Software Requirements and Design Document

for

<SEHAT HUB>

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<FAST NU Islamabad Campus>

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Table of Contents

1. Introduction

1.1 Purpose

To digitalize the process of tracking and managing vaccinations for children in Pakistan, enhancing the efficiency and coverage of immunization programs.

1.2 Product Scope

The scope of project includes the healthcare system in Pakistan, particularly the vaccination process for children, including polio immunization. This system aims to serve all regions of Pakistan, making sure no child is left behind in the vaccination process for whatsoever reasons.

1.3 Title

"Sehat"

1.4 Objectives

Enhance Tracking Efficiency: Implement a digital system to streamline the tracking and management of child vaccinations across Pakistan, ensuring accurate and up-to-date immunization records.
Improve Coverage and Accessibility: Extend the reach of immunization programs to remote and underserved areas, ensuring that no child is left behind due to geographical or socioeconomic barriers.
Support Health Workers: Equip health workers with mobile tools and data access to improve efficiency, reduce the burden of manual paperwork, and enable targeted vaccination drives rather than traditional door-to-door approaches.
Educate and Engage: Develop user-friendly platforms for parents and guardians to access vaccination schedules, health records, and educational materials, promoting better engagement and compliance with immunization programs.

1.5 Problem Statement

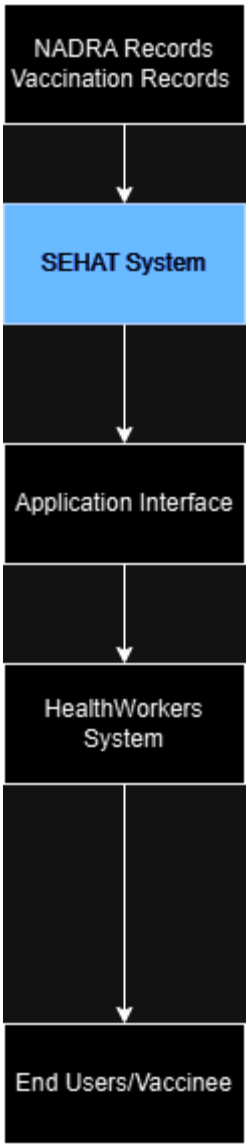
the problem of	*unorganized and manual tracking vaccination system for children in Pakistan as well as safety concerns of vaccination (including polio) health workers due to high illiteracy rate*
affects	*children and health workers in Pakistan*

the impact of which is	*health of children is compromised as well as safety of health workers*
a successful solution would be	*"Sehat" (Children Vaccination Management System) digitalizes the process, using data from NADRA to track birth and vaccination records, provide targeted visits instead of the traditional door to door method done by health workers, accessible management tools for parents, and automated reminders for vaccinations, improving public health outcomes. Also, a 24/7 emergency system to guarantee the safety of health workers.*

2. Overall Description

2.1 Product Perspective

The "Sehat" system is envisioned as a transformative solution within the healthcare landscape of Pakistan, particularly focusing on child vaccination management. This system is not just an incremental update to existing methods but a comprehensive overhaul designed to digitalize and optimize the entire vaccination process.
Integration with National Databases: *The system will leverage data from NADRA (National Database and Registration Authority) to automatically update and track birth and vaccination records, ensuring seamless integration with existing governmental data systems.*
Subsystem Interconnections: *"Sehat" will interact with several subsystems including healthcare facilities' management systems, regional health databases, and mobile networks to provide comprehensive coverage and real-time data synchronization.*
External Interfaces: *The system will provide interfaces for healthcare providers, ministry of health(government of Pakistan), and the public to access pertinent information and services. This includes a dedicated app for health workers and a portal for parents.*
Below is a simple diagram showing major components of overall system :



2.2 Product Functions

The "Sehat" system is designed to digitalize the process of child vaccination management in Pakistan. Here is list of the major functions the product will perform:

- ***User Management Functions:***
  - ***Create User:*** *Allows the creation of new user accounts to access the system.*
  - ***Manage User:*** *Enables administrators to update and manage user accounts, including permissions and access levels.*
- ***Health Worker Management Functions:***

- ***Create Health Workers:*** *Facilitates the entry of new health workers into the system, including their credentials and areas of operation.*
- ***Manage Health Workers:*** *Provides tools for updating health worker information, scheduling, and task allocation.*

- ***Vaccination Management Functions:***
  - ***Select Vaccination Appointment:*** *Allows health workers to select appointments for administering vaccinations.*
  - ***Accept Vaccination Appointment:*** *Enables health workers to confirm their availability for scheduled appointments.*
  - ***Cancel Vaccination Appointment:*** *Provides an option to cancel appointments due to various reasons such as unavailability of vaccines or the health worker.*
- ***Vaccination Tracking Functions:***
  - ***Track Vaccination Progress:*** *Tracks the vaccination status and history of children, ensuring all scheduled vaccines are administered on time.*
  - ***Report Vaccine Side Effects:*** *Enables health workers and users to report any adverse effects following vaccination, improving vaccine safety monitoring.*
  - ***Send Vaccination Reminders:*** *Automatically sends reminders to parents and health workers for upcoming vaccinations, ensuring high coverage.*
- ***Training and Updates:***
  - ***Receive Training and System Updates:*** *Keeps health workers updated with the latest vaccination protocols and system functionalities.*
  - ***View Center Vaccination Appointments:*** *Allows health workers to view reports of the center they are assigned to .*

2.3 List of Use Cases

User
1-Create User
2-Manage User
3-Select Vaccination Appointment
4-Accept Vaccination Appointment
5-Cancel Vaccination Appointment

Health Worker

1. Create Healthworkers
2. Manage Healthworkers
3. Track Vaccination Progress/Reports (Of their respective allocated centers)

   4-Receive Training and System Updates and Notifications

   Ministry Of Health

   1-Send Notifications/Public Health Announcements

2-View Vaccination Reports (nationwide)

2.4 Extended Use Cases

<table>
<tr><td>Member Name and ID</td><td>Wania Naeem – 22i-2369</td></tr>
<tr><td>a-Use Case name</td><td>Create User</td></tr>
<tr><td>b. Scope the system under design</td><td>SEHAT</td></tr>
<tr><td>c. Level</td><td>User Goal</td></tr>
<tr><td>d. Primary actor</td><td>User</td></tr>
<tr><td>e. Stakeholders and interests</td><td>User, Health Worker, Ministry of Health, NADRA</td></tr>
<tr><td>f. Preconditions</td><td></td></tr>
<tr><td>g. Postcondition</td><td>• User data is created/updated/deleted
• Audit Log/ Database is updated
• Notifications are sent
• System is stable</td></tr>
<tr><td>h. Main success scenario</td><td>
<table>
<tr><th>Actor Action</th><th>System Response</th></tr>
<tr><td>1. User selects to create account</td><td></td></tr>
<tr><td></td><td>2) System provides form for collecting details:
• Users form, if not existing.
• User’s descendant form</td></tr>
<tr><td>3) User selects form</td><td></td></tr>
<tr><td>4) User enters details and submits the form</td><td></td></tr>
<tr><td></td><td>5) System validates and verifies the user</td></tr>
<tr><td></td><td>6) System send notification on successful creation</td></tr>
<tr><td></td><td>7) System adds user/descendent to the database</td></tr>
<tr><td></td><td>8) System sends notification on successful deletion</td></tr>
<tr><td></td><td>9.) System updates database</td></tr>
</table>
</td></tr>
<tr><td>i. Extensions</td><td>4) User provides incorrect information, failing validation and verification. System should prompt user to enter the failed fields again.</td></tr>
</table>

Member Name and ID	Wania Naeem – 22i-2369
a-Use Case name	Manage User
b. Scope the system under design	SEHAT
c. Level	User Goal
d. Primary actor	User

<table>
<tr><td>e. Stakeholders and interests</td><td>User, Health Worker, Ministry of Health, NADRA</td></tr>
<tr><td>f. Preconditions</td><td>• User must be logged in
• User is identified and authenticated.
• User Management Feature is available</td></tr>
<tr><td>g. Postcondition</td><td>• User data is updated/deleted
• Audit Log/ Database is updated
• Notifications are sent
• System is stable</td></tr>
<tr><td>h. Main success scenario</td><td>
<table>
<tr><th>Actor Action</th><th>System Response</th></tr>
<tr><td></td><td>1. System provides user to select user management option (Update Account Details, Delete Account)</td></tr>
<tr><td>2.) User selects the option</td><td></td></tr>
<tr><td>3a.) If User selects Update Account Details (user account must be created):</td><td></td></tr>
<tr><td></td><td>3aa.) Systems tells user to choose to update:
• User’s account.
• Descendants’ account, if present</td></tr>
<tr><td>3ab.) User selects the account to update</td><td></td></tr>
<tr><td></td><td>3ac.) If user select own account, provide form with user’s details.</td></tr>
<tr><td></td><td>3ad.) If user select descendants’ account, provide form of that descendant’s details.</td></tr>
<tr><td>3ae.) User makes changes to relevant fields and submits</td><td></td></tr>
<tr><td></td><td>3af.) System validates the changes</td></tr>
<tr><td></td><td>3ag.) System send notification on successful updating</td></tr>
<tr><td></td><td>3ah.) System updates user in the database.</td></tr>
<tr><td>3b.) If User selects Delete Account (user account must be created):</td><td></td></tr>
<tr><td></td><td>3ba.) Systems tells user to choose to delete:
• User’s account
• Descendants’ account, if present</td></tr>
<tr><td>3bb.) User selects account and submits</td><td></td></tr>
<tr><td></td><td>3bc.) If user selects user’s account, then check for any linked descendants</td></tr>
</table>
</td></tr>
</table>

		3bci.) If descendants are present, prevent the deletion and display warning message.
		3bcii.) If none, then system proceeds with account deletion.
		3bd.) If user select descendant's account, then system proceeds with account deletion.
		3be.) System sends notification on successful deletion
		3bf.) System updates database
i. Extensions	3ab.) User provides incorrect updated information, system halts updating the fields and prompts user to enter correct updated details again.	

Member Name and ID	Wania Naeem – 22i-2369	
a-Use Case name	Create Healthworker	
b. Scope the system under design	SEHAT	
c. Level	User Goal	
d. Primary actor	HealthWorker	
e. Stakeholders and interests	User, Ministry of Health, NADRA	
f. Preconditions		
g. Postcondition	• User data is created/updated/deleted • Audit Log/ Database is updated • Notifications are sent • System is stable	
h. Main success scenario	**Actor Action**	**System Response**
	2. User selects to create account	
		2) System provides form for collecting details:
	3) User enters details and submits the form	
		4) System validates and verifies the user
		5) System send notification on successful creation
		6) System adds user/descendent to the database
		7) System sends notification on successful deletion
		8.) System updates database
i. Extensions	3) User provides incorrect information, failing validation and verification. System should prompt user to enter the failed fields again.	

Member Name and ID	Wania Naeem – 22i-2369

<table>
<tr><td>a-Use Case name</td><td>Manage Health Workers</td></tr>
<tr><td>b. Scope the system under design</td><td>SEHAT</td></tr>
<tr><td>c. Level</td><td>User Goal</td></tr>
<tr><td>d. Primary actor</td><td>Health Worker</td></tr>
<tr><td>e. Stakeholders and interests</td><td>Health Worker, Ministry of Health, NADRA</td></tr>
<tr><td>f. Preconditions</td><td>• Health Worker is identified and authenticated.
• Health Worker Management Feature is available
• Health Worker is logged in</td></tr>
<tr><td>g. Postcondition</td><td>• Health Worker data is updated/deleted
• Audit Log/ Database is updated
• Notifications are sent
• System is stable</td></tr>
<tr><td>h. Main success scenario</td><td>
<table>
<tr><th>Actor Action</th><th>System Response</th></tr>
<tr><td></td><td>1. System provides health worker to select management option (Update Account Details, Delete Account)</td></tr>
<tr><td>2. Health worker selects the option</td><td></td></tr>
<tr><td>3a.) If Health worker selects Update Account Details:</td><td></td></tr>
<tr><td></td><td>3aa.) Systems provides form with health worker’s details</td></tr>
<tr><td>3ab.) Health worker makes changes to relevant fields and submits</td><td></td></tr>
<tr><td></td><td>3ac.) System validates the changes</td></tr>
<tr><td></td><td>3ad.) System send notification on successful updating</td></tr>
<tr><td></td><td>3ae.) System updates health worker in the database.</td></tr>
<tr><td>3b.) If Health worker selects Delete Account:</td><td></td></tr>
<tr><td></td><td>3ba.) System proceeds with account deletion.</td></tr>
<tr><td></td><td>3bb.) System sends notification on successful deletion</td></tr>
<tr><td></td><td>3bc.) System updates database</td></tr>
</table>
</td></tr>
<tr><td>i. Extensions</td><td>3ab.) Health worker provides incorrect updated information, system halts updating the fields and prompts user to enter correct updated details again.</td></tr>
</table>

Member Name and ID	Wania Naeem – 22i-2369
a-Use Case name	Select Vaccination Appointment
b. Scope the system under design	SEHAT

<table>
<tr><td>c. Level</td><td>User Goal</td></tr>
<tr><td>d. Primary actor</td><td>User</td></tr>
<tr><td>e. Stakeholders and interests</td><td>User, Health Worker</td></tr>
<tr><td>f. Preconditions</td><td>• User must be logged in
• User must be eligible for vaccination
• Vaccination slots must be available
• Vaccination centers must be up to date</td></tr>
<tr><td>g. Postcondition</td><td>• Vaccination slot successfully reserved
• Confirmation sent to User
• System is stable</td></tr>
<tr><td>h. Main success scenario</td><td>
<table>
<tr><th>Actor Action</th><th>System Response</th></tr>
<tr><td></td><td>1. System displays due vaccination schedule for user</td></tr>
<tr><td>2. User selects the vaccination type</td><td></td></tr>
<tr><td></td><td>3. System displays available slots for vaccination (time slot with center)</td></tr>
<tr><td>4. User selects the preferred time & date slot</td><td></td></tr>
<tr><td></td><td>5. System verifies and validates the availability of the slot.</td></tr>
<tr><td></td><td>6. System permanently books the slot.</td></tr>
<tr><td></td><td>7. System sends notification to user on successful vaccination booking</td></tr>
<tr><td></td><td>8. System updates the vaccination schedule against the user</td></tr>
</table>
</td></tr>
<tr><td>i. Extensions</td><td>5. The slot becomes unavailable, so the system prompts the user to select another available slot.</td></tr>
</table>

Member Name and ID	Wania Naeem – 22i-2369
a-Use Case name	Accept Vaccination Appointment
b. Scope the system under design	SEHAT
c. Level	User Goal
d. Primary actor	Health Worker
e. Stakeholders and interests	User, Health Worker
f. Preconditions	• User must be logged in • User must be available at the vaccination center • Health workers must be available • Vaccination centers must be functional

<table>
<tr><td>g. Postcondition</td><td>• User successfully vaccinated
• User’s vaccination schedule will be updated
• System is stable</td></tr>
<tr><td>h. Main success scenario</td><td>
<table>
<tr><th>Actor Action</th><th>System Response</th></tr>
<tr><td>1. Health worker asks for appointment ID along with user’s details</td><td></td></tr>
<tr><td>2. User provides the details</td><td></td></tr>
<tr><td></td><td>3. System verifies the information against the daily vaccination appointments</td></tr>
<tr><td></td><td>4. System accepts the appointment</td></tr>
<tr><td>5. Health worker prepares vaccination</td><td></td></tr>
<tr><td>6. User is screened for any allergies or medical conditions</td><td></td></tr>
<tr><td>7. Health worker administers vaccine to the user</td><td></td></tr>
<tr><td></td><td>8. System updates the vaccination record</td></tr>
<tr><td></td><td>9. System sends notification to user on successful vaccination</td></tr>
<tr><td></td><td>10. System update database</td></tr>
</table>
</td></tr>
<tr><td>i. Extensions</td><td>3. System fails to verify the user information for appointment:
3a. Check user for correct vaccination center for appointment.
3b. User must make user that they have a valid vaccination appointment.</td></tr>
</table>

NAME : Emaan Ali 22i-2325	
a-Use Case name	**Cancel Vaccination Appointment**
b. Scope the system under design	“SEHAT”
c. Level	User goal
d. Primary actor	User, Health Worker
e. Stakeholders and interests	**User**: Want to manage their appointments efficiently. **Health Workers**: Want to maintain an accurate schedule.
f. Preconditions	User must have registered themselves in the system A vaccination appointment must exist for the user in the system .
g. Postcondition	The vaccination appointment is canceled. The system updates the appointment schedule.
h. Main success scenario	Actor Action | System Response

	1- The user navigates to Appointment section 2- System displays the appointments made by the user or health workers 3- The user selects the appointment to cancel 4- System prompts for confirmation for the cancellation of the appointment 5- The user confirms the cancellation 6- System cancels the appointment and sends a confirmation notification to the user.
i. Extensions	**E1: Appointment Not Found** 1a. If the selected appointment does not exist, the system displays an error message. 1b. User can return to the appointment list. **E5: Confirmation Denied** 5a. If the user chooses not to confirm the cancellation, the system returns to the appointment details. 5b. If the user doesn't reschedule later on the appointment is made by the health workers and sent via SMS notification through the system **E6: System Error** 6a. If a system error occurs during cancellation, the system informs the user and suggests retrying later.

