Vision Document
[Smart Home+]

1. Introduction

1.1 Purpose:

The purpose of this document is to define, gather and analyze needs and features of the system. The requirements are high-level in nature. This focuses on the needs and requirements of the stakeholders as well as end-users. It also specifies how the system will address these needs and why they are needed.

1.2 Product Overview:

SmartHome+ is a smart-home platform for home users to automate daily home tasks, reduce energy waste, and provide home security, and alerts in case of water leaking, fire, etc.
This system will mainly focus on six main areas/domains :

1. accessibility
2. environmental considerations
3. energy efficiency
4. security
5. automation
6. media and entertainment

The summation and harmonization of all the six categories of SmartHome+ will provide for a truly rewarding living experience for the SmartHome+ users.

1.3 References:

The documents referred to for this vision document is/are:

1. Requirement Elicitation Document
2. https://en.wikipedia.org/wiki/List_of_smart_TV_platforms_and_middleware_software
3. Johnny, Wong & Leung, Jodith & Skitmore, Martin & Buys, Laurie. (2017). Technical requirements of age-friendly smart home technologies in high-rise residential buildings: A system intelligence analytical approach. Automation in Construction. 73. 10.1016/j.autcon.2016.10.007.
4. Beckel, Christian & Serfas, Heinz & Zeeb, Elmar & Moritz, Guido & Golatowski, Frank & Timmermann, Dirk. (2011). Requirements for Smart Home Applications and Realization with WS4D-PipesBox. IEEE International Conference on Emerging Technologies and Factory Automation, ETFA. 1 - 8. 10.1109/ETFA.2011.6059229.
5. Davies, E.I & Anireh, Vincent. (2019). Design and Implementation of Smart Home System Using Internet of Things. Advances in Multidisciplinary & Scientific Research Journal Publication. 7. 33-42. 10.22624/AIMS/DIGITAL/V7N1P4.
6. Abdulrahman, T.A. & Isiwekpeni, O.H. & Surajudeen-Bakinde, Nazmat & Otuoze, Abdulrahaman & Abdulrahman, Abdulhakeem. (2016). Design, Specification and Implementation of a Distributed Home Automation System. Procedia Computer Science. 94. 473-478. 10.1016/j.procs.2016.08.073.
7. Requirements Elicitation: A Survey of Techniques, Approaches, and Tools by Didar Zowghi and Chad Coulin

2. Positioning

2.1. Problem Statement

The problem of	• Need for a smart, efficient, safe, and secure home
Affects	• Homeowners, their family members, guests, and maids.
The impact of which is	• uncertainty in the safety and security of the homeowners and their belongings, efficiency of home utilities, accessibility, quality of living, providing assistance to people with disabilities.
A successful solution would be	• a cost-effective, safe, and secure smart home, that can be easily configured by the home users. The product would provide 1.smart entertainment including Smart Tv, Integrated audio systems, Centrally controlled audio/video system with offline and online storage. Recording videos/audios. 2. Accessibility: all screens in the home have a bigger font and optimized for possible. In addition, all systems are voice-activated to assist users. 3.environmental considerations are made in the system. The home is equipped with water and air purification systems, water and air quality sensors, smoke detectors, carbon dioxide detectors, fire detectors. 4.energy efficiency the product would provide an automated thermostat with an AI learning system, motion sensors, and the home is equipped with a smart water leak and freeze Detectors, smart sprinkler system, solar panels, and home energy monitory system. 5 In terms of security, the home is equipped with cameras, door/window sensors, smart locks, motorized blinds. The product is equipped with a biometric and facial detection system which only allows the homeowner and family members to use the smart features. 6.automation is considered in the product homeowner would get a notification for alteration in any of sensors, arming and disarming the home alarm system is automated and can be done remotely, automatically turn off the water in case of a water leak, Turning lights and appliances off, and adjusting the heating/AC when leaving home, get a notification alert when a door is unlocked, when kids come home, spouse arrives from work, or workers are on site.

