SKKU GROUP BUY Application

Software Requirement Specification

2022.11.06.

Introduction to Software Engineering

TEAM 7 (SKKU GROUP BUY Application)

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1. Introduction

1.1. Purpose

This document is a Software Requirements Specification (SRS) for providing ‘SKKU Group Buy’ application services. It is an application where SKKU students spend less time, effort and find their friends to buy the things which they want at a low price. This service is designed and implemented by Team 7 of the Introduction to Software Engineering at Sungkyunkwan University. The requirements for this are summarized, analyzed, and the system is designed and implemented based on the contents described. In this document, Team 7 is the main reader, and Team 7 designs and implements the functions of this service according to this specification. Additionally, professor, TAs, and team members in the Introduction to Software Engineering class can be the main readers. The purpose of this document is to outline and publish the Requirement Specification for a new mobile application which enables users to efficiently purchase the items they want. Unlike other school community applications, our application has a set main purpose of joint purchase, so users can save time and effort. In addition, only our SKKU students can be users, so they can guarantee some reliability and users can be friends by finding compatible alumni.

1.2. Scope

SKKU GROUP BUY Application aims to help users efficiently purchase the item users want at a reliable and affordable price. Log in with users' SKKU account to fit the theme of smart campus and ensure trust between users. The users can view the group buying list and join the group. Users should be able to search for the item users want through the search box, and if the item users want is not found, users should be able to create a group. When users join a group, users have a group chat room where users can share their opinions about purchasing items. Allow group participants to leave a review for the host once they have received the items and the group buying process is complete. Through the above processes, our application wants to provide a more convenient and economical shopping environment to our

SKKU students who are busy with their daily life.

1.3. Definitions, Acronyms, and Abbreviation

The following table explains the acronyms and abbreviations used in this document.

[Table 1] Table of Acronyms and abbreviations

Acronyms & Abbreviations	Explanation
RAM	Random Access Memory
OS	Operating System
GUI	Graphical User Interface
API	Application Programming Interface
UI	User Interface
HTTP	Hypertext Transfer Protocol
AWS	Amazon Web Services
PK	Primary Key (on database)
FK	Foregin Key (on database)
MVC	Model-View-Controller Pattern

The following table defines certain technical terms used in this document.

[Table 2] Table of Terms and definitions

Terms	Definitions
User	Someone who uses a system
Host	User who hosts the group buying
Participant	User who participates the group buying

Terms	Definitions
System administrator	Someone who checks the overall process of registration, login and manages the system
Client (user device)	A user device/user that connected to server
Server	A computer or computer program which manages access to a centralized resource or service in a network
Software	The programs and other operating information used by a computer
Query	A request to display specific data from a database
Database	A set of data that is integrated and managed for the purpose of being shared and used by multiple people

1.4. References

- IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications, In IEEEXplore Digital Library http://ieeexplore.ieee.org/Xplore/guesthome.jsp
- “Software Requirement Specification”. SKKU 2021 Introduction to Software Engineering Team7. https://github.com/skkuse/2021spring_41class_team7/doc/Team7_SRS.docx

1.5. Overview

The remainder of this Software Requirements Specification document is mainly composed of three chapters. The second chapter provides the overall structure and description of the SKKU GROUP BUY Application. This chapter explains what the purpose of this application is and what it is used in the actual market, describes the users and system managers of the

application, functions, and the underlying environments, and describes the limitations and assumptions of the system in the operation process. Dependencies with other systems are also described. The third chapter describes the necessary requirements in more detail. Various system interfaces, database and system structures, characteristics of software systems, and system evolution are described. In the fourth and final chapter, the information referenced in the preparation of this Software Requirements Specification document is recorded. In addition, while making this Software Requirements Specification document, a description of the items to be modified, the modified version, and the name of the person who modified it should be written.

2. Overall Description

2.1. Product Perspective

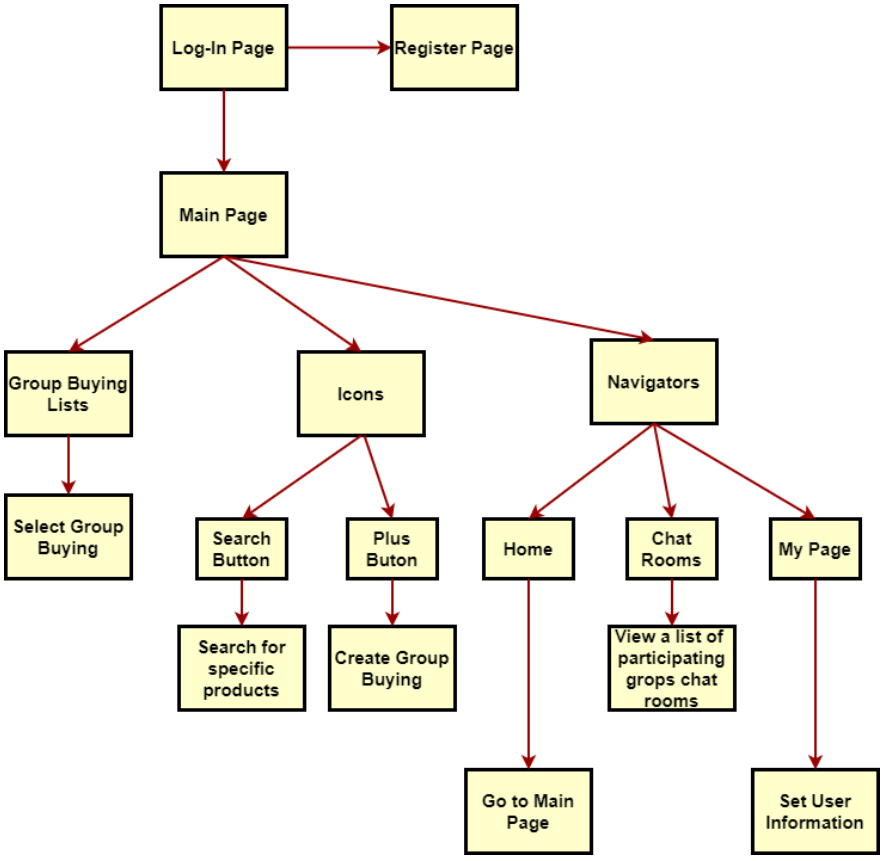
This product is designed for SKKU students who want to efficiently and economically group purchases on campus. This product provides a list of group buying so that you can find the items you want to purchase together. If there is no group for the item you want, you can become the host and create a group. A chat room function is provided for coordination of details and smooth communication in the group buying process. When the group buying is over, users can leave a review on the host so that other users can know the information about the host in the process of later group buying.

2.1.1. Market Status

There are two main ways to make group buying on campus. The first is “Everytime”, which is basically a community where you can get university timetables and various university information. Because university students basically use this application, it has the advantage of being easy to gather people, but since group buying is not the main purpose, it can be difficult to find people who really want to buy together. The second is KaKaoTalk. Even within

KaKaoTalk, you can use a group chat room with a large number of existing students or open-chatting room, but the number of people you know may be small and it is not easy to find same university students because open-chatting room contains many people other than students from the same university. So the current situation is that there is no separate system for group buying on campus.