NAME : Emaan Ali 22i-2325	
a-Use Case name	**Track Vaccination Progress**
b. Scope the system under design	"SEHAT"
c. Level	User Goal
d. Primary actor	User , Health Workers
e. Stakeholders and interests	**User**: Want to view their vaccination status and history. **Ministry of Health**: Requires data to monitor public health initiatives. **Health Workers**: Need to access and verify user vaccination data.
f. Preconditions	The user is logged into the system The user's vaccination records exist in the system.
g. Postcondition	The user successfully views their vaccination progress report. The report data is available for healthcare workers and ministry officials.
h. Main success scenario	Actor Action | System Response

	1- User selects the view vaccination progress section. | 2- The User selects the option to generate a report. | . 3-System retrieves the user vaccination history and current status 3- user views the report, which includes vaccination names, doses completed, doses left etc. |
i. Extensions	**E4: No Vaccination Records Found** 4a. If no records exist for the user, the system displays a message indicating no data is available. 4b. User can return to the main menu. **E5: Report Generation Error** 5a. If there's an error in generating the report, the system displays an error message and suggests trying again. 5b. User can choose to retry or exit.
NAME : Emaan Ali 22i-2325	
a-Use Case name	**Reporting Vaccine Side Effects**
b. Scope the system under design	"SEHAT"
c. Level	User Level
d. Primary actor	User,MOH
e. Stakeholders and interests	**User:** Want to report any side effects and receive feedback. **Health Workers**: Need to document and assess reported side effects. **Ministry of Health**: Requires data for public health monitoring.
f. Preconditions	The user suffers from a medical condition or The user has received a vaccination. The user is authenticated in the system.
g. Postcondition	Side effects are recorded in the system. Relevant stakeholders are notified of significant side effects. The user receives feedback or guidance based on their reported side effects.
h. Main success scenario	Actor Action | System Response 1- User navigates to Report Vaccine Side Effect form | 2- User reports side effects after the scheduled appointment |

		3- System records the side effects in database.
		4- System sends Ministry of Health a report of the aggregated side effects for public health monitoring.
	5- User may receive feedback and possible solutions(notification) from Ministry Of Health to manage their side effects	
i. Extensions	**E1: System Error** 1a. If there is a system error while logging side effects, the system displays an error message. 1b. User can retry or exit. **E4: Severe Side Effects Reported** 4a. If a severe side effect is reported, the Ministry Of Health would send feedback to the user. 4b. Health worker is prompted to take appropriate action. **E4: Follow-Up Required** 4b. If the user reports significant side effects, the health worker schedules a follow-up appointment for further evaluation.	

Member Details:	Nabeeha Shafiq (22i-2336)	
a-Use Case name	**Send Vaccination Reminders**	
b. Scope the system under design	"SEHAT"	
c. Level	Sub-function level	
d. Primary actor	System Driven use case	
e. Stakeholders and interests	**Users**: Parents get notified about which vaccine their child needs and when they should get it (very useful in case of illiterate parents) **Ministry Of Health**: Public health improves and education of parents related to vaccine is done **Health Workers**: Will not have to go door to door to remind people to get their children vaccinated	
f. Preconditions	User must be registered in the system A vaccination schedule must exist for the user in the system.	
g. Postcondition	Vaccination and appointment reminders sent successfully.	
h. Main success scenario	Actor Action	System Response

		1-Send notification to user if any vaccine was due for them
		2-Send reminder notifications to user if they had made any vaccine appointments
i. Extensions	1a-User does not receive notification due to network issues 1-System retries after a set interval	

Member Details:	Nabeeha Shafiq (22i-2336)	
a-Use Case name	**Access Unvaccinated Children**	
b. Scope the system under design	"SEHAT"	
c. Level	User Goal	
d. Primary actor	Ministry Of Health	
e. Stakeholders and interests	**Users**: Parents get notified about which vaccine their child needs and when they should get it (very useful in case of illiterate parents) **Ministry Of Health**: Public health improves and education of parents related to vaccine is done , increase in vaccination coverage , reports help revise strategies to vaccinate every child **Health Workers**: Will not have to go door to door to remind people to get their children vaccinated	
f. Preconditions	A vaccination schedule must exist for users of system	
g. Postcondition	System successfully displays the reports.	
h. Main success scenario	Actor Action	System Response
	1-MOH navigate to Track Vaccination Progress	1-System shows reports of unvaccinated and vaccinated children

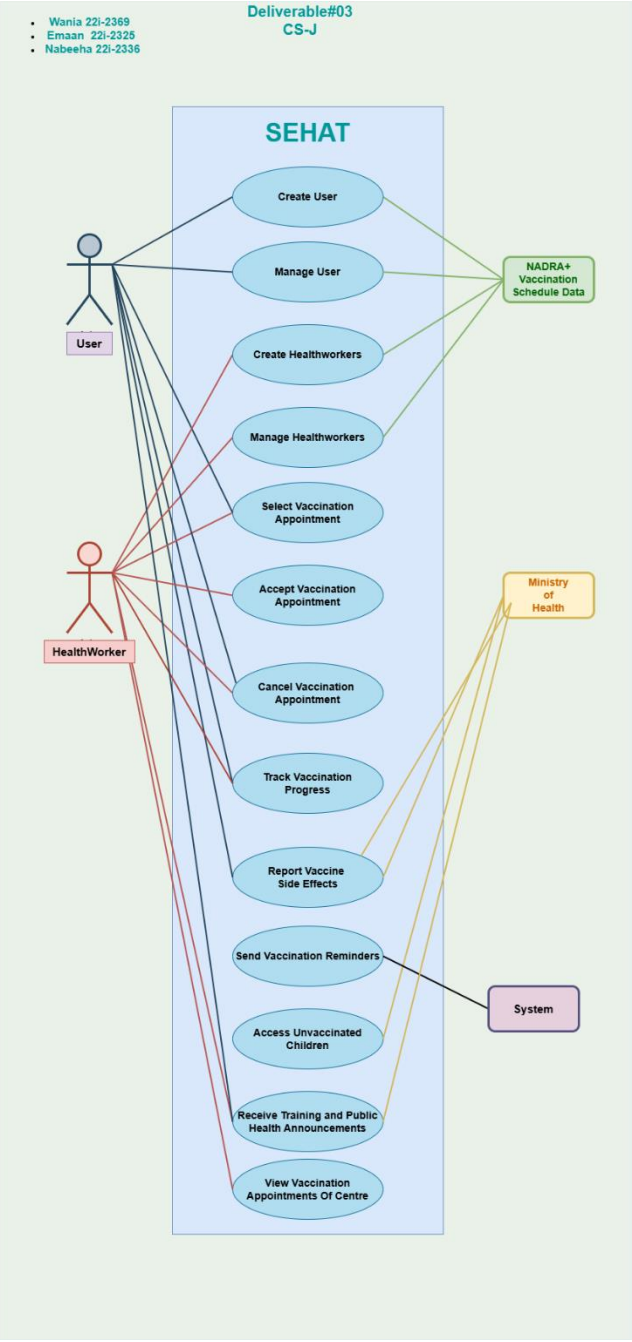
		corresponding to particular vaccine (filter reports too)
		2-Ministry Of Health further takes strict action against people who have not yet taken their due vaccines / ministry sends the users message in form of notification
i. Extensions	1-No data to display reports 1a-System displays this error of no data	

Member Details:	Nabeeha Shafiq (22i-2336)	
a-Use Case name	**View Vaccination Appointments Of Centre**	
b. Scope the system under design	"SEHAT"	
c. Level	User Level	
d. Primary actor	Health Worker	
e. Stakeholders and interests	**Ministry Of Health**: Public health improves and increase in vaccination coverage **Health Workers**: Efficient way to manage daily appointments, will not have to go door to door to remind people to get their children vaccinated , reports help revise strategies to vaccinate every child	
f. Preconditions	Health Worker must be registered and logged in the system Appointment Schedule of users must exist under supervision of health worker	
g. Postcondition	Health worker successfully sends notification to all missed appointments	
h. Main success scenario	Actor Action	System Response
	1- Health worker navigates to	

<table>
<tr><td></td><td><table>
<tr><td>Track Progress page</td><td></td></tr>
<tr><td></td><td>2-System displays report of the health worker’s respective center’s vaccinee appointments , vaccine name , doses due etc</td></tr>
</table></td></tr>
<tr><td>i. Extensions</td><td>1a-User does not receive notification due to network issues
1-System retries after a set interval</td></tr>
<tr><td>Member Details:</td><td>Nabeeha Shafiq (22i-2336)</td></tr>
<tr><td>a-Use Case name</td><td>Receive Training and Public Health Announcements</td></tr>
<tr><td>b. Scope the system under design</td><td>“SEHAT”</td></tr>
<tr><td>c. Level</td><td>User Goal</td></tr>
<tr><td>d. Primary actor</td><td>Users , Health Workers</td></tr>
<tr><td>e. Stakeholders and interests</td><td>Users: helps any user in using the system efficiently
Health Workers: helps any health worker in using the system efficiently
Ministry Of Health : good system knowledge and increased compliance of users</td></tr>
<tr><td>f. Preconditions</td><td>User must have system installed and up to date</td></tr>
<tr><td>g. Postcondition</td><td>User learns to use system efficiently
User is notified of any updates in system</td></tr>
<tr><td>h. Main success scenario</td><td><table>
<tr><td>Actor Action</td><td>System Response</td></tr>
<tr><td>1- User navigate to training section and select their preferred language</td><td></td></tr>
<tr><td></td><td>2- System displays manual , videos to show user how to use system</td></tr>
</table></td></tr>
</table>

		3- Send any system update to users in system
i. Extensions	1-No data to display reports 1a-System displays this error of no data	

2.5 Use Case Diagram



3. Other Nonfunctional Requirements

3.1 Performance Requirements

- **Response Time**: The system should respond to user inputs and queries within few seconds under normal operating conditions.
- **Concurrency**: The system must support up to 500 concurrent users without significant degradation of performance.
- **Data Processing**: The system must process updates and generate reports within acceptable time frames, not exceeding a few seconds seconds for data entries and for report generation.

3.2 Safety Requirements

- **Data Integrity**: The system must ensure high data integrity with checks to prevent corruption due to simultaneous access.
- **Error Handling**: The system should handle errors gracefully, providing meaningful error messages to users without system failure.

Abstraction : The system must be abstract for the users , a black box, all implementation details are hidden from user classes by using System Controller “SEHAT Hub”.

3.3 Security Requirements

4. - **User Authentication**: The system shall implement robust user authentication mechanisms to ensure that only authorized users can access the system.
5. - **Data Encryption**: All the implementation classes in the system are set to private and their attributes are also private .Use of getter setter methods and polymorphism ensures data encapsulation.

5.1 Software Quality Attributes

- **Reliability**: The system should be reliable in context of security and safety requirements.
- **Usability**: The interface should be user-friendly, with easy navigation and accessible features for non-technical , illiterate users.
- **Maintainability**: The codebase must be well-documented and structured to facilitate easy maintenance and updates.

Closed for Modification , Open for Extension: The system is designed as to implement this basic rule in software designing by making interfaces of classes and using inheritance OOP principles .

5.2 Business Rules

Access Control: Users must have appropriate access rights defined by their role in the system for example

Users: Can manage their accounts , view their vaccination progress , send vaccine side effects to system.

Health workers: Can manage their own accounts , view vaccination progress of their own center where they are allocated etc
Ministry Of Health: Can send messages in form of notifications to users /health workers , view reports related to vaccination progress nationwide (all centres) , view vaccine side effects reports to work better on their vaccines.

5.3 Operating Environment

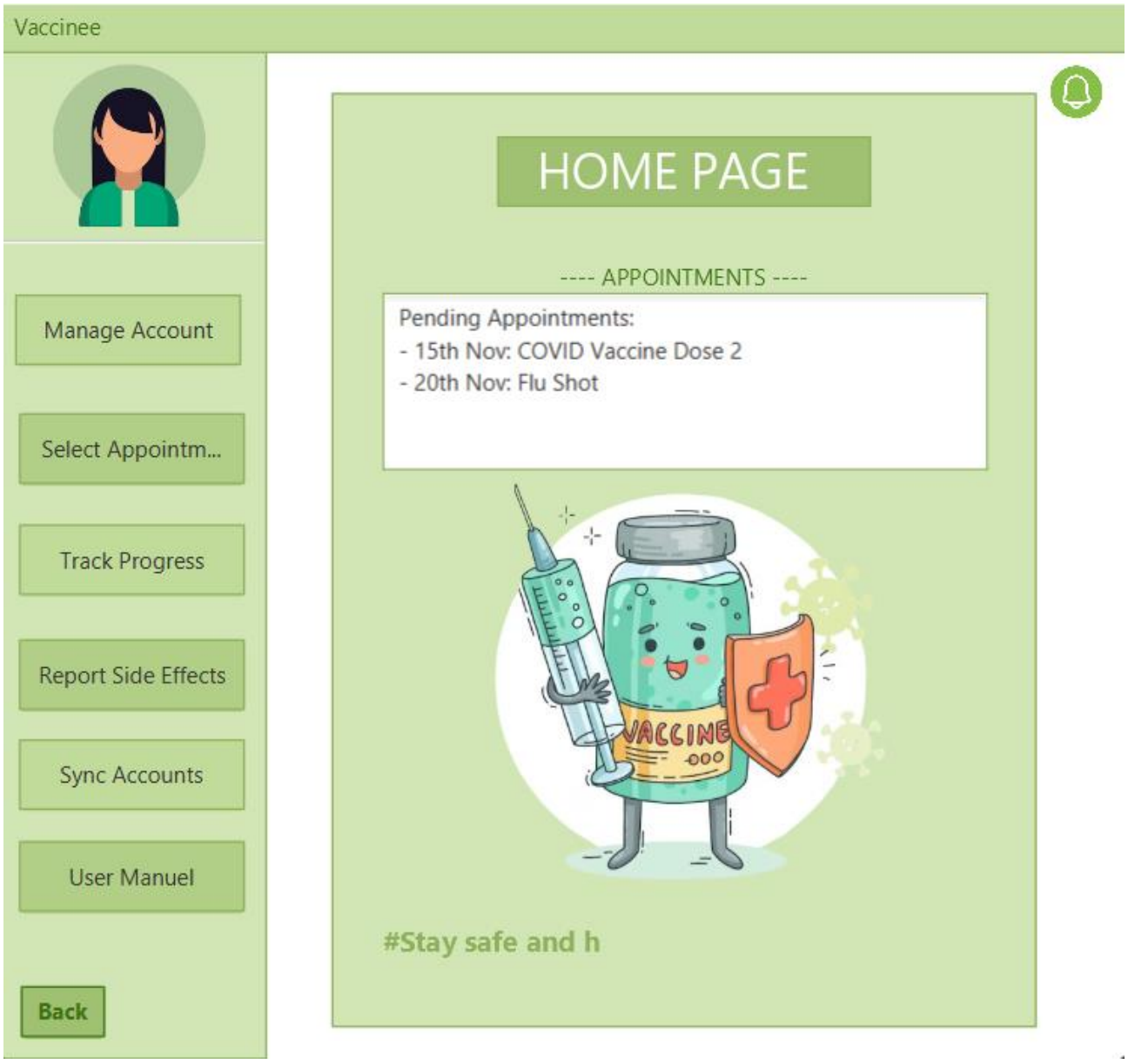
Hardware Environment:
The application is a desktop app designed to run on personal computers or laptops.

Software Requirements:
Java Runtime Environment (JRE): Java 11 or higher installed on the host machine.
JavaFX SDK: JavaFX 11 or later for GUI development and execution.
Database Server: SQL Server Management Studio 19 with required drivers configured.

