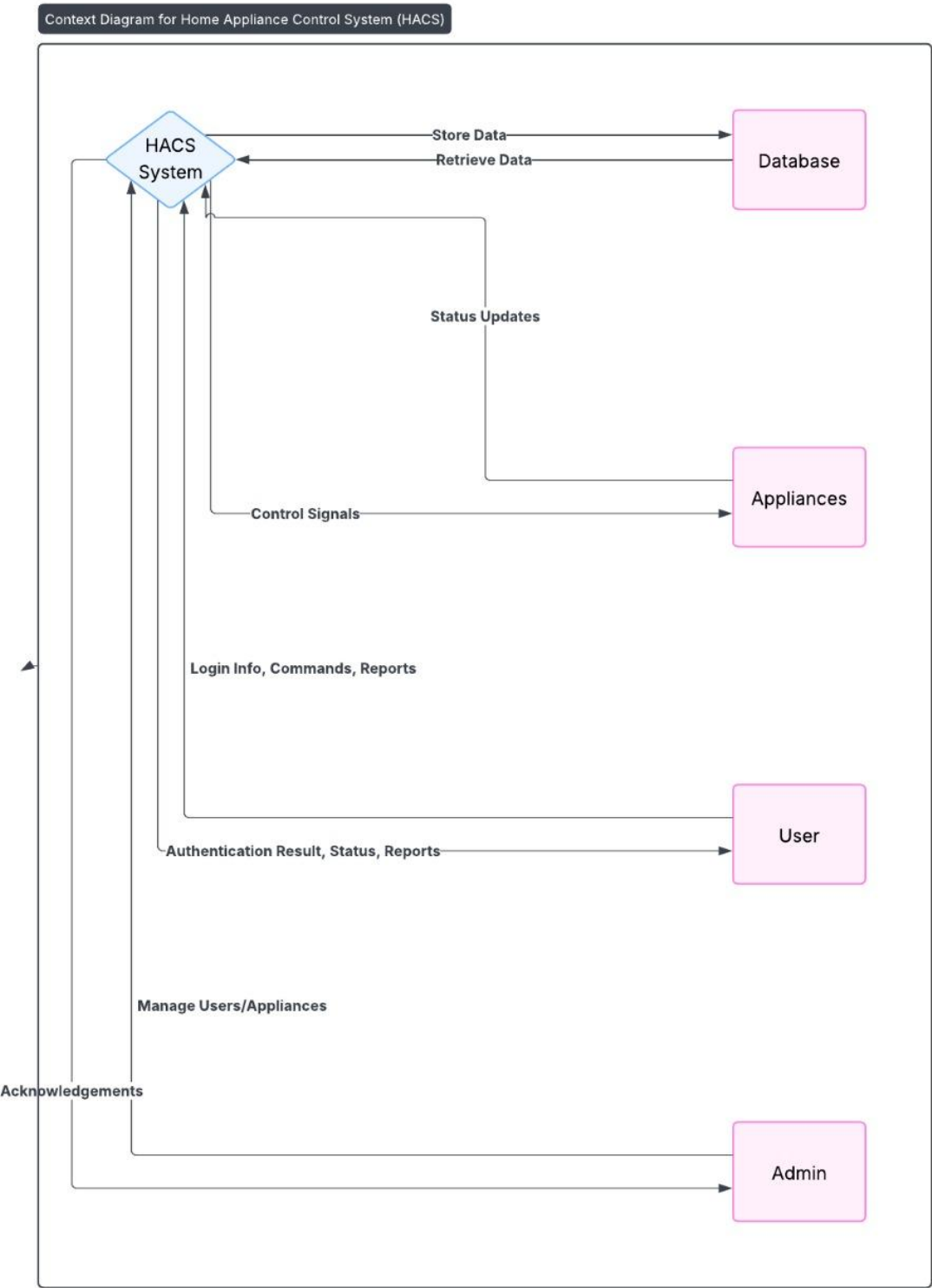
The external context model illustrates how the Home Appliance Control System (HACS) interacts with external entities.

- **Actors:** Users (Admin, Adult, Child), Cloud Server, Smart Appliances, Internet, External Storage.
- **Flows:**
 - Users send commands (e.g., login, appliance ON/OFF, schedule).
 - HACS communicates with appliances via hardware and cloud gateway.
 - System sends feedback to users (status updates, energy usage reports, alerts).