2.1.2. Overall Structure



[Figure 1] System Structure

2.2. Product Functions

2.2.1. Create User Account and Log-in

The first step for users to do is to download the application. After the download is complete, the user needs to log in with an account to use the application functions. The first page of our application is the log-in page which includes one log-in button and one register button. Users can enter the registration page with this register button and fill in the required information field to create their own account. Users need to register with their own campus email for our application to verify student identities. The user can log in and enter the system with their account by the log-in button.

2.2.2. View the Main Page

After logging in, users can view the main page. On the “Main page”, users can view a list of existing group buying items. When pressing on the item, users can enter the “Post detail page” to get item details. The “search(검색)” button in the upper right corner of the main page allows users to search for a specific group buying item they want. At the bottom of the main page is the application navigator through which users can reach other pages. The plus button in the lower right corner of the main page takes the user to the “Creating room page” which provides the function to create new items.

2.2.3. Search for Items

At the top of the map screen is “search(검색)” item where users can search for the specific item they want. The search keyword can be the item title or detailed contents.

2.2.4. Icons

At the bottom of the home screen there are three icons in the navigator. One is “Home(홈)”, another is “Chat List(채팅)”, and the last is “My Page(마이페이지)”. Users can view a list of existing group buying items by clicking the “Home(홈)” icon. Users can click and enter the project to view the project details. Users can click the “Chat List(채팅)” icon to view the list of group buying chat rooms they participate in at current. A user can change his or her profile by clicking on the “My Page(마이페이지)” icon, view the reviews he or she has received, and also view a list of group buying projects that he or she created. In the bottom right corner of the home page, there is a “plus(+)” icon. Users can click this icon to open the creating room page to initiate a new group buying project.

2.2.5. Create Items and Chatting Rooms

After pressing the “search(검색)” button, users enter the “Creating room page”. Users need to complete the information of the group buying item on the page, including photos, title, number of members, end date, detailed description, etc. Clicking the “create(공동 구매 생성하기)” button, a new group buying item will be created and posted to the application, also the chatting room which can be only viewed by joined users.

2.2.6. Join Chatting Rooms

On the “Post detail page”, users can view the detail of a posted specific item. Also, users can check the host, project participation progress, due date, etc. Users can press the “participate(참여하기)” button to join the group buying project which will automatically make users join the chatting room. If users have already joined the project, they can click the “go to chatting room(채팅방으로 이동하기)” button to transfer to the specific chatting room. Also, when users want to quit the project, they can click the “quit(공동구매 탈퇴하기)” button which will help users automatically quit the chatting room either.

2.2.7. Review

Users can evaluate the host of finished group buying projects they participated in on the review page. Users can reach the review page after confirming the project is complete. Also, when users check the “Post detail page” of one specific item, they can click the host profile to go to the host page, where they can check the former reviews by other users to this host.

2.3. User Classes and Characteristics

2.3.1. User

Users of this application are limited to students of certain universities. For example, you might be a student at SKKU. It assumes a user is interested in creating or joining a group to buy something with other schoolmates. Users being capable of reading and understanding basic Korean or English is also assumed. It is assumed that users have basic knowledge of using or installing applications on their devices.

2.3.2. System Manager

The system administrator of this application is limited to experts in the system. They need to know enough about the system and be able to understand the whole system. It also assumes that you have a system error or the ability to detect such a problem. They should be able to handle that bug or problem. System administrators assume the ability to incorporate changes to new systems. To meet these requirements, system administrators must be experts in computer engineering, networking, or systems, or have equivalent knowledge and qualifications. Moreover, they must also have software ethics awareness.

2.4. Operating Environment

2.4.1. Hardware

This application is developed based on the Android system. As a result, it requires an Android phone with at least 1 GB RAM and a 1.0 GHz single processor to operate it.

2.4.2. Software

The operating system for this application must be Android 6.0 (API 23) or higher. However, for a better experience, Android 11 (API 30) is more recommended to be a better environment.

2.5. Design and Implementation Constraints

The system will be designed and implemented by considering the following checklist. There are details of design and implementation directions.

1. Going to all screens should take no more than 2 seconds.
2. The system should protect the privacy of all users.
3. The system should put the needs of the users first.
4. Running on mobile devices with at least 1GB RAM.
5. Requiring at least 700MB for installation and execution by the system.
6. The source code is properly optimized to avoid wasting memory.
7. User devices and servers communicate with the HTTP protocol.
8. Consider both the system cost and its maintenance cost.
9. Requiring users to know Korean and English.
10. Using open source software whenever possible to avoid additional royalties.
11. Developing with Windows 11 environment and Android Studio, and the build tools version is 31.0.0

12. Developing with at least Android version 6.0 (API 23)
13. Emulating the system using Android version 11 (API 30)

2.6. User Documentation

Minimum hardware and software requirements are required to help users use the application and its services. It also needs a user manual that guides users unfamiliar with the device how to start the system and use the various features of the system. The user manual is provided with descriptions of the main functions and sample inputs and outputs. In addition, contact information for the system developer is provided.

2.7. Assumptions and Dependencies

This application is designed based on Android devices which means all functions and contents are implemented based on the Android operating system. This application should run on an operating system with at least Android 6.0. Also, it cannot be applied to other kinds of operating systems.

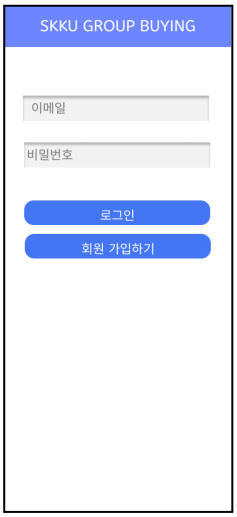
3. Specific Requirements

3.1. External Interface Requirements

3.1.1. User Interfaces

[Table 3] Interface of Start page

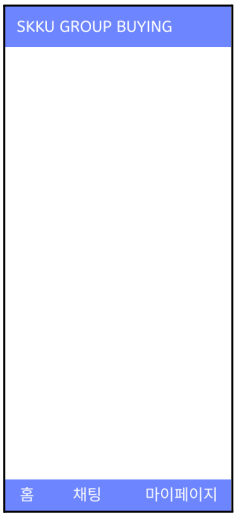
Name	Features of Start page
Purpose/Description	The first stage appears when users start this application. Users choose whether to login or register to use this program.

Name	Features of Start page
Input source / Output destination	Client/Server
Time / Velocity	Login verification takes less than 1 second
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. Users who have an account fills the ID and Password field and presses the “로그인” Button. 2. Users who do not have any account press the “회원 가입하기” Button. Then the screen switches to Register Process. 3. System checks if the email and password fields are valid when the “Login” button is clicked. If input values are valid, send a request to the designated server. 4. If users have logged in before, fill the ID field with the previous input. 5. If the login is successful, it goes to the main page, and if it fails, a message is displayed.
Data type	Text
Instruction type	Call API, Switch the Screen.