Development Environment:
Developed and tested on:
IDE: Eclipse IDE for Java Developers with e(fx)clipse plugin installed.
JavaFX Scene Builder for designing the graphical user interface forms(.fxml files).

5.4 User Interfaces

Our frontend developer started off by making login , signup pages for all roles , pretty standard pages hence not including their screenshots .Then she made homepage screens for each role where each button took user to a specified new page .Back buttons were implemented on every page to provide seamless transition between pages.Proper error messages are displayed too. Here are screenshots of homepages of each Role:
Vaccinee(user):



Health worker:

HelthWorker

Manage Account

Make Appoint...

Accept Appoint...

Track Progress

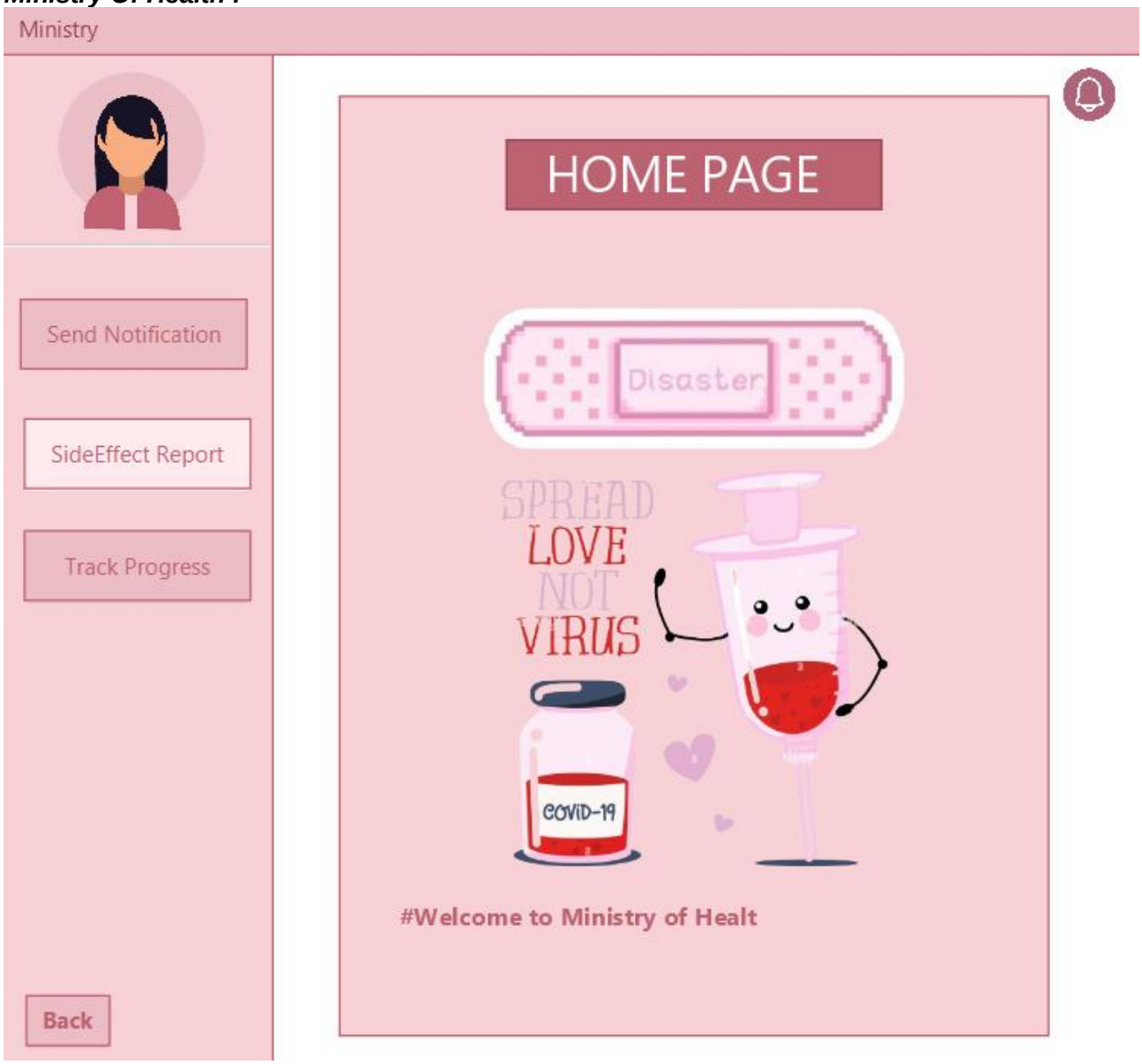
Training Manuel

Back

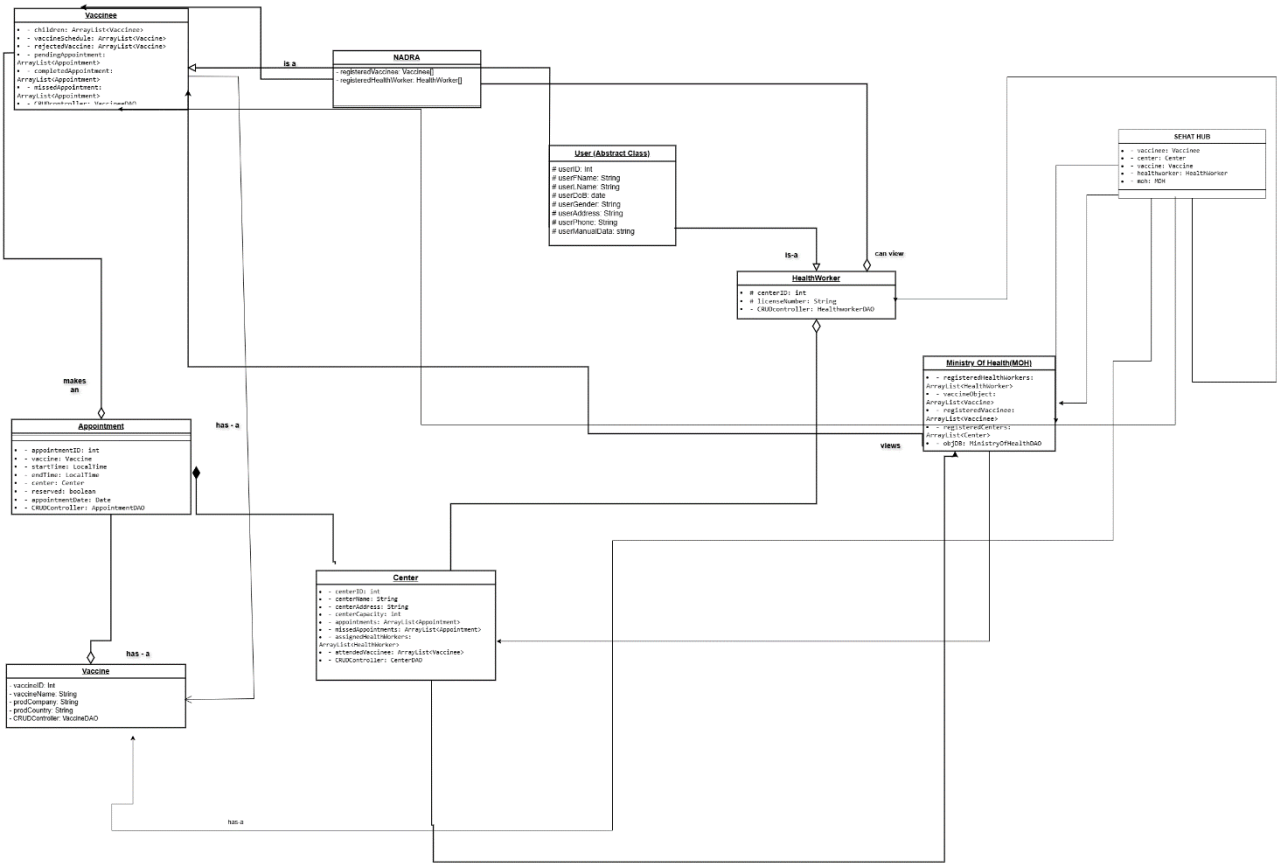
HOME PAGE

#Welcome to Health Wor

Ministry Of Health :

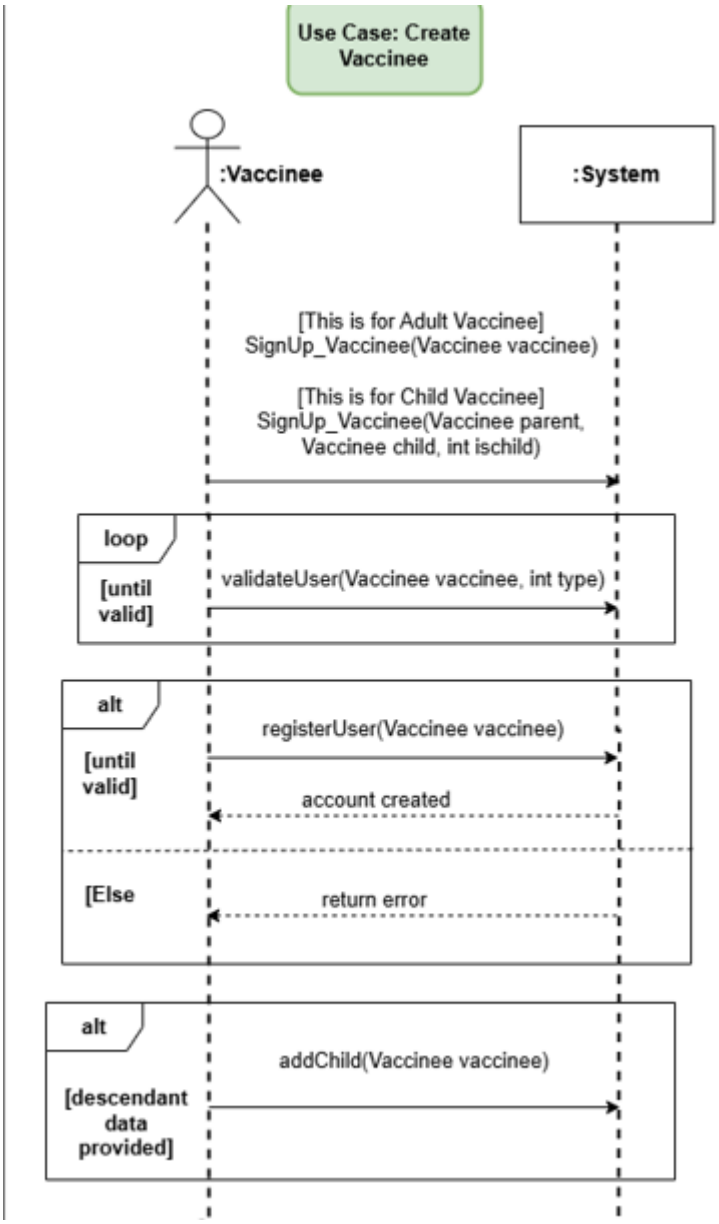


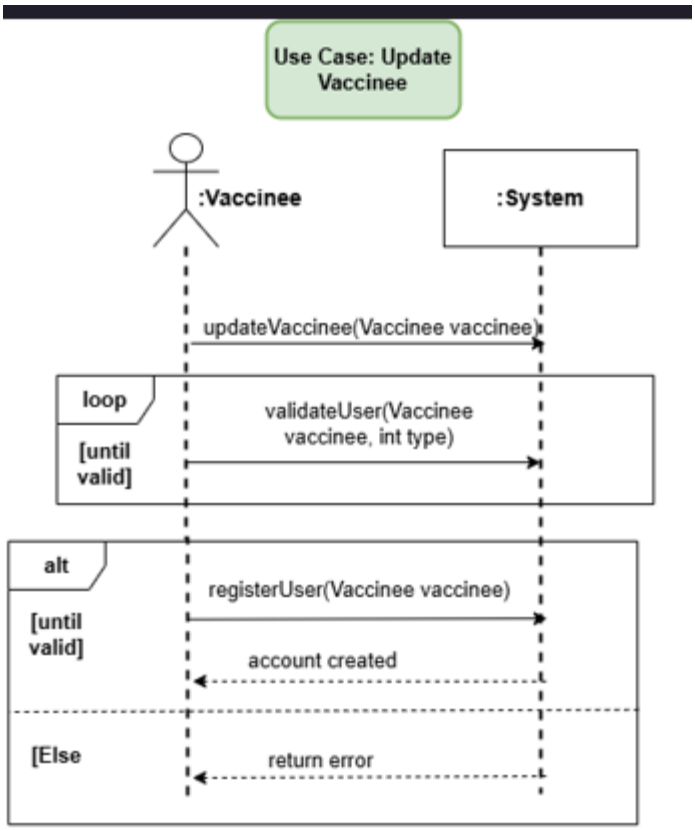
6. Domain Model

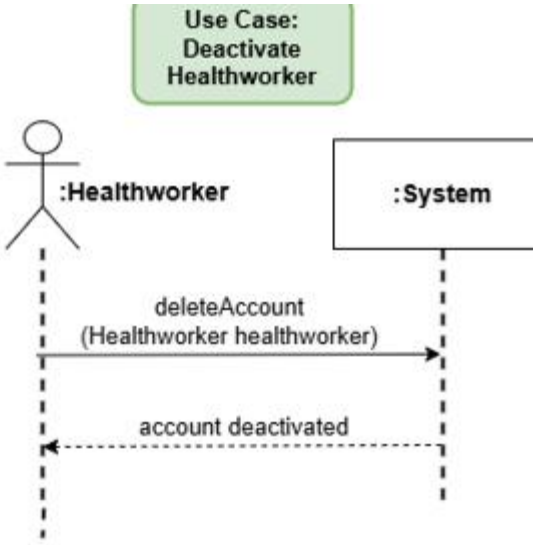


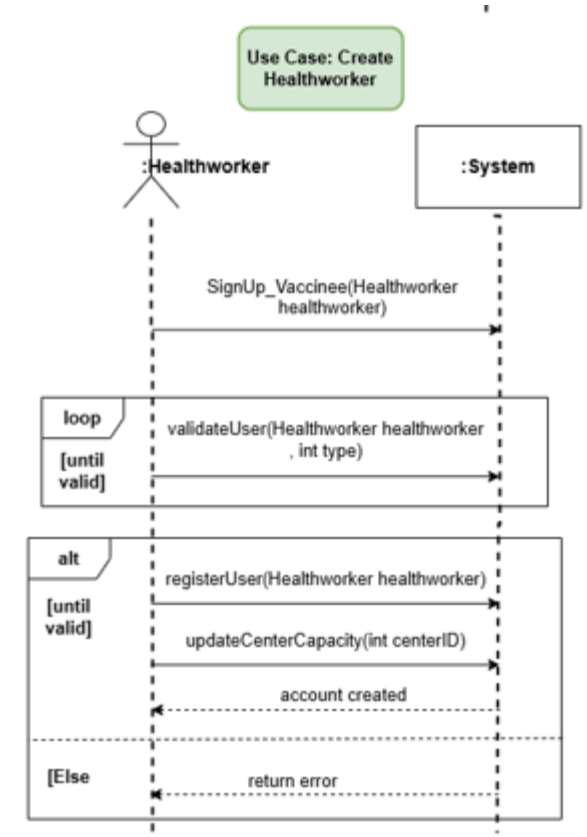
7.

