**Software Requirements Specification (SRS)**

Revision History:

|  |  |  |
| --- | --- | --- |
| Date | Author | Description |
| 2019.3.21 | Zhi Zhou | Overall block diagram |
| 2019.3.21 | Zimu Hu | Edit functional documentation |
| 2019.3.23 | Zhi Zhou | Modify functional documentation |
| 2019.3.25 | Zhi Zhou | Add Server Logic into User Test Case |
| 2019.3.25 | Zhi Zhou | Add Server System Context |
| 2019.3.25 | Zhi Zhou | Add System Input & Output |
| 2019.3.25 | Renxiang Zhu | Add Quality Requirments |
| 2019.3.25 | Renxiang Zhu | Integrate documents |

**1.  Introduction**

**1.1    Intended Audience and Purpose**

This document is for the customers and everyone who joins in this project. In this document, we will explain how every part of the system could work together. What users could do and what will happen. By using the Use Case, we want not only user but also every developer could know what they can do and what information they can get from the system. And if this document passed by everyone, all work should be finished follow it.

**1.2    How to use the document**

In this document, all the situations the users can faced to will be found. In the second part of this document, which is the Use Case’s part, users can look up what they can do in what situations. And when users follow the Use Case, what will happen is written clearly. For every developer, what information and operations could other groups can provide for you is also said specifically. When the project finished, we will also use this document to check if all the requirements can be solved. And if everyone accepts what the document written, when the developers finish all the functions, the project will be finished completely.

**2.    System Capabilities**

**2.1    System Context**

System requirements:

If you use web to login the system, you need a browser with Chrome or IE core. If you use APP to login in the system, you need a phone with android system.

**2.2 System capabilities**

**Use Cases**

**2.1.1.  Hardware connects to server**

|  |  |  |  |
| --- | --- | --- | --- |
| Use Case  Case | Hardware connects to server. | | |
| Version | V1.0 | Created | *2019.3.25* |
| Author | Zhi Zhou | | |
| Source | Hardware | | |
| Purpose |  | | |
| Goals | Build connects between server and hardware. | | |
| Summary | Hardware raise a connecting request. After authenticating hardware’s identification, server will build the connection. | | |
| Actors | Hardware | | |
| Trigger | Hardware boot. | | |
| Precondition | Server is running | | |
| Basic Flow | *Actor* | | System |
| 1 | Hardware | | Raise a connecting request. |
| 2 | Server | | Authenticate hardware’s key. (Move to alternate flow 1 when error) |
| 3 | Server | | Authenticate whether hardware is registered in the database. (Move to alternate flow 1 when error) |
| 4 | Server | | Build connection with Hardware. |
| Frequency |  | | |
| Type | Primary | | |
| Postconditions | Connection is built. | | |
| Chart |  | | |
| Alternate Flow | *Actor* | | System |
| 1 | Server | | Reject the connecting request. |

**2.1.2.  Hardware reports data**

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| --- | --- | --- | --- |
| Use Case  Case | Hardware reports data | | |
| Version | V1.0 | Created | *2019.3.25* |
| Author | Zhi Zhou | | |
| Source | Hardware | | |
| Purpose |  | | |
| Goals | Report sensors’ data to server | | |
| Summary | Report sensors’ data to server. | | |
| Actors | Hardware | | |
| Trigger | Sensors’ data changed.  sS | | |
| Precondition | Connection is built. | | |
| Basic Flow | *Actor* | | System |
| 1 | Hardware | | Send sensors’ data to server through socket. (Move to alternate flow 1 when failed.) |
| 2 | Server | | Record the data in memory. |
| Frequency |  | | |
| Type | Primary | | |
| Postconditions | Data is sent. | | |
| Chart |  | | |
| Alternate Flow | *Actor* | | System |
| 1 | Hardware | | Try to reconnect. |

**2.1.3.  Terminal sends command**

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| --- | --- | --- | --- |
| Use Case  Case | Terminal sends command | | |
| Version | V1.0 | Created | *2019.3.25* |
| Author | Zhi Zhou | | |
| Source | Terminal | | |
| Purpose |  | | |
| Goals | Give hardware the command after handled by intelligence controller. | | |
| Summary | Server give intelligence controller the command submitted by the terminal. And then send the result generated by the intelligence controller to hardware. | | |
| Actors | Terminal | | |
| Trigger | Terminal sends command | | |
| Precondition | Server and hardware is running | | |
| Basic Flow | *Actor* | | System |
| 1 | Terminal | | Send command to server. |
| 2 | Server | | Check user’s authority. (Move to alternate flow 1 when failed.) |
| 3 | Server | | Check whether the target is online. (Move to alternate flow 2 when target is offline) |
| 4 | Server | | Pack necessary and related data, and send them to intelligence controller with command. |
| 5 | Intelligence Controller | | Generate the command and return it to the server. |
| 6 | Server | | Send command to hardware. |
| Frequency |  | | |
| Type | Primary | | |
| Postconditions | Hardware executed the command. | | |
| Chart |  | | |
| Alternate Flow | *Actor* | | System |
| 1 | Server | | Reject the command |
| 2 | Server | | Tell terminal that the target is offline. |