[Table 4] Interface of Register page

Name	Features of Register page
Purpose / Description	Users can create their account.
Input source / Output destination	User input / API Server
Time / Velocity	Sending a verification email takes less than 5 seconds. Creating a user account takes less than 1 second.
Relationship with other input / outputs	Switch from Start Page
GUI Sketch	
Format and configuration of screen	1. Users fill the email, verifying code, Password, Nickname field. 2. When “인증 번호 받기” button pressed, system checks the email format and sends a request to designated server to get verifying code. 3. When “회원 가입하기” button pressed, system send the input field data to the server. According to the server response, show the notification(toast).
Data type	User Input text

[Table 5] Interface of Tab navigator

Name	Features of Tab navigator
Purpose / Description	Users can switch the screens using Tab Navigation.
Input source / Output destination	Touch Event from the user. / User's display.
Time / Velocity	Instant response for user's action.
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. Tab Navigation bar is below the screen. 2. There are 3 tabs; Home, Chat Rooms, MyPage. 3. The selected tab should be highlighted to be recognized.
Data type	User Action
Instruction type	Navigate the screen.

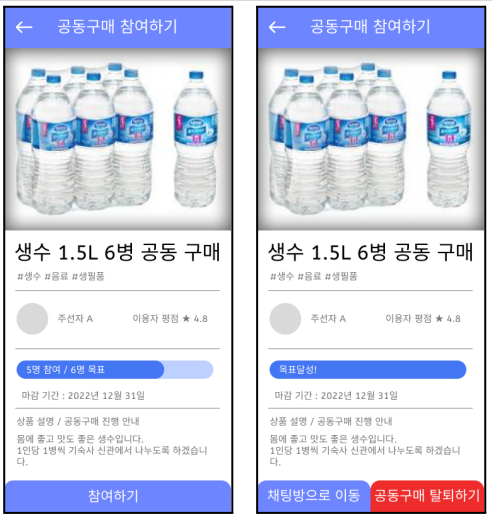
[Table 6] Interface of Main page

Name	Features of Main page
Purpose / Description	The page shows when users select the "Home" tab on tab Navigator.

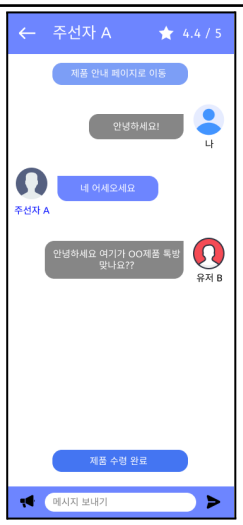
Name	Features of Main page
Input source / Output destination	Touch Event from the user. / User's display.
Time / Velocity	Showing the contents within 2 seconds.
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. Main contents are placed on the vertical scroll view. 2. When the user presses an item of the list, open the "Post detail Page" with an argument of the id of the selected item. 3. When the user presses the circle button below (+), open the "Creating room Page". 4. When the user presses the "검색" button in the header, the input field is shown and user can type the keywords. When the user enters the keyword, send a request to the server to get the list of related posts.
Data type	Server Response(Text)

[Table 7] Interface of Post detail page

Name	Features of Post detail page
Purpose / Description	The page shows when users select the "Post" item on the post list.
Input source /	Touch Event from the user. / User's display.

Name	Features of Post detail page
Output destination	
Time / Velocity	Showing the contents within 2 seconds.
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. Main contents are placed on the scroll view. 2. Contents contain information about the buying items, host,the goal number of persons, due date. 3. User can decide to join the group buying by pressing the “참여하기" button below the screen. 4. If the user already joined the group buying. “채팅방으로 이동하기" button and “공동구매 탈퇴하기” button should be shown instead of “참여하기" 5. When the user pressed the “채팅방으로 이동하기", the chat room page is open 6. When the user pressed the “공동구매 탈퇴하기", it automatically exits the group buy
Data type	Server Response(Text)

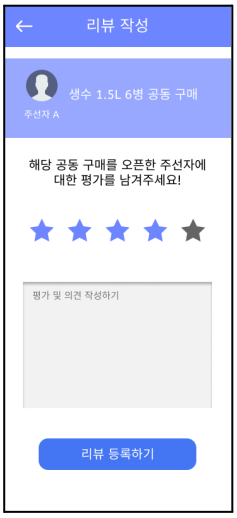
[Table 8] Interface of Chat room page

Name	Features of Chat room page
Purpose / Description	In the chat room, users can exchange detailed information about the group buying with the host.
Input source / Output destination	Client/Server Server/Client
Time / Velocity	The time it takes to retrieve chat content from the server should not exceed 1 second.
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. When users enter, the page brings chat logs from the server and displays them on the screen. It also renews continuously. 2. Users can return to the main page by clicking the “left arrow” button. 3. Users can view the name and evaluation of the host from the top bar. The information is derived from the host information stored on the server. 4. The name of the host is displayed in blue, unlike other users.

Name	Features of Chat room page
	5. Once the user has received the product, it can be notified by clicking “제품 수령 완료” button at the bottom. If everyone in the chat room presses the button, then move to the review page together. 6. Users can register a notice by clicking the “loudspeaker” button at the bottom. 7. At the bottom, users can create and send messages. The message is stored on the server.
Data type	Text

[Table 9] Interface of Review page

Name	Features of Review page
Purpose / Description	When the group buying that the user participated in ends, it will be connected to the review page. On the review page, users can evaluate the host to see if the group buying was satisfactory.
Input source / Output destination	Client/Server
Time / Velocity	The time it takes to upload a review to the server should not exceed 1 second.
Relationship with other input / outputs	What users have written here appears on the host page and is constantly updated.

Name	Features of Review page
GUI Sketch	
Format and configuration of screen	1. Users can return to the main page by clicking the “left arrow” button. 2. At the top, users can check which hosts and group buying are being reviewed. 3. Users can choose how many points to give the host by clicking on the star in the middle. 4. Users can write additional content they want to convey in “평가 및 의견 작성하기". 5. Users can save their scores and text to the server by clicking the "리뷰 등록하기" button.
Data type	Int, Text

[Table 10] Interface of Creating group buying room page

Name	Features of Creating group buying room page
Purpose / Description	These pages allow users to create pages and lists for new group buying.
Input source /	Client/Server

Name	Features of Creating group buying room page
Output destination	
Time / Velocity	The newly created group buying page must not exceed 1 second before it is stored on the server.
Relationship with other input / outputs	What users have written here appears in the list of main pages and in the list of host pages. However, delete pages that are past the deadline.
GUI Sketch	
Format and configuration of screen	1. Users can return to the main page by clicking the “left arrow” button. 2. Users can upload photos of the group buying product by clicking the “camera” button. 3. Users must enter a title in the “제목" section. 4. Users should write the target number in the “목표 인원” section. 5. Users should click the “calendar” button to select a deadline. 6. Users should write down where to divide the product in the "물품 수령 장소 입력" section. 7. Users can write additional detailed information in the "게시글 내용 작성" section.