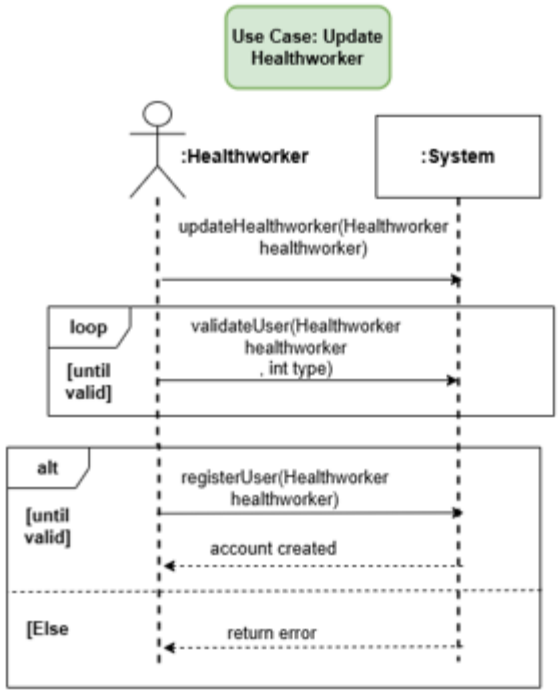
8. System Sequence Diagram

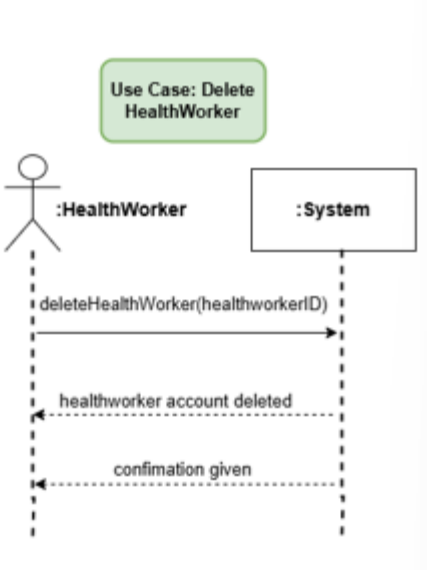


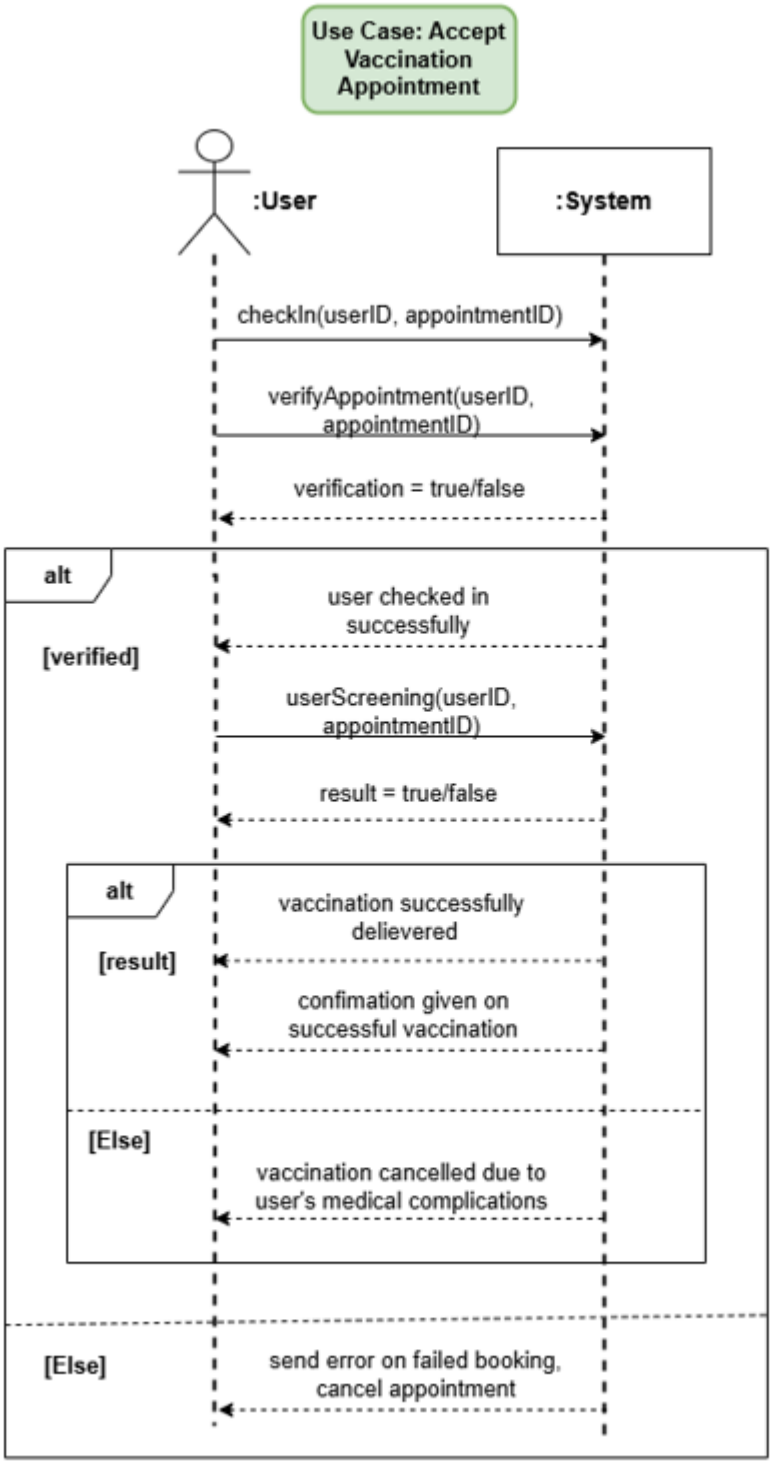

Use Case: Update Vaccinee
:Vaccinee
:System
updateVaccinee(Vaccinee vaccinee)
loop
[until valid]
validateUser(Vaccinee vaccinee, int type)
alt
[until valid]
registerUser(Vaccinee vaccinee)
account created
[Else
return error

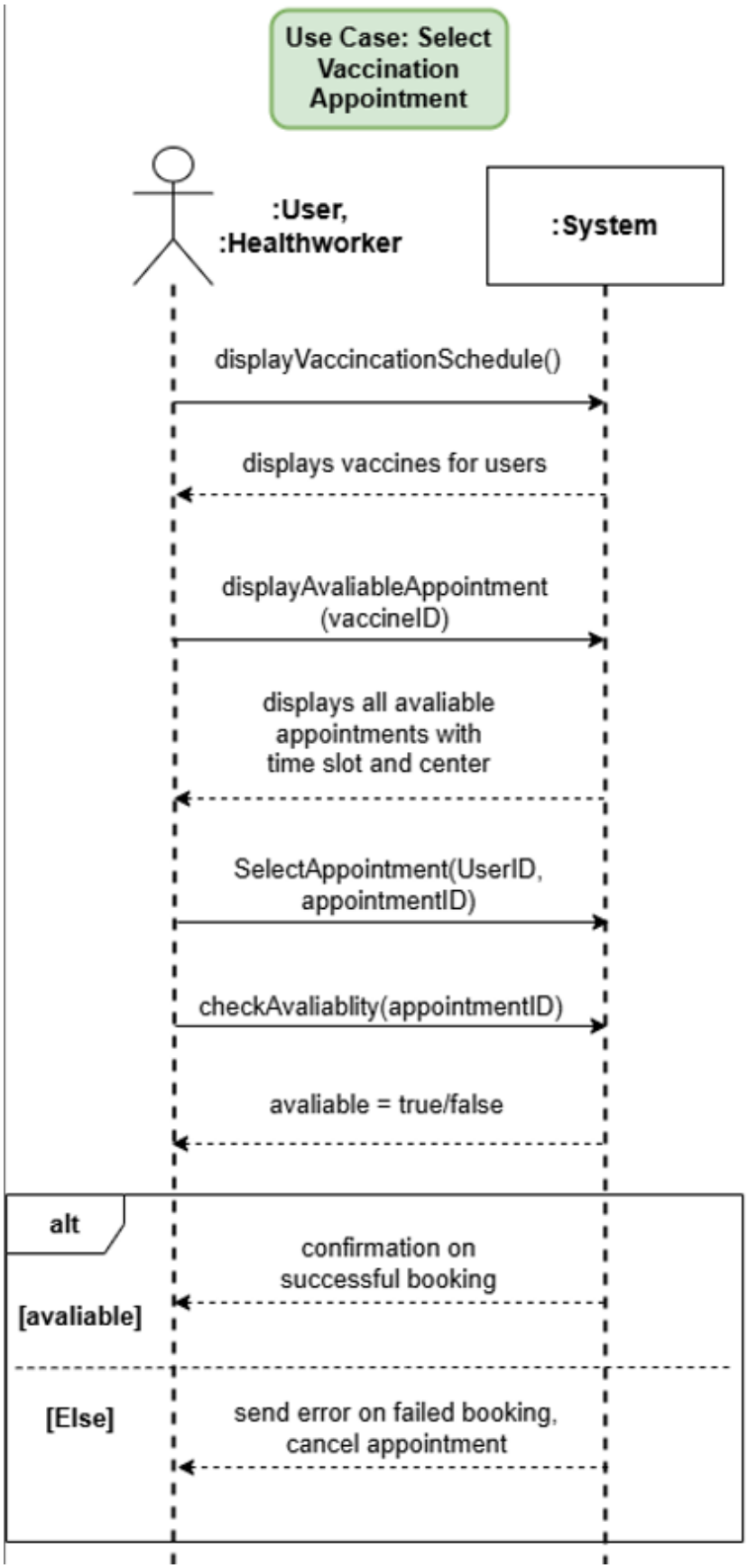

Use Case: Deactivate Healthworker
:Healthworker
:System
deleteAccount (Healthworker healthworker)
account deactivated

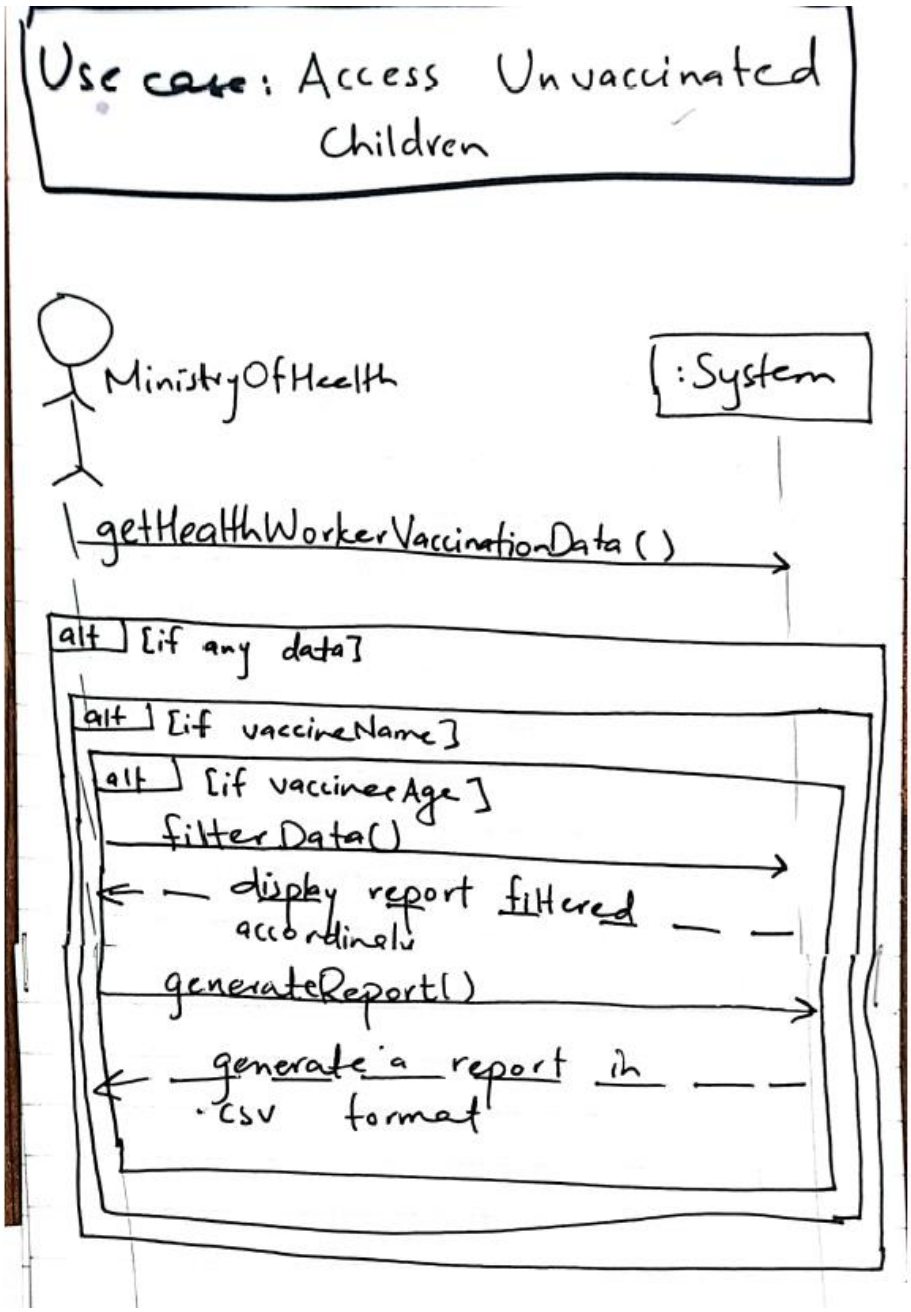

Use Case: Create Healthworker
:Healthworker
:System
SignUp_Vaccinee(Healthworker healthworker)
loop
[until valid]
validateUser(Healthworker healthworker , int type)
alt
[until valid]
registerUser(Healthworker healthworker)
updateCenterCapacity(int centerID)
account created
[Else
return error

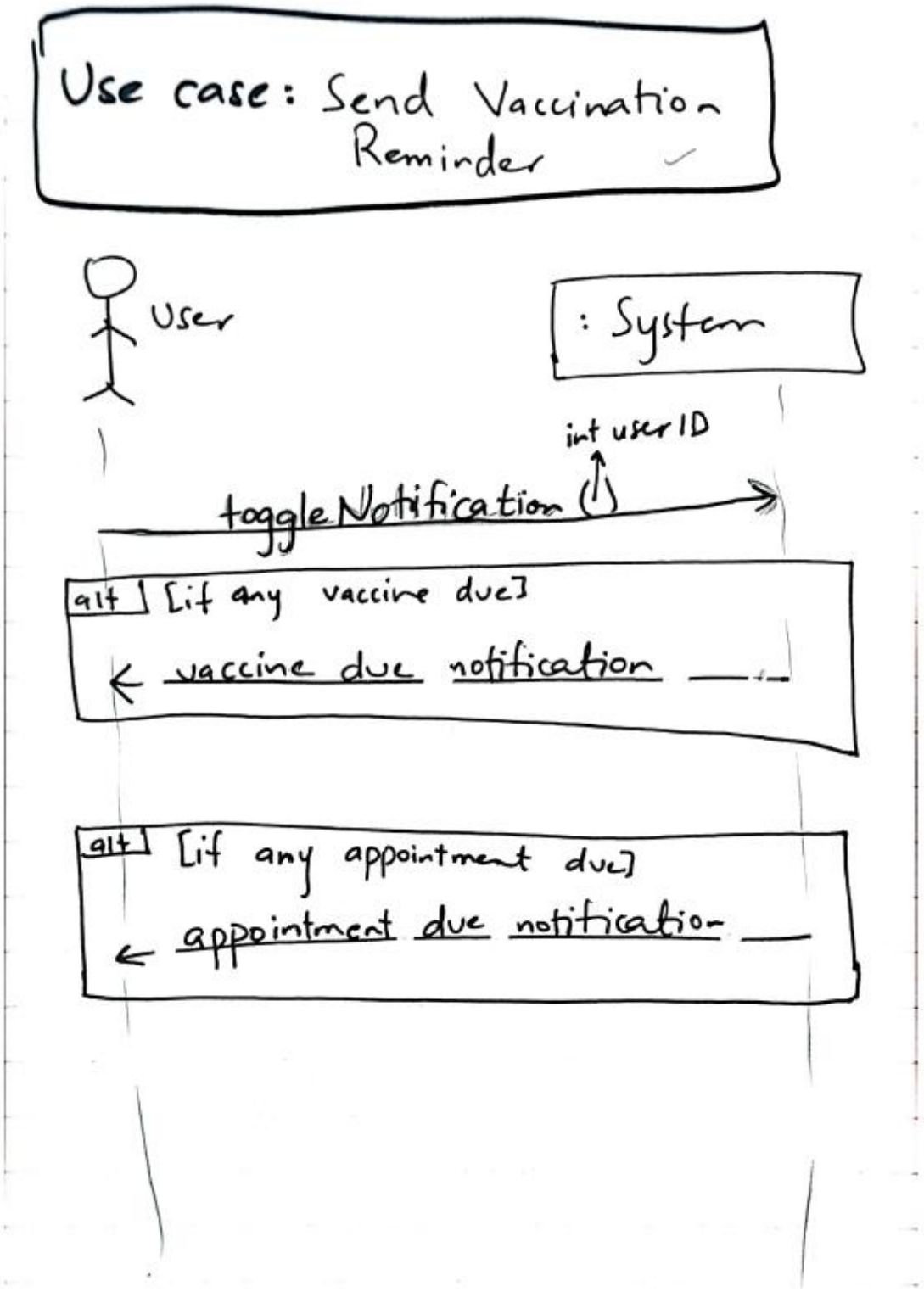

Use Case: Update Healthworker
:Healthworker
:System
updateHealthworker(Healthworker healthworker)
loop
[until valid]
validateUser(Healthworker healthworker , int type)
alt
[until valid]
registerUser(Healthworker healthworker)
account created
[Else
return error