**2.1.4.  Terminal queries hardware’s information**

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| --- | --- | --- | --- |
| Use Case  Case | Terminal queries hardware’s information | | |
| Version | V1.0 | Created | *2019.3.25* |
| Author | Zhi Zhou | | |
| Source | Terminal | | |
| Purpose |  | | |
| Goals | Terminal got the hardware’s information. | | |
| Summary | Terminal raises a query request. After authenticating user’s authority, server give terminal what it wants. | | |
| Actors | Terminal | | |
| Trigger | Terminal raises a request. | | |
| Precondition | Server is running | | |
| Basic Flow | *Actor* | | System |
| 1 | Terminal | | Raise a query request. |
| 2 | Server | | Authenticate user’s authority. (Move to alternate flow 1 when error) |
| 3 | Server | | Report the data. |
| Frequency |  | | |
| Type | Primary | | |
| Postconditions | Terminal got the information. | | |
| Chart |  | | |
| Alternate Flow | *Actor* | | System |
| 1 | Server | | Reject the query request. |

**2.1.5.  Sensors’ data affect the hardware**

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| --- | --- | --- | --- |
| Use Case  Case | Sensors’ data affect the hardware | | |
| Version | V1.0 | Created | *2019.3.25* |
| Author | Zhi Zhou | | |
| Source | Intelligence Controller | | |
| Purpose |  | | |
| Goals | Hardware got the command. | | |
| Summary | Server send intelligence controller’s command to hardware. | | |
| Actors | Server | | |
| Trigger | Service received hardware’s data. | | |
| Precondition | Server is running and hardware just reported its data. | | |
| Basic Flow | *Actor* | | System |
| 1 | Server | | Pack necessary and related data, and send them to intelligence controller with command. |
| 2 | Intelligence Controller | | Generate the command and return it to the server. |
| 3 | Server | | Send command to hardware. |
| Frequency |  | | |
| Type | Primary | | |
| Postconditions | Hardware executed the command. | | |
| Chart |  | | |
| Alternate Flow | *Actor* | | System |

**3.    Detailed Requirements  
3.1 System Inputs and Outputs**

**3.1.1 Inputs**

The inputs send to the server when terminal queries hardware’s data should be in the form of json which content is:

uid: The user’s unique identification.

sid: User’s secure ID.

hid: The hardware’s unique identification.

The inputs send to the server when terminal want to operate a hardware should be in the form of json which content is:

uid: The user’s unique identification.

sid: User’s secure ID.

hid: The hardware’s unique identification.

cmd: The command terminal sent.

The inputs send to server when hardware want to report their data should be in the form of json which content is:

data: The data which sensor want to report.

The inputs send to server when intelligence controller generated command should be in the form of json which content is:

data: The command that intelligence controller generated.

**3.1.2 Outputs**

The outputs send to intelligence controller from server when something need to do with hardware should be in the form of json which content is:

sensors: The list of sensors with their up-to-date data.

device: The device and its up-to-date data.

cmd: The command (Leave blank if there is no command existed.)

authority: The level of operator.

The outputs send to terminal when server report hardware’s information should be in the form of json which content is:

hid: The hardware’s unique identification.

online: Whether the hardware is online.

nickname: The nickname of hardware.

last: The timestamp of last update.

data: The hardware’s data.

The outputs send to hardware when server send command should be in the form of json which content is:

data: The command.

**3.2 Detailed Output Behavior**

**4   Quality Requirements (Non-functional Requirements)**

The system must show good behavior in many fields like Performance, Security, Availability, Reliability, Modifiability, Maintainability, Understandability.  
  
Performance:

the system can respond the users’ operation in less than 500ms

the hardware can respond the command in less than 1000ms

Security:

The system must have different jurisdiction. The administrator’s jurisdiction must not be used by any other users.

Availability:

The user’s operation must be judged strictly by control part. Every situation must have a solution even if the user has a wrong operation.

Reliability:

The system must be anti-interference. When some signal comes in a wrong way, the system should recognize it and give the respond.

Modifiability:

The system can be changed. When users need some new functions, we can add up them into the system.

Maintainability:

The system has to easily to be fixed. If some parts get wrong, it can easily to find some other things to take place.

Understandability:

The system must be easy for users. The UI and specification have to be good for users.

**5. Expected Subsets**

Subsets one: Intelligent control technology interface module

This module is designed to connect with the raspberry pi which takes charge of the intelligent control of the whole light system. The server need to contact with the raspberry pi at any time.

Subset two: Server management module.

This module is in charge of the basic functions of the whole server.

Subset three: Hardware interface module.

Accept states from the hardware.

**6.    Fundamental Assumptions**

Hardware: Raspberry pi 3B+, Camera, Light sensor, Light.

Software: Linux operating system，Python 3.6

**7.    Expected Changes**

* Add light history analysis function.
* Add monitor function.

**8.    Appendices**

**8.1    Definitions and acronyms**

**8.1.1    Definitions**

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| --- | --- |
| **Keyword** | **Definitions** |
| Raspberry Pi | A kind of card computer |
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|  |  |

**8.1.2    Acronyms and abbreviations**

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| --- | --- |
| **Acronym or**  **Abbreviation** | **Definitions** |
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|  |  |
|  |  |

**8.2    References**