Pill Dispenser & Reminder - Requirements

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Group 11

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Requirements Definition

Functional Requirements

1. The system shall consist of a hardware unit, a mobile app, and a web app.
2. The system shall be capable of interfacing with a consumer or institutional version of the hardware unit.
3. The system shall authenticate user credentials via face id.
4. The system shall allow users to create accounts as patients, medical professionals, or family/caregivers.
5. The phone app shall display reminder notifications for all users of the instance of the system.
6. The phone app shall allow users to change the amount of medication dispensed.
7. The phone app shall allow users to dismiss alerts without dispensing medication.
8. The web app shall display reminder notifications for all users of the instance of the system.
9. The web app shall allow users to change the amount of medication dispensed.
10. The web app shall allow users to dismiss alerts without dispensing medication.
11. The hardware unit (both) shall display the medication's intended recipient.
12. The hardware unit (both) shall interrogate the alarm responder's identity via facial recognition.
13. The hardware (both) unit shall dispense the patient's medication if the responder is the patient or credentialed professional/caregiver.

Non-functional Requirements

1. The system shall dispense medication within X seconds of successful authentication.
2. The system shall wait 10 minutes after alerting the user, then dismiss the alert if medication is not retrieved.
3. The system shall interface via the Internet, with the hardware unit wireless-capable.
4. The phone app shall allow users to change the frequency, (and volume, and brightness, for consumer devices) of reminders.
5. The web app shall allow users to change the frequency, (and volume, and brightness, for consumer devices) of reminders.
6. The web app shall record patient use statistics (dosage, frequency) and display them as graphs.
7. The web app shall record & display skipped medication alert statistics.
8. The hardware unit (both) shall dispense medication from refillable hoppers.
9. The hardware unit (both) shall display the patient for whom the alert is triggered.
10. Multiple hardware units shall be able to be linked in order to increase the system's effective capacity.
11. The consumer hardware unit (both) shall flash reminder alarm sounds and lights per scheduled dose.
12. The consumer hardware unit shall contain up to 10 different varieties of medication.
13. The institutional unit shall contain and dispense up to 50 different varieties of medication.

Use Case #1

- Nurse dispensing pills to individual in hospital room

Actors

- Pill Dispenser
- Nurse making rounds to distribute medication
- Individual taking pills distributed

Preconditions

- Hospital has pill dispenser installed in all rooms
- Nurse & user are in room or in close proximity to hear or see alarm
- Nurse, doctor, or pharmacist has stocked dispenser with pills to be taken
- Nurse, doctor, or pharmacist has used app or website to specify when pills are to be dispensed
- Nursing staff has set up face ID with the pill dispenser

Postconditions

- Lights flashed & the alarm sounded, telling the nursing staff to distribute the pills
- Nurse heard and/or saw it was time to retrieve the patient's pills
- Dispenser has confirmed that someone on the nursing staff is picking up the pills
- Pills have been dispensed to the user
- Dispenser confirms that pills have been retrieved

Flow of Events

- Hospital has all nurses, doctors, & pharmacists create accounts & add face IDs
- Doctor inputs prescription & pill dispersal time for each prescription (with some help for scheduling from nursing staff)
- Pharmacist adds pills to dispenser
- Dispenser confirms that it has pills to dispense
- Pill dispenser checks the time against its dispersal schedule

- Dispenser sees that it is time to disperse pills to the nursing staff & starts alerting the user it's time using an audible alarm & flashing light. User may also be alerted via app if they have it
- Dispenser confirms that it has pills to dispense
- Dispenser gives the nursing staff 10 minutes to come authenticate that they are authorized to distribute the pills
- Dispenser records if user does not come to pick up the pills
- After dispenser confirms nurse's identity, only then does it dispense the pills
- Dispenser confirms that the nursing staff has picked up pill

Use Case #2

- Individual reminding themselves to take pills

Actors

- Pill Dispenser
- Individual being reminded to take pills

Preconditions

- User has pill dispenser installed correctly in their house.
- User is in house or close proximity to hear or see the alarm.
- User has stocked dispenser with pills to be taken.
- User has used app or website to specify when pills are to be dispensed.
- User has set up face id with the pill dispenser.