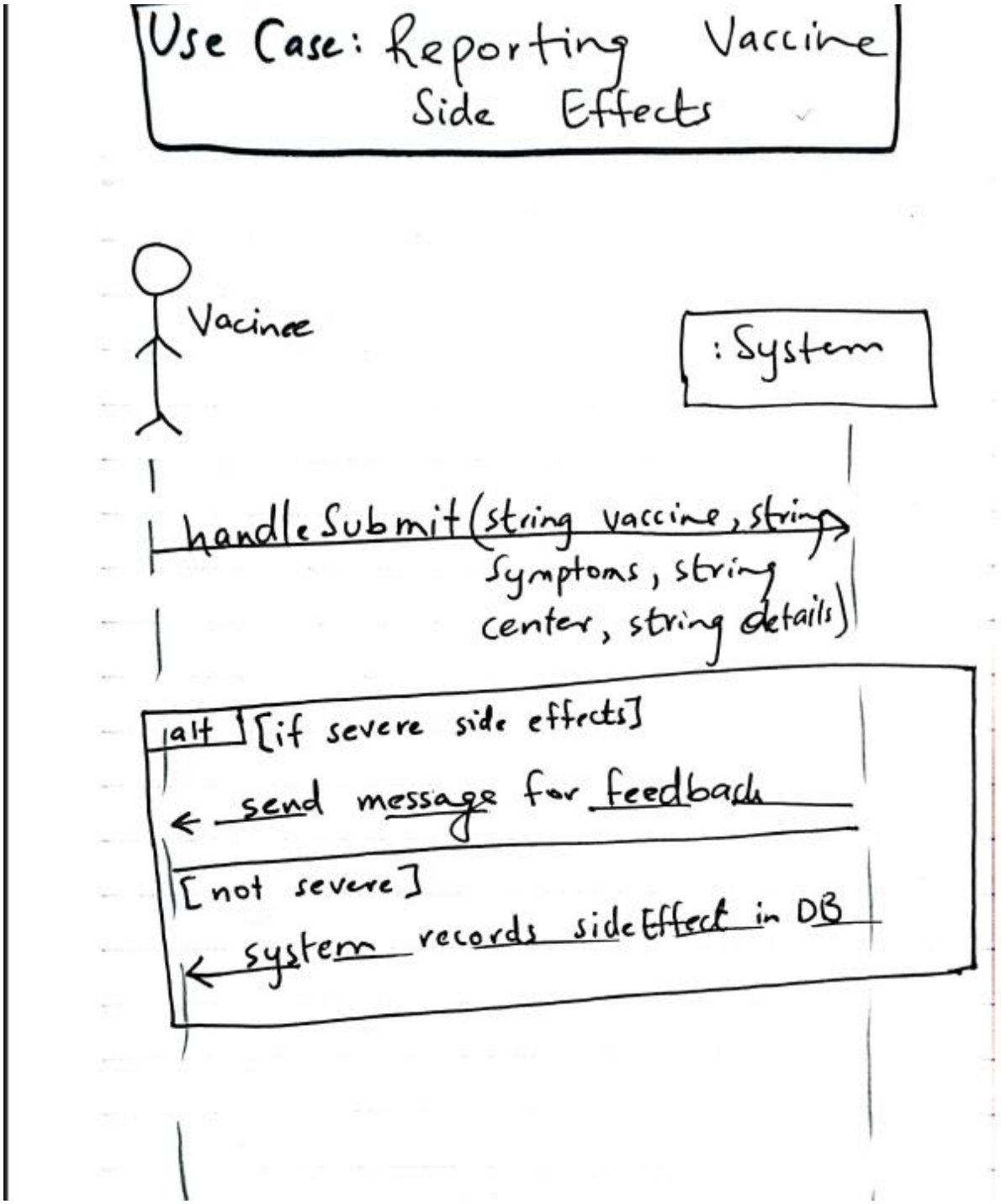

Use Case: Delete HealthWorker
:HealthWorker
:System
deleteHealthWorker(healthworkerID)
healthworker account deleted
confimation given


Use Case: Accept Vaccination Appointment
:User
:System
checkIn(userID, appointmentID)
verifyAppointment(userID, appointmentID)
verification = true/false
alt
[verified]
user checked in successfully
userScreening(userID, appointmentID)
result = true/false
alt
[result]
vaccination successfully delievered
confimation given on successful vaccination
[Else]
vaccination cancelled due to user's medical complications
[Else]
send error on failed booking, cancel appointment

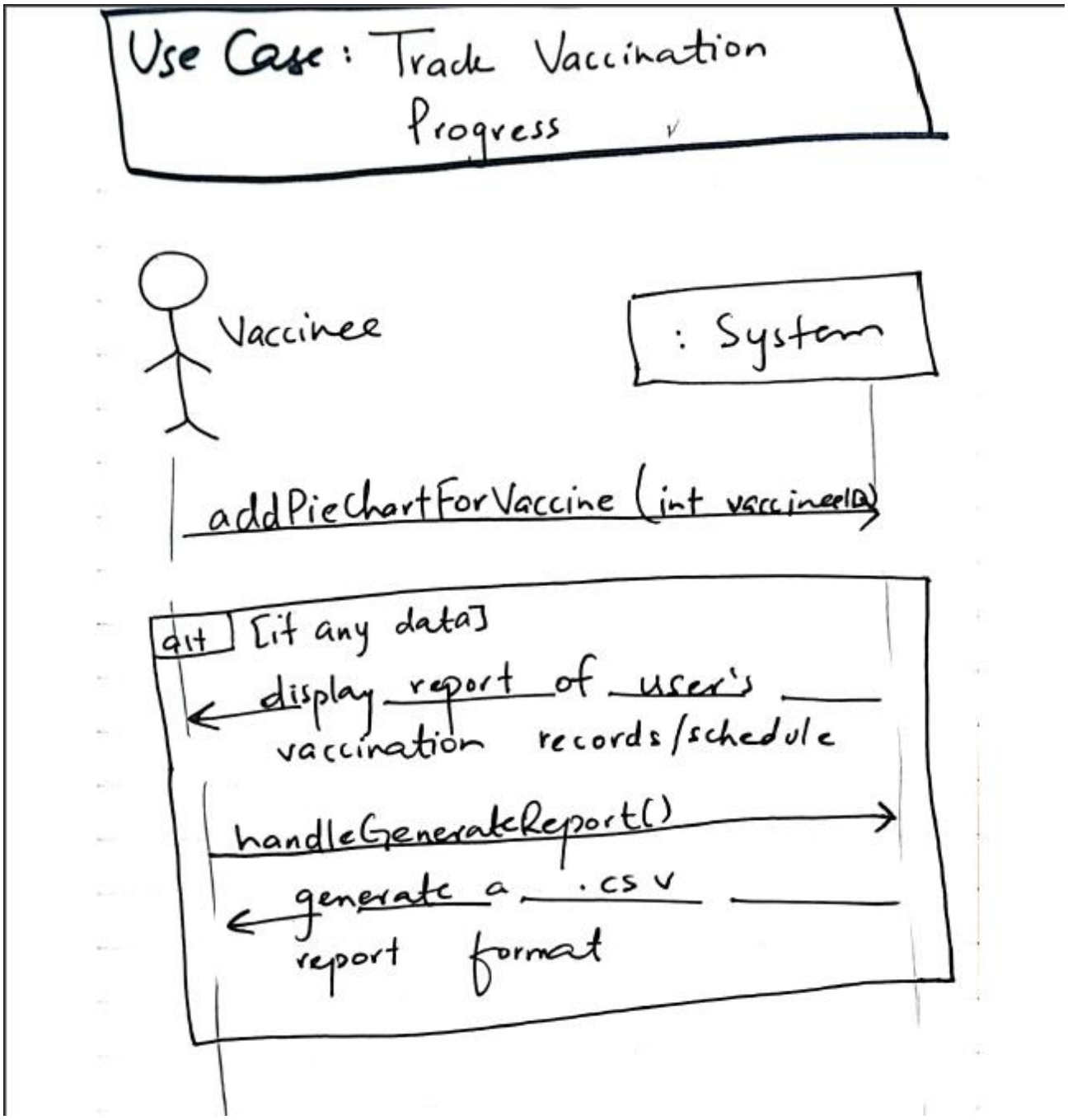

Use Case: Select Vaccination Appointment
:User, :Healthworker
:System
displayVaccincationSchedule()
displays vaccines for users
displayAvaliableAppointment (vaccineID)
displays all avaliable appointments with time slot and center
SelectAppointment(UserID, appointmentID)
checkAvaliablity(appointmentID)
avaliable = true/false
alt
[avaliable]
confirmation on successful booking
[Else]
send error on failed booking, cancel appointment

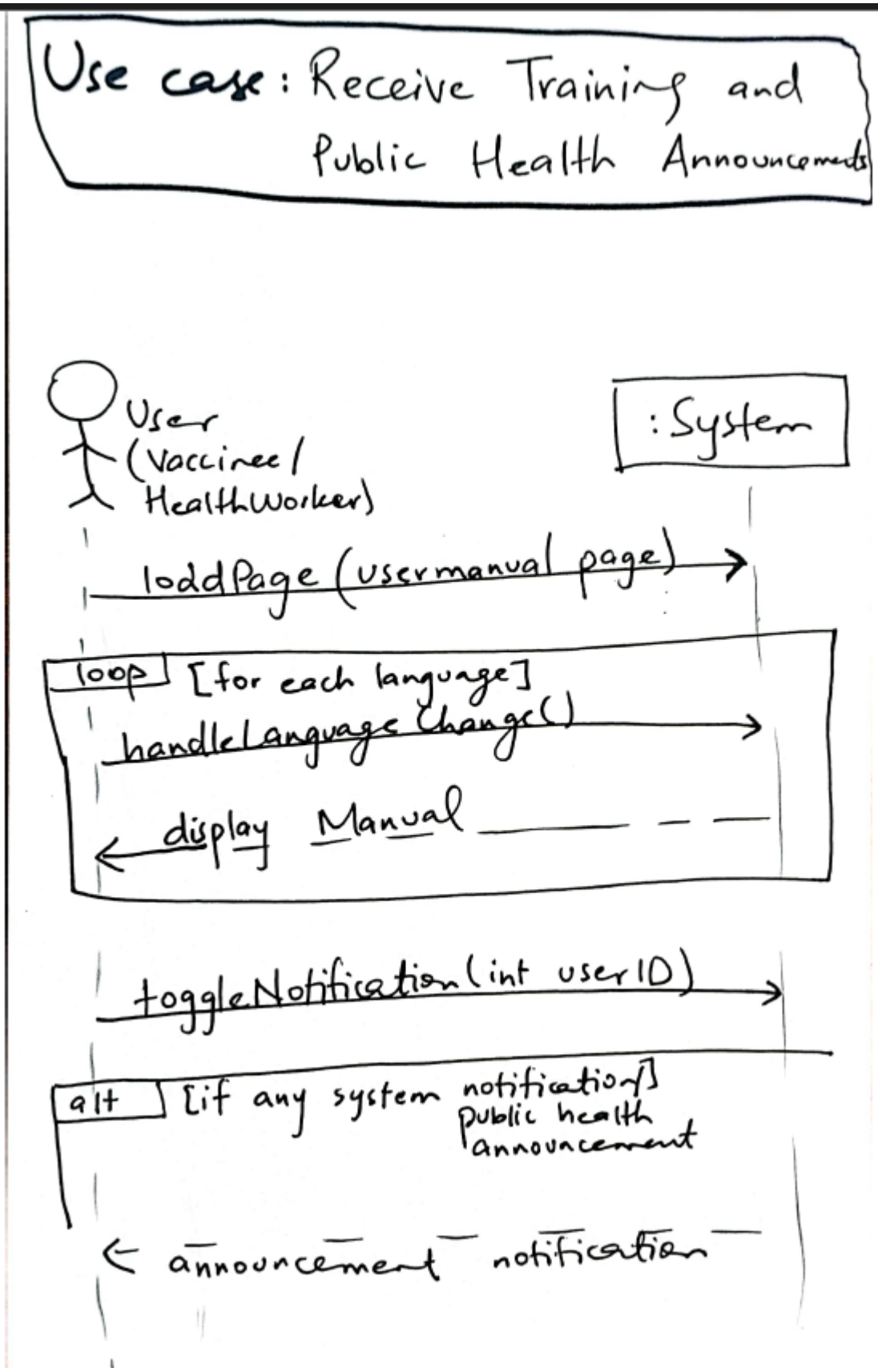

Use case: Access Unvaccinated Children
MinistryOfHealth
:System
getHealthWorkerVaccinationData()
alt [if any data]
alt [if vaccineName]
alt [if vaccineAge]
filterData()
display report filtered accordingly
generateReport()
generate a report in .csv format


Use case: Send Vaccination Reminder
User
: System
int userID
toggleNotification ()
alt [if any vaccine due]
vaccine due notification
alt [if any appointment due]
appointment due notification


Use Case: Reporting Vaccine Side Effects
Vaccinee
: System
handleSubmit(string vaccine, string symptoms, string center, string details)
alt [if severe side effects]
send message for feedback
[not severe]
system records side effect in DB

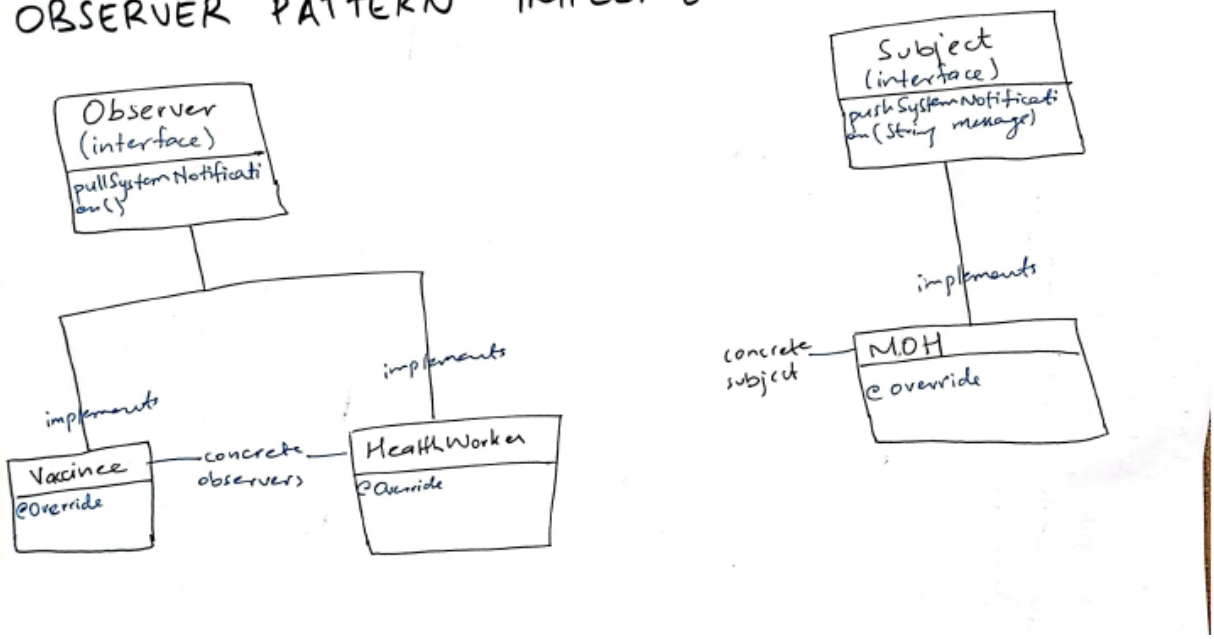

Use case: View Vaccination Appointments Of Centre
HealthWorker
: System
loadVaccinationData(int hwId)
alt [if any data]
display report of respective Center of healthworker
generateReport()
generate .csv report


Use Case: Track Vaccination Progress
Vaccinee
: System
addPieChartForVaccine (int vaccineID)
alt [if any data]
display report of user's vaccination records/schedule
handleGenerateReport()
generate a .csv report format