2.2. Product Position Statement

For	● homeowners and their family members primarily and secondarily working staff.
Who	● feel the need for a smart home, automating daily home tasks, monitoring water/air quality and safety, saving energy and providing sustainable energy practices, entertaining people with multimedia streaming and guaranteeing personal security by detectors and the identification system.
Smart Home+	● is an internet of thing system combining user interface and a wide variety of home appliances.
That	● provides good accessibility with different kind of devices including smartphone, tablets, laptop and televisions, provides the ability to automate daily home tasks, provides the purification of water and air, provides energy efficiency system incorporating sustainable energy practices, equips with smart entertainment facilities such as smart TV and centrally controlled media system with offline and online storage, keeps secure of personal information and home.
Unlike	● current available smart home systems that do not support the practices of sustainable energy, and do not support the capability to make a difference in the privilege of accessibility between owners and guests, and do not support the integration with other existing ecosystems.
Our product	● supports sustainable energy practices like solar energy, solar heating, water harvesting, and our platform has a temporary guest login system which limits accessibility to the working staff for the purpose of security and privacy, and our platform supports the integration with other existing ecosystems.

3. Stakeholder Descriptions

3.1. Stakeholder Summary

Name	Description	Responsibilities
Non User Stakeholder:		
1. System Analyst	1. This person works with other Stakeholders to accumulate their needs.	1. Coordinates requirements elicitation and use-case modeling.
2. Requirements Specifier	2. This person works with Analysts to translate needs to requirements.	2. Specifies and lists all the aspects of requirements both functional and non-functional.
3. Technical Reviewer	3. This person maintains the development cycle.	3. Provides feedback to the review process by providing timely feedback on artifacts being reviewed.
4. Software Architect	4. This person is responsible for leading the development of the project.	4. Responsible for the software architecture. Also, makes key decisions about design and implementation.
5. Project Manager	5. This person is responsible for managing the project development.	5. Responsible for planning, management and allocation of all resources. Coordinates interactions with customers and end-users.
6. Developers	6. This person is responsible for the development of a software system.	6. Responsible for translating the requirements into a software system. Also, responsible for maintenance and support of software systems.
7. Testers	7. This individual is responsible for maintaining quality control of the system.	7. Responsible for all testing and quality control of the system and its artifacts.

User Stakeholders:		
1. Home Members	1. Primary end users.	1. Receive important notifications like intruder detection, water filtration health status etc.
2. Non Essential Members (Maintenance / Delivery Personnel)	2. Temporary Users.	2. Receives temporary and limited access to home features like one time access key, internal system status , maintenance status etc.
3. Housekeepers, Nannies etc.	3. Secondary Users.	3. Given access to some house services but not all. Receives temporary access to features on a need basis.
4. Smart Solution Inc.	4. End Users	4. Receives all the admin features for the product, responsible for maintaining the quality of the system and provide regular feedback.

3.2. User Environment

- **People and pets Involved:**

  Most tasks could be completed by one person, while some users who have less knowledge about computing devices, disabilities and children may need assistance from others when using the SmartHome+ platform at the first time.

  For pets, the system will automatically analyze that pets are present in the home and will accommodate all systems accordingly. For example, motion detectors would not trip when the home alarm system is activated but a pet is still inside.

- **Task Cycle:**

  The task cycle is task-dependent varying from one task to another. Some tasks could be accomplished in a relatively short time, such as turning off the light, closing the curtain, while other tasks are time-consuming taking much time to be completed, such as air purification, monitoring the gate of the house or performing a maintenance cycle on the house ventilation system. The amount of time spent on each activity depends on different activities.

