Software Design Document

for Virtual Room Reservation Assistant

Version 2.0

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B10715037 張家菁

B10715016 梁欣童

B10730033 宋旻芸

B10715053 吳政杰

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1. Introduction

1.1 Purpose

The purpose of this document is to describe the overall structure of our meeting room reservation system, as well as the detailed content inside of the system, the detailed functions of the objects in the system, and the detailed functions of different functions, and part of the original code. Therefore, this document is mainly used for users or managers with engineering background. Of course, if you don’t have engineering background, you are welcome to read this document and learn about the principles and architecture of the system.

1.2 Scope

The purpose of this meeting room reservation system is to allow people who need to use the meeting room to make online reservations, thus saving many unnecessary procedures. For example, spending lots of time commuting just to reserve meeting rooms in person, and there may be times when all rooms are full , this situation can be avoided after using this system, which saves both manpower and time.

1.3 Overview

The following is the overview of this document:

Chapter 1 Introduction

This chapter is mainly used to introduce the chapters of this document, and some reference documents and explanations of terms.

Chapter 2 System Overview

This chapter is an introduction to the system.

Chapter 3 System Architecture

This chapter is used to introduce the main internal architecture of the system, which contains some visual graphics of the model to help users understand, such as the ER model.

Chapter 4 Data Design

This chapter is used to introduce the data structure design of this system.

Chapter 5 Component Design

This chapter is used to introduce some internal functions (including code) and the role of objects.

Chapter 6 Human Interface Design

This chapter is used to introduce some system UI and user interface graphics.

Chapter 7 Requirements Matrix

This chapter shows some system requirements, which will be presented in the form of tables.

1.4 Reference Material

There are two extra files here, if you are interested in this system, you can also check it out.

1. SRS document.[1]
2. Architecture document.

1.5 Definitions and Acronyms

1. SRS document: SRS doucment is a software requirements specification (SRS) helps you lay the groundwork for product development.[1]

2. System Overview

Functional Analysis

Input: Collect the commands that users want to perform actions on the system, such as pressing buttons, inputting data, etc.

Output: According to the user's behavior, the corresponding data presentation, appointment and other processes are carried out.

Process

- User query reservation information
- User (management level) queries all user reserving data
- Recall reserved data
- User cancels reservation
- Determine whether cancel reservation or not (whether it is within the time limit)
- User reserves reference room
- Determine whether the reference room can be borrowed or not (whether the number of people meets the limitation)
- The user (management level) changes the authority of other users
- Determine whether one has the authority to change the user's authority
- The user (management level) changes the room settings

Modules

According to the functions of this system, we can divide the modules into the following five types:

1. login module
2. reservation module
3. record module
4. setting module
5. exit module

login module

The module that allows users to log in.

reservation module

A module for users to reserve a reference room, which contains the reference room's ID number, date, time, attendees and other information.

record module

A module for users to inquire about reserving records, which includes the function that allow users to cancel.

setting module

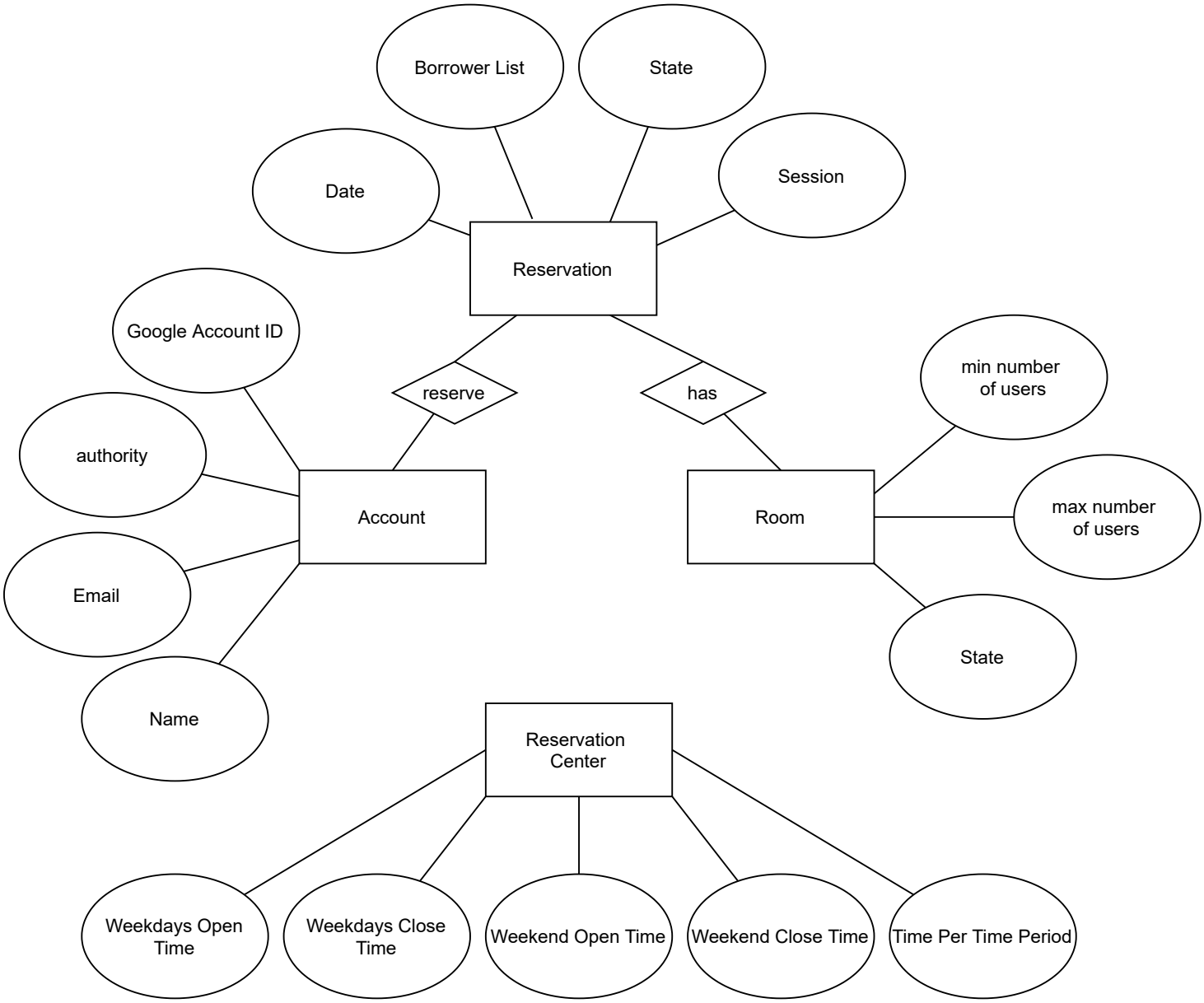
Only for managers, it is a module for managers to set room data and user's authority.

exit module

The module that allows users to log out.