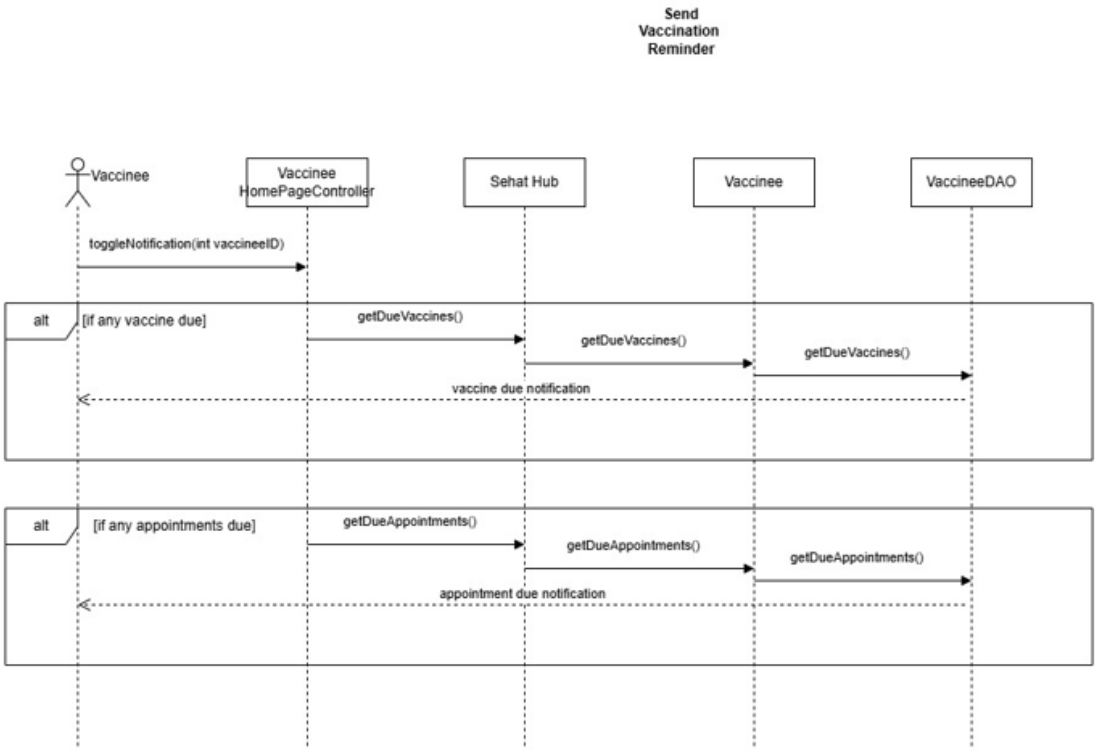

Use case: Receive Training and Public Health Announcements
User (Vaccinee / HealthWorker)
:System
loadPage(usermanual page)
loop [for each language]
handleLanguageChange()
display Manual
toggleNotification(int userID)
alt [if any system notification/ public health announcement
announcement notification

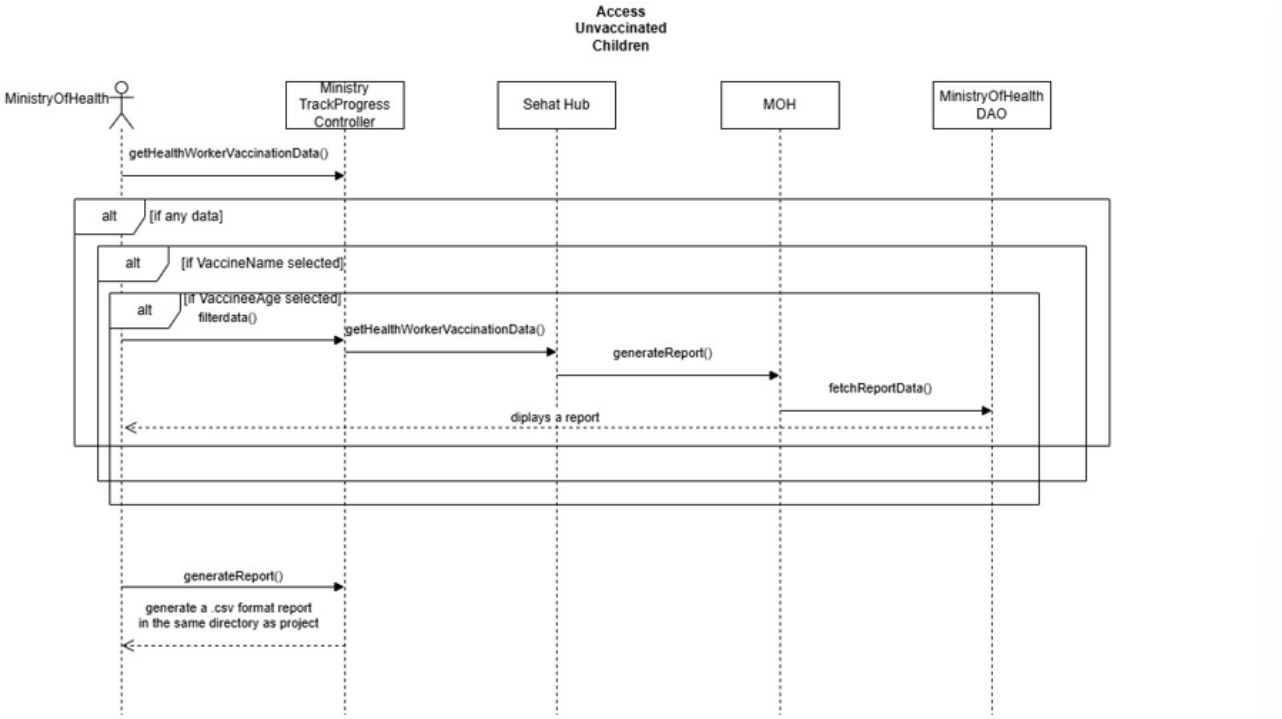
Use Case: Send System Notification / Public Health Announcement