Appendix B: Internal Context Model

The internal context model explains the subsystems inside HACS and how they work together:

- *Subsystems: Authentication Module, Appliance Control Module, Energy Monitoring Module, Notification & Alerts Module.*
- *Data Storage: Appliance database, user database, logs.*
- *Interactions:*
 - *Authentication validates users.*
 - *Appliance Control manages device states.*
 - *Monitoring tracks energy usage and stores data.*
 - *Notification system pushes alerts to the user app.*

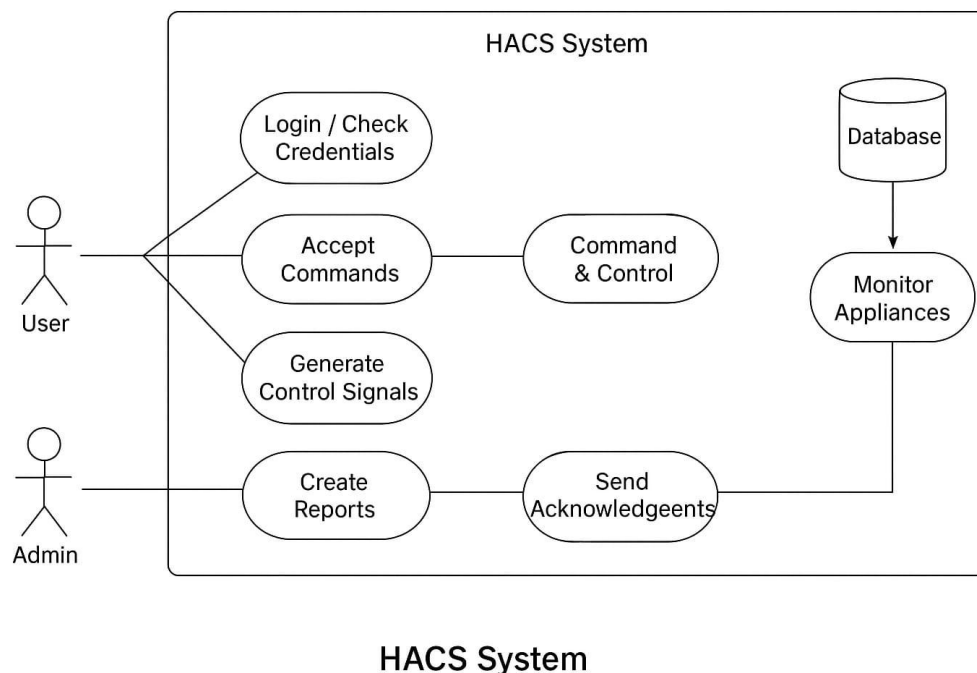


Appendix C: Use Case Analysis Notes

Identified use cases include:

- *Login/Signup – User authentication and session creation.*
- *Control Appliance – Turn appliances ON/OFF, change modes.*
- *Schedule Appliance – Automate appliance actions at set times.*
- *Energy Report – View energy usage in graphs and tables.*
- *Notifications – Receive alerts for unusual events or device activity.*

Each use case defines Triggers, Preconditions, Postconditions, Exceptions, as outlined in Section 3 of the document.



Appendix D: Development Process

The development of this document followed structured steps:

Tasks Undertaken:

1. *Requirement Elicitation – Brainstorming sessions, surveys, and document reviews.*
2. *System Analysis – Identification of functional and non-functional requirements.*
3. *Modeling – Drafting context diagrams, use cases, and data flows.*
4. *Documentation – Writing the Software Requirements Specification.*
5. *Review & Validation – Peer review and correction of draft versions.*

Techniques Used: Brainstorming, Interview Analysis, Survey Reports, Document Inspection.

Outputs Produced: Requirement list, functional flow, use cases, system constraints.

Tasks Undertaken

| Task Name | Description | Technique(s) Used |
|--------------------------------|---|--|
| Requirement Elicitation | Brainstorming sessions, surveys, and document reviews. | Brainstorming, Surveys, Interviews |
| System Analysis | Identification of functional and non-functional requirements. | Document inspection, Comparative study |
| Modeling | Drafting context diagrams, use cases, and data flows. | Context diagrams, Use case analysis |
| Documentation | Writing the Software Requirements Specification. | IEEE SRS template, Writing tools |
| Review & Validation | Reviewed draft and incorporated improvements | Peer review, Faculty feedback |

Table 51.0 Tasks undertaken in the development of this document

Task Name: The common name for this task.