3. System Architecture

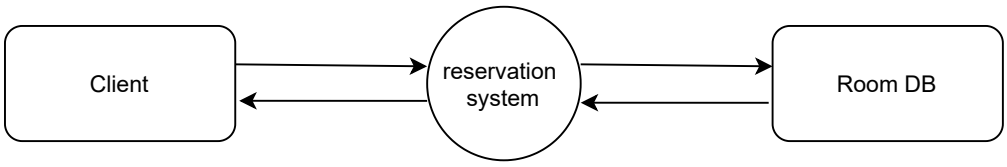
3.1 Architectural Design



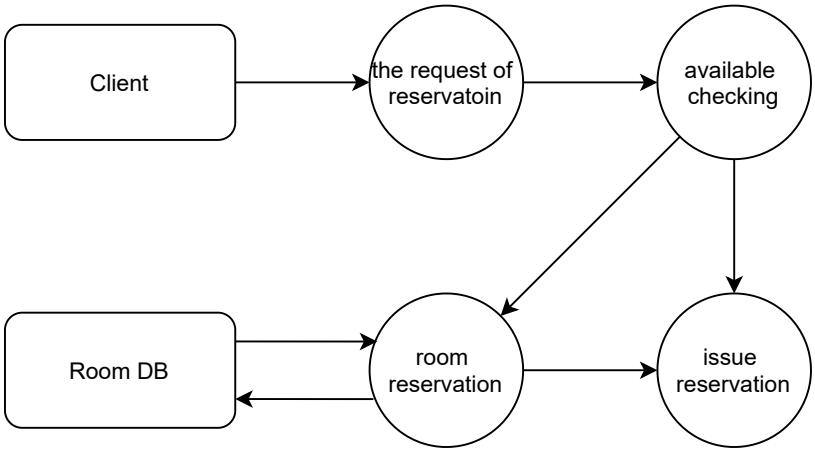
3.2 Decomposition Description

Data Flow Diagram:

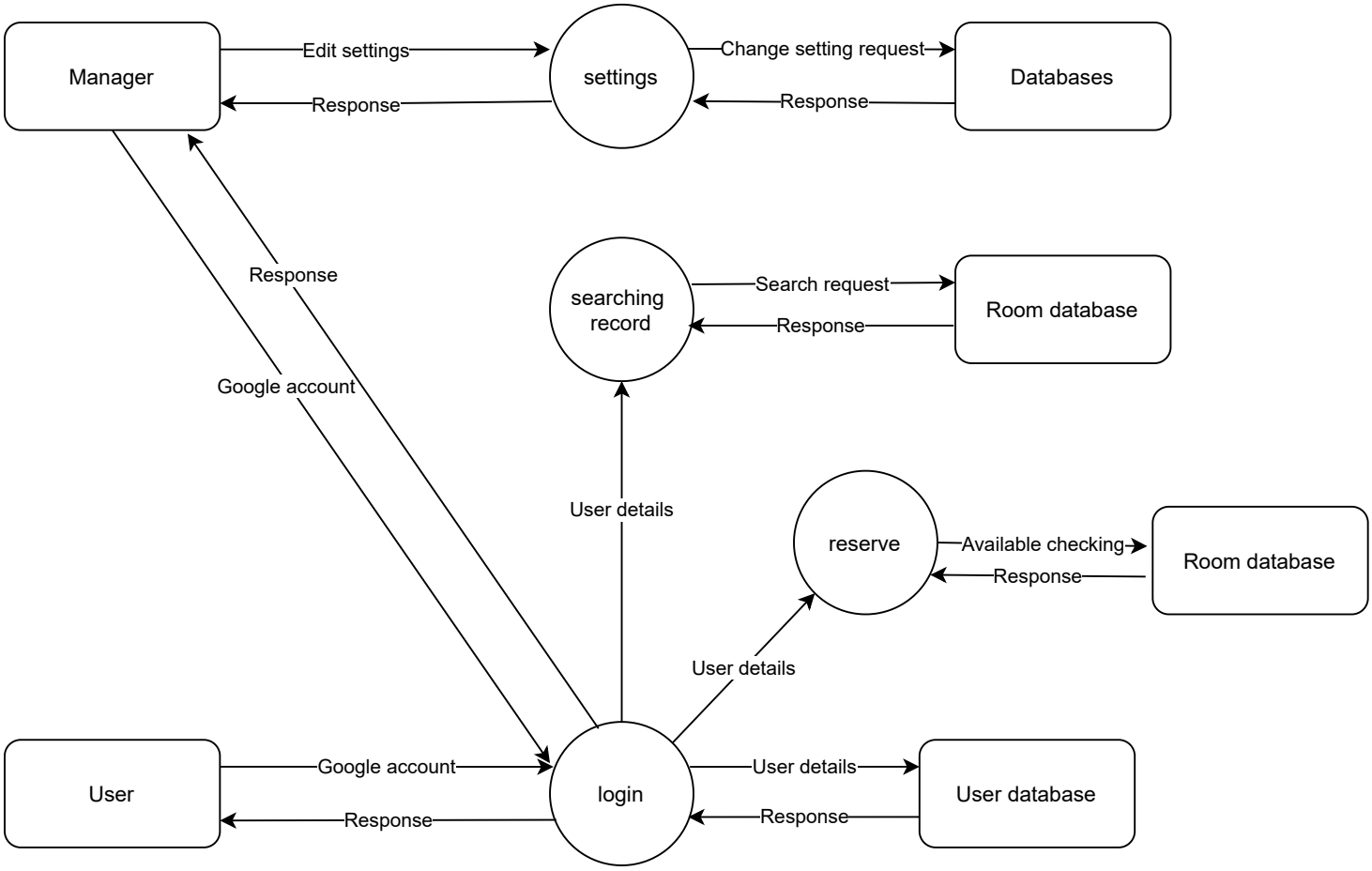
level 0:



level 1:



level 2:



3.3 Design Rationale

In section 3.1, we can see that there are four main entities. According to these four entities, users can know the architecture of the entire system more easily. Through the diagram in section 3.1, users can also know the attributes of each entity very easily, and could infer that what kind of data the system will need when the system is operating, and how the entire system works, too. We think it would be more convinient for users to get familiar with our system.

4. Data Design

This section describes the category of data required by the system. The data listed below showed the entity relationship of the system.

4.1 Data Description

This section explain how the information domain of the system is transformed into data structures. It also show the major data such as database and data storage items used in system.

- A List of Room including:
  - Room number (Room ID)
  - The maximum number of total attendees
  - The minimum number of total attendees
  - The condition of the room (enable or disable)
- The information about the reservation center:
  - The open hours during weekdays
  - The closed hours during weekdays
  - The open hours during weekend
  - The closed hours during weekend
- The information about the room that user reserved:
  - Room number (Room ID)
  - The password of the Room
  - Reservation's date and time
  - The rules of the room
- The information of Reservation made:
  - User's Name
  - attendees' email
  - Room number (Room ID)
  - Date and Time of the reservation
  - The Number of attendees
  - Duration
- User Information, most importantly containing:
  - Google client ID
  - User's Room reservation records
  - User Privilege
- Manager Information, most importantly containing:
  - Manager Google client ID
  - Manager Privilege

4.2 Data Dictionary

This section list the major data of the system by a table. As the table listed below describes the field name, data type, data format, field size, description and is it accepts null value.

