Metaverse GLS schoolbag system

Software Requirement Specification

2021.10.31

Introduction to Software Engineering 41

TEAM 1

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1. Introduction

1.1. Purpose

This document is a software requirement specification (SRS) for providing Metaverse GLS schoolbag system services. This service is designed and implemented by Team 1 of the Introduction to Software Engineering at Sungkyunkwan University. We will design and implement this system based on summary, analysis, and description of the requirements of this.

In this document, Team 1 is the main reader, and Team 1 designs and implements the functions of the laptop recommendation Metaverse service according to this specification. Additionally, professors, 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 Requirements Specification for a system that implements school bag services in Sungkyunkwan University's GLS system using a metaverse that is in the spotlight in the post-COVID-19 era. Unlike the existing GLS's school bag service, it will provide several convenient functions and communication spaces for classmates. The main purpose is to create a system that enhances the sociality that is lacking through continuous online-based classes and complements the needs of the existing school bag system.

1.2. Scope

Since most lectures have been held online for two years, this Metaverse GLS schoolbag system facilitates students' communications to solve the difficulties of listening to lectures alone. And also, you can ask senior who is connected to this service in real time questions about the subject you will take. And basically, it checks the information about the lecture and shows how many people put this lecture in their school bags in real time to help the students choose the lecture. The system is built on VRChat, an online virtual reality social service. At least all subjects within the College of Software and Informatics will be put in the database, and up to 20 concurrent users will be available. In addition, it will be implemented in consideration of immediately reflecting changes in user information or databases and displaying them on the screen.

1.3. Definitions, Acronyms, Abbreviation

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

[Table 1] Table of acronyms and abbreviations

Acronyms & Abbreviations	Explanation
VRChat	Virtual Reality Chat
DB	Data Base
PK	Primary Key
FK	Foreign Key
N/A	Not Applicable/ Not Available

CPU	Central Processing Unit
VGA	Video Graphics Array
RAM	Random Access Memory
HDD	Hard Disk Drive
SDD	Solid-State Drive

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

[Table 2] Table of terms and definitions

Terms	Definitions
Interface	A contact point or interface when exchanging information or signals between two different systems and devices
Unity Engine	It is a game engine that provides a development environment for 3D and 2D video games, and an integrated production tool for creating interactive content such as 3D animation and architectural visualization, and virtual reality (VR)
Processor	The most essential computer control device that controls computer systems and executes and processes program operations.
Memory	the faculty of the brain by which data or information is encoded, stored, and retrieved when needed
User	Someone who uses a system
System Administrator	Someone who quantify the keywords included in the reviews for each laptop and manage the system
Network	For connect devices together so that they can share information. In this system, it usually means internet
Server	A computer or computer program which manages access to a centralized resource or service in a network
Client	A user device/user that connected to server
Packet	Formalized blocks of data delivered by packet-based computer networks in information technology

1.4. References
- l IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications, In IEEEXplore Digital Library

http://ieeexplore.ieee.org/Xplore/guesthome.jsp

- Team 1. "Software Requirement Specification". SKKU, Last Modified: May. 13, 2020.

  https://github.com/skkuse/2020spring_41class_team1/tree/master/docs

- https://help.vrchat.com/hc/en-us/articles/1500002378722-System-Requirements
- https://docs.vrchat.com/docs/vrc_webpanel

1.5. Overview

This Software Requirements Specification (SRS) consists of a total of three parts: Introduction, Overall Description, and Specific Requirements, and at the end, a chapter such as appendix is added. The second part defines the interface at which this system is implemented and operated. And describe the overall functionality, user characteristics, constraints, and assumptions and dependence of the system. In the third part, various and specific requirements of an interface, functionality, performance, and database are described. Organizational and security-related requirements as well as various requirements for the product are included. In the fourth part, additional information and the timeline of this document will be included.

2. Overall Description

2.1. Product Perspective

This system is designed for SKKU students who sign up for courses. The students can choose the course they want to take and check the competition rate and information like GLS school bag system.

2.1.1. System Interfaces

The operation of the system is done through VRChat. The user information and course information will be stored in DB using MySQL. The system will be implemented with Unity engine. MySQL can be linked to Unity engine.

2.1.2. User Interfaces

An interface is provided through the monitor screen of a PC or VR device connected to the PC. Sound is also connected for communication.
Users can move around the VR world and interact with certain objects.

The administrator can access the course database. The administrator is provided with an interface for supporting registration, deletion, and correction of course information.

2.1.3. Hardware Interfaces

Because the system works through VRChat, a PC for running VRChat without difficulty is needed. The minimum and recommended specification for running VRChat are as follows.

Minimum PC Specifications:
Processor: Intel® i5-4590 / AMD FX 8350 equivalent or greater

Memory: 4 GB RAM
Graphics: NVIDIA GeForce® GTX 970 / AMD Radeon™ R9 290 equivalent or
greater
Network: Broadband Internet connection (25+ megabit preferred)
Storage: 21.5GB (~1.5GB for application, remaining for content cache)

Recommended PC Specifications:
Processor: Intel® i5-6500 / AMD Ryzen 5 1600 equivalent or greater
Memory: 8 GB RAM
Graphics: NVIDIA GeForce® GTX 1060 / AMD Radeon™ RX 580 equivalent or greater
Network: Broadband Internet Connection (25+ megabit preferred)
Storage: 21.5GB (~1.5GB for application, remaining for content cache)

VRchat does support VR headsets but it is not required to play VRchat. So, regular PC
equipment such as monitor, speaker, keyboard and mouse will be fine.