Description: A short description of what was undertaken as part of this task.

Technique(s) Used: What techniques were used to complete this task.

Task Outputs

| Task Name | Outputs | Section(s) |
|-------------------------|--|-------------------|
| Requirement Elicitation | Initial requirement list | 1.2, 1.4, 1.8 |
| | Functional and non-functional requirements | 5.3 – 5.6 |
| | User and system characteristics | 2.3, 7.0 |
| System Analysis | General constraints | 2.5 |
| | Requirement prioritization | 2.6 |
| | Draft acceptance criteria | 7.0 |
| Modeling | External context diagram | Appendix A |
| | Internal context model | Appendix B |
| | Use case analysis notes | Appendix C |
| Documentation | Draft SRS with structured sections | Sections 1–6 |
| | Glossary and References | End sections |

| | | |
|--------------------------------|---|--------------------------------------|
| <i>Review & Validation</i> | <i>Revised content after faculty review</i> | <i>Entire document</i> |
| | <i>Final polished SRS</i> | <i>All sections (I – Appendices)</i> |

Table 52.0 Sections affected by the various tasks.

Appendix E: Contributions

This section shall contain the names of all the contributors to this document. The sections that each contributor has worked on shall be described in the table below.

| Contributor Name | Sections Worked On |
|-------------------------|---|
| ABINAYA.S | FUNCTIONAL REQUIREMENT, CONTEXT DIAGRAM |
| ILAKKIA.T | NON FUNCTIONAL REQUIREMENT,USE CASE DIAGRAM, DATA FLOW DIAGRAM. |
| SARVESH A K | USER INTERFACE REQUIREMENT, PRODUCT OVERVIEW, OPERATING ENVIRONMENT. |
| NAVEENYA.M | REFERENCE,GLOSSARY,APPENDIX,INDEX,IDEAS FOR FUNCTIONAL AND NON FUNCTIONAL REQUIREMENT,DOCUMENTAION. |
| VENNILA | INTRODUCTION, IDEAS FOR FUNCTIONAL AND NON FUNCTIONAL REQUIREMENT. |

Appendix F: Meeting Agendas/Minutes

This section shall include agendas and minutes from all the various meetings that team members have attended as part of this project.

| ID | Meeting Date/Time | Apologies |
|----|--|-----------|
| 1 | August 9 th 2025, 2:30 – 5:30 pm | - None - |
| 2 | August 19 th 2025, 2:30 – 5:30 pm | - None - |
| 3 | August 24 th 2025, 2:30 – 5:30 pm | - None - |

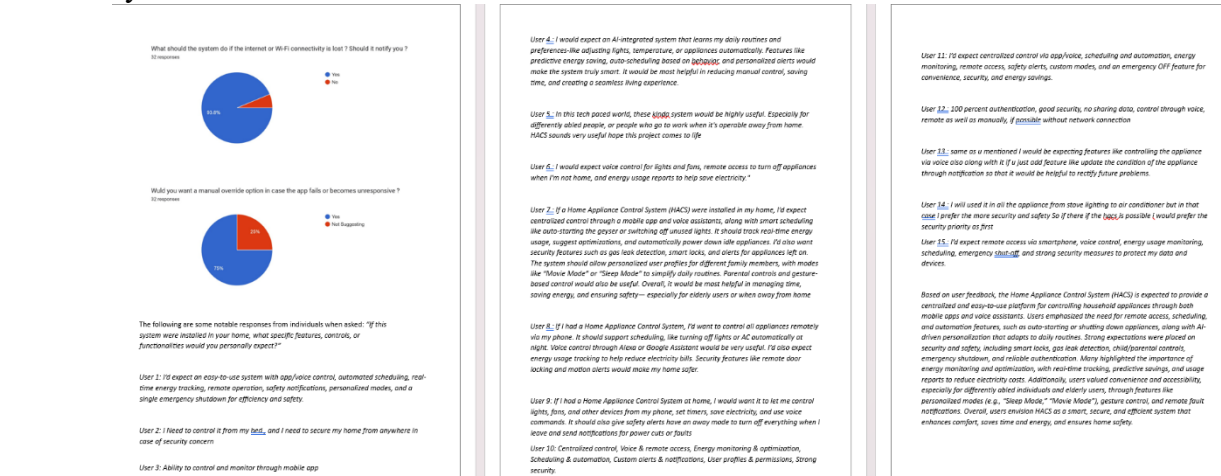
Appendix G: Problem Investigation Reports