Name	Features of Creating group buying room page
	8. Users can click the "공동 구매 생성하기" button to transmit and store the above information to the server.
Data type	Int, Text, Date

[Table 11] Interface of Host page

Name	Features of Host page
Purpose / Description	Users can enter the host page by clicking the host profile in the chat room or in the group buying page. The host page is a page to inform users of various information about the host.
Input source / Output destination	Server/Client
Time / Velocity	It takes less than 1 second to get the score and group buying list for that host from the server.
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. Users can return to the main page by clicking the “left arrow” button. 2. Users can check the profile and name of the host at the top.

Name	Features of Host page
	3. Users can check the score of the host in the middle. 4. Users can check the group buying list created by the host in the "생성한 공동 구매 목록" section. This section is taken from the server and is continuously updated.
Data type	N/A

[Table 12] Interface of My page

Name	Features of My page
Purpose / Description	The first stage appears when users start this application. Users choose whether to login or register to use this program.
Input source / Output destination	Server/Client
Time / Velocity	It takes less than 1 second to get user information from the server.
Relationship with other input / outputs	N/A
GUI Sketch	
Format and configuration of screen	1. Users can return to the main page by clicking the “left arrow” button. 2. Users can check the profile and name of the user at the top.

Name	Features of My page
	3. Users can change the profile picture stored on the server by clicking the "프로필 사진 변경" button. 4. Users can change the profile picture stored on the server by clicking the "아이디 및 비밀번호 변경" button. 5. In the "Participating Joint Purchase" section, users can check which group buying they are participating in and go to the appropriate group buying page. 6. When users press the "회원 탈퇴하기" button, the user's content on the server is deleted.
Data type	N/A

3.1.2. Hardware Interfaces

[Table 13] Hardware Interface

Name	Applicable device for the system
Purpose / Description	Enable users to take advantage of the service provided by the system / Android OS Enabled Smartphone. (At least Android 6.0)

3.1.3. Software Interfaces

[Table 14] Software Interface

Name	AWS Real-time Database
Purpose / Description	Query input/output for managing image/meta data
Input source /	Host server/ User, User/Host server, User/User

Name	AWS Real-time Database
Output destination	
Range / Accuracy / Margin of error	Depends on the performance of the AWS
Unit	Query
Time / Velocity	Instant reaction
Relationship with other input / outputs	Related to all inputs/outputs from server
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	Query
Instruction type	Query statement
Exit message	N/A

3.1.4. Communication Interfaces

[Table 15] Communication Interface

Name	Client and Server
Purpose / Description	After each client is verified to login to the server, they receive information about group buying lists, my page and host page information, and chat rooms & content from the server. Each client can communicate with another client in a chat room through a server. Server provides group buying lists, my page and host page information, and chat rooms, and chat content to the client.
Input source / Output destination	Client/Server
Unit	packet

Name	Client and Server
Time / Velocity	At least 10Mbps
Relationship with other input / outputs	Related to all inputs/outputs from server
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	Query
Instruction type	Query statement
Exit message	N/A

3.2. Functional Requirements

3.2.1. Use Case

<Account Management>

[Table 16] Use case of Register

Use case name	Register
Actor	Unregistered user
Description	Unregistered user tries to register for the service.

Normal Course	1. If the user is unregistered, then the user tries to register for the service.
	2. The user enters the “Register Page”.
	3. The user should verify his/her own school email address. The detailed process is:
	  1. The user enters his/her school email address in “이메일” field. (@skku.edu, @g.skku.edu)
	  2. The user clicks “인증 번호 받기” button.
	  3. The system sends verification code to the entered email address.
	  4. The user gets verification code from the email.
	4. The user should fill following fields:
	  1. “이메일”: school email address, as described above.
	  2. “인증번호 입력”: verification code, as described above.
	  3. “비밀번호 입력”: password, will be used later for login.

	4. “비밀번호 확인”: password, should be same as “비밀번호 입력”. 5. “닉네임”: nickname, will be used as nickname while using our service. 5. The user clicks “회원 가입” button. 1. If “비밀번호 입력” value and “비밀번호 확인” value are not same, then pop-up the error message, and go back to step 5. 6. The information is sent to the system. 1. “비밀번호 입력” value is not the plaintext, but the hashed value. 2. If “이메일” value is already in the system account database, that is, there is someone registered with the same email address, then pop-up the error message, and go back to step 5. 3. If “닉네임” value is already in the system account database, that is, if another registered user is using the same nickname, then pop-up the error message, and go back to step 5. 7. If there is no error, then the system records the information to the account database.
Pre-condition	The user is not registered to the system. The user has a school email. The user enters valid information. There is no registered user who is already using the entered nickname. There is no registered user who already registered with the entered email address.
Post-condition	Following information is added to system account database, as encrypted: 1. email address 2. hash value of password 3. nickname
Assumptions	N/A

[Table 17] Use case of Log-in

Use case name	**Log-in**
Actor	Registered user
Description	Registered user tries to log-in to the service.
Normal Course	1. To use the service, the user should login to the service. 2. When the user runs the application, the first page is “Start Page”. 3. The user fills the following fields: 1. “이메일”: school email address 2. “비밀번호”: password 4. The user clicks “로그인” button. 5. The information is sent to the system. 1. “비밀번호” value is not the plaintext, but the hashed value.

	6. The system checks if the information is valid. The valid information must satisfy following conditions: 1. “이메일” is stored in the system account database. 2. Hashed “비밀번호” value is same with the value from system account database, using “이메일” as key. 7. If the information is valid, then the login succeeds, and the user is redirected to “Main Page”.
Pre-condition	The user is registered. The user knows his/her own account information.
Post-condition	The user is logged in, that is, now available to use the service.
Assumptions	N/A

[Table 18] Use case of Sending verification code

Use case name	**Sending verification code**
Actor	System administrator
Description	When the unregistered user tries to register to the service, the user requests the verification code to the system. Then, the system sends verification to the user's school email address.
Normal Course	1. In “Register Page”, the unregistered user fills all required fields. 2. The system gets the information from the user. 3. The system checks if the email address is a school email address. 4. The system generates a random verification code. 5. The system sends the verification code to the email address.
Pre-condition	The input email address is a school email address. (@skku.edu, @g.skku.edu)
Post-condition	The verification code is sent to the email address.
Assumptions	N/A

<Group Buying Management>

[Table 19] Use case of Starting new group buying

Use case name	**Starting new group buying**

Actor	Registered user
Description	The registered and logged-in user tries to start a new group buying, that is, tries to create a new group buying item and add it to the group buying list.

Normal Course	1. In the “Main Page”, the user clicks the “+” button on the bottom-right.
	2. The user is redirected to the “Creating room Page”.
	3. The user enters following fields:
	  1. “제목”: title of the group buying
	  2. “목표 인원”: target number of participants
	  3. “마감 날짜”: the date that the group buying finishes
	  4. “물품 수령 장소 입력”: where participants get the item
	  5. “게시글 내용 작성”: description of the group buying
	4. The user clicks “공동 구매 생성하기” button.
	5. If the information is valid, then the information is sent to the system.
	  1. If the information is invalid, return to step 3.
	6. The system adds the information to the group buying list database.