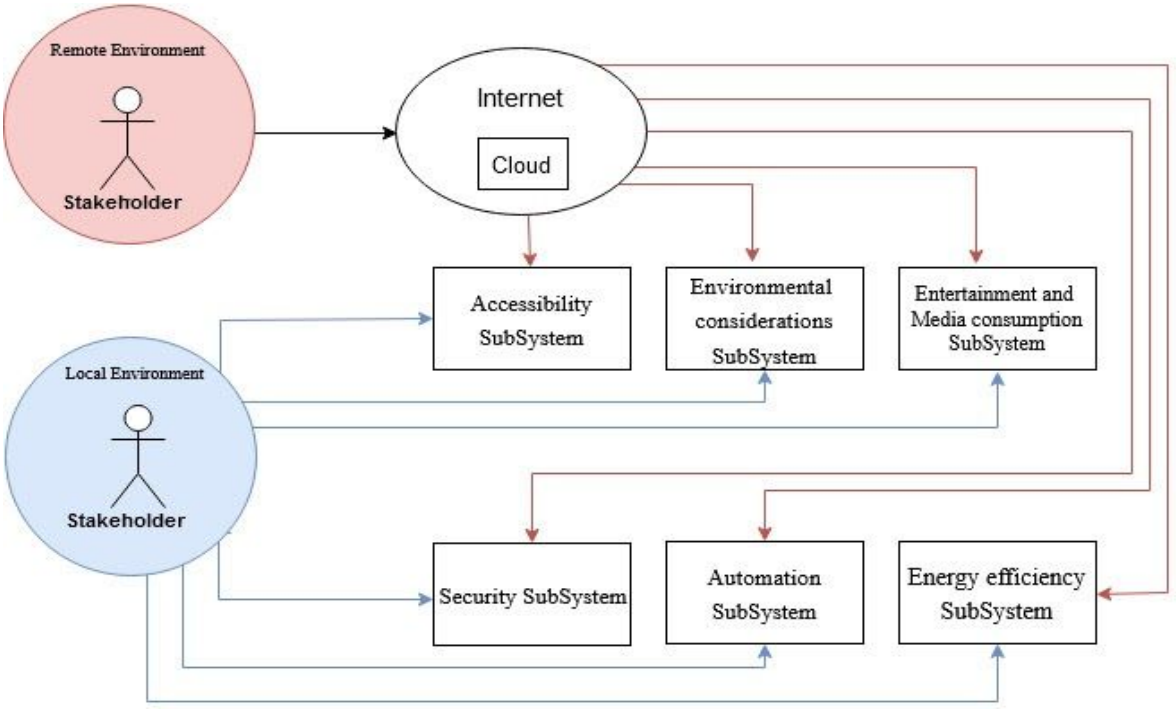
- **Environmental Constraints:**

  The users access the SmartHome+ system remotely and locally. Remote access is wireless (mobile phone data, wi-fi, personal hotspot) or using a landline (dial-up modem), so users could access the SmartHome+ system indoor, outdoor, in-flight with internet connection. Local access is achieved through the platform and controlling pads installed in the owner's home.

- **Supported System Platform:**
  - Mobile Phone: Android (Google), IOS (Apple)
  - Laptop/PC: MacOS(Apple), Windows (Microsoft), Linux(Linux Foundation)
  - Tablet: Android (Google), WebOS(HP), BlackBerry Tablet OS(BlackBerry)
  - Smart Television: Android TV(from Google), Boxee(from Boxee), Fire TV(from Amazon), Firefox OS for TV(from Mozilla)
- **Ability to Integrate with Other Ecosystems:**
  - Amazon Alexa
  - Google Assistant
  - Apple HomeKit

4. Product Overview

4.1. Product Perspective



4.2. Assumptions and Dependencies

These assumptions have been derived from literature study on existing systems and their related documents.

Assumptions	Dependencies
The default language is US English	• All voice controlled devices won't be able to comprehend the user commands
The users will go through the usage guide and act accordingly	• Devices won't function properly
24/7 power supply will be available	• On power failure the smart devices will switch to traditional device mode except emergency services like surveillance cameras which will have power backups.
Strong WiFi support	• The remote communication between devices will be hampered if Wifi is disconnected. The user commands might not be executed.
Smart assumes everyone has a basic understanding of tech, with a base level of computer literacy.	• This presents a difficulty when many Smart tools are operated by touch-screen interfaces or mobile devices
Operating system is compatible with all kinds of hardware	• We might face integration issues