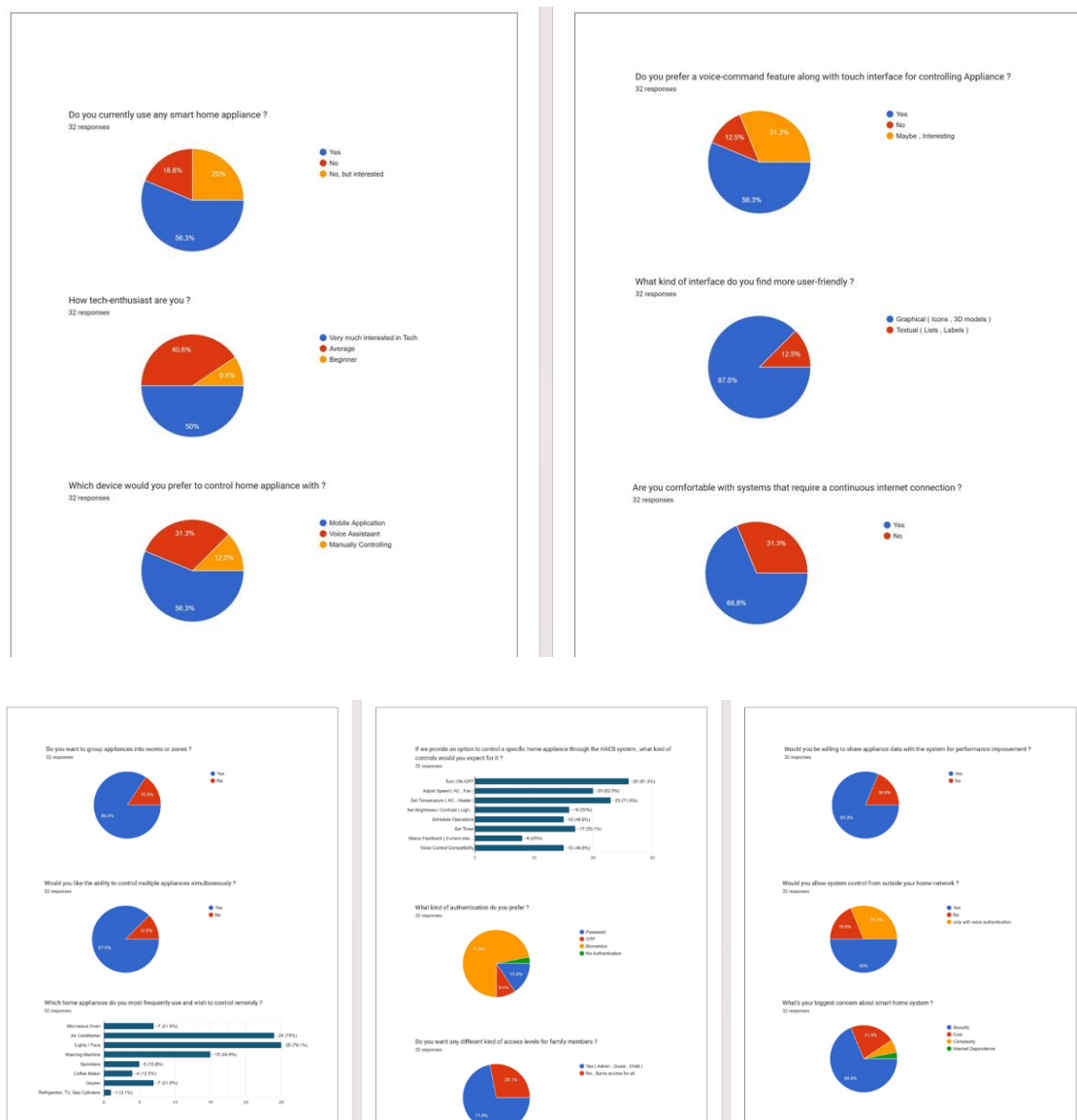
Interview Analysis Notes

- Interviews were conducted with potential users including homeowners, students, and working professionals.
- Most users preferred mobile-based control rather than desktop interfaces.
- Parents raised concerns about children accessing high-risk appliances such as heaters, geysers, and ovens.
- Users requested features like notifications for appliances left ON and scheduling for daily routines.