Pre-condition	The length of “제목” value is in the proper range. (3 <= length <= 20) The length of “목표 인원” value is in the proper range. (2 <= num <= 30) The length of “게시글 내용 작성” value is in the proper range. (0 <= length <= 200) The user is logged-in to the service.
Post-condition	The entered information is added to the group buying list database.
Assumptions	N/A

[Table 20] Use case of Search

Use case name	**Search**
Actor	Registered user
Description	The registered and logged-in user tries to find a matching group buying with the search keyword.
Normal Course	1. In “Main Page”, there is “검색” button on the top of the page 2. The logged-in user clicks “검색” button, then “검색어 입력” field appears on the top of the page. 3. The logged-in user enters the keyword to search. 4. The system finds matching group buyings from the group buying list database. 5. The system sends the matched group buying list to the client. 6. The application shows the list to the logged-in user.
Pre-condition	The length of “검색어 입력” value is proper for search. (3 <= length <= 20) The user is logged-in to the service.

Post-condition	The user gets the list of group buyings which contain search keywords in the title.
Assumptions	N/A

[Table 21] Use case of Join group buying

Use case name	**Join group buying**
Actor	Registered user
Description	This is the process that users join group buying.
Normal Course	1. The user can find desired items through the Main page item list or search engine. 2. If there is an item you want, click the "참여하기" button to go a page that has detailed description of the item. 3. The user reads a detailed description of the item. 4. The user decides to buy the item, then click the “참여하기” button to join Group Buying.
Pre-condition	The user is registered, and logged-in the system.
Post-condition	When the user clicks the ‘참여하기” button, the current number of participants in the group buying chatting room should be updated.
Assumptions	N/A

[Table 22] Use case of Chat room

Use case name	**Chat room**
Actor	Registered user
Description	In this process, the user can decide how to buy and distribute items through the chat room.
Normal Course	1. Users who have already joined the chat room click the "채팅방으로 이동하기" button and users who join the chat room for the first time click the "참여하기" button to join the chat room. 2. A host and participants decide how to do transactions and how to distribute the item through the chat room.

	3. Once the user has received the product, it can be notified by clicking “제품 수령 완료” button at the bottom. If everyone in the chat room presses the button, then move to the review page together. 4. If the user wants to exit the chat room, then clicks “공동 구매 탈퇴하기” button in the detail page.
Pre-condition	The user is registered, and logged-in the system.
Post-condition	Records should be saved until the chat room is gone.
Assumptions	N/A

[Table 23] Use case of Review

Use case name	**Review**
Actor	Registered user
Description	Users can evaluate the host to see if the group buying was satisfactory.
Normal Course	1. Once the user has received the product, it can be notified by clicking “제품 수령 완료” button at the bottom. If everyone in the chat room presses the button, then move to the review page together. 2. Participants can rate the host as a star point (out of 5). 3. Participants can write their opinions about the group buying they did this time. 4. Participants save the review through “리뷰 등록하기” button. 5. When the host arranges another group buying transaction, participants can refer to the host's review results.
Pre-condition	Everyone in the chat room presses the “제품 수령 완료” button.
Post-condition	In the host page, all reviews of the host should be saved.
Assumptions	N/A

<User Information Management>

[Table 24] Use case of Changing user profile

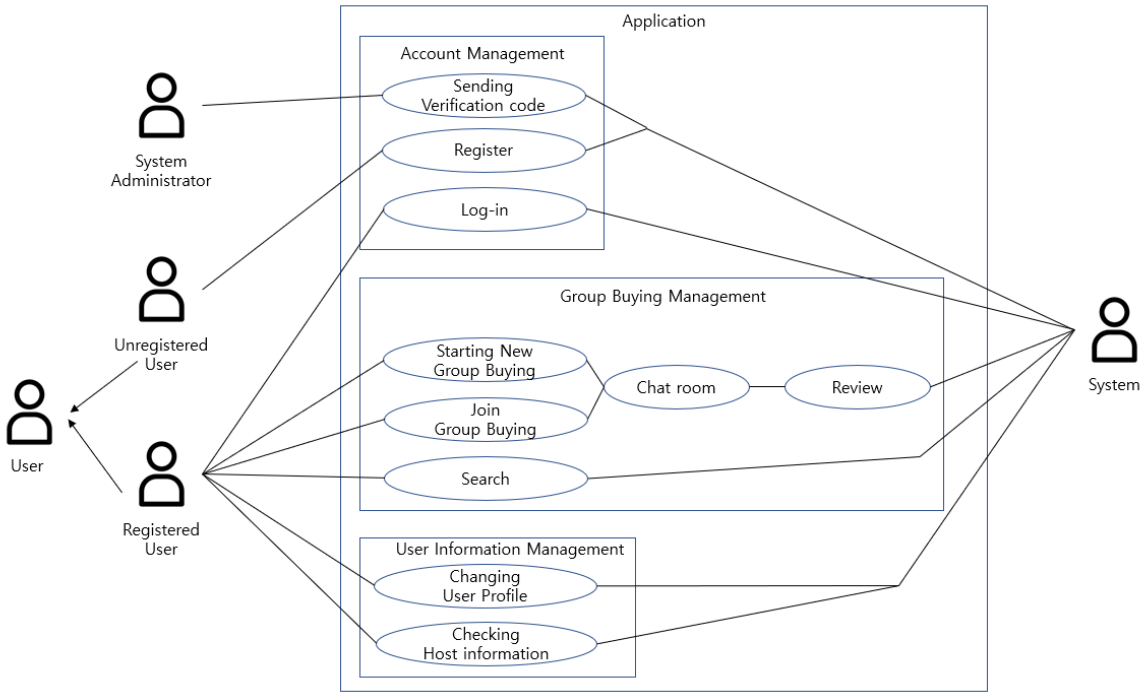
Use case name	**Changing user profile**

Actor	Registered user
Description	When the user wants to change their profile, the user can change their information.
Normal Course	1. The user clicks the “마이 페이지” button at the bottom right of the main page to change their profile. 2. The user can change the user’s image through “프로필 사진 변경” button 3. The user’s image will change instantly. 4. The user can change ID/PWD through “아이디 및 비밀번호 변경” button 5. The user’s ID/PWD will change instantly
Pre-condition	The user is registered, and logged-in the system.
Post-condition	The user’s id/pwd should be updated in the database.
Assumptions	The user wants to change their profile.

