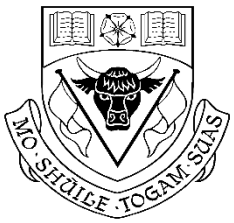


UNIVERSITY OF CALGARY

WELLNESS CENTER MULTI-AGENT SYSTEM

(Assignment 1: Design Document)

Group 7:

30221523 - Sara Montajab

30191990- Zahra Arabi

30192546 - Mahboobe Shakeri

30228075 - Amirhossein Foroughi

October 6, 2023

Table of Content

1. Project Background

Access to healthcare is one of the most important challenges in Canada. Although the healthcare system is funded in Canada, it often faces constraints and lengthy wait times even for non-emergency medical services.

Getting medical appointments can be a challenging task in Canada, and students should not worry about this additional stress while pursuing their education. Education is meant to be a life-changing experience, but when students are constantly anxious about accessing quality healthcare, it affects both their academic progress and their general well-being.

Also, with a significant number of international students in Canada, many students are far away from their friends and families. These students are already coping with the challenges of adapting to a new culture and they need a reliable and accessible healthcare system that covers their different mental and physical needs. A system that offers appointments for various reasons will provide them with a sense of security and support, which will help reduce the stress associated with living in a foreign country.

For these reasons, implementing a centralized appointment system at the university's student wellness center will help the students not to worry about accessing healthcare professionals when needed, allowing them to focus on their studies and personal growth. This is an important step toward overcoming the significant healthcare challenges for students in Canada.

2. Goal Identification

The primary goal of implementing this system is that it allows students to schedule various well-being service appointments at the university which ensures that every student has access to healthcare services. This goal aligns with the university's commitment to student well-being, ensuring that students can address a wide range of health concerns efficiently, whether they relate to physical health or mental health.

Additionally, this system empowers students to select healthcare providers based on their needs and preferences, which will result in enhancing the quality of care for students. With the help of this system, we create a healthier community at the university where students can focus on their educational pursuits with confidence in their easy access to healthcare resources.

For this project, we are going to use GAIA methodology for the analysis and design of our agent-based system. We chose the GAIA methodology since it can be used with a variety of multi-agent systems and is broad. It deals with both the macro-level (societal) and the micro-level (agent) aspects of systems. It's particularly interested in understanding how a community of agents collaborates to achieve system-level objectives, as well as specifying the tasks and responsibilities of each agent to accomplish this collective goal.

3. Project Functionalities

The system is required to adhere to the following functionalities.

- Allows users to register or log in through a user interface to the application.
- Check for the uniqueness of users in registration and authenticate the user using username, email, password, phone, and address in the login portal.
- Allow the user to select between different types of appointments: medical services, mental health services, chiropractic services, and massage services.
- Display the selected doctor availability and the user will be able to select their preferred appointment based on date and time.
- Allocate the selected date and time for the user in the scheduler.
- Send an email to the user confirming their appointment.
- Send the reminder email to the user within 24 hours before their appointment.

4. Assumptions

It is assumed that:

- Every user's distinct identity is established through their UofC email address (firstname.lastname@ucalgary.ca), ensuring that no duplicates exist.
- The system has a database that stores a list of all user information including usernames, email addresses, phone numbers, addresses, and authentication credentials, as well as their appointment history at the wellness center.
- The system maintains a database containing all available appointment services, along with details of the corresponding healthcare providers at the wellness center.
- Users have the flexibility to schedule available appointments according to their preferred service types, their preferred healthcare providers, and their preferred date and time.
- The system will automatically generate a detailed email to confirm the user's appointment.
- The system will automatically generate a detailed email as a reminder of the user's confirmed appointment.

5. System Requirements

The system should meet these requirements.

- The system should check for the uniqueness of the user in the registration process using the Users Database.
- The system should authenticate the user using the Users Database.
- The system should display different types of appointments, their available healthcare providers, and dates and times from the Appointment Database.
- The user should be able to select the preferred appointment type and healthcare provider.
- The user should be able to select the preferred appointment date and time.

- The system should reserve the selected appointment on the user's appointment history in the Appointments Database.
- The system should generate a detailed email and send it through the email service to the user.
- The system will generate a detailed reminder email and send it through the email service to the user within 24 hours before their appointment.

6. Role identification

We defined the following roles for the system.