Postconditions

- Lights flashed and the alarm sounded, telling user to pick up the pills.
- User heard and/or saw it was time to retrieve their pills
- Dispenser has confirmed that the right person is picking up the pills.
- Pills have been dispensed to the user.
- Dispenser confirms that pills have been retrieved,

Flow of Events

- User creates account and adds face id, pill dispersal time, and pills.
- Dispenser confirms that it has pills to dispense
- Pill dispenser checks the time against its dispersal schedule
- Dispenser sees that it is time to disperse pills the user and starts alerting the user it’s time using an audible alarm and flashing light. User may also be alerted via app if they have it.
- Dispenser confirms that it has pills to dispense.
- Dispenser gives the user 10 minutes to come authenticate that they are the desired user
- Dispenser records if user does not come to pick up pills

- After dispenser confirms users identity, only then does it dispense the pills
- Dispenser confirms that the user has picked up pills

Use Case #3

- A family member making sure that another family member has taken their needed pills

Actors

- Pill Dispenser
- Individual that is checking that their family member has taken their pills
- Individual being checked on

Preconditions

- User being checked on has pill dispenser installed correctly in their house.
- User has stocked dispenser with pills to be taken.
- User has used app or website to specify when pills are to be dispensed.
- User has set up face id with the pill dispenser
- User has authorized their family member to be able to check whether or not they took their pills, by also setting up face id for their family member

Postconditions

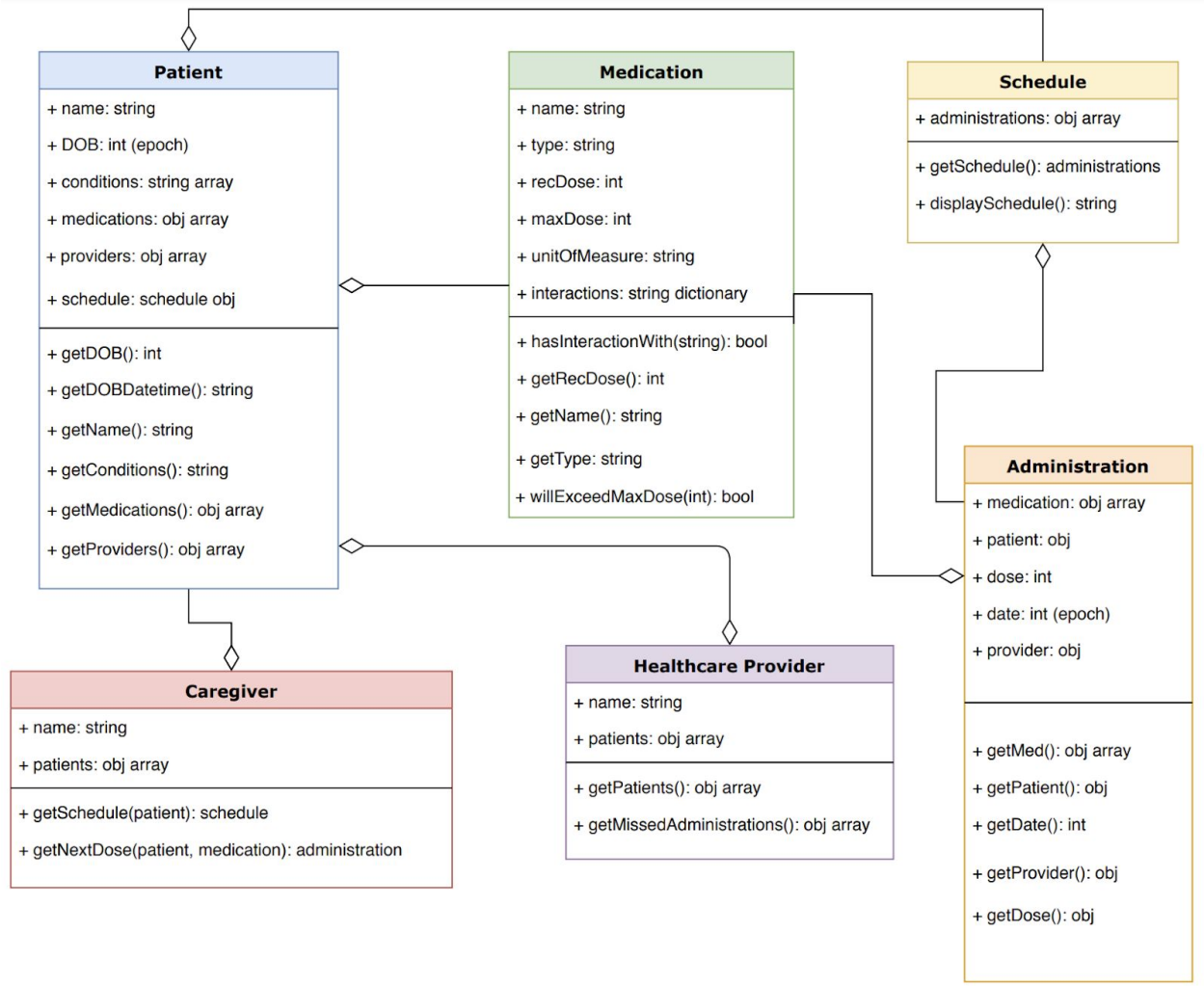
- Lights flashed and the alarm sounded, telling user to pick up the pills.
- Dispenser indicated whether or not the pills have been retrieved
- Family member checked whether or not the pills have been retrieved and reminded their relative to take the pills if the pills were not retrieved