[Table 25] Use case of Checking host information

Use case name	**Checking host information**
Actor	Registered user
Description	This is the process that users can check the host information before joining the host’s group buying.
Normal Course	1. If the participants want to buy the item, check the host information for a clean transaction. 2. Participants can enter the host page by clicking the host profile in the chat room or in the group buying page 3. Participants can check the score of the host and detailed descriptions of the host. 4. If participants are satisfied with the host profile then the participants join Group Buying.
Pre-condition	The user is registered, and logged-in the system.
Post-condition	N/A
Assumptions	N/A

3.2.2. Use Case Diagram



[Figure 2] Use case diagram

3.2.3. Data Dictionary

[Table 26] Data dictionary of User

Field	Key	Constraint	Description
email	PK	Not Null	User email, used as id
nickname		Not Null	User nickname, distinct
password		Not Null	User password, hashed

rating_as_host			Rating as host user

[Table 27] Data dictionary of Group buying

Field	Key	Constraint	Description
group_buying_id	PK	Not Null	Group buying id
host_email	FK	Not Null	Host user's email
group_buying_image			Image for group buying, uploaded by host user
group_buying_title		Not Null	Group buying title, uploaded by host user
group_buying_target_people		Not Null	Target people of group buying, uploaded by host user
group_buying_receipt_place		Not Null	Where to receive group buying item, uploaded by host user
group_buying_description			Description for group buying, uploaded by host user
is_ongoing		Not Null	0: finished 1: ongoing 2: canceled

[Table 28] Data dictionary of User's group buying

Field	Key	Constraint	Description
user_email	PK, FK	Not Null	User email
group_buying_id	FK	Not Null	Group buying id

is_host		Not Null	0: not host user (participant) 1: host user

[Table 29] Data dictionary of Chat room

Field	Key	Constraint	Description
group_buying_id	PK, FK	Not Null	Related group buying id
notice_chat_id	FK		Chat id of notice
host_email	FK	Not Null	Host user of group buying

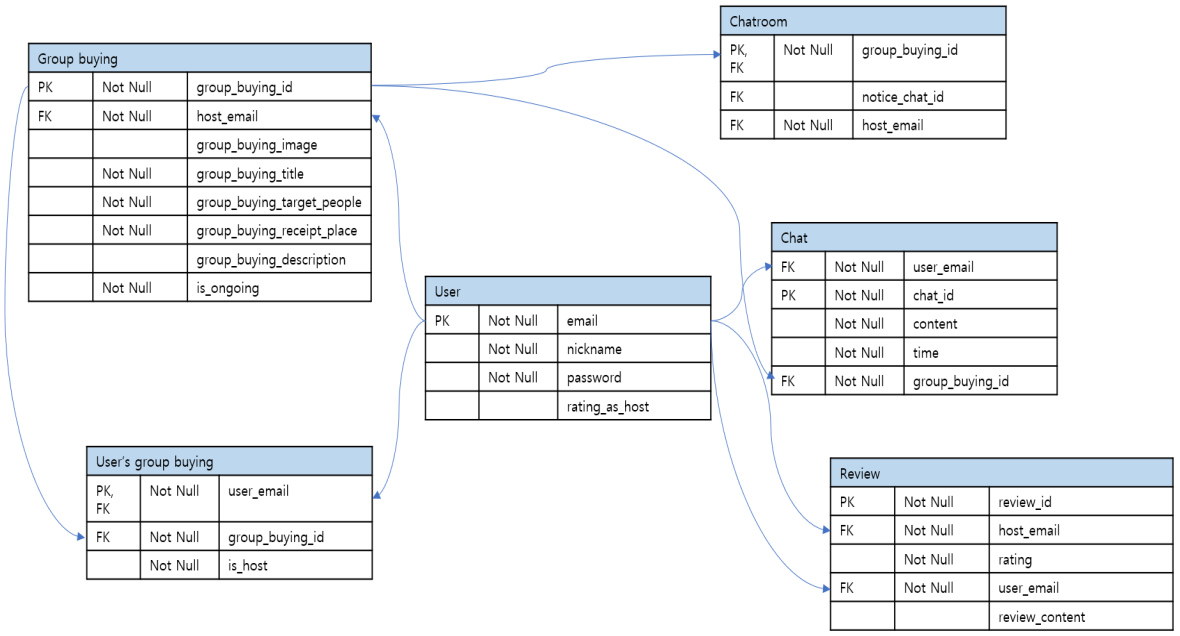
[Table 30] Data dictionary of Chat

Field	Key	Constraint	Description
user_email	FK	Not Null	User who write the chat
chat_id	PK	Not Null	Internal chat id for system management
content		Not Null	Content of the chat
time		Not Null	Time that the chat has been sent
group_buying_id	FK	Not Null	Related group buying id

[Table 31] Data dictionary of Review

Field	Key	Constraint	Description

review_id	PK	Not Null	Internal review id for system management
host_email	FK	Not Null	Target user for review
rating		Not Null	Rating for target user
user_email	FK	Not Null	User who wrote the review
review_content			Review content, written by participant user



[Figure 3] Entity Relationship Diagram

3.3. Performance Requirements

The following are non-functional requirements related to the performances of this program. These requirements should be tested numerically.

3.3.1. Static Numerical Requirement

This system should work well on android mobile devices with minimum 4GB of RAM and a 2.0GHz single processor. System supports the latest version of Android 8.0 and above.

3.3.2. Dynamic Numerical Requirement

- The system works well in environments with at least 300 concurrent users. And the system is built to manage at least 20000 total registered users.

- All API calls should respond in 3 seconds at least. Even if there are too many requests, the backend system should not be shut down and requests should not be lost.

3.4. Logical Database Requirements

The system manages user information through a database called MySQL. The system stores user information and location information in a database. The database is managed so that it can have basic performance for processing information through the database.

3.5. Design Constraints

The system must not contain components that are not covered under the license. All assets used in the system such as images or Font are verified for copyrights. The system must be

accessible from various android mobile devices with different screen sizes or resolutions. The choice of color should take into account people with visual impairments.

3.6. Programming Convention Compliance

All programs in the system are written according to computer language standards. Naming conventions must be followed.

3.7. Software System Characteristics

This section describes non-functional requirements that are categorized as product requirements, organizational requirements, and external requirements. Software system characteristics are revealed through non-functional requirements.

3.7.1. Product Requirements

The system must meet the following product requirements.

3.7.1.1. Usability Requirement

The most important of the non-functional requirements, the system should be designed so that it can be easily used by non-experts. Users should be able to use the functions of the system without reading documents or manuals. The UI should provide an intuitive user experience for all users.

3.7.1.2. Performance Requirement

This system should be stuck for more than 3 seconds to respond to the user's actions. If any processes take more than 3 seconds it should be shown with status of progress or animated method should be used.

3.7.1.3. Security Requirement

User data must be stored securely and collected and used in accordance with previously agreed upon terms and conditions.

3.7.2. External Requirements

This section covers requirements for external factors.

3.7.2.1. Safety Requirement

All data must be safely protected from malicious attacks. This system must not be abused by criminals. Users should not be harmed by other inappropriate users.