4.3. Needs and Features

Need	Priority	Features	Planned Release
Security and Privacy 1. Protecting the system from hackers 2. Receiving instant notifications and video clips when motion detectors or alarms are triggered 3. Lock/unlock homes from a long distance	High	1. Security cameras 2. Door/window sensors 3. Smart locks 4. Facial detection 5. Fingerprint 6. Intrusion detection system .	Planned release 1: Fingerprint Planned release 2: Facial recognition Planned release 3: Pin keypad Planned release 4: Installing home video surveillance systems Planned release 5: Isolate the smart home network from the other networks
Accessibility manage devices in the home using voice	High	1. Voice-activated systems	Planned release: Using voice-activated systems
Environmental considerations 1. saving money as well as reducing the carbon footprint 2. keeping the environment safe and clean 3. ensure to have great water quality 4. early detection of a fire in your home	High	1. water and air purification systems 2. water and air quality sensors 3. smoke detectors 4. carbon dioxide detectors 5. fire detectors	Planned release 1: Water air purification Planned release 2: Health and safety detectors Planned release 3: Installing smoke, carbon and fire detectors
Entertainment and Media consumption 1. Smart Tv, 2. Integrated audio systems	Medium	1. Smart Tv 2. Integrated audio systems 3. Centrally controlled audio/video system with offline and online storage 4. Recording videos/audios	Planned release 1: Centrally controlled audio/video system with offline and online storage, Planned release 2:Recording videos/audios

Automation 1. savings, 2. safety, 3. convenience, and 4. control functions 5. Provide Better Care to family	High	1. getting a notification for alteration in any of sensors 2. arming and disarming the home alarm system 3. automatically turning off the water in case of a water leak, Turning lights and appliances off 4. adjusting the heating/AC 5. Automatically measure the height	Planned release 1: Using Sensors and also by programming the features Planned release 2: Using smart human height detector
Energy efficiency 1. more precise control over the heating and cooling of your home with a programmable smart thermostat 2. the energy consumption can be reduced exponentially when smart devices run at home 3. less need for heating and cooling when no one is at home	High	1. automated thermostat 2. motion sensors 3. smart water leak and freeze Detectors 4. smart sprinkler system 5. solar panels 6. home energy monitor system	Planned release1: designing in a way to make the most out of available energy Planned release2: saving energy by keeping track of which rooms are being used and when you use them.

4.4. Alternatives and Competition

Product	Strengths	Weakness
ADT Home Security System - Provides various smart devices for security.	1. Reliable and secure communication mode 2. Reduces your energy consumption and costs 3. Cellular connection type provides 24/7 support and more availability and reliability	1. No support for media and entertainment 2. AI features like facial recognition or package detection are not available yet. 3. ADT uses multiple contractors for everything from sales to installation. 4. If you plan to move out, you need to leave the devices and start fresh again.
Vivint Smart Home Systems - Provides smart devices and Platform to control them.	1. All devices function using Z-Wave and are wireless which makes the equipment transportable. 2. lets you set up all the cameras you need to keep an eye on your home without eating up all your bandwidth 3. integrated smart home with home security without having to buy different devices	1. Completely Cellular based But without a Wi-Fi or landline backup the cellular connection limits availability if you live in a rural area or somewhere else with little to no cell service. 2. Vivint is currently compatible with only Google Nest and Amazon Echo. 3. Not compatible with devices from other companies.Hence you need to invest on those devices again every time you change address.
Ecobee Platform - It's a platform that can control various smart devices	1. Compatible with all ecosystems. The user can switch between devices of different OS without breaking the Smart Home system. 2. Alexa-enabled Ecobee Switch+ allows you to command your home from anywhere with your voice. cd	1. The Ecobee 4 draws its power through the C-wire, which some older homes may not have, they compensate for this by providing a Power Extender Kit (PEK) 2. The Ecobee 4 does not have a battery backup power source
Nest Platform 1. It's a platform that can control various smart devices	1. unlike other devices , Nest relies on its learning capacity to understand the daily routine of the home	2. Not compatible with Apple operating systems