Account

Field Name	Data Type	Data Format	Field Size	Description	Accepts null value?
id	String	OOOOOOOO-OOOO-OOOO-OOOO-OOOOOOOOOOOO	128	The id of the user	N
privilege	Int		16 bit	Defined the user's privilege	N
email	String	OOO@OOO.OOO	128	Defined the user's email	N
name	String		256	Defined the user's name	N

Room

Field Name	Data Type	Data Format	Field Size	Description	Accepts null value?
id	Int		16 bit	The id of the room	N
maxNumber_of_users	Int		16 bit	The maximum number of total attendees	N
minNumber_of_users	Int		16 bit	The minimum number of total attendees	N
enable	Bool			The room is enable or disable	N

Reservation

Field Name	Data Type	Data Format	Field Size	Description	Accepts null value?
id	int		128	The id of this reservation	N
user_id	String	OOOOOOOO-OOOO-OOOO-OOOO-OOOOOOOOOOOO	128	The id of the user	N

Field Name	Data Type	Data Format	Field Size	Description	Accepts null value?
room_id	Int		16 bit	The id of the room	N
participantsEmail	String	OOO@email.com;OOO@email.com..	1280	The participants' email	Y
session	int		8 bit	a period of time arranged for the reservation	N
date	date	yyyy-MM-dd		The date of the reservation	N
disable	Bool			The room is enable or disable	N

Reservation_Center

Field Name	Data Type	Data Format	Field Size	Description	Accepts null value?
weekdays_open_time	time	hh:mm:ss.fffz		The open hours of the reservation center during weekdays	N
weekdays_close_time	time	hh:mm:ss.fffz		The close hours of the reservation center during weekdays	N
weekdend_open_time	time	hh:mm:ss.fffz		The open hours of the reservation center during weekend	N
weekdend_close_time	time	hh:mm:ss.fffz		The close hours of the reservation center during weekend	N
time_per_time_period	time	hh:mm:ss.fffz		The length of duration	N

5. Component Design

Class name: Reservation

Brief Description:	
Attributes (fields)	**Attributes Description**
int id;	serial number of reservation record
	Program Description Language
	private int id;
string userID;	**Attributes Description**
	User that reserved conference room
	Program Description Language
	public string userID;
int roomID;	**Attributes Description**
	Reserved conference room
	Program Description Language
	public int roomID;
string borrowerList;	**Attributes Description**
	People who reserved conference room together
	Program Description Language
	public string borrowerList;
bool disable	**Attributes Description**
	Whether to cancel or not
	Program Description Language
	public bool disable;
int session;	**Attributes Description**
	Reserved time period
	Program Description Language

	public int session;
Datetime date;	**Attributes Description**
	Reserved date
	Program Description Language
	public Datetime date;
Methods (operations)	**Method Description**
void create();	Create reservation record
	Program Description Language
	db.Reservations.Add(reserveModel);
void cancel();	**Method Description**
	Cancel the reservation
	Program Description Language

	System.Models.Reservations reservation = (from s in db.Reservations where s.Id == id select s).First();
	
	reservation.Disable = true;
	
	db.SaveChanges();

void show();	**Method Description**
	According to the authority and query content, the reservation record will be sent to users
	Program Description Language

	if (user.Authority > 0) {
	
	reservations = (from s in db.Reservations select s).ToList();
	
	}
	
	else
	
	{

	reservations = (from s in db.Reservations where s.AspNetUserId == ASPNetUserID select s).ToList();
	}
	if (Date != null)
	{
	DateTime date = DateTime.ParseExact(Date, "yyyy-MM-dd", System.Globalization.CultureInfo.InvariantCulture);
	reservations = reservations.Where(x => x.Date == date).ToList();
	}
	if (roomId != null)
	{
	reservations = reservations.Where(x => x.RoomId == roomId).ToList();
	}
	}

Class name: Account	
Brief Description:	
Attributes (fields)	**Attributes Description**
int id;	User ID
	Program Description Language
	public int id;
int authority;	**Attributes Description**
	User's authority
	Program Description Language
	public int authority;
string email;	**Attributes Description**

	User’s google email
	Program Description Language
	public string email;
string name;	**Attributes Description**
	User name
	Program Description Language
	public string name;
Methods (operations)	**Method Description**
void create();	Create reserving record
	Program Description Language
	db.Account.Add(accountModel);
void editAuthority();	**Method Description**
	Edit user’s authority
	Program Description Language
	System.Models.AspNetUsers user = (from s in db.AspNetUsers where s.Id == Id select s).First(); user.Authority = int.Parse(Authority);
void show();	**Method Description**
	Return all users
	Program Description Language
	List<System.Models.AspNetUsers> users = (from s in db.AspNetUsers select s).ToList(); return users;

Class name: Room
Brief Description:

Attributes (fields)	Attributes Description
int id;	serial number of conference room
	Program Description Language
	private int id;
int minNumberOfUsers;	**Attributes Description**
	Min number of people using conference room
	Program Description Language
	public int minNumberOfUsers;
int minNumberOfUsers;	**Attributes Description**
	Max number of people using conference room
	Program Description Language
	public int minNumberOfUsers;
bool enable	**Attributes Description**
	Is the conference room available or not
	Program Description Language
	public string enable;
Methods (operations)	**Method Description**
void create();	Create a conference room to the system
	Program Description Language
	db.Reservations.Add(roomModel);
void edit();	**Method Description**
	Edit data and settings of conference room
	Program Description Language
	System.Models.Rooms room = (from s in db.Rooms where s.Id == id select s).First();

	room = roomModel;
void delete();	**Method Description**
	Delete conference room(Only set room as unavailable)
	Program Description Language
	System.Models.Rooms room = (from s in db.Rooms where s.Id == id select s).First(); room.Enable = false;
void show();	**Method Description**
	Return all of the information of conference room
	Program Description Language
	List<System.Models.Rooms> rooms = (from s in db.Rooms where s.Enable select s).ToList(); return rooms;

6. Human Interface Design

6.1 Overview of User Interface

Login

- User Login Interface
- View any interface that need user to login. After any action is done successfully will lead the user back to this interface. After login successfully, the website will lead the user back to the main page.

Home

- An interface introducing the system.
- Only allowing the users who have logged in to access.

Reserve

- The interface that user reserves a meeting room here.
- Only allowing the users who have logged to access.

Record

- The interface that display the reservation record.
- Only allowing the users who have logged in to access.
- Common users can only access their own reservation record, the manager can view all the record within the database.
- General users can only view their own reservation record, the manager can view all the records in the database.

RoomCenterSetting

- The interface that the manager manages the system settings and selects the meeting rooms whose settings need to be changed.
- Only the managers who have logged in can access.
- It is an interface that manages the system settings and selects the meeting rooms which it's settings need to be changed.

RoomSetting

- The interface that the manager manages the overall setting of the meeting room and lists all the meeting room.
- Only the managers who have logged in can access.

RoomCreate

- The interface that the manager create a new meeting room in the system.
- Only the managers who have logged in can access.