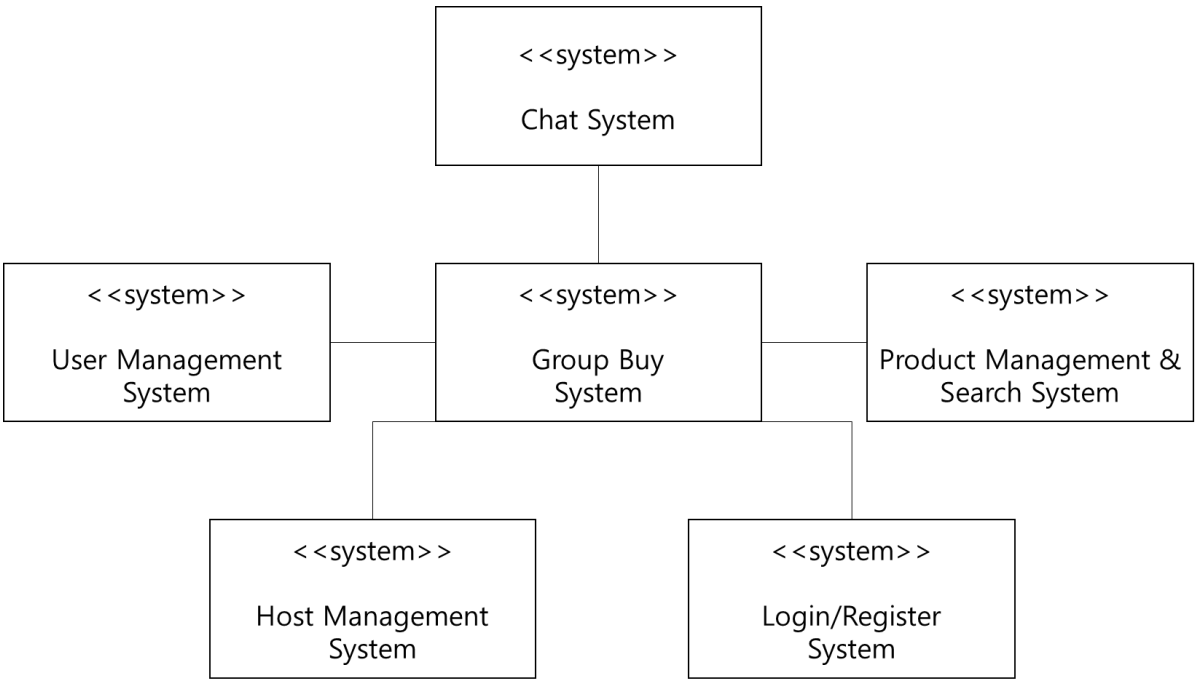
3.7.2.2. Regulatory Requirement

This system should prevent illegal actions by users such as selling inappropriate things or deceived other users.

3.8. Organizing the Specific Requirements

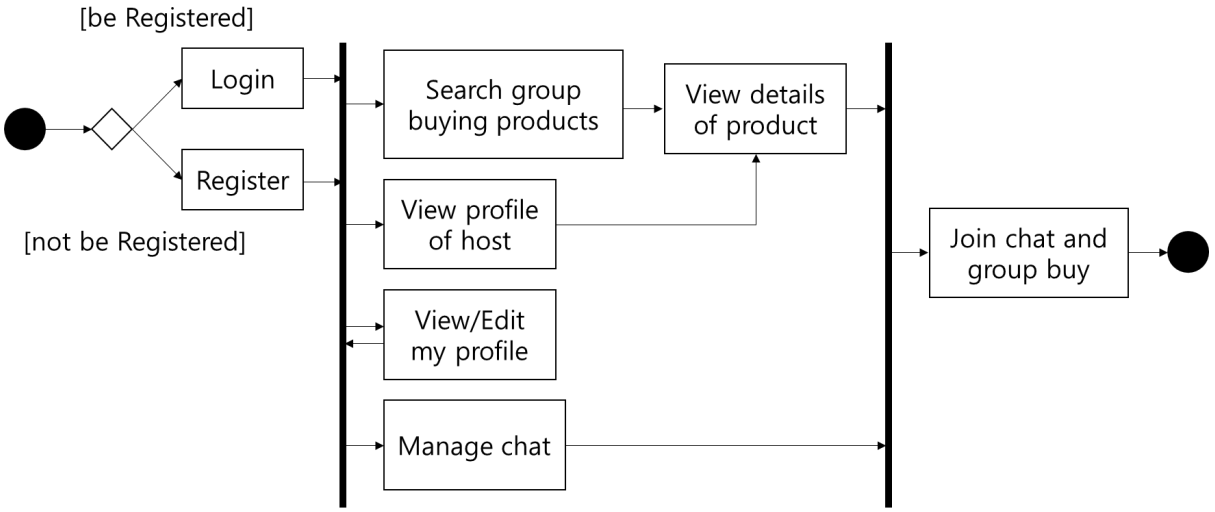
This section allows finding out specific system model for requirements. The system model uses a graphical notation based on UML (Unified Modeling Language) and tabular format.