Flow of Events

- User creates account and adds face id for both the user and a designated family member that will make sure that the user is taking their pills. User also adds pill dispersal time and pills.
- Dispenser confirms that it has pills to dispense
- Pill dispenser checks the time against its dispersal schedule

- Dispenser sees that it is time to disperse pills for the user and starts alerting the user that it is time to collect the pills, by using an audible alarm and flashing light. User may also be alerted via the pill dispenser app if they have it.
- Dispenser gives the user 10 minutes to come authenticate that they are the desired user. If, in the 10 minutes, the user successfully authenticates that they are the user intended to receive the pills, the dispenser dispenses the pills.
- Dispenser records whether or not the user picked up the pills.
- The designated family member authenticates that they are indeed the designated family member and checks whether or not the user picked up the pills.
- If the user didn't pick up the pills, the family member reminds the user to pick up their pills. If the user did pick up the pills, the family member does nothing.

UML Class Diagram



Requirements Specification

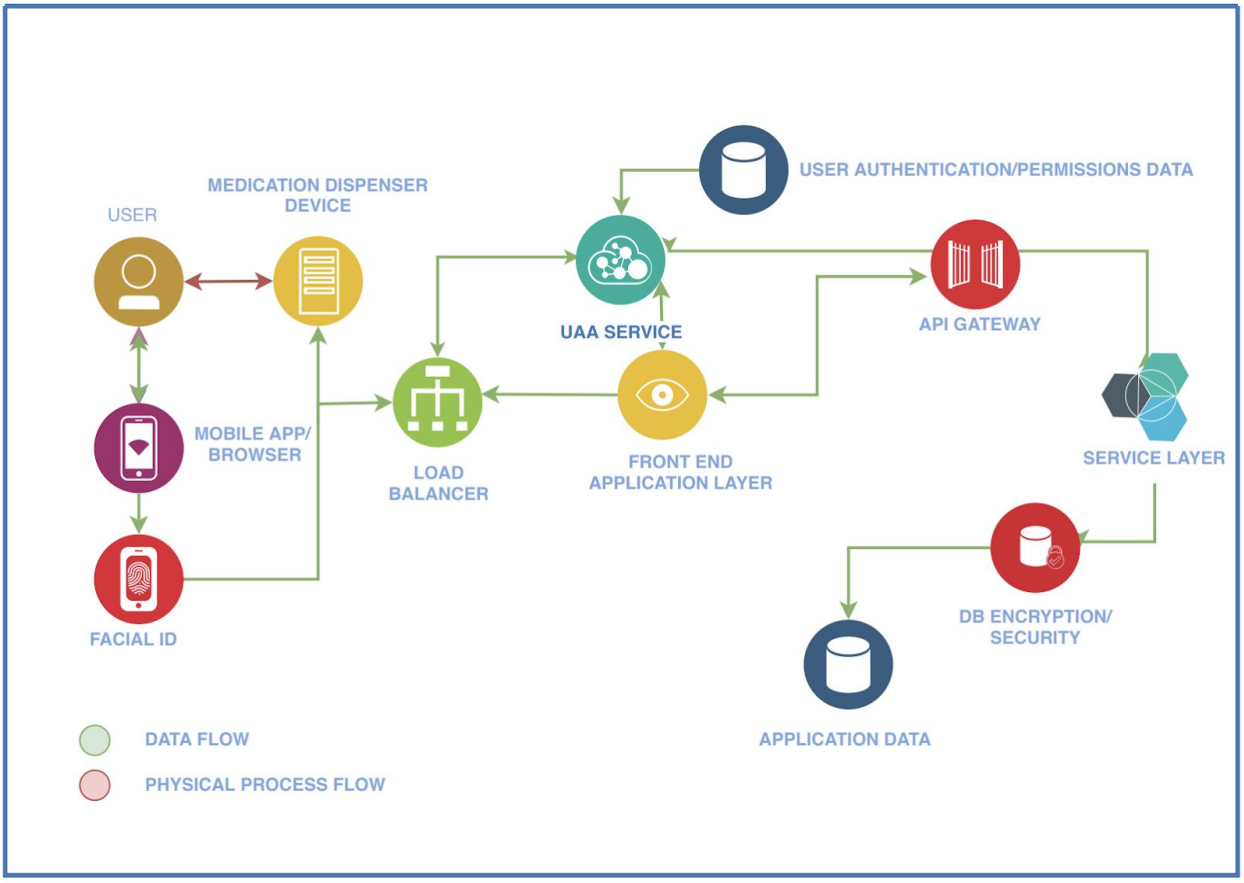
Functional Requirements

1. The system shall dispense medication only for a specific patient per alert.
2. The system shall display which patient the medication alert is for, either visually or with a name.
3. The hardware unit shall authenticate the identity of the recipient as a patient or caregiver.
4. The hardware unit shall dispense pills into a holder after authenticating identity.
5. The web app shall alert users that medication needs to be taken.
6. The web app shall allow users to assign medications to hoppers for dispensing (and change assignments).
7. The web app shall track and display usage frequency and amount (including skipped doses).
8. The web app shall display tracked data as graphs, with the ability to compare over periods of time.
9. The web app shall allow users to add or modify new medication reminders – the time of day, frequency, amount of pills to dispense.
10. The web app shall allow alerts to be dismissed without dispensing.
11. The phone app shall allow users to assign medications to hoppers for dispensing (and change assignments).
12. The phone app should alert users that medication needs to be taken.
13. The phone app should allow alerts to be dismissed without dispensing.