UsersSetting

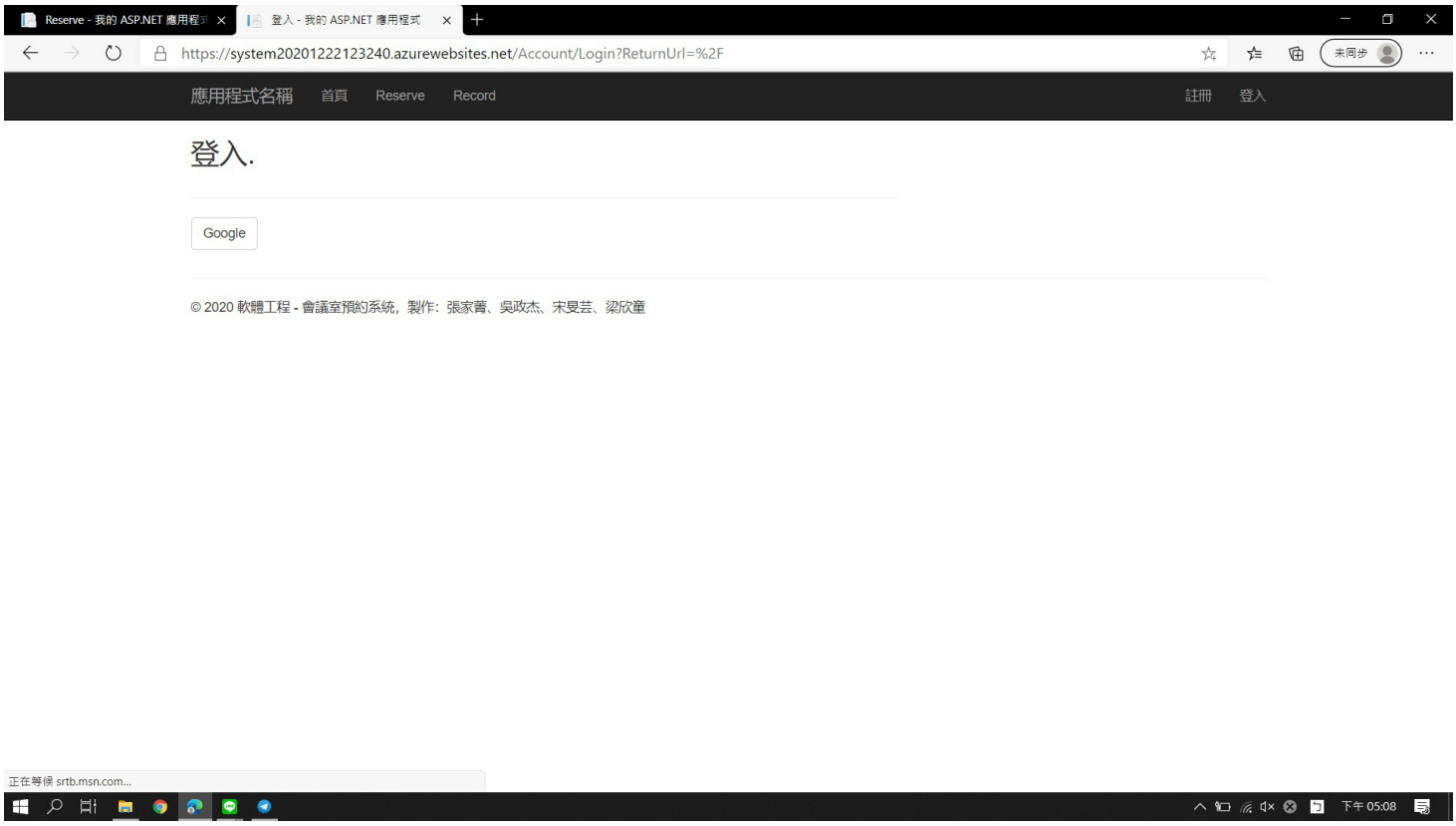
- Only the managers who have logged in can access.
- The interface that show all the users and the manager can select a user for editing his/her information.

UserEdit

The interface that the manager edits the user's privilege.
Only the managers who have logged in can access.