2.1.4.   Software Interfaces
The system is intended for Window OS version at least Window 7 with DirectX
version 11, and targeting Window 10. The intended version of VRChat is 2021.3.4.

2.1.5.   Communication Interfaces
Using VRChat function, typing and voice, both can be done. all the communication
interface is the same with vrchat.

2.1.6.   Memory Constraints
The system should run on PC with at least 4 GB RAM and requires at least 21.5
GB for installation and execution of VRchat.
administrator: The number of users will increase on the registration day. So, the memory
usage will spike at that period.

2.1.7.   Operations
2.1.7.1.   System administrator
- Management
  - System administrator reflects changes of college structure.
  - System administrator manages the course database.
    - Add new courses
    - remove existing courses
    - modify existing courses
  - Announce notice
  - Bulletin board

2.1.7.2.   User (Students)
- Log in/out
  - User can log in & out the system through VRChat.

- Choose major/elective
  - User can choose major course or selective course

- Choose department and major
  - If user choose major course, reselect which major he belong to

- Check course information
  - Check brief information about the course at the hall
  - Check more detail information about the course in the classroom

- Check competition rates
  - competition rates of the courses can be checked whether or not they are in school bag

- Lecture preview
  - Inside the course classroom, user can see sample lecture

- Add course to the school bag
  - Users can update the school bag with the course they want to take

- Communication
  - Users can communicate with others who have chosen the same course inside the VR classroom.
  - Users can communicate with others regardless of their course or their academic year at the main hall

- Profile
  - Automatically create profile to a user at first visit
  - Change profile if needed
  - A single user can only have one profile

2.2. Product Functions

2.2.1. Classification

- After the user logs in, the user is allowed to select a major or an elective course, and in the case of a major, select which major the user belongs to. After the classification, the user can check the courses he wants to take.

2.2.2. Show real-time competition rates

- The user can check the real-time competition rate of each course from the database. Using this, the user can make a course registration plan.

2.2.3. Course information and details

- The user can check information of each course such as course ID, professor, class time, credits, recommended grade etc.

2.2.4. Show sample lecture of the course

- In the case of courses that have a sample lecture video, the user can play the video.

2.2.5.   Add course to school bag
- If there are courses that the user wants to take, the user can select it and put it in a school bag. The user can check these courses again later.

2.2.6.   Communication space
- An auditorium or a hall for students to communicate each others and pick interesting courses
- Create a classroom for each course where only classmates or candidates of certain courses can enter. In this space, users can share information related to courses with each other or find friends to attend lectures with.

2.2.7.   Profile
- Basic profile is set and the user can change it later.
- Few profile information can be hidden from other users

2.3.   User Characteristics

2.3.1.   System Administrator
It is assumed that the system administrator has some understanding of the course registration and GLS school bag system. In addition, it is assumed that the system administrator is familiar with VRChat.

2.3.2.   User (student)
Major users are students of SKKU. Most of them use Korean. It is assumed that they are about to register for courses and familiar with the existing GLS school bag system. Also, it is assumed that their primary purpose of using the system is to view course information and to share information with others.

2.4.   Constraints
- Prohibit inadequate data or links
- Changes via this system especially competition rate must be real-time
- The course information should be identical to the actual GLS information.
- Consider future maintenance such as course information change.
- Develop with VRChat version 2021.3.4
- Develop with Windows environment.

2.5.   Assumptions and Dependencies
- This system is for SKKU only. The users are students of SKKU, so students of other schools will not be approved to access.
- The users can access the courses which were already taken in the past.
- The system in this document is based on Windows OS and VRChat version 2021.3.4 and may not be applied to other OS or VRChat versions.

3. Specific Requirements
3.1. External Interface Requirements
3.1.1. User Interfaces

[Table 3] User interface of mouse

Name	Input from Mouse
Purpose/Description	Users transmit their instructions through the mouse
Input source/Output destination	User / user's screen
Range/Accuracy/Margin of error	Range according to the number of buttons of the mouse/ Accuracy according to the accuracy of user's mouse/ Margin of error of click range
Unit	A click
Time/Velocity	Asynchronous user input/ Instant execution of a user instruction
Relationship with other input/outputs	Depending on the input, the client processes it or requests a command from the server.
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	int type value of a button code
Instruction type	Instruction mapping according to the value of a button code

Exit message	N/A

[Table 4] User interface of keyboard

Name	Input from Keyboard
Purpose/Description	Users transmit their instructions through the keyboard
Input source/Output destination	User / user's screen
Range/Accuracy/Margin of error	Range according to the number of key of the keyboard/ Accuracy according to the accuracy of user's keyboard / Margin of error of key recognition range
Unit	Press key
Time/Velocity	Asynchronous user input/ Instant execution of a user instruction
Relationship with other input/outputs	Depending on the input, the client processes it or requests a command from the server.
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	int type value of a button code
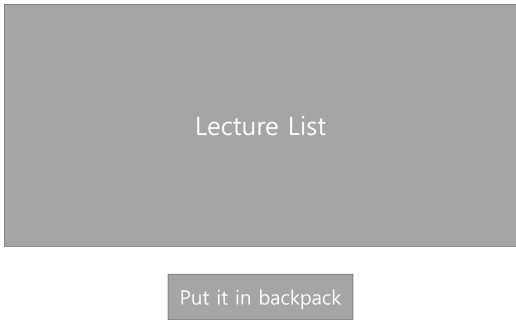
Instruction type	Instruction mapping according to the value of a button code
Exit message	N/A