Non-Functional Requirements

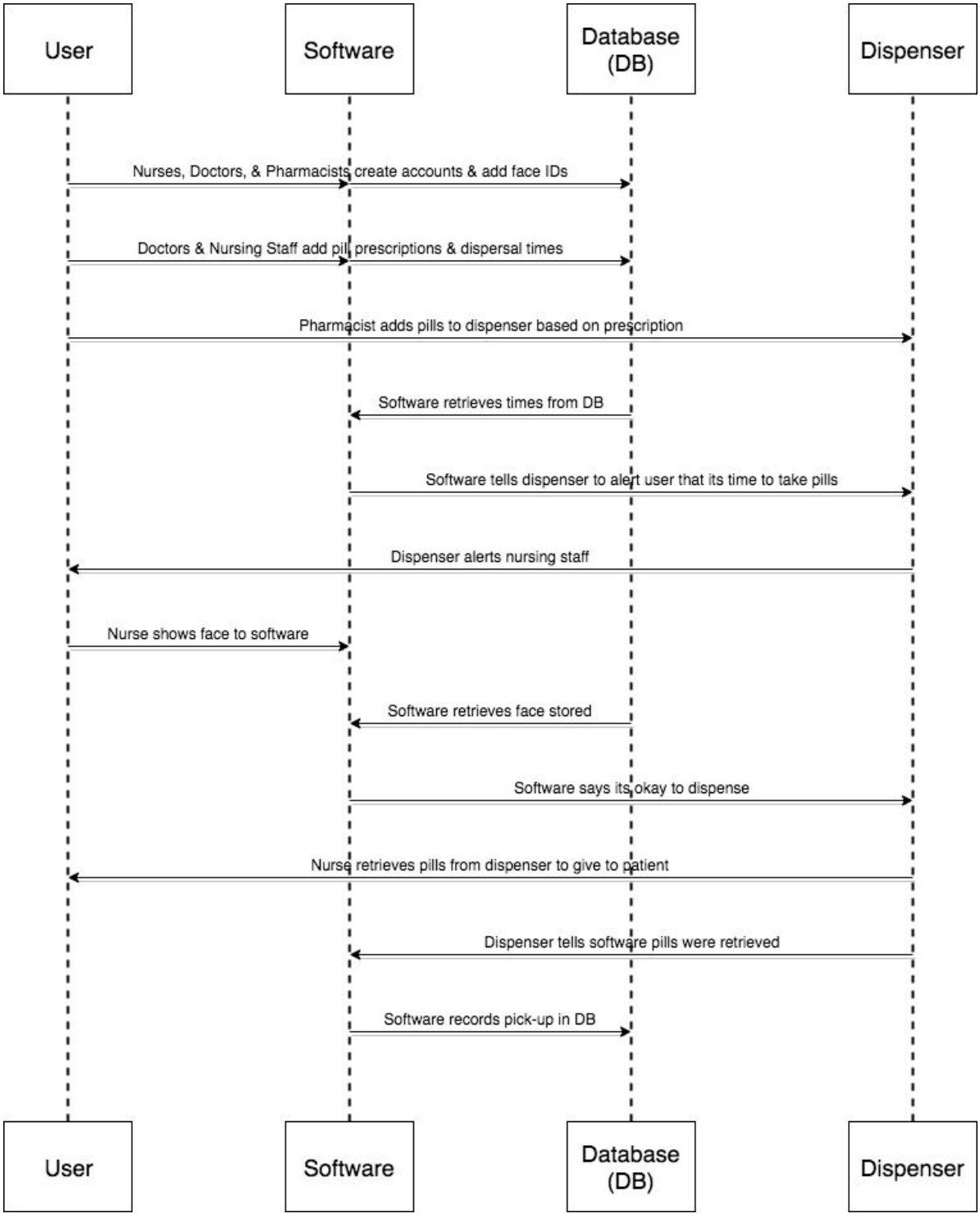
1. The system should alert the user when pill stock is low.
2. The web app should store data over the life of the patient and sort it by month, year, and decade.
3. The hardware unit (both) should be fillable with medication by the user.
4. The hardware unit (both) shall feature a light brighter than daylight/typical household lights.
5. The hardware unit (both) speaker shall be capable of volumes louder than 60 decibels (normal conversation).