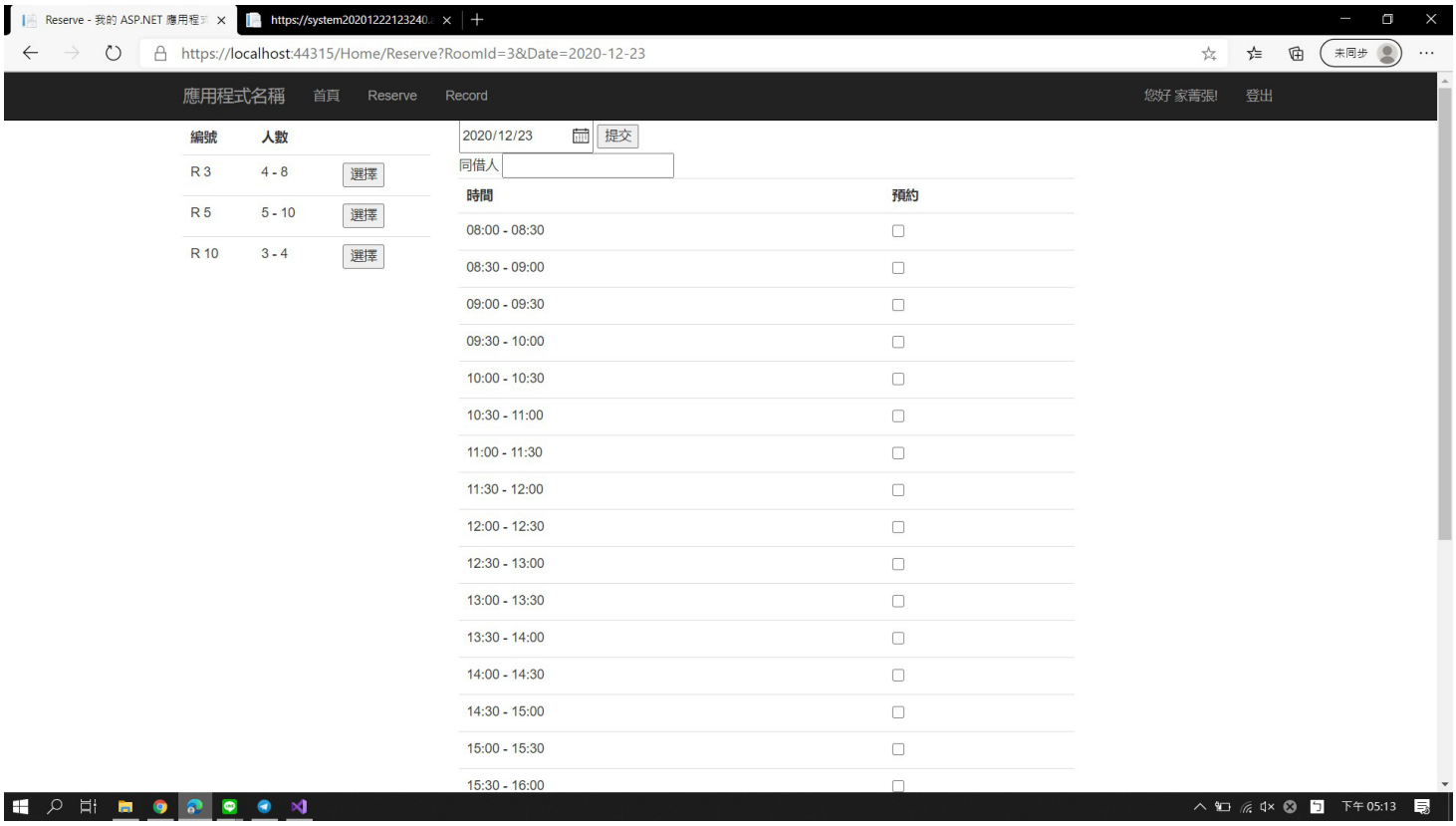
6.2 Screen Images

Login

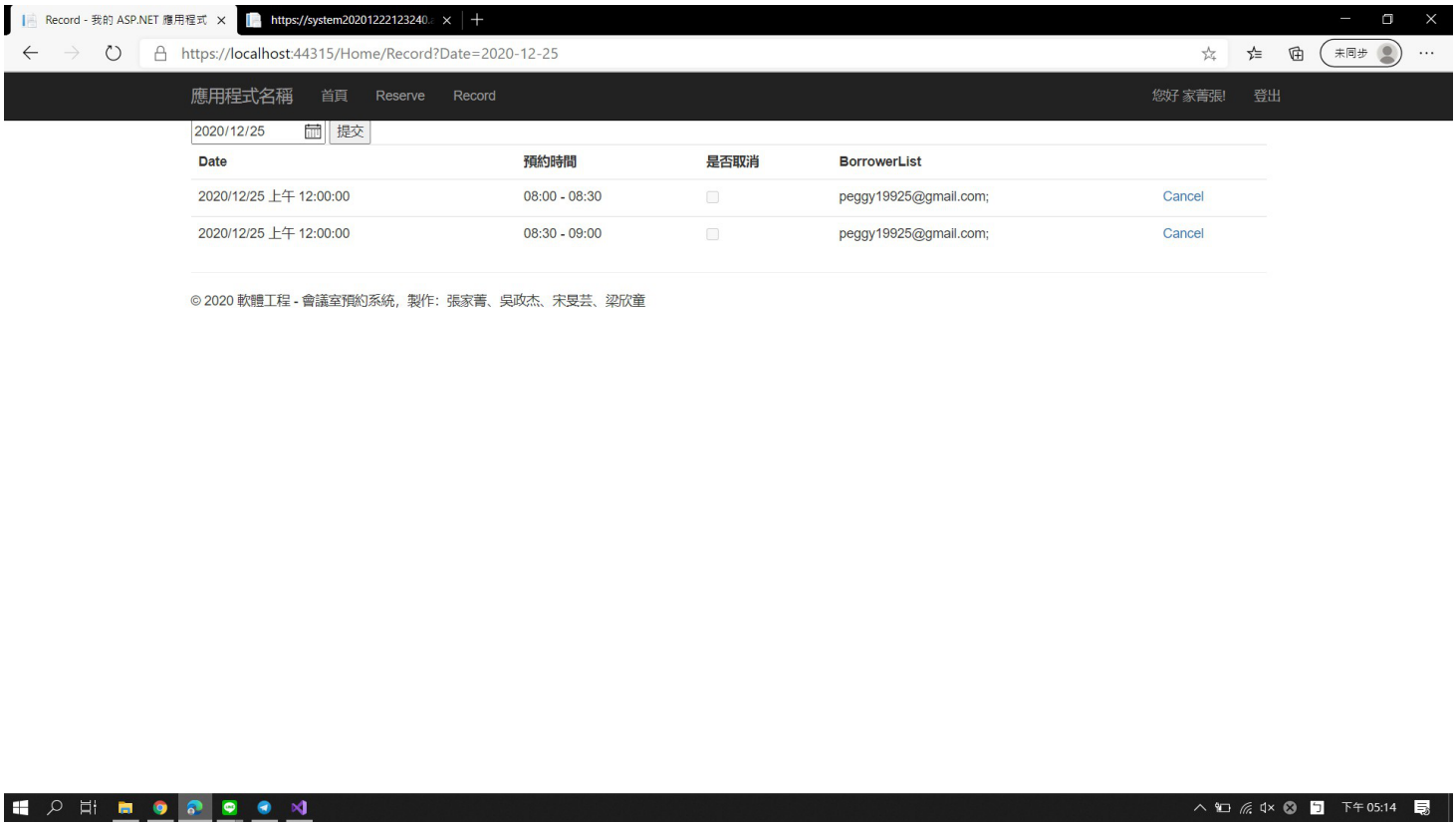


Home

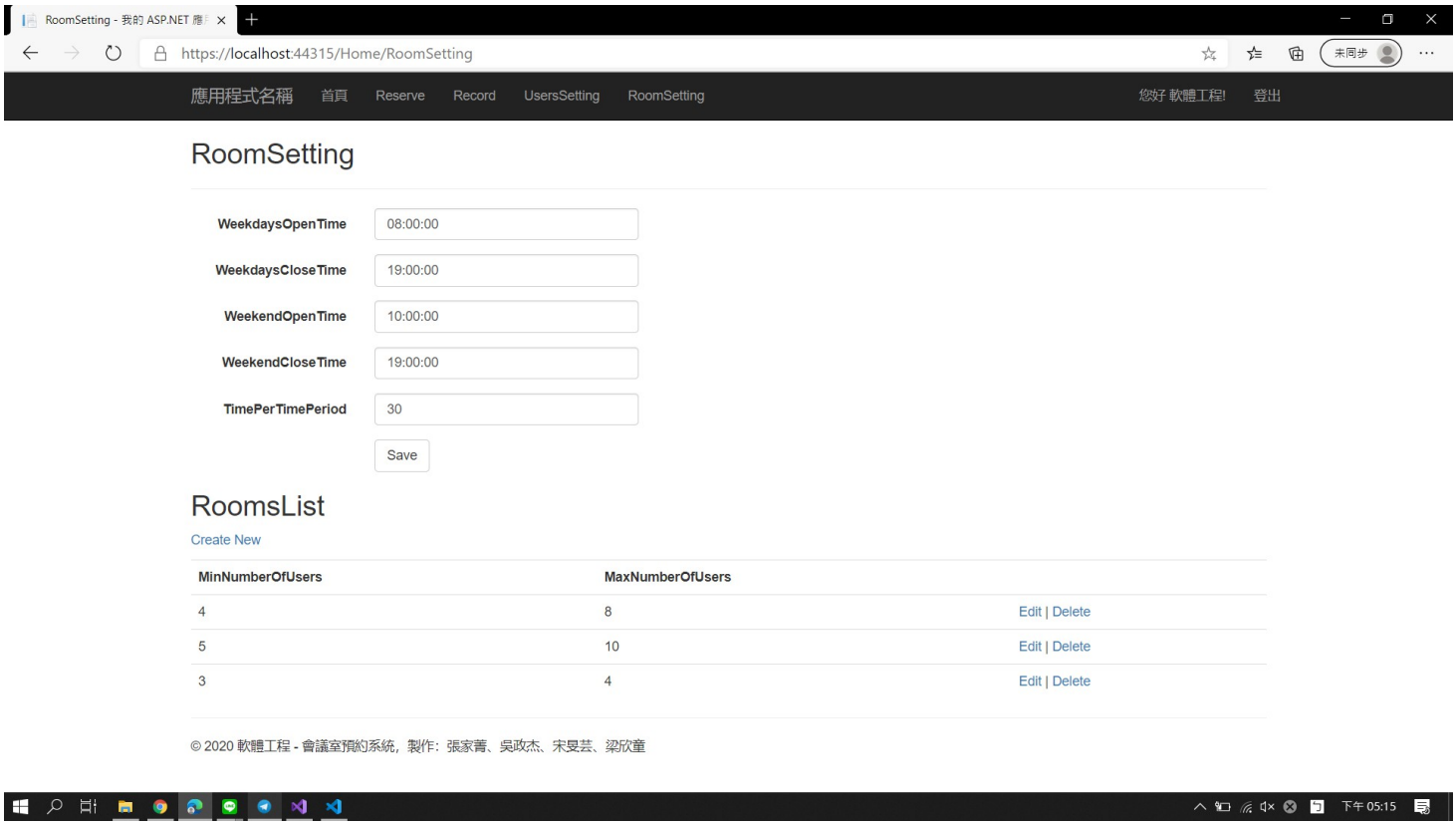
Reserve



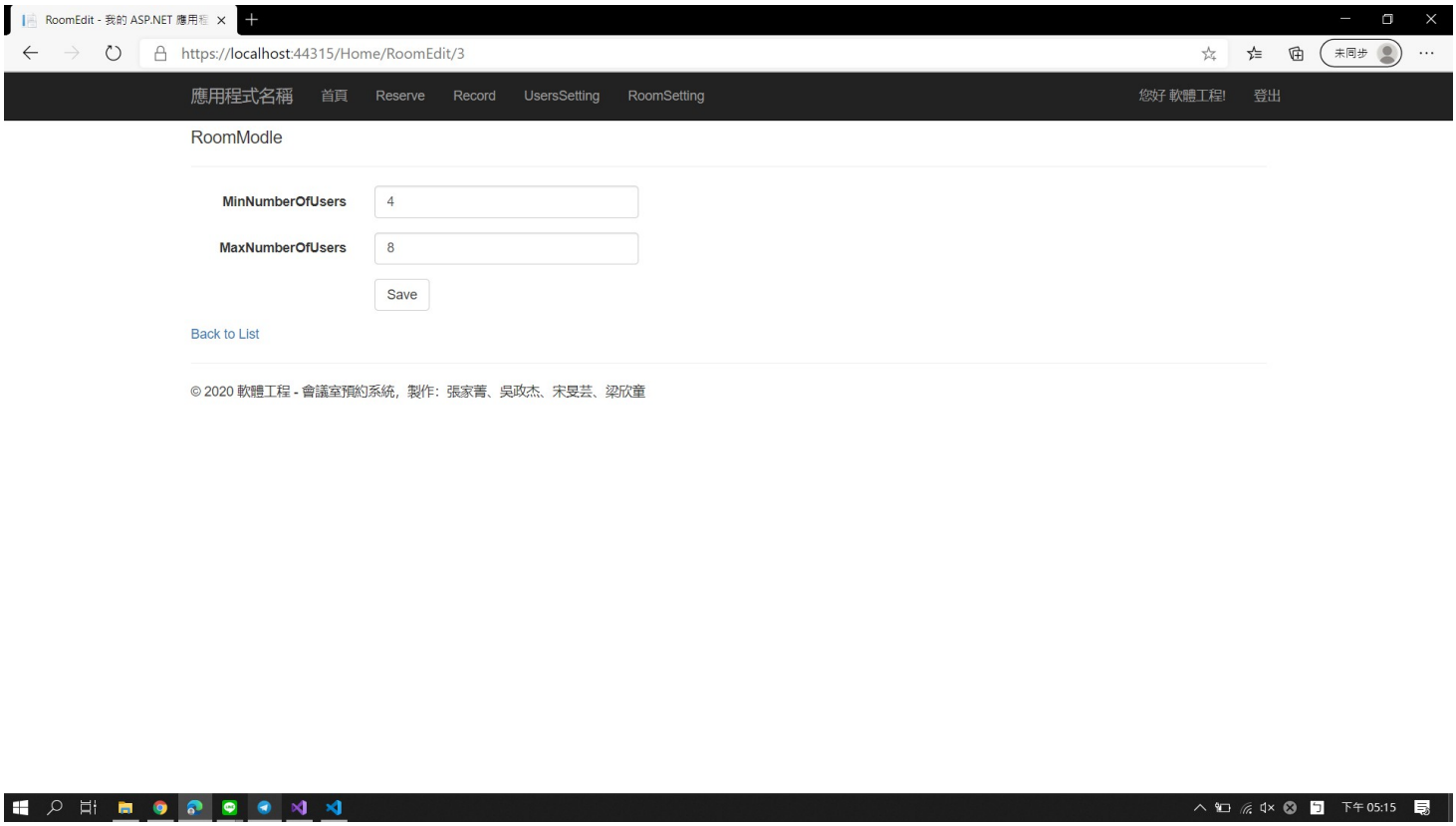
Record



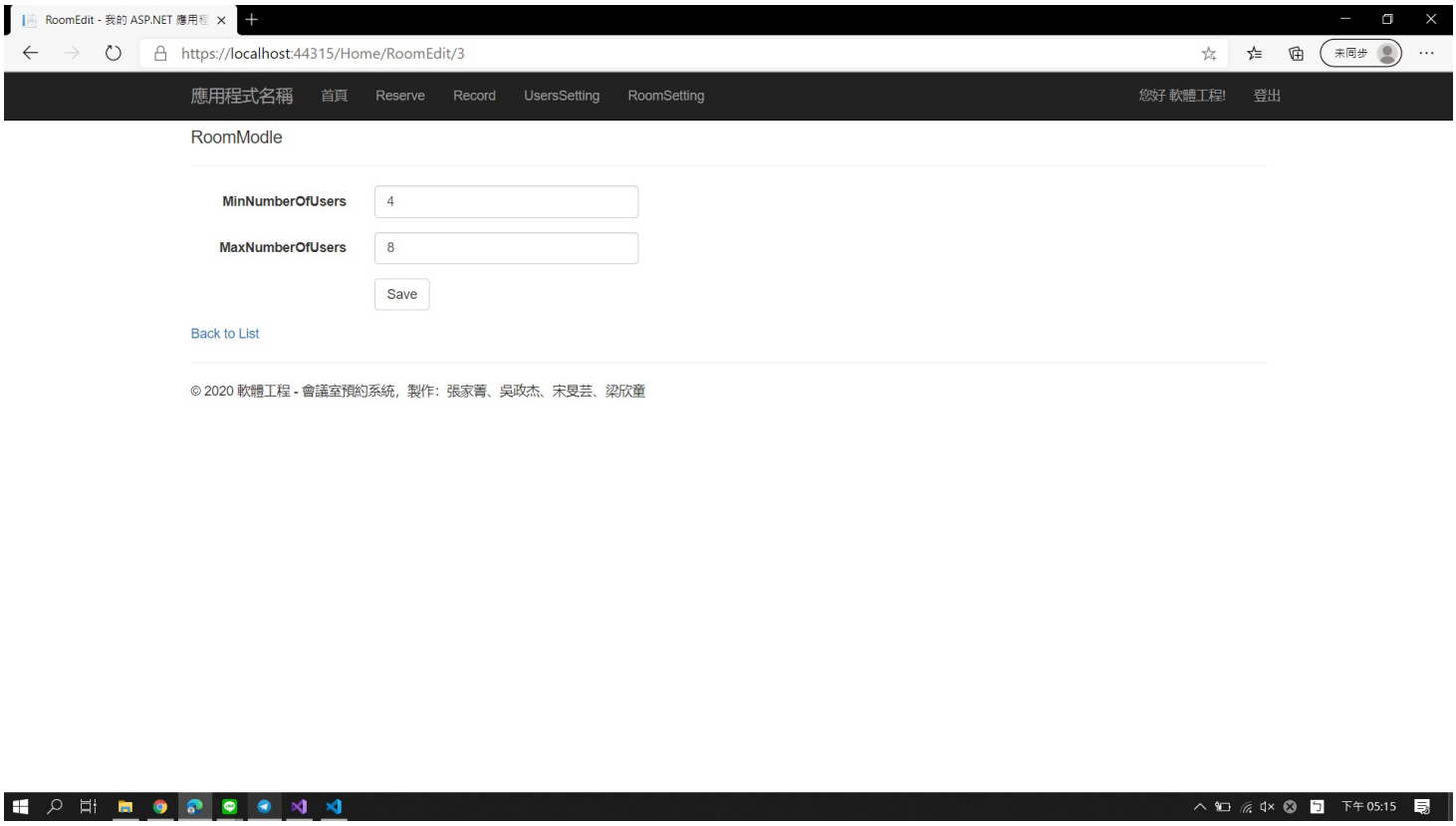
RoomCenterSetting



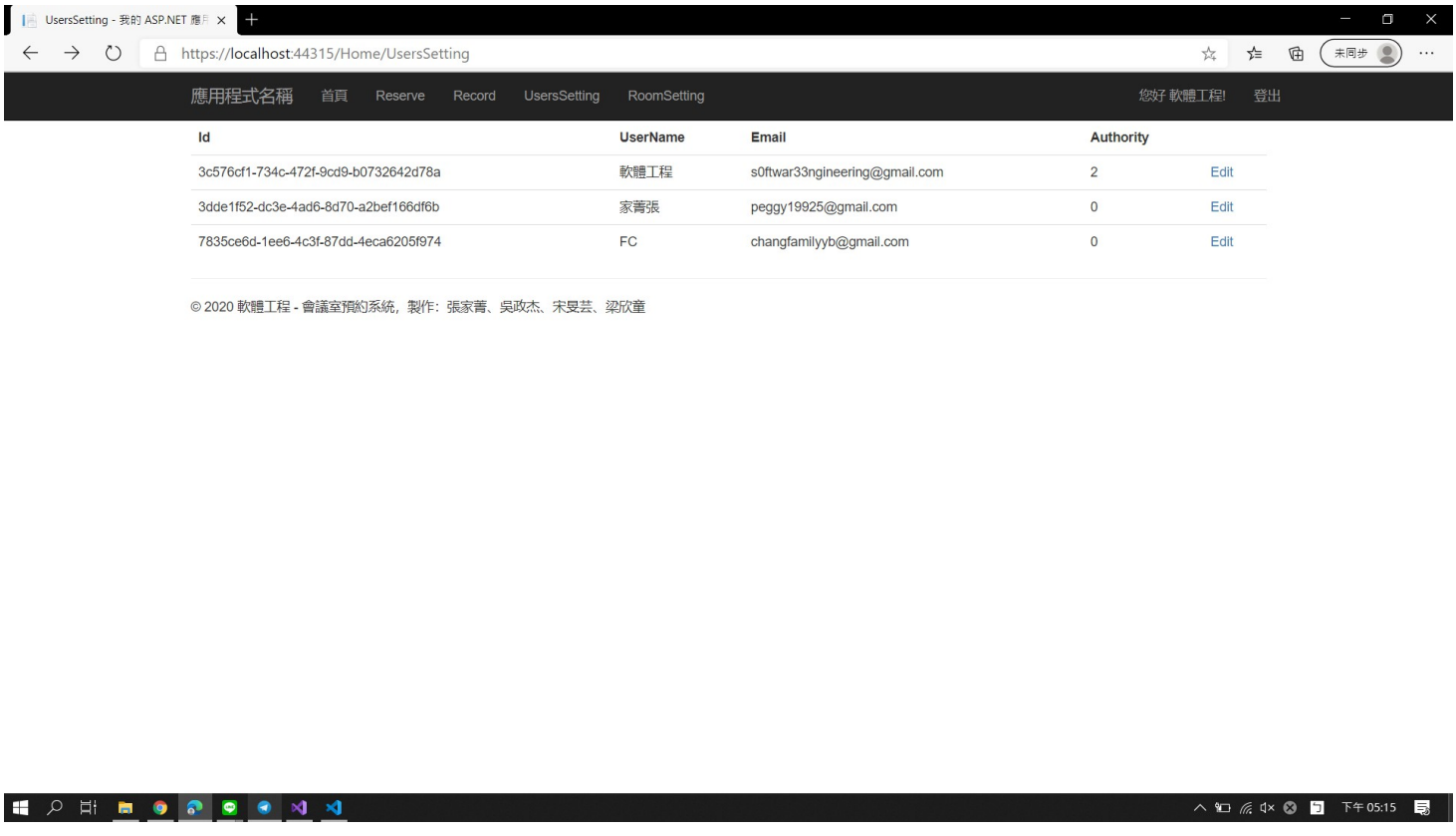
RoomSetting



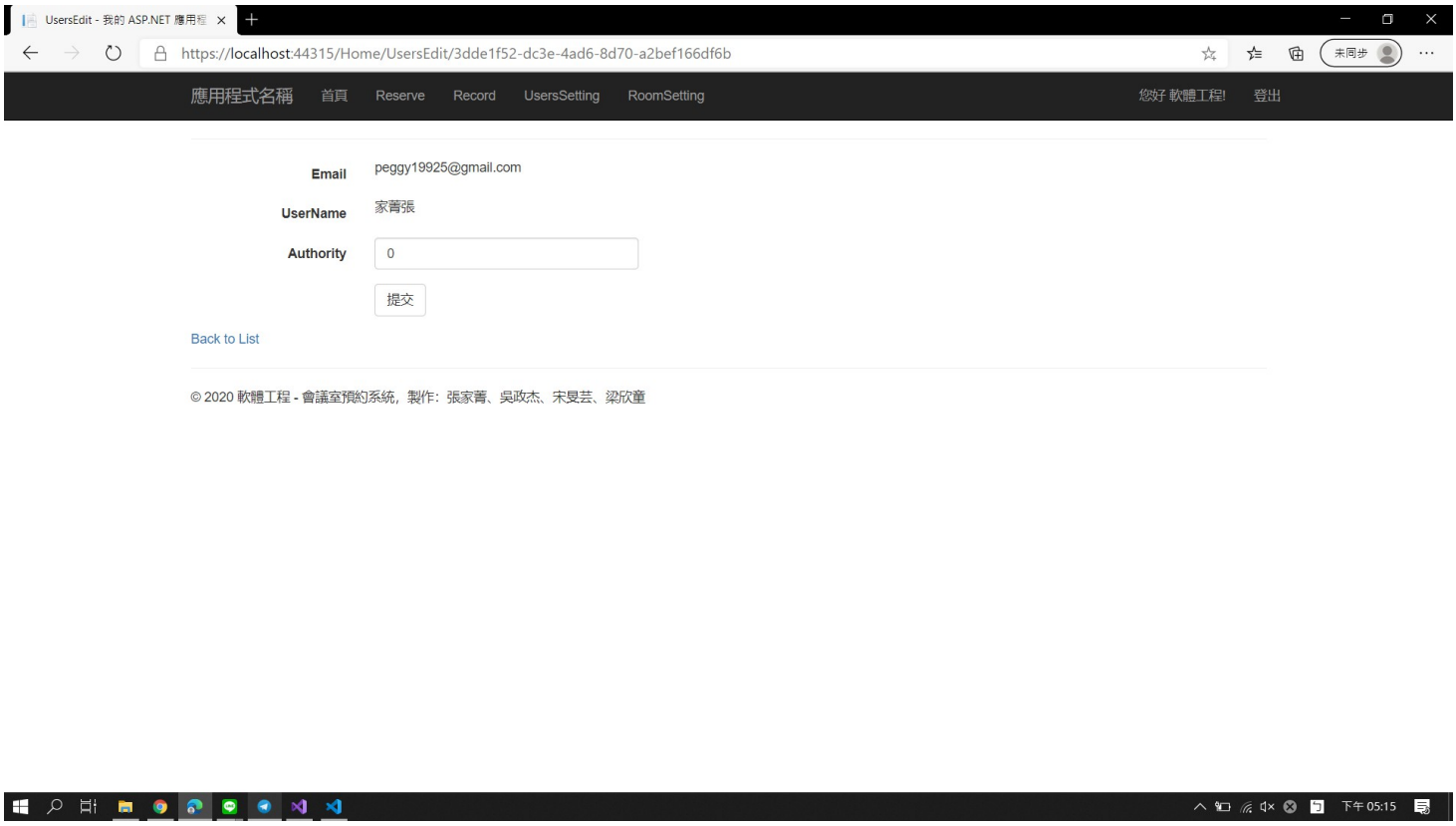
RoomCreate



UsersSetting



UserEdit



6.3 Screen Objects and Actions

Login

- After clicking Google, call Google's Oauth 2.0 API to jump to the Google login interface and get user's identity.
- If it is the user's first login (that is, there is no user's data in the database), add a new user and add it to the database.
- If it is not the user's first login (that is, the user's data is already in the database), the user's data in the database is obtained.
- After getting the user's identity, according to the returnURL accessed by the query, direct to the original page opened by the user.

Home

This page can only be viewed when the user has logged in. This is the introduction page of the system.

Reserve

- When the user selects a conference room, it will send "get request" to the server side, the server side will reply for the reservation conditions of the meeting room selected by the user.
- When the user switch the selected meeting room to others, it will send "get request" to the server side, the server side will reply for the reservation conditions of the date selected by the user.
- After pressing "submit", it will sent "post request" to the server side, the server side will add a reservation record to the database which is based on the options selected by the user.

Record

- The server side replies the user's own reservation records to users.
- When clicking "date query", a get request will be sent to the server side, and the server side will respond the corresponding date's reservation record.