[Table 5] User interface of monitor

Name	Output with Monitor
Purpose/Description	Interface provided to the user
Input source/Output destination	Monitor client/user
Range/Accuracy/Margin of error	N/A
Unit	Screen
Time/Velocity	Switching screen according to user input
Relationship with other input/outputs	Waiting for user input after printing as an interface for user input
Format and configuration of screen	Screen that shows a part of the map Screen where user can use various functions when pressing the esc button.
Format and configuration of window	N/A
Data type	Image
Instruction type	N/A

Exit message	N/A
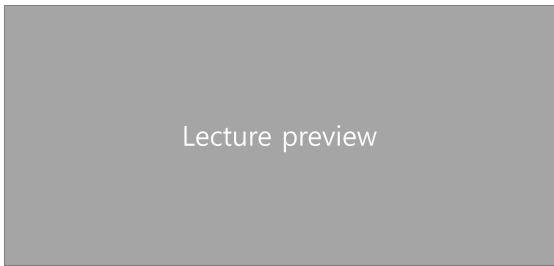
[Table 6] User interface of put lecture in school bag

Name	Search Interface1 – Put Lecture in school bag
Purpose/Description	User can put the desired lecture in the school bag
Input source/Output destination	User / Host server
Range/Accuracy/Margin of error	Up to 25 credit can be contain/ N/A / N/A
Unit	Screen
Time/Velocity	After all input data were received to the user device/ Communication time between server and client
Relationship with other input/outputs	N/A
Format and configuration of screen	Section of lecture list When the user clicks the button 'Put it in school bag', the selected lecture will be inserted to the user's school bag Lecture List Put it in backpack

Format and configuration of window	Common widget
Data type	Text, Widget
Instruction type	N/A
Exit message	N/A

[Table 7] User interface of watch lecture preview

Name	Search Interface2 – Watch Lecture Preview
Purpose/Description	Show the preview of the lecture to the user
Input source/Output destination	Host server / Client
Range/Accuracy/Margin of error	N/A
Unit	Screen
Time/Velocity	Whenever a user inputs, such as clicking play or stop button/ Communication time between server and client
Relationship with other input/outputs	N/A

Format and configuration of screen	section to play video button for play or stop the video button for changing volume Lecture preview
Format and configuration of window	N/A
Data type	Video
Instruction type	N/A
Exit message	N/A

3.1.2. Hardware Interfaces

[Table 8] Hardware interface of user's PC

Name	User's PC
Purpose/Description	A computer with an OS that can run STEAM
Input source/Output destination	Keyboard, mouse / Monitor
Range/Accuracy/Margin of error	According to hardware spec
Unit	Command of user

Time/Velocity	Asynchronous user input/ Instant execution of a user instruction
Relationship with other input/outputs	All input/output from client
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	All key input
Instruction type	Key and click
Exit message	N/A

3.1.3.   Software Interfaces

[Table 9] Software interface of VRChat

Name	VRChat
Purpose/Description	Basic interface for user
Input source/Output destination	Client or server / server or client
Range/Accuracy/Margin of error	According to spec of VRChat server
Unit	Key input
Time/Velocity	Asynchronous user input/ Instant execution of a user instruction

Relationship with other input/outputs	All input/output
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	N/A
Instruction type	Code
Exit message	N/A

3.1.4.   Communication Interfaces

[Table 10] Communication interface of client and host

Name	Client and Host
Purpose/Description	Each client request the connection to the host, requesting play the lecture preview Host provides lecture list and preview to the client
Input source/Output destination	Client / Host server
Unit	Packet
Time/Velocity	According to the VRChat server spec
Data type	Query
Instruction type	Query statement

Exit message	N/A

3.2. **Functional Requirements**
3.2.1. **Use Case**

[Table 11] Use case of log-in/out

Use case name	Log-in/out
Actor	Logged-in user
Description	Log-in is a process when a registered user in the school system tries to access to use the service from the system. Log-out is a process when a user who has logged-in tries to get out of the system.
Normal Course	\<Log-in\> 1. A user who has already registered in the school system wants to use the service from the system. 2. The user enters school number and password that are same as school portal login information. 3. If the information exists on the school server and is correct, the system allows the user to get into the system. The user may use all services provided by the server. \<Log-out\> 1. When the user no longer uses the system and wants to disconnect, the user presses the log-out button. 2. If the system is shut down without pressing the logout button, the system automatically logs out the user.

Precondition	<Log-in> The user must be a registered student within the school system. <Log-out> The user should be in a logged-in status.
Post Condition	The user should be connected to network.
Assumptions	There may be users who are not linked to the school system for various reasons (system errors, new students who have not started a formal semester, etc.).

