

EHR Analysis

1 Introduction

The United States Medical Industry makes up close to 18% of the total US GDP and is expected to grow at an average rate of 5.5 % for the next 10 years [4]. Within the past few years, this nearly 3.8 trillion dollar industry has been revolutionized by advances in the health IT technology. Once such revolutionary advancement was the creation of the Electronic Health Record System (EHR) which carried the potential to not only save the medical industry nearly 371 billion dollars over 15 years but also drastically increase access to healthcare information [5]. Adoption of the EHR has been pronounced with nearly 75% of Canadian doctors using some form of an EHR in a 2014 survey and 86.6% of US respondents in another 2014 study reporting that their healthcare provider maintained medical records in a computerized system. [2, 3].

2 Previous Work

Currently two companies, Epic and Cerner, dominate the EHR market with a combined market share of 85% [6]. These two companies have developed systems that work in large hospital settings and are often used in order to communicate information across large hospital chains. However, these system and lesser known competitors, for all of their worth, remain far from a perfect solution to healthcare problems. Issues such as the complexity of the system, inability of users to anticipate potential problems, safety concerns, and difficulty in system migration mitigate some of the supposed benefits of EHR's [1]. These concerns have placed a stain on the EHR industry.

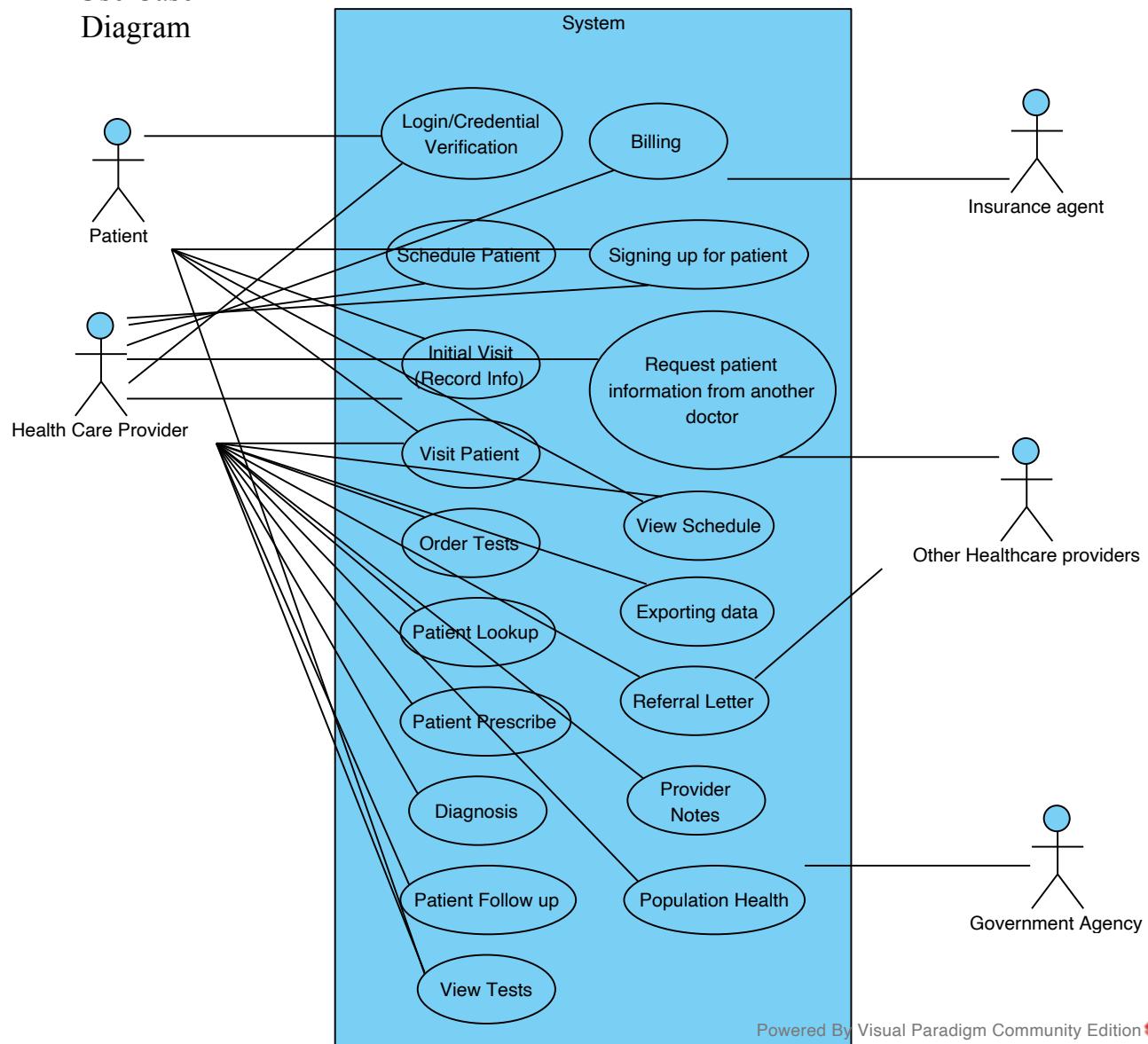
3 Proposition

Thus, our team goal for the course of this project is to develop an EHR specifically focused towards primary care and general practice physicians. In order to address preexisting concerns with existing EHRs, we plan on developing a system that focuses on ease of use for general and primary care healthcare providers and their patients. By developing a system with this goal in mind, we hope to create an EHR that fulfills the potential of an EHR system.