Data Flow Diagram

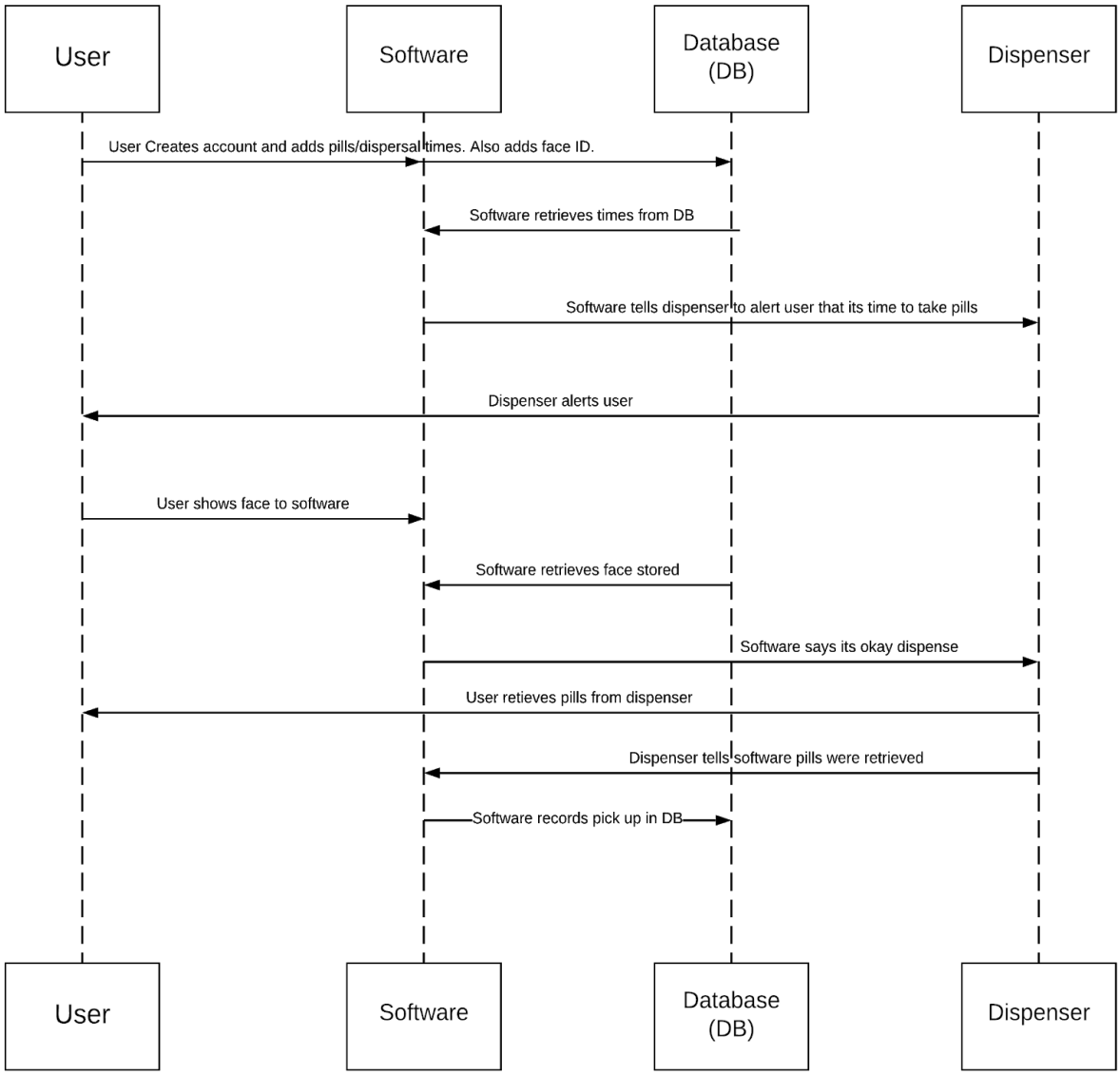


Message Sequence Charts

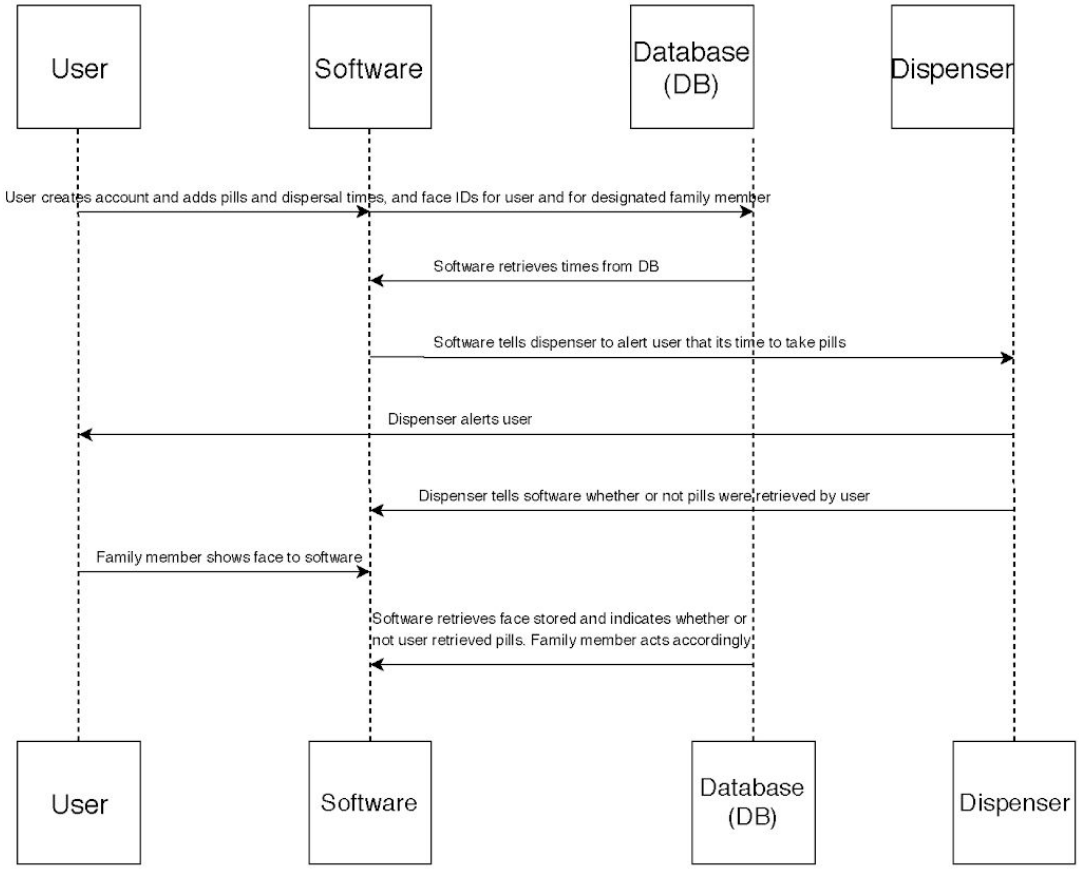
Use Case #1



Use Case #2


User
Software
Database (DB)
Dispenser
User Creates account and adds pills/dispersal times. Also adds face ID.
Software retrieves times from DB
Software tells dispenser to alert user that its time to take pills
Dispenser alerts user
User shows face to software
Software retrieves face stored
Software says its okay dispense
User retieves pills from dispenser
Dispenser tells software pills were retrieved
Software records pick up in DB
User
Software
Database (DB)
Dispenser

Use Case #3


User
Software
Database (DB)
Dispenser
User creates account and adds pills and dispersal times, and face IDs for user and for designated family member
Software retrieves times from DB
Software tells dispenser to alert user that its time to take pills
Dispenser alerts user
Dispenser tells software whether or not pills were retrieved by user
Family member shows face to software
Software retrieves face stored and indicates whether or not user retrieved pills. Family member acts accordingly
User
Software
Database (DB)
Dispenser

Customer Evaluation

Our customer joined our team's Slack channel and participated in the week's project discussion answering several questions about use cases & project specifications. He has actively helped us understand his initial vision and helped paint the picture in how to make it a reality throughout the several use cases.

Contribution Summary

The following indicates team member contributions during the project stages leading up to & including HW1:

- All - participated in continuous communication through our Slack channel, worked with our customer to determine expectations for the project, & reviewed/edited final drafts of each individual portion of HW1 into one cohesive submission.
- Mario Bocaletti - coordinated our initial group interaction to make sure we all communicated & joined our Slack channel. Also completed our UML & Data Flow diagrams.
- Henry Clay - coordinated our communication with our customer to get him involved in our Slack channel & also helped to coordinate individual contributions to be combined for HW1. Also completed our Requirements Definition & Requirements Specification.
- Corey Nielsen - templated our use cases to make them more cohesive. Also completed Use Case #2.
- Samantha Tone - compiled our individual contributions into one cohesive document for submission. Also completed Use Case #1.
- Pavan Thakkar - Completed Use Case #3.