[Table 12] Use case of search

Use case name	Search lecture
Actor	Logged-in user
Description	It is a process in which users can search for courses opened in the semester they registered, and basic information about the courses (lecture name, lecture time, class plan, competition rate, etc.) is provided.

Normal Course	1. Users who have logged in use the system.
	2. It allows users to search for courses opened in the semester they registered.
	3. Users can check more detailed information by clicking on the subject they want to examine in detail.
	    A. Each major
	    B. Type of elective
	    C. Prerequisite/Optional
	    D. Name of the lecture
	4. The system provides information (lecture name, lecture time, class plan, competition rate, etc.) on the subject the user wants to examine.

Precondition	Information on the user's major should be provided. The user selects one of several search conditions. The server provides data on courses opened in the semester to the system.
Post Condition	The user must be logged in to the system. The user has executed the search function.
Assumptions	A lecture that doesn't exist (a lecture that wasn't held this semester or a lecture that didn't originally exist)

[Table 13] Use case of school bag

Use case name	Put lecture in school bag
Actor	Logged-in user

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Description	It is the process of storing lectures that users want to listen to in a place called "school bag." "school bag" is a service that allows you to apply by placing lectures you want to listen to in advance by priority, and opening windows in that order when registering for classes.
Normal Course	1. The user selects the lecture he or she wants to listen to. 2. The user presses the "Put in a school bag" button on the lecture description page. 3. The lecture is included in the user's school bag.
Precondition	The user must select the 'Put in a school bag' button on the lecture search page.
Post Condition	N/A
Assumptions	The user must have decided to select the lecture.

[Table 14] Use case of school bag checking page

Use case name	Check school bag
Actor	Logged-in user
Description	It is a process in which users can directly check and prioritize the lectures they choose to put in their school bags.

Normal Course	1. The user presses a button to check his school bag. 2. The lectures are rearranged by prioritizing them in the order the user wants. 3. The user stores the rearranged lectures and reflects them in the system.
Precondition	The user should have pressed the 'My school bag' button.
Post Condition	N/A
Assumptions	N/A

[Table 15]   Use case of communication page

Use case name	Communicate with others
Actor	Logged-in user
Description	It is a process that provides a space for users to communicate with other users who have access to the system so that they can share information about lectures opening in the semester or find people to take lectures together.
Normal Course	1. The user accesses the communication space. 2. Users who access the system communicate with each other as needed. Users communicate with each other through chat or voice. 3. Users can access or disconnect the communication space at any time.

Precondition	Users must access the communication space through the portal.
Post Condition	Users must be connected to the Internet. The user must have input tools to communicate (keyboard, microphone, etc.).
Assumptions	N/A

[Table 16]   Use case of provide/review data analysis

Use case name	**Provide/review data anaylsis**
Actor	System administrator
Description	It manages information on each lecture and provides updated information every moment. This information is provided in the form of numbers when searching for each lecture.
Normal Course	1. Information (number) on lectures that change according to users' choices is collected. 2. Data is preprocessed and stored in a database. 3. When a user searches for a specific lecture, the server transmits related data to the user and displays the information on the screen according to the format.

Precondition	1. The user should be in a logged-in status. 2. Users should be in the process of searching lectures.
Post Condition	N/A
Assumptions	Basic information on lectures is provided on the school server, and data that changes according to users' choices on the system are managed and provided.