Brilliant Control -Wall Switch that uses Wifi to connect to and control smart devices -has built -in Amazon Alexa voice support	1. 1.user-friendly button controls 2. 2.Compatible with many smart home platforms 3. 3.Takes care of entertainment, automation of lighting and temperature control	1. Expensive 2. Access to some devices is limited 3. Installation and setup, maintenance needs expert help.
The TP-Link Kasa Smart Wi-Fi Power Strip HS300 -six-outlet smart surge protector	1. Supports all Amazon Alexa, Google Assistant, and Microsoft Cortana voice commands 2. Surge protection and Energy monitoring	3. Expensive 4. Outlets aren't childproof
Wyze Cam Pan -indoor security camera -offers a 360-degree pan range and a 93-degree vertical tilt range	1. motion and sound detection, time-lapse recording 2. free cloud storage 3. Alexa and IFTTT support 4. Inexpensive Has won the Editors Choice Award	1. CO alarm detection feature was ineffective 2. minor barrel distortion

5. Other Product Requirements

- **Applicable standards/ Regulations:**

  All standards that the product must and will comply with. The list includes the following standards:

  - Legal and regulatory standards (FDA, UCC)
  - Communications standards (TCP/IP, ISDN)
  - Platform compliance standards (Windows, UNIX, IOS, ANDROID,MacOS)
  - Quality and safety standards (UL, ISO, CMM)
  - Water Quality ISO/TC 147,ISO/TC 224,ISO/TC 138,ISO/TC 153
  - Air Quality ASTM D7297 - 14, ANSI/ASHRAE Standards 62.1 and 62.2
  - Home security NFPA 731, P2900, NFPA 92, NFPA 204

- **Environmental requirements:** In terms of environment requirements the Smart Home+ system needs power and a reliable internet connection.

- **Constraints:**
  - **Security:**

    Smart Home+ includes authentication, access control, data integrity, and data privacy.
    - Authentication of the user is by facial recognition followed by a password.
    - Family information including biometrics are secured and only family members can access these smart features with limited accessibility to the working staff.
    - Cameras are not installed in rooms/other private areas.
    - Users can only monitor the system and manually place a medical alert 911 emergency request for an ambulance.
    - Transmissions will be encrypted for privacy.
    - House keepers, maintenance guys, and guests have limited access to the system.
  - **Usability:**

    The Smart Home+ system is compatible with children and adult with shorter hight The system is user-friendly and is designed in a way that people with disabilities like weak eyesight or shorter heights are able to use the system easily.
  - **Maintenance:** maintenance of the Smart Home+ should be only done by authorized expert
  - **Performance requirements :**
    - The Smart Home+ system should be able to operate on all major web-browsers and operating systems with all of its fundamental functions .
    - It should not slow-down the system even at peak hours when all family members are using smart home features affecting the quality of service of the system.
    - In case of power outage the security system must continue working with backup battery.
  - **Availability:** The internal network has to be available 24 hours a day.
  - **Communication Security:** All the communication and between the system and family member devices must be encrypted
  - **Responsiveness:**
    - The system response should be less than a second in case of fire or any other hazard incidents.
    - System responds quickly to user requests or changes in the environment.
  - **Portability:** The homeowner and family members should be able to control the Home smart system if they are not home using their portable devices.

- **Documentation Requirements**

  - **Release notes, read me file:** there will be a Readme file to guide the user.
  - **Online help:** There will be online support for the Smart Home+ system in which the user can ask for guidance to use the system or declare a problem in the system.Online help is provided for each of the features available with the Smart Home+. All the features provide an online help system to assist the user.
  - **Installation guides:** An installation document will be provided that includes the installation instructions and configuration guidelines, which is important to a full solution offering.
  - **User manual:** The User Manual describes the use of the system to the family members. It describes the use of Smart Home+. The user manual should be available as a hard copy and also as online help.
  - **Labeling and packaging:** there will not be a specific packing for this system