RoomCenterSetting

- After the server side confirms that the user is a manager, it will return the information of all conference rooms.
- After clicking "Save", the edited content will be sent to the server side by post request, and let the server side save the changes according to the roomid.
- After clicking "Edit Room" of any of the conference rooms, system will switch to the RoomSetting interface.
- After clicking any "Delete Room" of any of the conference rooms, a request will be sent to the system side, and "disable" in the corresponding roomid will be set to "true".
- After clicking "Create Room", it will switch to the RoomCreate page.

RoomSetting

- After the server side confirms that the user is a manager, according to the roomid clicked by the user, it will return all of the information of the corresponding room.
- When the user finishes editing, send post request to the system side, and let the system side save the changes according to the roomid.

RoomCreate

- The interface will be shown after the server side confirms that the user is a manager.
- After clicking "Finish", a post request will be sent to the backend, then the server side can add the new room data to the database.

UsersSetting

- After the server side confirms that the user is a manager, it will return all of the user's data.
- After clicking "Edit", it will switch to the UserEdit interface.

UserEdit

- After the back-endthe user confirmed as a manager, according to the incoming user id, it will return the data of the corresponding user.
- After the user finish editing, use post request to return data to the server side, then the system side can save the changes according to the roomid.

7. Requirements Matrix

REQ ID.	REQ Description	Components	Trace Description
REQ2.2.1 / REQ2.2.2 / REQ2.2.3	The login and logout system is using log-in-out module provides by google	Google Client ID	Google Client module can be used in system