3.2.2.   Use Case Diagram
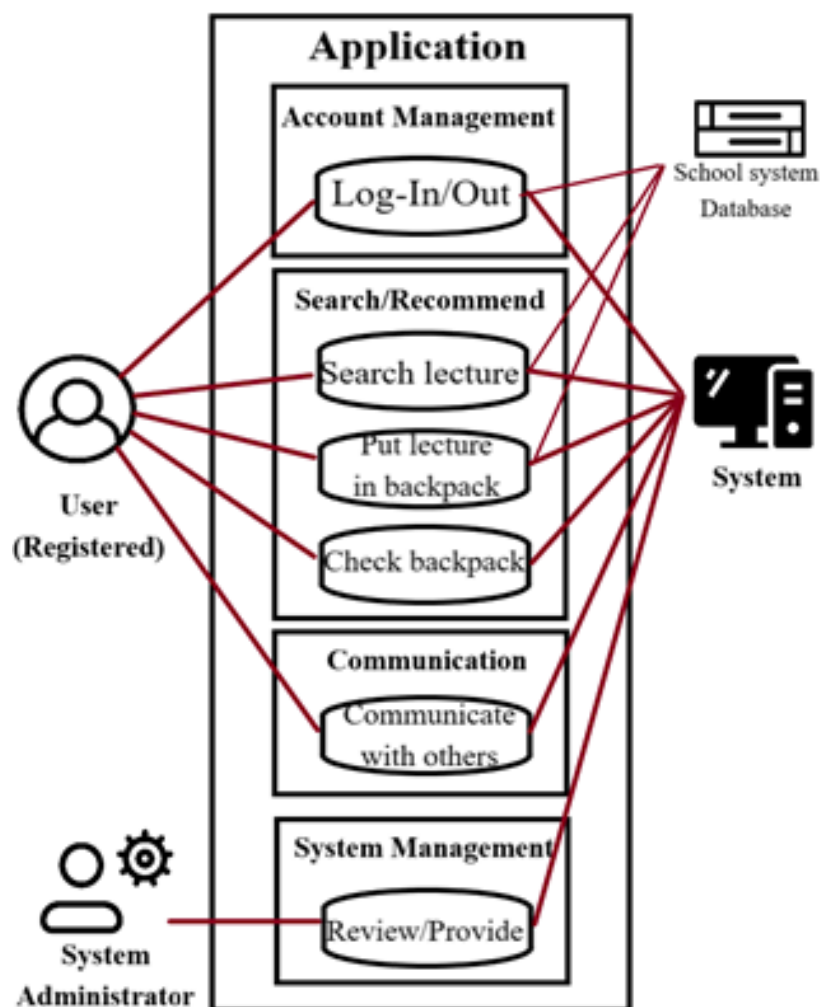
[Figure 1] Use case diagram

3.2.3.   Data Dictionary

[Table 17] User

Field	Key	Constraint	Description
id	PK	Not Null	User id (Student ID)
name		Not Null	Username
major		Not Null	User major (+Double)

[Table 18] CPU

Field	Key	Constraint	Description
name	PK	Not Null	CPU name
manufacturer		Not Null	Manufacturer of CPU
core		Not Null	CPU core number
clock_rate		Not Null	CPU clock rate
chipset		Not Null	CPU chipset

[Table 19] VGA

Field	Key	Constraint	Description
name	PK	Not Null	VGA name

Field	Key	Constraint	Description
manufacturer			Manufacturer of VGA
vram capacity			VGA RAM capacity
chipset		Not Null	CPU chipset

[Table 20] Storage

Field	Key	Constraint	Description
name	PK	Not Null	Storage name
manufacturer			Manufacturer of storage
type		Not Null	Storage type (HDD/SDD)
capacity		Not Null	Storage capacity

[Table 21] RAM

Field	Key	Constraint	Description
name	PK	Not Null	RAM name
manufacturer			Manufacturer of RAM
type		Not Null	RAM type
capacity		Not Null	RAM capacity
bandwidth			RAM bandwidth

Field	Key	Constraint	Description
clock_rate			RAM clock rate

[Table 22] Panel

Field	Key	Constraint	Description
name	PK	Not Null	Panel name
manufacturer			Manufacturer of panel
type		Not Null	Panel type
size		Not Null	Panel size
resolution		Not Null	Panel resolution
aspect_ratio		Not Null	Aspect ratio
screen_brightness			Screen brightness
color_gamut			Color gamut
frame_rate			Frame rate

[Table 23] Laptop

Field	Key	Constraint	Description
product_code	PK	Not Null	Product code
manufacturer		Not Null	Manufacturer of laptop

brand			Laptop brand
device_type			Device type
display_name	FK	Not Null	(Panel)
cpu_name	FK	Not Null	(CPU)
vga_name	FK	Not Null	(VGA)
battery_capacity			Battery capacity
operating_system			Operating system
weight			Weight of laptop

[Table 24] Laptop(Storage)

Field	Key	Constraint	Description
laptop_product_code	PK/FK	Not Null	(Laptop)
storage_name	PK/FK	Not Null	(Storage)

[Table 25] Laptop(RAM)

Field	Key	Constraint	Description
laptop_product_code	PK/FK	Not Null	(Laptop)
ram_name	PK/FK	Not Null	(RAM)

[Table 26] Laptop (Review/Provide)

Field	Key	Constraint	Description
user_id	PK/FK	Not Null	(User)
laptop_product_code	PK/FK	Not Null	(Laptop)
updated_data		Not Null	Updated Data

[Table 27] School bag

Field	Key	Constraint	Description
user_id	PK/FK	Not Null	(User)
laptop_product_code	PK/FK	Not Null	(Laptop)
number		Not Null	Number of lectures
credit		Not Null	Number of credits
priority		Not Null	Order of priority

[Table 28] Search

Field	Key	Constraint	Description
query_id	PK	Not Null	Search query id (lecture/key)

| user_id | FK | Not Null | (User) |
| query_option | | Not Null | Search options |

[Table 29] Search(Result)

Field	Key	Constraint	Description
search_lec_id	PK/FK	Not Null	(Search)
Laptop_product_code	PK/FK	Not Null	(Laptop)

3.2.4. Data flow Diagram
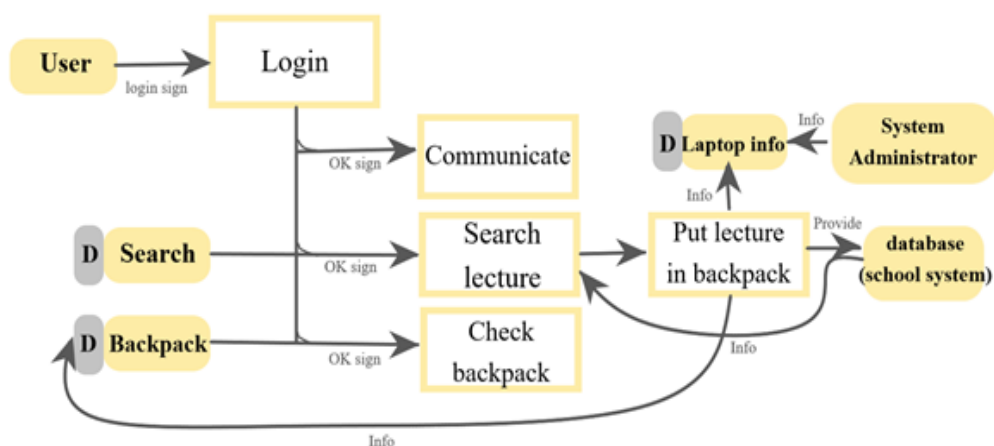
[Figure 2] Data flow diagram

3.3. Performance Requirements

The following requirements are based on estimates and may be changed in the final application.