Survey Findings

- 70% of respondents wanted energy consumption monitoring to track electricity usage.
- 60% requested scheduling features to automatically switch appliances ON/OFF.
- Internet connectivity issues in rural and semi-urban areas were identified as a major limitation.
- 45% of respondents mentioned security as their biggest concern in smart home systems.





Document Inspection Reports

- Existing smart home platforms (Google Home, Alexa, Samsung SmartThings) were studied to identify gaps.
- IEEE 830 and IEEE 29148 standards were used to guide requirement documentation.
- Compared features of other IoT-based systems to ensure HACS includes necessary security and usability improvements.

Problem Investigation Summary

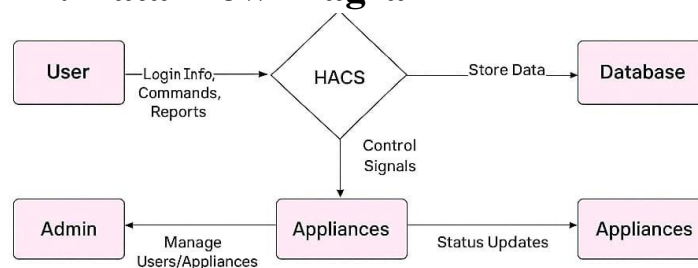
- Connectivity Issues:** Reliance on internet alone may cause system downtime; a backup local communication mode is needed.
- Security Risks:** Weak passwords and unencrypted communication can expose the system to cyberattacks.
- Energy Data Storage:** Long-term energy consumption data must be stored securely for analysis.

- **User Interface Challenges:** The system must be simple enough for children and elderly users while providing advanced features for admins.

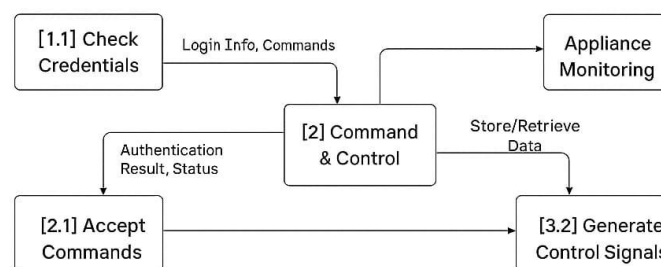
Recommendations

- Provide dual connectivity options (Wi-Fi and Bluetooth) to ensure reliability.
- Enforce strong password policies and enable two-factor authentication.
- Store data securely in the cloud with encryption for privacy and backup.
- Introduce multiple interfaces: **Child Mode** (restricted controls) and **Admin Mode** (full access).
- Provide offline functionality for basic appliance control in case of internet failure.

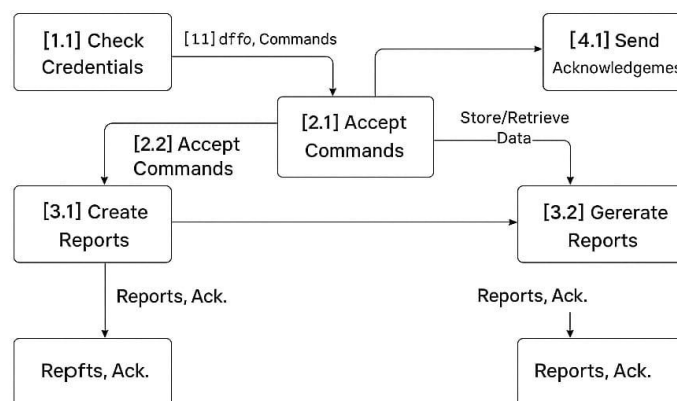
Appendix H : Data Flow Diagram



Level 1 DFD



Level 2 DFD



Appendix I : Appliances List and ERD

- Living Room: Lights, Fan, AC, TV, Automatic Curtains
- Kitchen: Chimney, Refrigerator, Stove/Oven, Purifier, Dishwasher
- Bedroom: Lights, Fan, AC, TV, Automatic Bed
- Bathroom: Lights, Fan, Heater, Shower
- Dining Room: Fan, Lights
- Storeroom: Fan, Lights
- Laundry Room: Washing Machine, Dryer
- Playroom/Gym: Fan, Lights
- Outdoor/Garden: Sprinkler, Grass Cutter, Motor, Garden Lights
- Garage: Door, Smart Lock
- Swimming Pool: Pump, Cleaner, Heater
- Security: CCTV Surveillance, Alarm System

Here's a sample ER diagram