Requirements

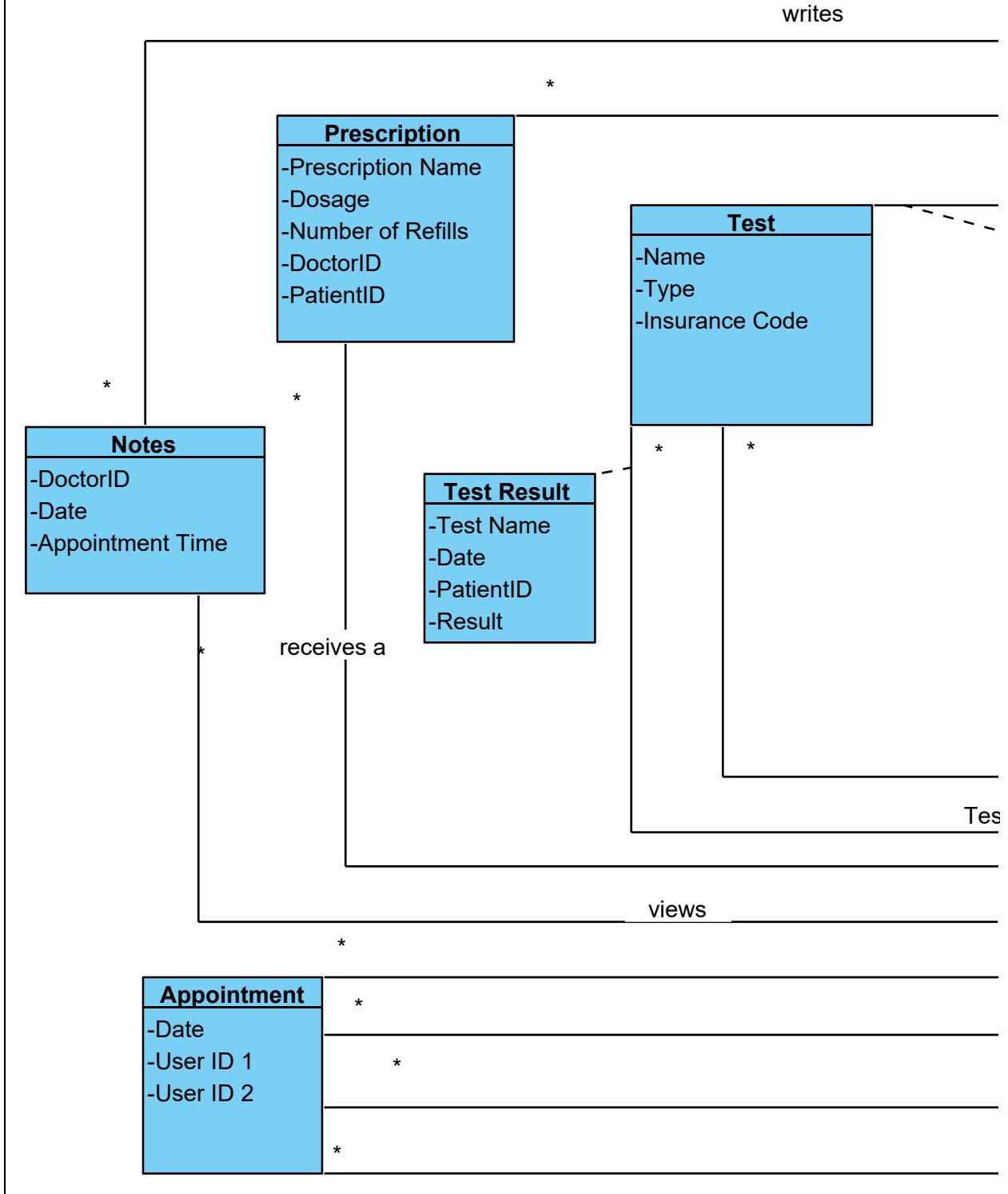
<p><<requirement>></p> <p>Different fields for different types of patient visits</p> <p>Text = "All patients must be accounted for - correct info for each patient (database)" ID = "REQ001" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Text = "Doctors have to be able to use the interface" ID = "REQ002" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Doctor-to-Patient</p> <p>Text = "Multiple doctors need to see each patient" ID = "REQ003" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>
<p><<requirement>></p> <p>Doctor Database</p> <p>Text = "Doctor Information - patients seeing" ID = "REQ004" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Time sheet</p> <p>Text = "Time sheet for doctors schedules" ID = "REQ005" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>insurance code</p> <p>Text = "Each condition needs to be associated with an insurance code" ID = "REQ006" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>
<p><<requirement>></p> <p>Patient - User Interface</p> <p>Text = "" ID = "REQ007" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Clinical Test</p> <p>Text = "Orders and view clinical test being done" ID = "REQ008" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Orders</p> <p>Text = "Orders and prescriptions" ID = "REQ009" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>
<p><<requirement>></p> <p>Look up</p> <p>Text = "Fast lookup" ID = "REQ010" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Access</p> <p>Text = "System should be access specific (should only display patient name and condition to doctors)" ID = "REQ011" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Input</p> <p>Text = "Easy data input" ID = "REQ012" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>
<p><<requirement>></p> <p>Data consistency</p> <p>Text = "Managing data" ID = "REQ013" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Easy file sharing</p> <p>Text = "Easy file sharing between doctors" ID = "REQ014" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>	<p><<requirement>></p> <p>Population health</p> <p>Text = "stats of population health." ID = "REQ015" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p>