3.3.1. Static numerical Requirement

The system should be compatible with the vr device and run without problems on the computer.

The minimum specifications to run VRChat are as follows.

Intel i5-4590/ AMD FX 8350 equivalent or greater

4 GB RAM

NVIDIA GeForce GTX 970 / AMD Radeon R9 290 equivalent or greater

3.3.2. Dynamic Numerical Requirement

The system must allow at least 1000 concurrent connections.
The system must be able to authorize 30000 account creation.
The map should take about 10 seconds to load.
Each account must be activated within 5 seconds of linking.
The login process should be completed within 5 seconds.
The delay in traversing the map should not exceed 2 seconds.
The main action (ex course registration) should not be delayed for more than 2 seconds.

3.4. Logical Database Requirements

An additional database will be designed to store users' student numbers and course registration courses, and MySQL will be used as the architect.

3.5. Design Constraints

All objects that can be used in map creation will be treated as permitted by copyright law.
Since the goal is to create a map that runs in a program called VRChat, operation is done in VRChat. It can be accessed through a computer or VR devices.

3.6. Standards Compliance

All programs in the system are written in accordance with the Unity standards, and other matters follow conventional programming techniques. The names of functions and variables in the program use camel notation, and underscore notation is applied to databases. Using 3D asset for making program while complying with copyright laws.

3.7. Software System Characteristics

Software system characteristics are revealed through non-functional requirements. So, this section describes several non-functional requirements of the system. Non-functional requirements are classified Product Requirements, Organization Requirements, External Requirements as follows.

3.7.1. Product Requirements

3.7.1.1. Usability Requirements
Since the course registration process and series of courses are included in the map, it is important to intuitively know what action to take from the user's point of view for the first time. Since the user interacts with the system through graphics by connecting through a VR device or computer, graphic objects should be used rather than displaying the manual in a text box. Users who enter the map for the first time should be able to learn how to use the map without any problems.

3.7.1.2. Security Requirements
In the case of student number or course registration, we have to pay attention to security because it is personal information.Also, since it is a map for Sungkyunkwan University students, it should be distributed so that only authorized users can use it.

3.7.2.   Organizational Requirements
3.7.2.1.   Environmental Requirements
As it imitates the existing Sungkyunkwan University course registration system, subject information must be obtained from the Sungkyunkwan University website.
3.7.2.2.   Operational Requirement
In addition to the course registration system, a space to talk about subjects must be implemented. Users can log in to the map through your student number.

3.7.3.   External Requirements
3.7.3.1.   Safety / Security Requirement
The system should guarantee that any personal information is not accessed by external system. In addition, unauthorized users must not access, modify/delete other people's information without permission.

3.8.   Organizing the specific Requirements

In this section, we are going to describe the system model using graphical notation based on Unified Modeling Language(UML), tabular form and sequence diagrams. By using sequence diagrams, we add detail by showing the sequence of event processing in the system.

System model describes the relationships among the system, sub-systems, components, and surrounding environments.

3.8.1.   Context Model
By representing the functional model of the system by diagram, it is easy to understand which functions are inside the system and which functions are outside the system.
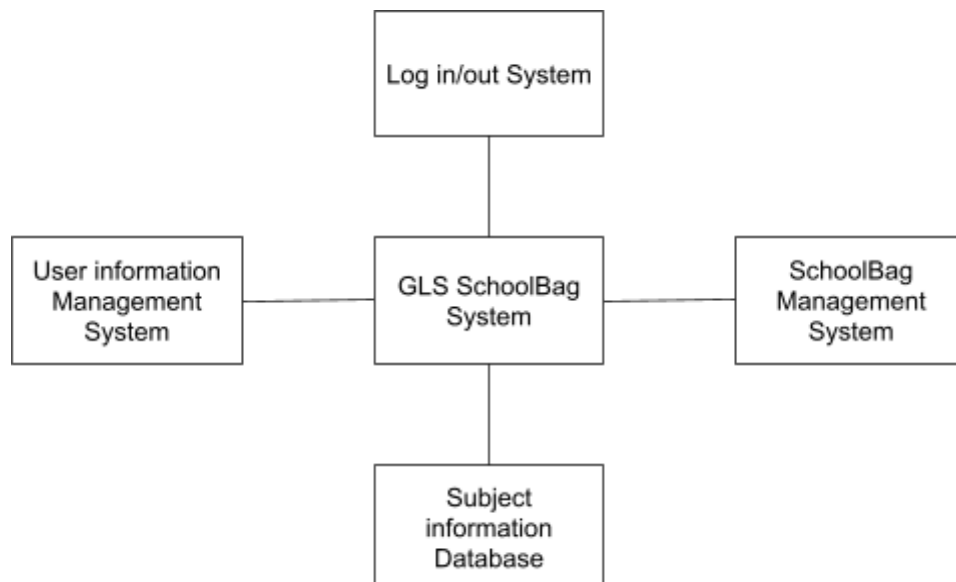
[Figure 3] Context model

