Table of Contents

[Document Version 2](#_Toc170140413)

[1. Purpose 3](#_Toc170140414)

[1.1. Intended Audience 3](#_Toc170140415)

[1.2. Intended Use 3](#_Toc170140416)

[1.3. Scope 3](#_Toc170140417)

[1.4. Definitions and Acronyms 3](#_Toc170140418)

[2. Overall System Description 4](#_Toc170140419)

[2.1. Use Case Diagrams 4](#_Toc170140420)

[2.2. System Architecture 5](#_Toc170140421)

[2.3. Functional Requirements 6](#_Toc170140422)

[2.3.1. Dashboard 6](#_Toc170140423)

[2.3.2. Function pH 6](#_Toc170140424)

[2.3.3. Function Temperature 7](#_Toc170140425)

[2.3.4. Function Humidity 8](#_Toc170140426)

[2.3.4. Function Light Intensity 9](#_Toc170140427)

[2.3.5. Function Electrical Conductivity (EC) 10](#_Toc170140428)

[2.4. Non-Functional Requirements 11](#_Toc170140429)

[2.4.1. Non-Functional Requirement 11](#_Toc170140430)

[3. Software Architecture 12](#_Toc170140431)

[3.1. Static Software Architecture 12](#_Toc170140432)

# Document Version

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Update | Name | Date | Version |
| 1. | Initial version |  |  | 1.0 |

# Purpose

## Intended Audience

This SRS document describes the System Requirements and Software Design for an Automated Gardening system, and the target audience is Government Officials In line with the Singapore government’s “30 by 30” goal to produce 30% of food locally in Singapore by 2030

## Intended Use

The SRS defines the overall System Architecture and Requirements as well as the Software Architecture and Design. This document also contains the definition of the System Requirements which shall be used as the input for System Test cases and Software Unit Test cases.

## Scope

## Definitions and Acronyms

|  |  |
| --- | --- |
| **Acronym** | **Description** |
| IR | Infra-Red |
| LED | Light Emitting Diode |
| NFC | Near Field Communication |
| SW | Software |
| HW | Hardware |

# Overall System Description

## Use Case Diagrams

Monitoring Services

Counter measure services

Dashboard

Automated Gardening System

Mobile Phone

Plant

To tell user about that the  
countermeasure system

Is online.

## System Architecture



Servo/DC

Motor

Fan

Ambient Temperature sensor

SPI\_ADC\_CH01

LCD

I2C

**Raspberry Pi Development Board**

UV Light

(LED)

EC Level

Sensor

Light Intensity  
Sensor

Relative Humidity Sensor

pH level Sensor

nodeRED

Dashboard

## Functional Requirements

### Dashboard

Matplotlib

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ-01 | Show pH levels in a 10 min interval (Top left corner of dashboard) |
| REQ-02 | Show a line graph of Temperature across time |
| REQ-03 | Show a percentage of humidity at that time |
| REQ-04 | Show the light intensity of that surroundings at that time |
| REQ-05 | Show a line graph of Electrical Conductivity (EC) levels across time |

### Function pH

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ-01 | Show graph of pH levels (Top left corner of dashboard) |

Start

REQ - 02

Input pH levels using the keypad

Display pH levels in screen

&

Upload data to nodeRED

REQ - 03

### Function Temperature

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ-04 | Show a line graph of Temperature across time. |
|  | If temperature gets too high gets, then fan needs to be activated. |

Start

REQ - 05

Temperature sensor measure temperature

Temperature >25°C

REQ - 06

The fan will be off

The fan will be activated.

Display temperature in screen

&

Upload data to nodeRED

REQ - 07

**N**

**Y**

DC motor switches on

DC motor switches off

REQ - 08

REQ - 09

### Function Humidity

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ-10 | Show a percentage of humidity at that time. |

Start

REQ - 11

Humidity sensor measure humidity

Humidity sensor measure humidity

Display humidity in screen

&

Upload data to nodeRED

REQ - 12

### 2.3.4. Function Light Intensity

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ-13 | Show the light intensity of the surroundings at that time. |
|  | when light intensity is too low the UV light will be activated. |

Start

LDR measure Light Intensity

REQ - 14

LDR measure Light Intensity

REQ - 15

Display Light Intensity in screen

&

Upload data to nodeRED

Presence of light?

The LED will be activated.

**Y**

**N**

The LED will be switched off

REQ - 17

REQ - 18

REQ - 16

### Function Electrical Conductivity (EC)

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ - 19 | Displays a line graph for EC levels. |
|  | If the EC level is too low, then additional nutrient solution needs to be dispensed into the hydroponics solution by activating a pump based on a DC motor or servo. |

Start

REQ - 20

Potentiometer   
changes

Does EC levels fall between 1.0 and 2.5

REQ - 21

Solution will be dispensed into the plants

Display electrical conductivity in screen & Upload data to nodeRED

Solution will not be dispensed into the plants

Servo Motor remains at 0 degrees to not let solution out

**N**

**Y**

Servo Motor turns 90 degrees to let solution out

REQ - 24

REQ - 23

REQ - 22

## Non-Functional Requirements

### Non-Functional Requirement

|  |  |
| --- | --- |
| **REQ\_ID** | **Requirement** |
| REQ - 25 | Displays the dashboard on the mobile application |
| REQ - 26 | From REQ – 25, when the pH levels display is clicked, a more detailed representation of the pH levels would be shown on a new page (Changes over time with values, etc.). |
| REQ - 27 | From REQ – 25, when the Temperature display is clicked, a more detailed representation of the pH levels (Changes over time with values, etc.) and when was the fan switched on would be shown on a new page. |
| REQ - 28 | From REQ – 25, when the Humidity display is clicked, a more detailed representation of the pH levels (Changes over time, etc.) would be shown on a new page. |
| REQ - 29 | From REQ – 25, when the Light Intensity display is clicked, a more detailed representation of the pH levels (Changes over time, etc.) and at what time was the LED lit up would be shown on a new page. |
| REQ - 30 | From REQ – 25, when the Electrical Conductivity (EC) levels display is clicked, a more detailed representation of the pH levels (Changes over time, etc.) and when was the solution dispensed into the plants would be shown on a new page. |

# Software Architecture

## Static Software Architecture

The Software Architecture defines the various Software Components that are developed to realize the implementation of the system requirements.

**Light Intensity**

**EC**

**Relative humidity tempeRelative humidity**

**Application Layer**

**Hardware Abstraction Layer (HAL)**

**ADC**

**Keypad**

**NFC**

**Servo**

**Tempsens**

**RainSens**

**PH levels**

**BlackCoffee**

**Light intensity**

**Temperature**

**HotWater**

**EC levels**

**BlackCoffee**

**Light intensity**