Role		Client Portal
Description		This role serves as the point of interaction between the user and the system.
Protocols and Activities		ReadUserInput, RouteService
Permissions		read UserInput
Responsibilities	**Liveness**	UserInteraction = (UserInteraction, UserInput, Route)
	Safety	Correct routing and data display

Role		User Registration
Description		Manages the process of registering new users by collecting, verifying, and storing their information securely.
Protocols and Activities		RegisterUser, AuthenticateUser
Permissions		read UsersData, write UsersData
Responsibilities	**Liveness**	Register = (Register, User)
	Safety	Create user profile

Role		Login (User Authentication)
Description		Ensures that users log in securely and that their credentials are verified before granting access to the system.
Protocols and Activities		AuthenticateUser
Permissions		read UsersData, authenticate User
Responsibilities	**Liveness**	RequestAccess = (RequestAccess, User)
	Safety	Grants system access

Role		Appointment Scheduler
Description		Retrieves the available appointment times and assigns them upon confirmation.
Protocols and Activities		GetAppointments, SetAppointment
Permissions		read AppointmentsData, write AppointmentsData, write UsersData
Responsibilities	**Liveness**	GetAppointments = (GetAppointments, AppointmentsType, HealthcareProvider) BookAppointment = (BookAppointment, User, AppointmentsType, HealthcareProvider, Date)
	Safety	Returns available appointments, Book an appointment

Role		Appointment Confirmation Email Generator
Description		Generates and sends an appointment confirmation notification via email to the user once an appointment has been successfully scheduled.
Protocols and Activities		SendEmail
Permissions		read UsersData, read AppointmentsData
Responsibilities	**Liveness**	SendConfirmationEmail= (SendConfirmationEmail, User, Appointment)
	Safety	Confirmation Email Sent

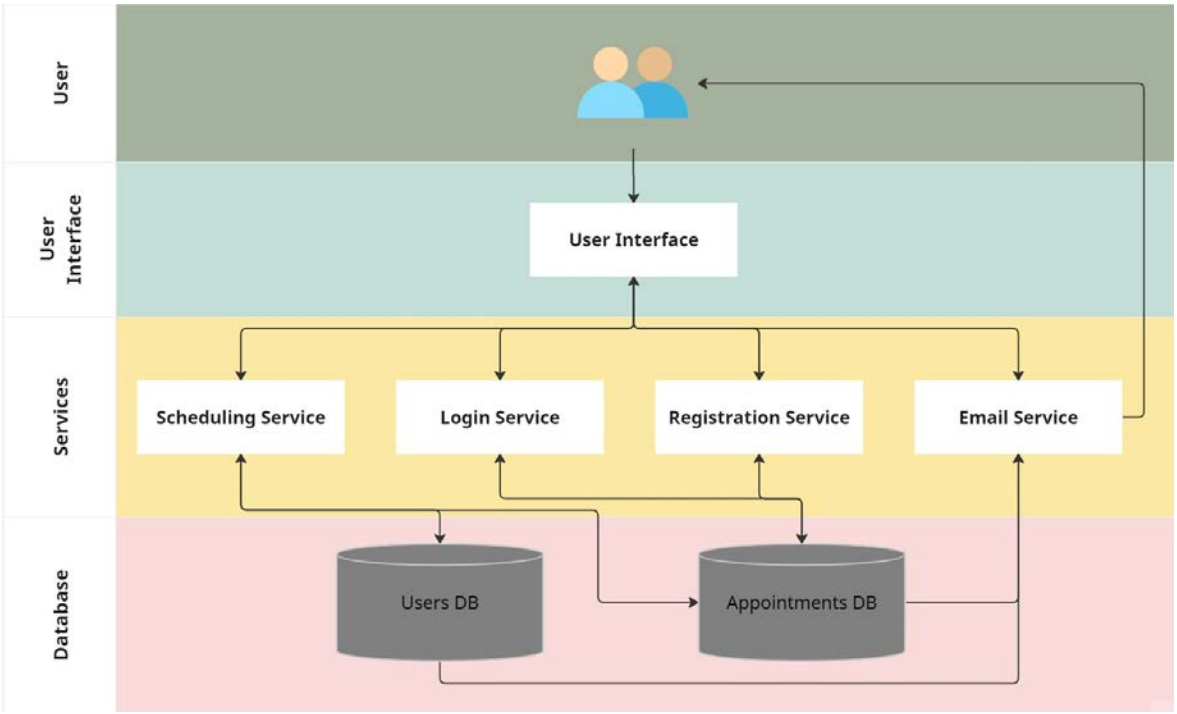
Role		Appointment Reminder Email Generator
Description		Generates and sends an appointment reminder via email to the user within 24 hours before the appointment.
Protocols and Activities		SendEmail
Permissions		read UsersData, read AppointmentsData
Responsibilities	**Liveness**	SendReminderEmail= (SendReminderEmail, User, Appointment)
	Safety	Reminder Email Sent

7. System Interactions

Protocol	UserInteraction	Register	RequestAccess	GetAppointments
Purpose / Parameters	Facilitate interaction between users and the system	Register user	Login user	Gather available healthcare providers appointments
Initiator	Web Browser	User Interface	User Interface	User Interface
Receiver	Web Server	Register	Login	Scheduling
Responding Protocol	Data presentation	Client registration success/fail	Client access granted/denied	List of appointments