3.8.1. Context Model



[Figure 4] Context Model

3.8.2. Process Model



[Figure 5] Overall Process Model

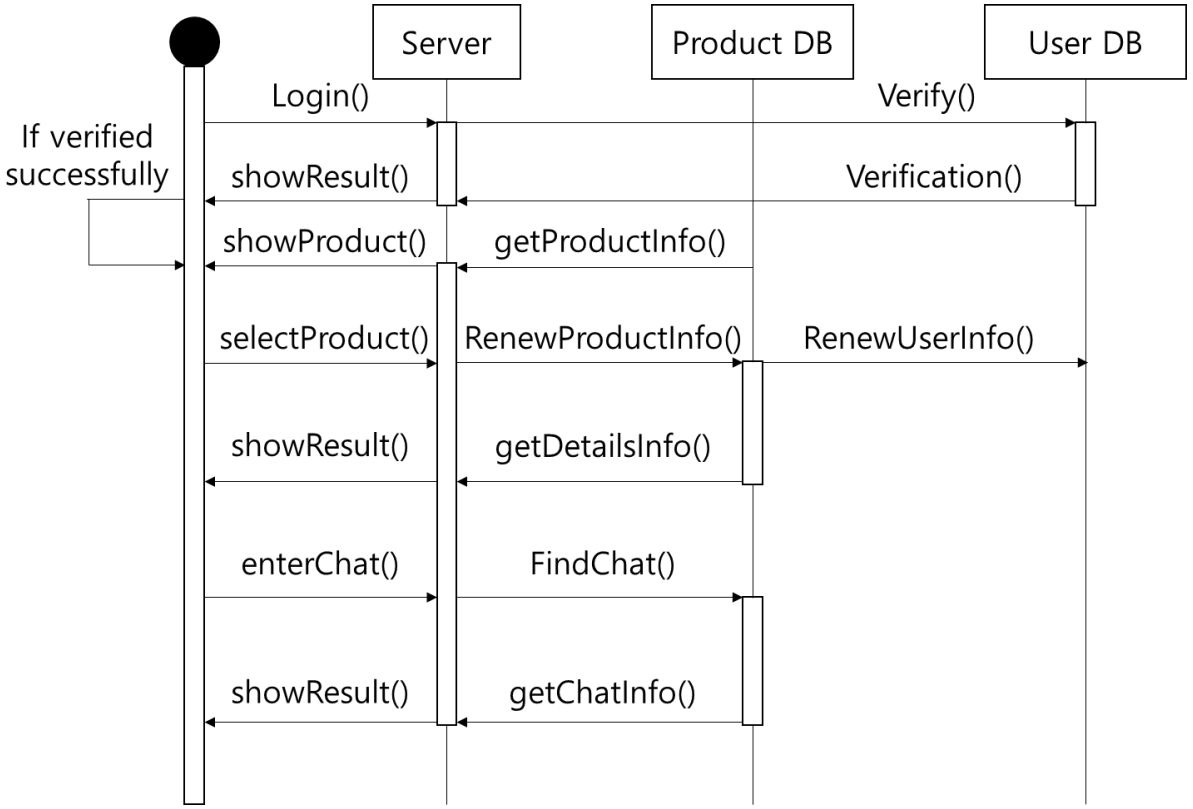
3.8.3. Interaction Model

See 3.2.2 Use Case Diagram

3.8.4. Behavior Model

3.8.4.1. Sequence Diagram

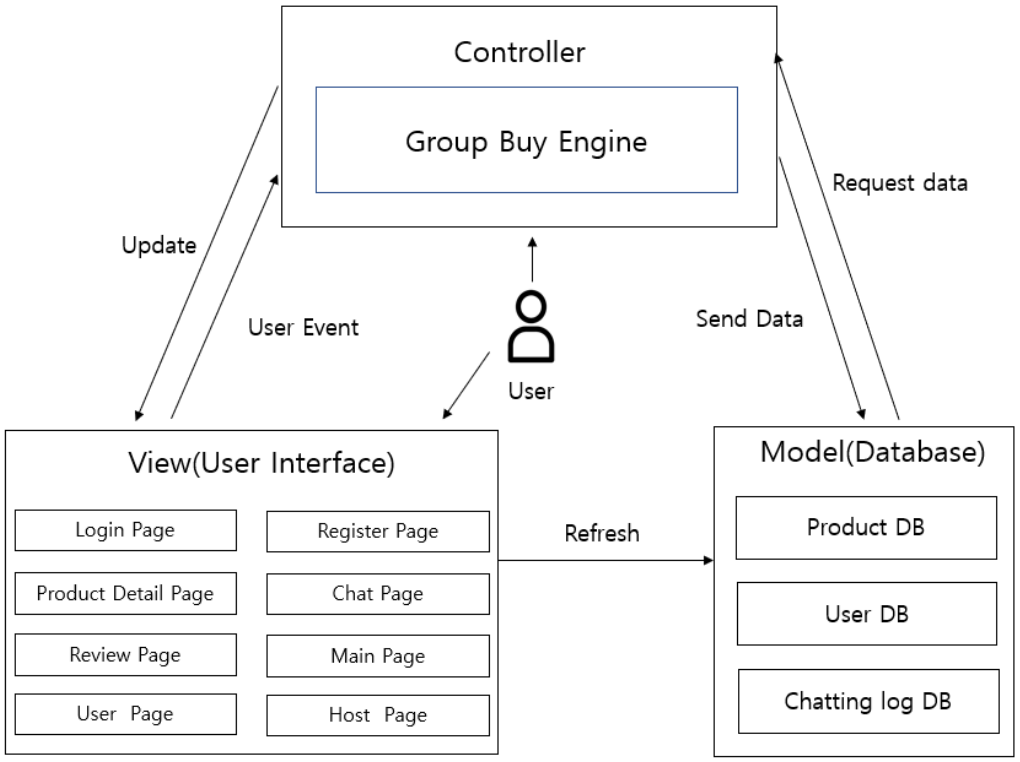
It mainly describes our main system, the locating sequence.



[Figure 6] Sequence Diagram

3.9. System Architecture

This section describes the relationship and functionality between system modules using the MVC pattern.



[Figure 7] System Architecture

3.10. System Evolution

This section explains the basic assumptions underlying the system. Also, this section describes the anticipated changes caused by hardware development and user requirements to help system designers make decisions in the future system evolution.

3.10.1. Assumptions

SKKU Group Buy App Requirement Specification was designed assuming that it is a system

for members of Sungkyunkwan University. The system was designed assuming that Sungkyunkwan University members have the desire to join group buying for saving daily money. The system assumes that there may be matching people problems and financial problems in the process of group buying, so the system was designed to have solutions for those problems.

3.10.2. Anticipated Changes

With the development of the device performance, the system will be updated to match that capability. Therefore, the minimum specification of the device based on this specification may increase. Currently, the purpose of the system is to gather users who want to purchase together, but according to the user's request, a function which can proceed with money transactions directly from this application can be added. In addition, if the user requests new functions, the requirements may change accordingly.

4. Supporting Information

4.1. Software Requirement Specification

This software requirements specification was written with reference to the IEEE Recommendation (IEEE Recommended Practice for Software Requirements Specifications, IEEE-Std-830).

4.2. Document History

[Table 32] Document History

Date	Version	Description	Writer
2022/10/31	0.1	Initialization (Overview)	Kyungmin Min
2022/10/31	1.0	Addition of 4.1, 4.2	Kyungmin Min
2022/11/01	1.1	Addition of 1.3, 1.4	Jeongjae Park
2022/11/01	1.2	Addition of 3.1.1	Jaesung Lee
2022/11/02	1.3	Addition of 3.1.2 - 3.1.4	Jaesung Lee
2022/11/02	1.4	Addition of 3.2.1	Kyungmin Min
2022/11/04	1.5	Revision of 3.2.1	Jongyoon Kim
2022/11/04	1.6	Revision of 3.2.1	Kyungmin Min
2022/11/04	1.7	Addition of 2.4 - 2.7	Yiqin Wei
2022/11/04	1.8	Addition of 2.2 - 2.3	Yiqin Wei
2022/11/05	1.9	Addition of 3.8	Jaesung Lee
2022/11/05	1.10	Addition of 2.1	Jeongjae Park
2022/11/05	1.11	Addition of 1.1, 1.2, 1.5	Jeongjae Park
2022/11/05	1.12	Addition of 3.2.2	Kyungmin Min
2022/11/05	1.13	Addition of 3.2.3	Jongyoon Kim
2022/11/05	1.14	Addition of 3.10	Kyungmin Min
2022/11/06	1.15	Addition of 3.3 - 3.7	Seongyun Lee
2022/11/06	1.16	Revision of 1.1 - 1.5, 2.1	Jeongjae Park
2022/11/06	1.17	Revision of 2.2 - 2.7	Yiqin Wei
2022/11/06	1.18	Addition of 3.9	Kyungmin Min
2022/11/06	1.19	Formatting	Jongyoon Kim

Date	Version	Description	Writer
2022/11/06	1.20	Final Revision	Jongyoon Kim