3.8.2. **Process Model**

It is defined as an activity diagram of UML, and define the system used for each activity. It shows how the system is connected to the external system.
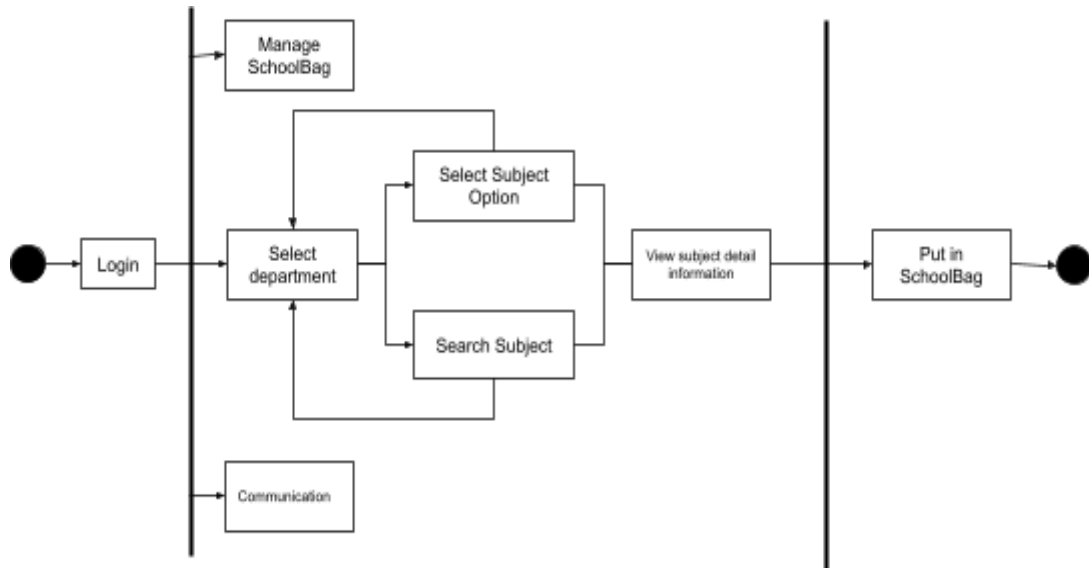
[Figure 4] Overall process model
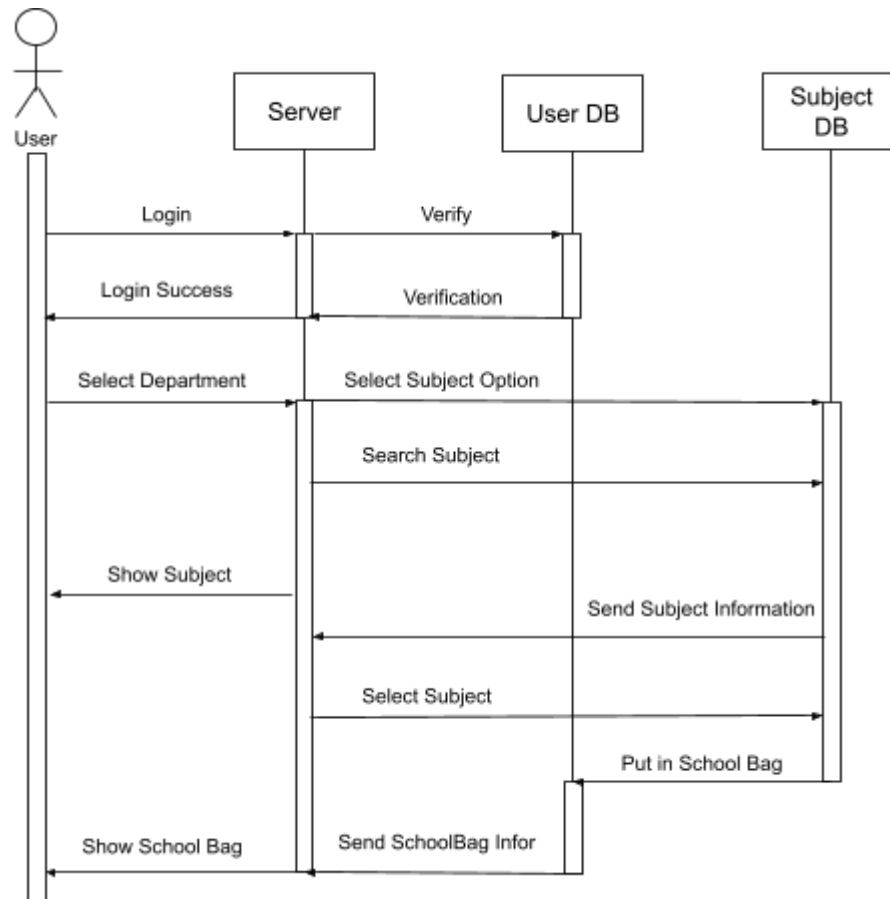
3.8.3. **Interaction Model**

See 3.2.2. Use Case Diagram

3.8.4.   Behavior Model

3.8.4.1.   Data Flow Diagram
See 3.2.4. Data Flow Diagram

#### 3.8.4.2.   Sequence Diagram
Using sequence diagram, we represents the interaction between user and system, system and system, and component and component.