Protocol	BookAppointment	SendConfirmationEmil	SendReminderEmail
Purpose / Parameters	Allocate preferred healthcare providers appointment	Generate and send confirmation email	Generate and send Reminder email
Initiator	User Interface	Scheduling	-
Receiver	Scheduling	Email Service	Email Service
Responding Protocol	Appointment allocation success/fail	Email send success/fail	Email send success/fail

8. Agent System Architecture



9. Agent Description

1. Client Agent

The Client Agent stands as the primary interaction point for users, facilitating seamless navigation, input gathering, and relative information display in a comprehensible and user-friendly manner. It engages in dialogues with other agents to orchestrate a coherent user experience. It interfaces with the Login Agent, transferring user-provided credentials to verify whether access to the system should be permitted. In the case of new users, it dialogues with the Registration Agent to affirm the non-existence of the user in the system and subsequently creates a user record. Furthermore, it converses with the Scheduling Agent to first extract available appointments upon healthcare provider selection, and subsequently to secure an appointment once the user has confirmed their preferred timing.

2. **Login Agent**

   Upon receipt of a request from the Interface Agent, the Login Agent searches the Users database. It assesses whether the credentials shared by the Interface Agent correlate with any existing database record, thereby permitting user access upon successful authentication, and rejecting the request if no correlating record is discovered.

3. **Registration Agent**

   The Registration Agent, upon communication from the Interface Agent, evaluates the information against the Users database. Initially, it verifies that the provided user does not pre-exist in the database; if the user does exist, the request is declined. Conversely, if the user's details are new, the Registration Agent initiates the creation of a user record in the database.

4. **Scheduling Agent**

   The Scheduling Agent checks with the Appointments database and collects all the available appointments for the selected healthcare provider or date and time based on the request received from the Interface Agent. Once a request from the Interface Agent has been received, this agent will reserve the time slot in the Appointments DB. After the appointment is confirmed, the Scheduling Agent communicates with the Notifier Agent to generate and dispatch an appointment confirmation email to the user.

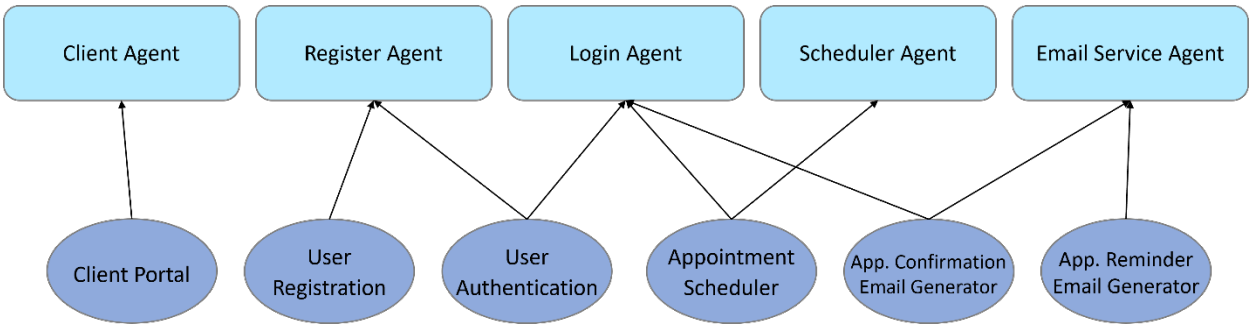
5. **Email Service Agent**

   Upon a trigger from the Scheduling Agent, the Email Service Agent emails a confirmation notification to the user, affirming the scheduled appointment. Also, it will send a reminder to the user within 24 hours before the appointment. This agent guarantees that the user is precisely informed of their appointment details and any preparatory actions that may be requisite.

10. Service Model

Sevice	Input	Output	Pre-condition	Post-Condition
UserInteraction	User Data	Results generated by database	GUI is available	User can see the data generated
Register	User Data	Shows success message to the user	Web form is loaded correctly	Data is sent correctly to the database
RequestAccess	User Data	Shows the user portal	Web page is loaded correctly	User is able to see their portal
Get Appointment	Appointments Type, Healthcare Provider	Shows all the available dates and times for that appointment type	Appointments Type,Healthcare Provider is sent correctly	The user can review the list of appointments available
Book Appointment	Appointments Type, Healthcare Provider, Date	Shows message to the user that the appointment is successfully booked	The date for that specific appointment is available	The user can see the confirmation message
Send Confirmation Email	User Data, Selected Appointment	Generates an email to confirm the user appointment	User data is correctly fetch from database	The email is correctly sent to the user
Send Reminder Email	User Data, Selected Appointment	Generates a reminder email to remind the user appointment	User data is correctly fetch from database	The reminder email is correctly sent on correct date

11. Agent Model



12. Acquaintance Model