REQ2.2.4	User Reserve Conference Room	Calendar	Select invalid date
		Room selection	Select no room
			Select a room which is disable
		System marks the time which is already reserved is disable	Select a room which is disable
			The table of conference room is marked automatically by the system
		User confirm	Sending a confirmed email to the user's email include the information about the reserved room
REQ2.2.5	User View own reserved record	Record Button	The module of record button works or not
		Search	Is the database works correctly
		Display Record	The table of reservation record display any error
			The table of reservation record display any error while the user have over one reservation records
REQ2.2.6	User cancels room reservation	Record Button	The module of record button works or not
		Search	Is the database works correctly
		Display Record	The table of reservation record display any error
			The table of reservation record display any error while the user have over one reservation records
		Cancel	After confirm cancelation, the database delete the reservation record correctly
		Room settings Button	The module of room settings button works or not
		(Single room's) Room selection	Select no room and change the overall setting, press save button

REQ2.2.7 / REQ2.2.8	Manager edits the room's / single room's overall settings	Recall	Is the database works correctly
		Display Room Information	The table of room's information display any error
			The table of room's informaiton display any error while there are a lot of data or reservation records
		Change	Changing the room setting with an invalid input
		Save Button	The module of save button works or not
			Find the database changed after pressed save button
REQ2.2.9	Manager: Search User	User settings Button	The module of user settings button works or not
		Search	Is the database works correctly
			Type any special characters for searching
			Type a name or ID which is not existed
		Search Button	The module of search button works or not
		Display information	The information table of user display any error
			The information table of user display any error while there are a lot of user
			Display every information about the user correctly
REQ2.2.10	Manager edits user's privilege settings	User settings Button	The module of user settings button works or not
		Call	Is the database works correctly
		Display information	The information table of user display any error
			The information table of user display any error while there are a lot of user
			Display every information about the user correctly
		Change privilege	Input wrong privilege setting
		Save Button	The module of save button works or not
			Find the user's privilege changed after pressed save button

			after pressed save button
REQ2.2.11	Manager views individual user's room reservation record	User settings Button	The module of user settings button works or not
		Call	Is the database works correctly
		Search	Is the database works correctly
			Type any special characters for searching
			Type a name or ID which is not existed
		Search Button	The module of search button works or not
		Display Information	The information table of user display any error
			The information table of user display any error while there are a lot of user
			Display every information about the user correctly
			The user's information displayed is matching the user searched by the manager
		View Button	The module of view button works or not
		Display Record	The table of reservation record display any error
			The table of reservation record display any error while the user have over one reservation records
			The user's reservation record displayed is matching the user searched by the manager