OBSERVER PATTERN IMPLEMENTATION

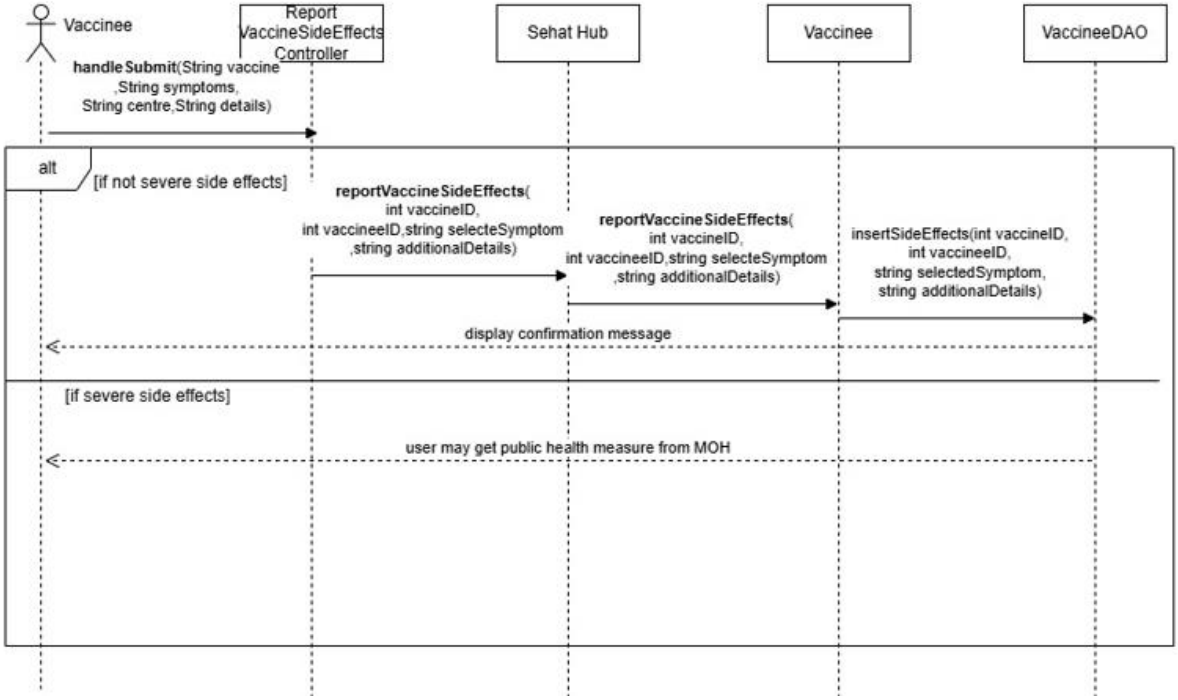


9. Sequence Diagram

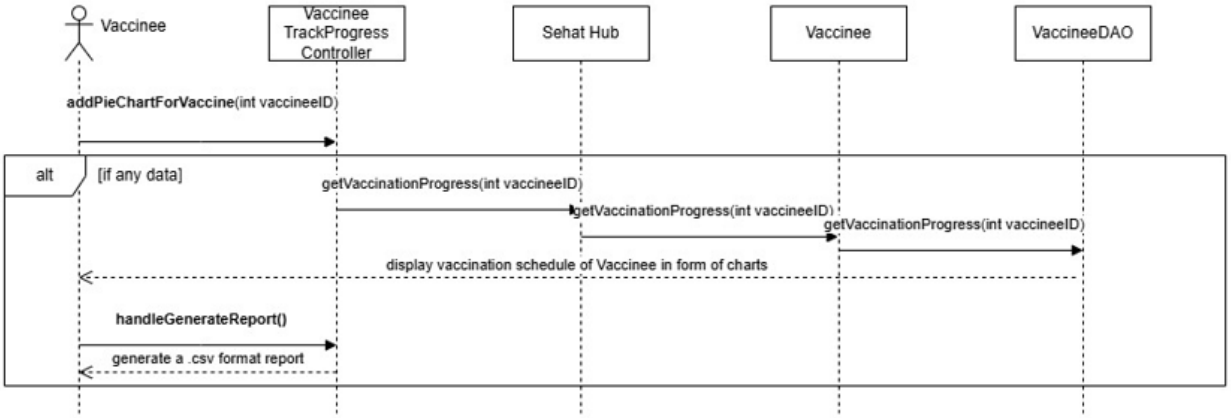


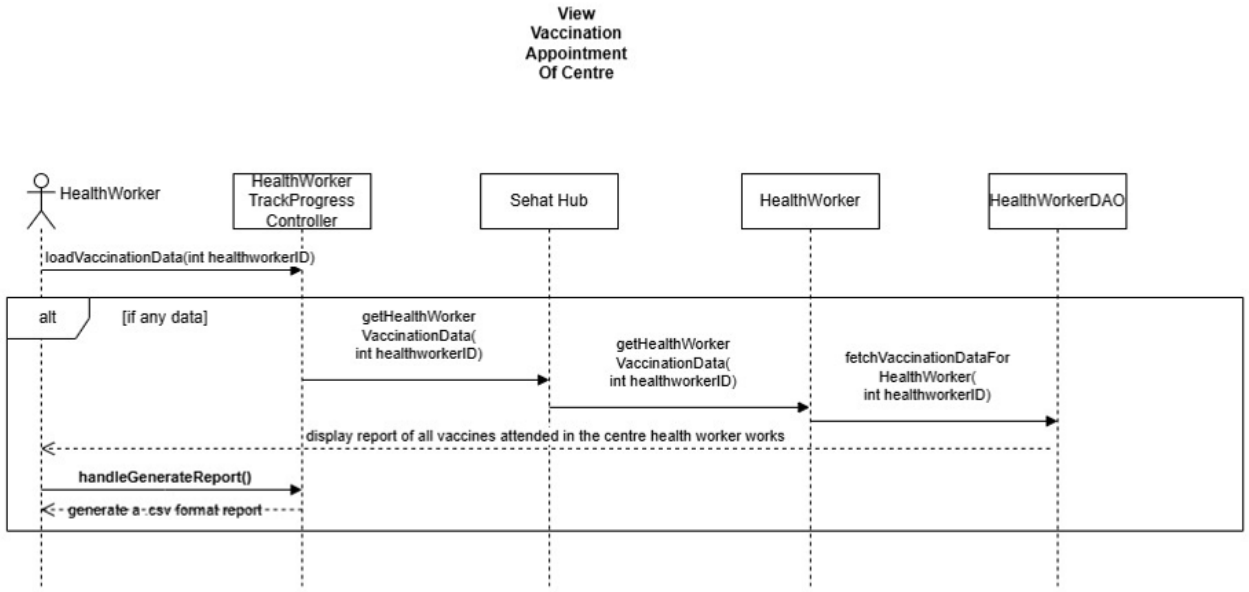


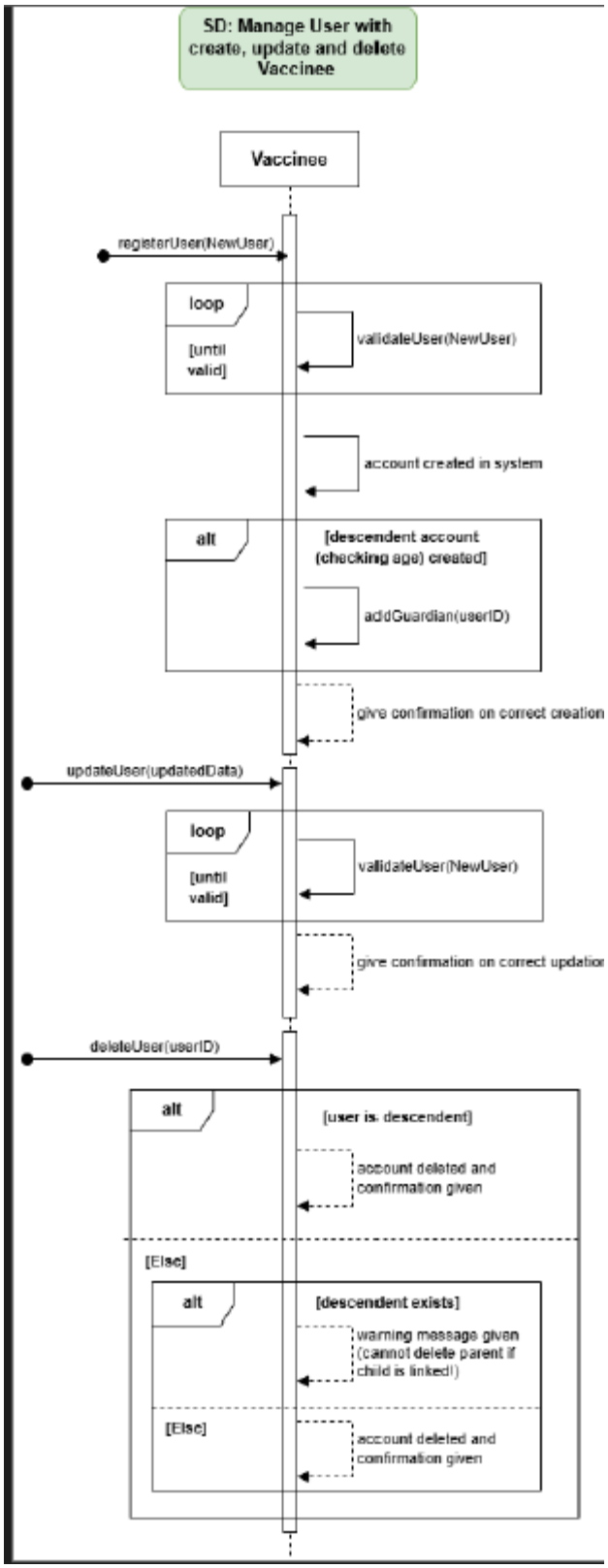
Reporting Vaccine SideEffects

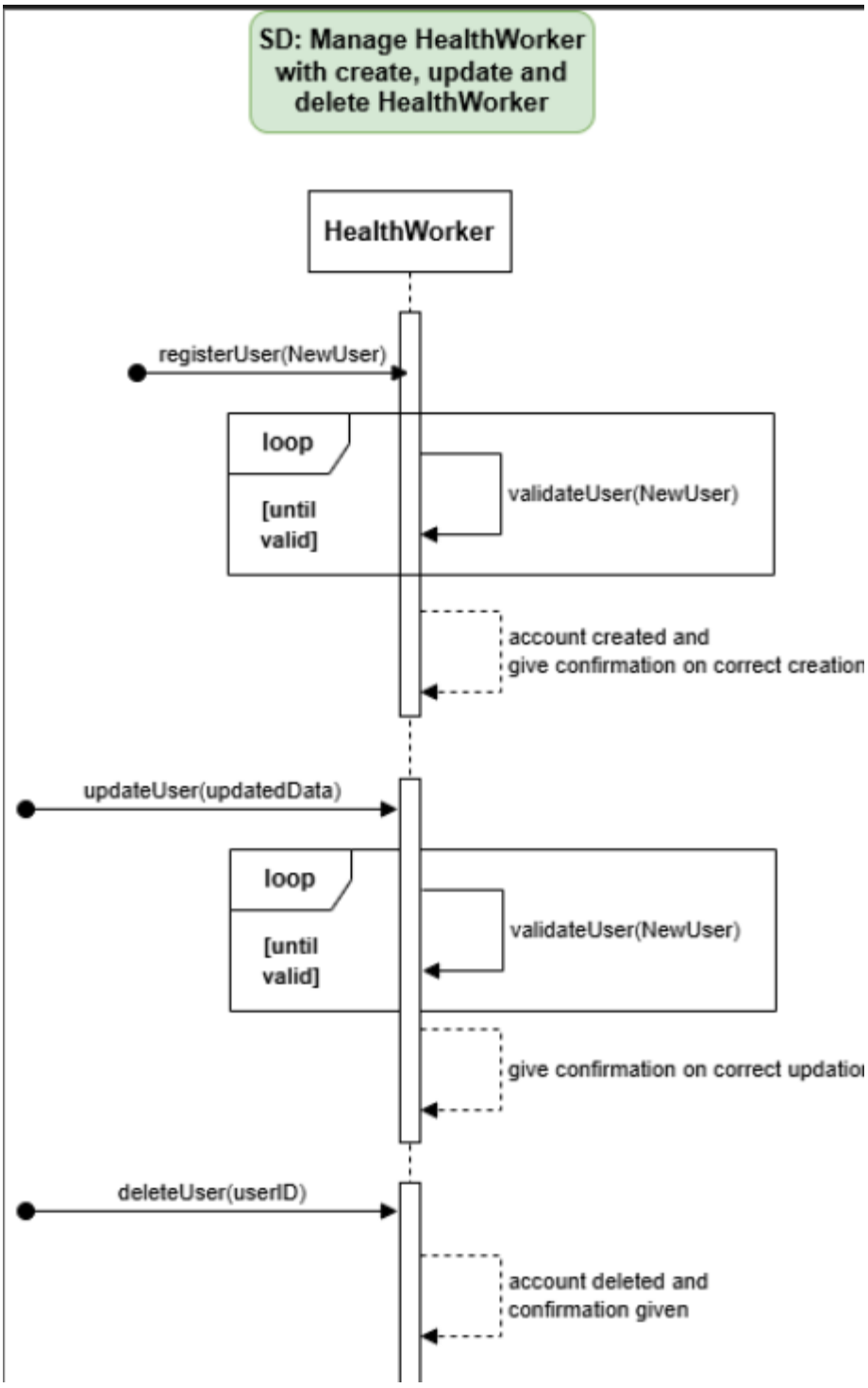


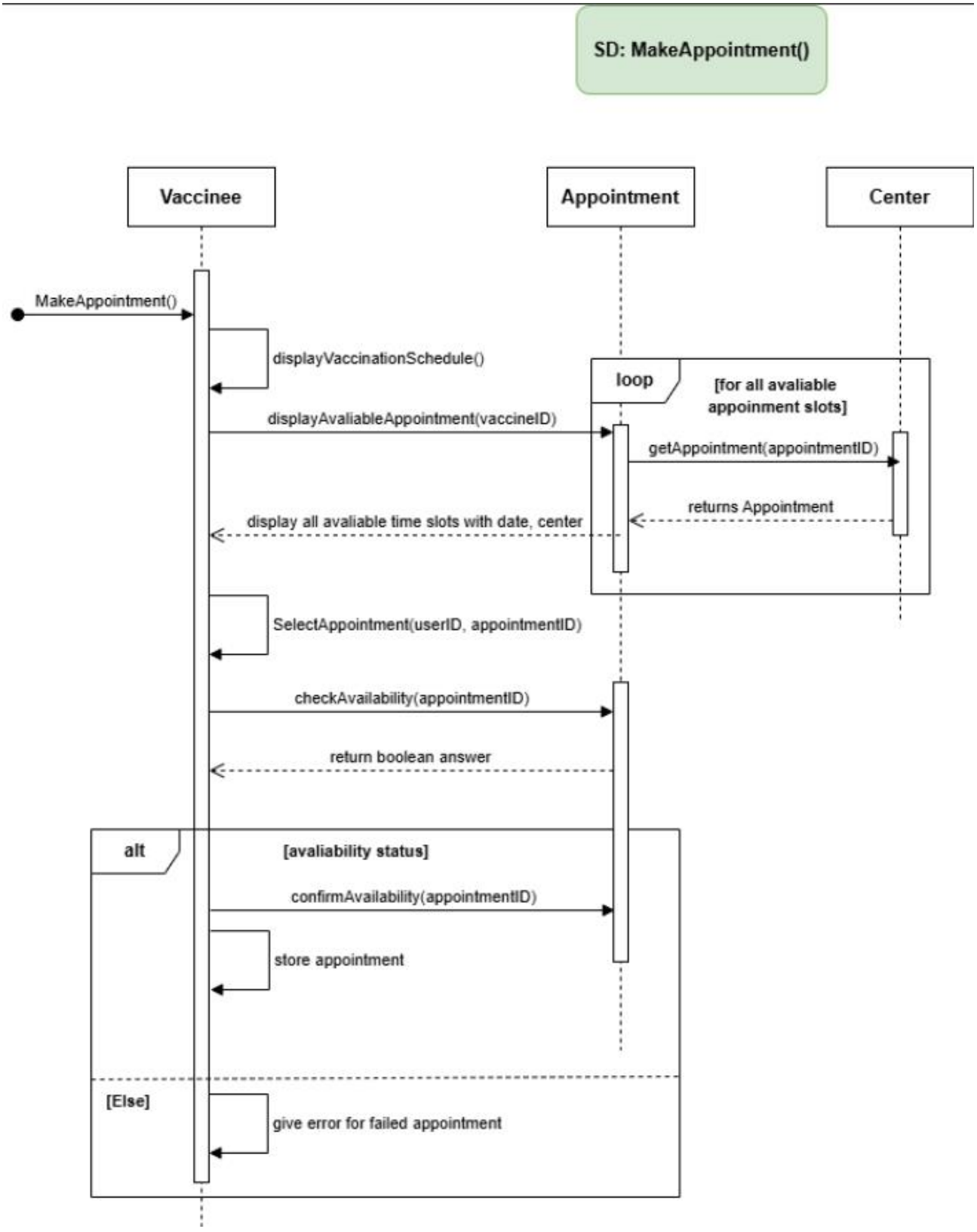
Track Vaccination Progress

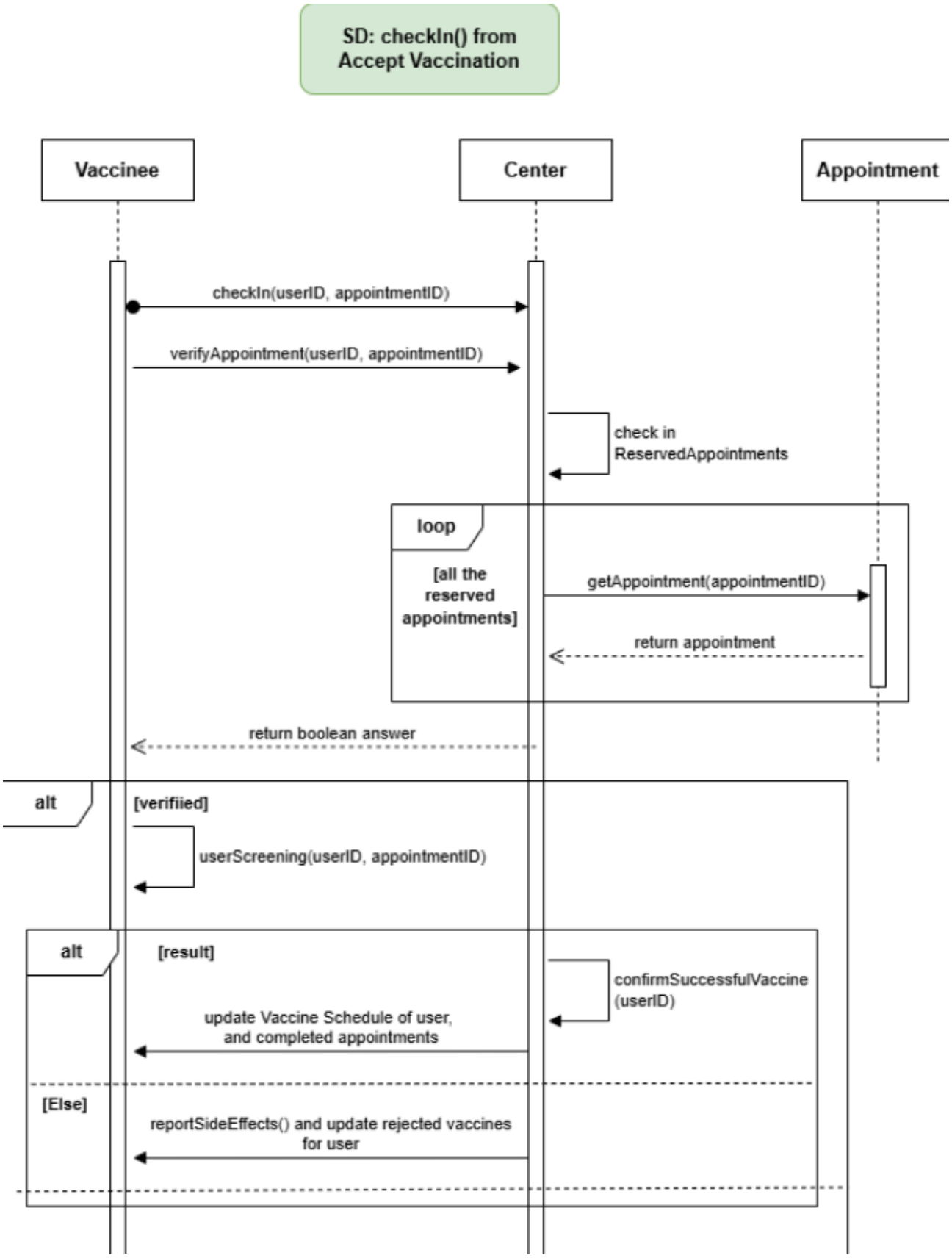


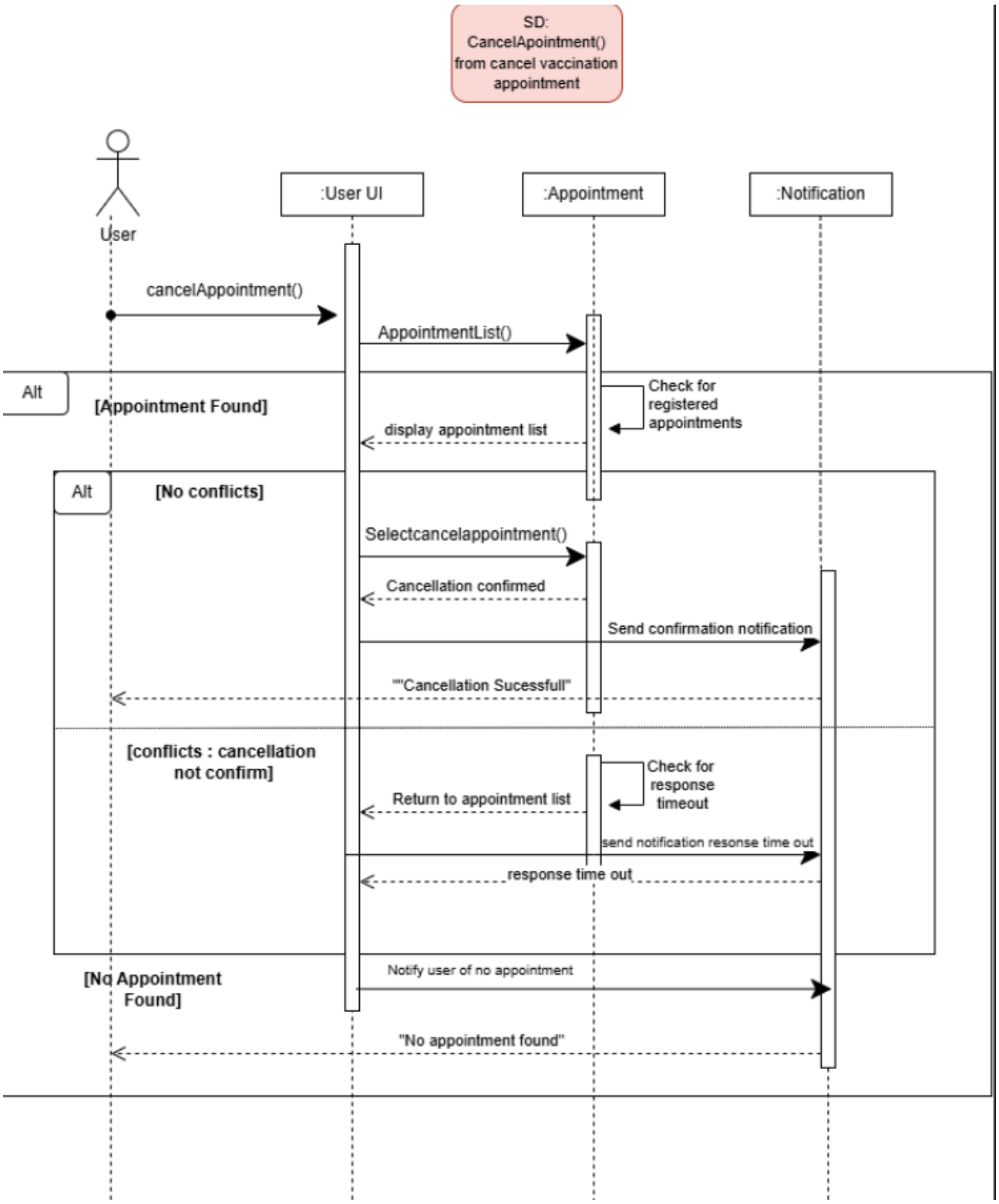

View
Vaccination
Appointment
Of Centre
HealthWorker
HealthWorker
TrackProgress
Controller
Sehat Hub
HealthWorker
HealthWorkerDAO
loadVaccinationData(int healthworkerID)
alt
[if any data]
getHealthWorker
VaccinationData(
int healthworkerID)
getHealthWorker
VaccinationData(
int healthworkerID)
fetchVaccinationDataFor
HealthWorker(
int healthworkerID)
display report of all vaccines attended in the centre health worker works
handleGenerateReport()
generate a .csv format report