[Figure 5] Sequence diagram

3.9.   System Architecture

In this section we describe the system architecture. It presents the overall structure of the system, composition of each subsystem and the relationship between subsystems by using diagram.
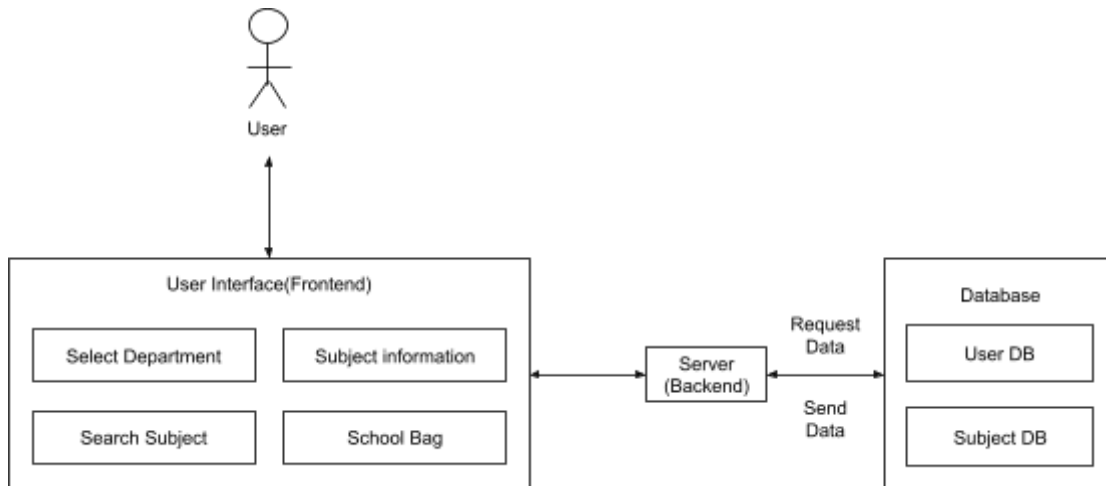
[Figure 6] System architecture of the system

3.10.   System Evolution

In this section, we describe the limitation and assumption to service this system, and anticipate the changes in requirements that occur due to software evolution and changing user requirements.

3.10.1.   Limitation and Assumption

The GLS SchoolBag System is only dealing with students who registered and attending the SungKyunKwan University(SKKU). Because all the subjects that are stored in Subject DB only exist and are opened by SKKU. And we are only dealing with the regular semester subject. For the seasonal semester, there are not many users registered for the seasonal semester and not many subjects are open. So we assume that users are only SKKU students and system only service for regular semesters.

3.10.2.   Change of User Requirements

If the service is provided only to SKKU, the users are too limited and it is not cost-effective to maintain the service. Also, the number of students enrolled in SKKU is limited, so we cannot get more users. If we provide the service not only SKKU but also to other university, we can get more user and so we can cost-effectively maintain the service.

Provide the service to other university, there would be many user using our system. It means that user requirements would be changed. To provide the service to other university, we need to consider how other university search or find subject and how they manage the subject before course registration.
And if there are many user using our system, we cannot ignore the number of students who register for the seasonal semester. So, we prepare to provide the service to seasonal semester.

4. Supporting Information

4.1. Software Requirement Specification

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

4.2. Document History

Date	Description	Writer
2021/10/23	Addition of 2.1, 2.2	Hyunseong Na
2021/10/23	Addition of 2.3, 2.4, 2.5	Seowang Park
2021/1025	Revision of 2.3	Hyunseong Na
2021/10/25	Addition of 3.8.1	HanBeul Kim
2021/10/25	Addition of 3.3	HwanSeung Chang
2021/10/26	Addition of 3.8.2	HanBeul Kim
2021/10/26	Addition of 3.4,3.5	HwanSeung Chang
2021/10/27	Addition of 3.8.3, 3.8.4	HanBeul Kim
2021/10/27	Revision of 3.4	HwanSeung Chang
2021/10/28	Addition of 3.9, 3.10	HanBeul Kim
2021/10/28	Addition of 3.6	HwanSeung Chang
2021/10/29	Revision of 3.8.2, 3.8.4	HanBeul Kim
2021/10/29	Addition of 3.7	HwanSeung Chang
2021/10/29	Addition of 3.2.1, 3.2.2	Hyunjeong Lee
2021/10/29	Addition of 3.1	Yebin Park
2021/10/29	Addition of 1.1, 1.2, 1.5	Seonye Lee
2021/10/30	Revision of 3.1	Yebin Park
2021/10/30	Revision of 3.7	HwanSeung Chang
2021/10/30	Addition of 3.2.3, 3.2.4	Hyunjeong Lee
2021/10/30	Addition of 1.3, 1.4, 4.1	Seonye Lee
2021/10/31	Revision of 3.2.1, 3.2.3	Hyunjeong Lee
2021/10/31	Revision of 2.3, 2.4	Seowang Park

2021/10/31	Addition of list of figures, list of tables, Revision of Contents	Seonye Lee