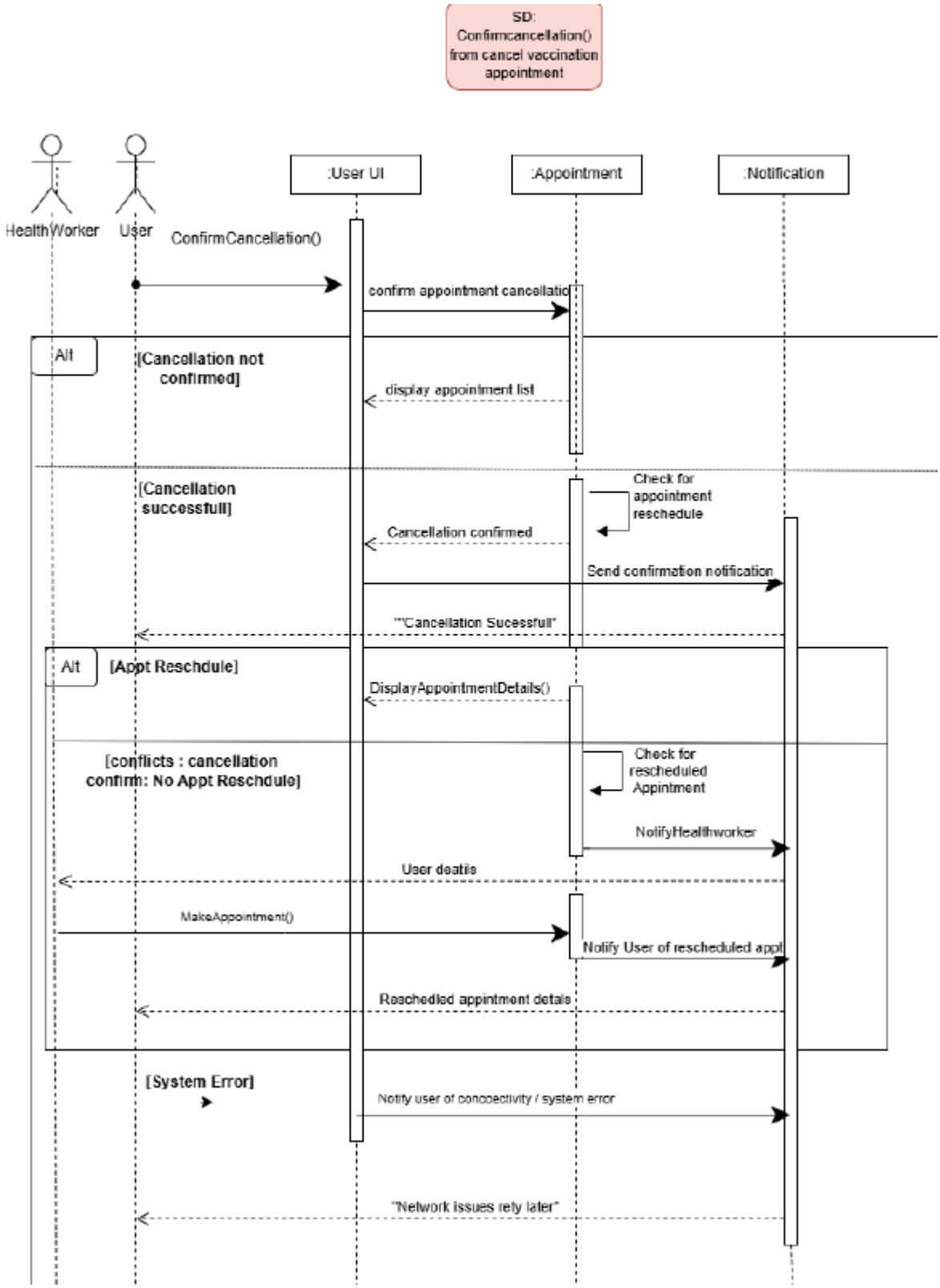

SD: Manage User with create, update and delete Vaccinee
Vaccinee
registerUser(NewUser)
loop
[until valid]
validateUser(NewUser)
account created in system
alt
[descendent account (checking age) created]
addGuardian(userID)
give confirmation on correct creation
updateUser(updatedData)
loop
[until valid]
validateUser(NewUser)
give confirmation on correct updatio
deleteUser(userID)
alt
[user is descendent]
account deleted and confirmation given
[Else]
alt
[descendent exists]
warning message given (cannot delete parent if child is linked!)
[Else]
account deleted and confirmation given


SD: Manage HealthWorker with create, update and delete HealthWorker
HealthWorker
registerUser(NewUser)
loop
[until valid]
validateUser(NewUser)
account created and
give confirmation on correct creation
updateUser(updatedData)
loop
[until valid]
validateUser(NewUser)
give confirmation on correct updatio
deleteUser(userID)
account deleted and
confirmation given

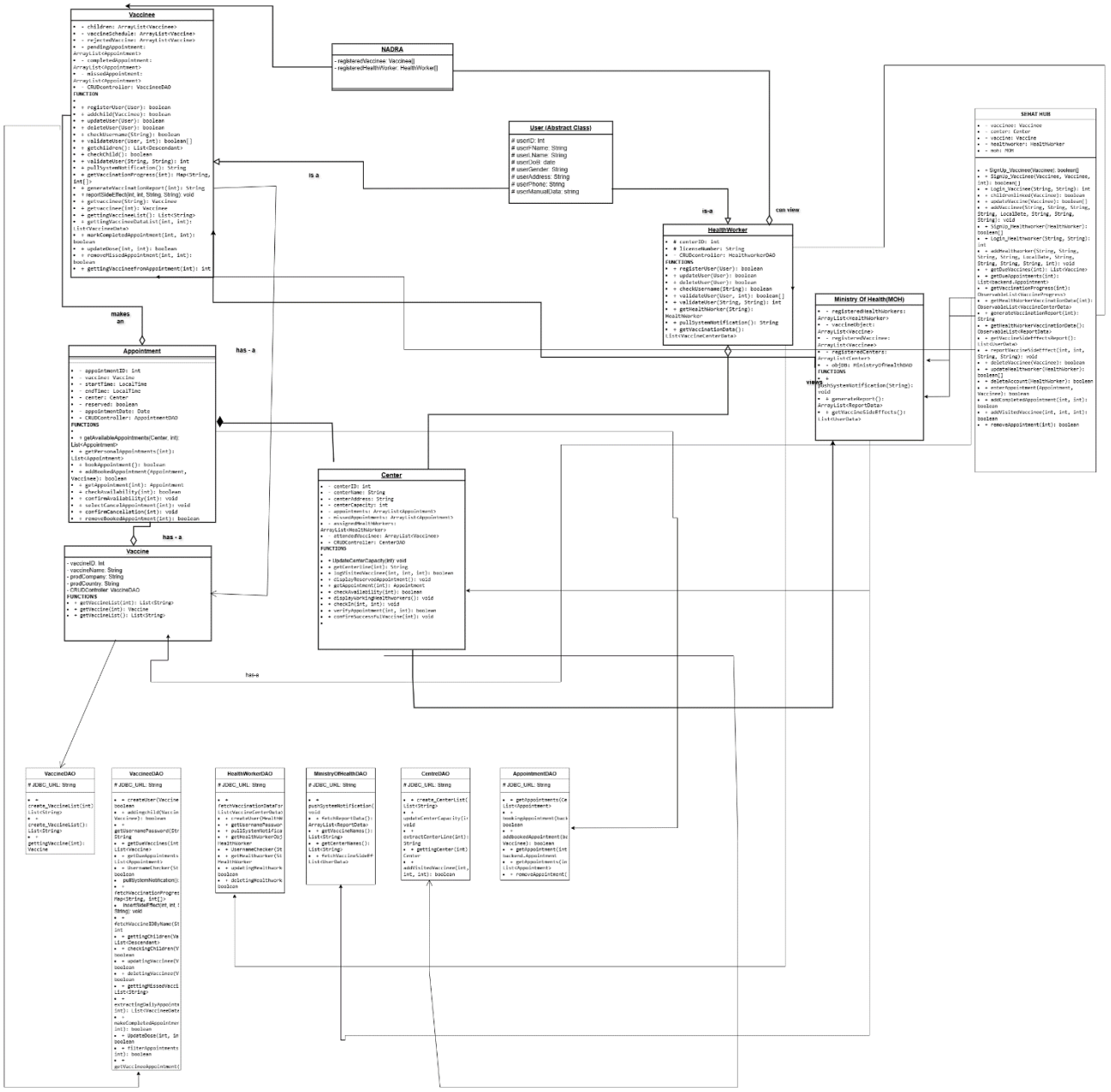

SD: MakeAppointment()
Vaccinee
Appointment
Center
MakeAppointment()
displayVaccinationSchedule()
loop
[for all avaliable appoinment slots]
displayAvaliableAppointment(vaccineID)
getAppointment(appointmentID)
returns Appointment
display all avaliable time slots with date, center
SelectAppointment(userID, appointmentID)
checkAvailability(appointmentID)
return boolean answer
alt
[avaliability status]
confirmAvailability(appointmentID)
store appointment
[Else]
give error for failed appointment


SD: checkIn() from Accept Vaccination
Vaccinee
Center
Appointment
checkIn(userID, appointmentID)
verifyAppointment(userID, appointmentID)
check in ReservedAppointments
loop
[all the reserved appointments]
getAppointment(appointmentID)
return appointment
return boolean answer
alt
[verifiied]
userScreening(userID, appointmentID)
alt
[result]
confirmSuccessfulVaccine (userID)
update Vaccine Schedule of user, and completed appointments
[Else]
reportSideEffects() and update rejected vaccines for user


SD:
CancelApointment()
from cancel vaccination
appointment
User
:User UI
:Appointment
:Notification
cancelAppointment()
AppointmentList()
Alt
[Appointment Found]
Check for
registered
appointments
display appointment list
Alt
[No conflicts]
Selectcancelappointment()
Cancellation confirmed
Send confirmation notification
""Cancellation Sucessfull"
[conflicts : cancellation
not confirm]
Check for
response
timeout
Return to appointment list
send notification resonse time out
response time out
[No Appointment
Found]
Notify user of no appointment
"No appointment found"

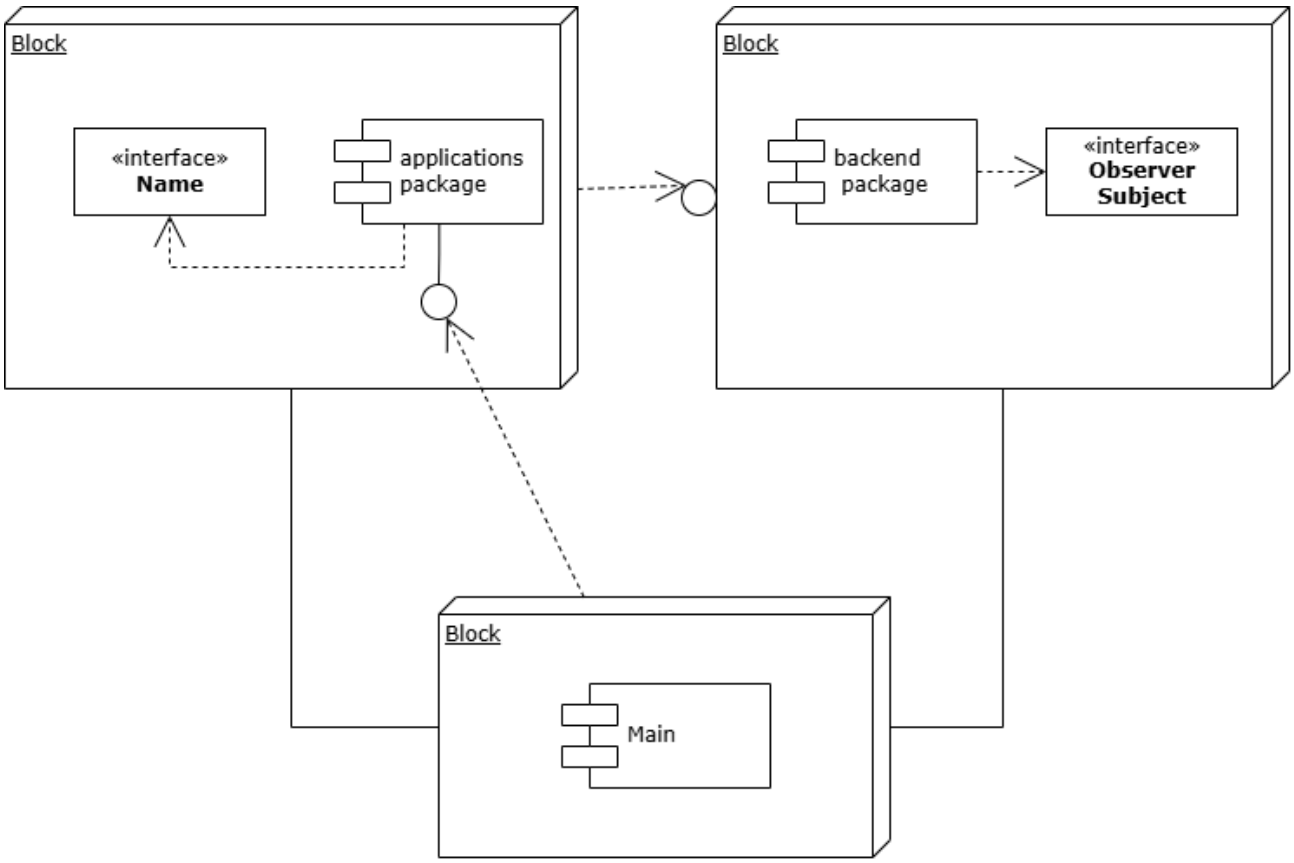

SD:
Confirmcancellation()
from cancel vaccination
appointment
HealthWorker
User
:User UI
:Appointment
:Notification
ConfirmCancellation()
confirm appointment cancellatio
Alt
[Cancellation not
confirmed]
display appointment list
[Cancellation
successfull]
Check for
appointment
reschedule
Cancellation confirmed
Send confirmation notification
"'Cancellation Sucessfull"
Alt
[Appt Reschdule]
DisplayAppointmentDetails()
[conflicts : cancellation
confirm: No Appt Reschdule]
Check for
rescheduled
Appintment
NotifyHealthworker
User deatils
MakeAppointment()
Notify User of rescheduled appl
Rescheduled appintment details
[System Error]
Notify user of concoectivity / system error
"Network issues rety later"

10. Class Diagram



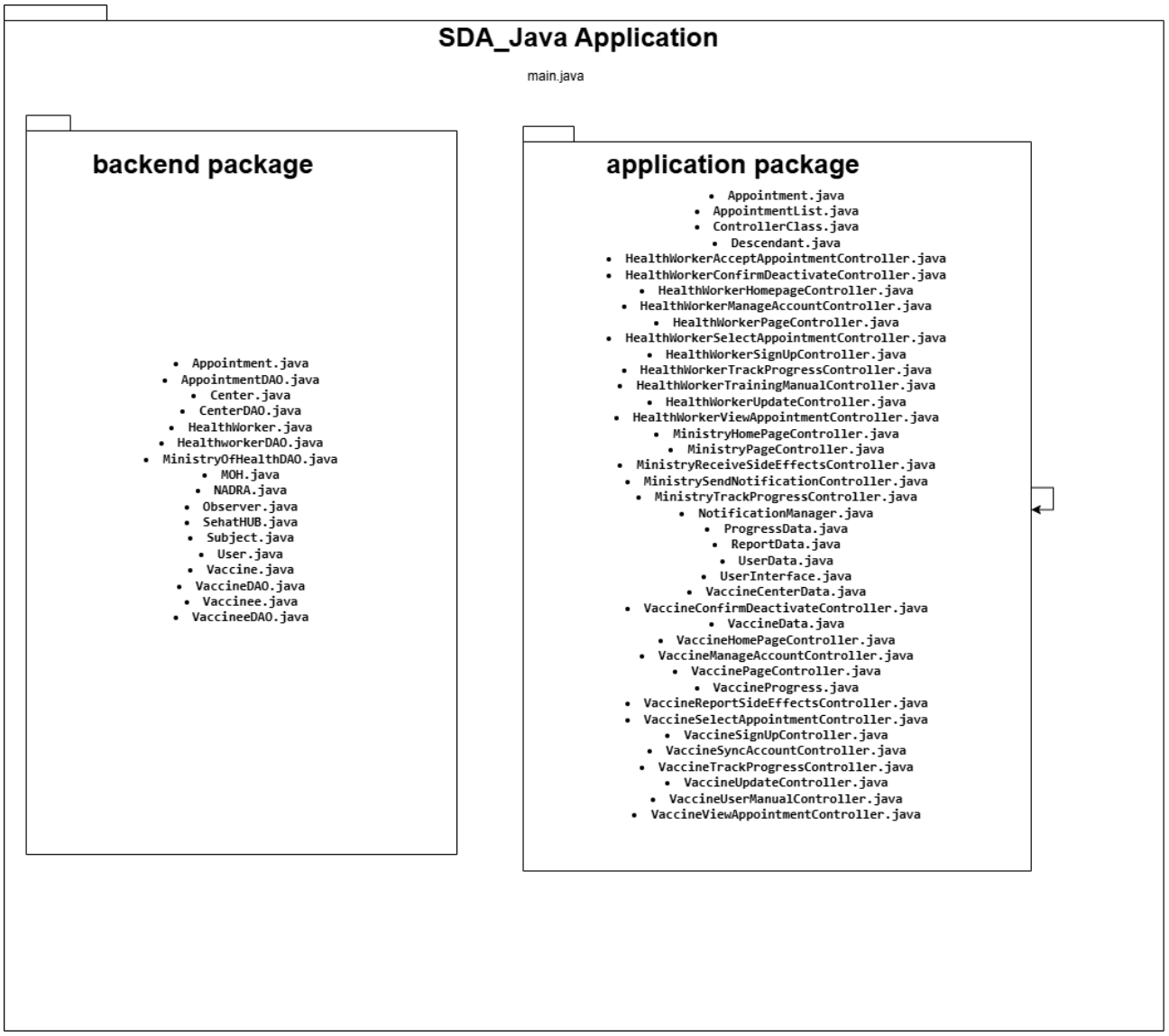
11.

12. Component Diagram



13. Package Diagram

14.



15. Deployment Diagram