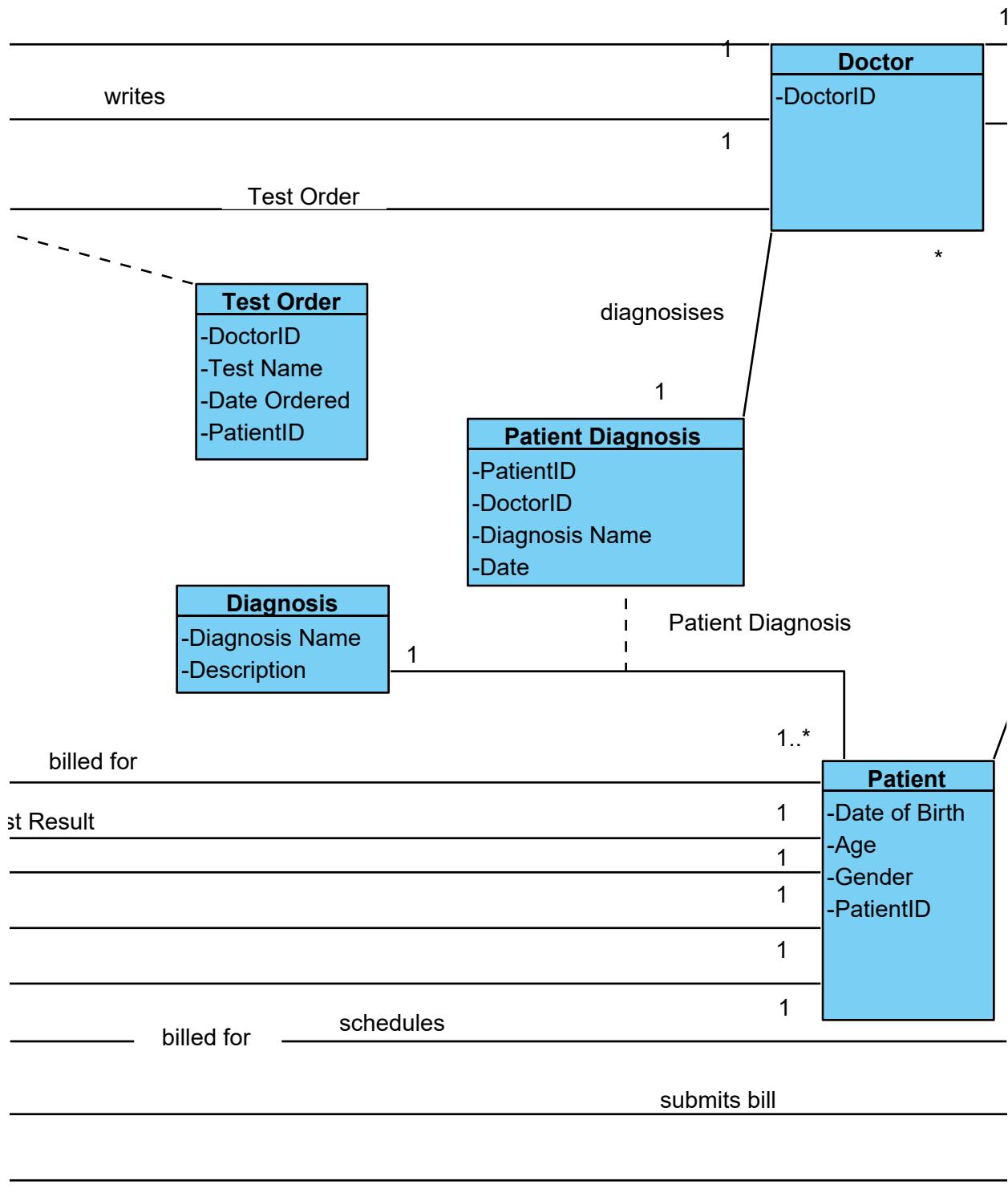
Use Case Diagram

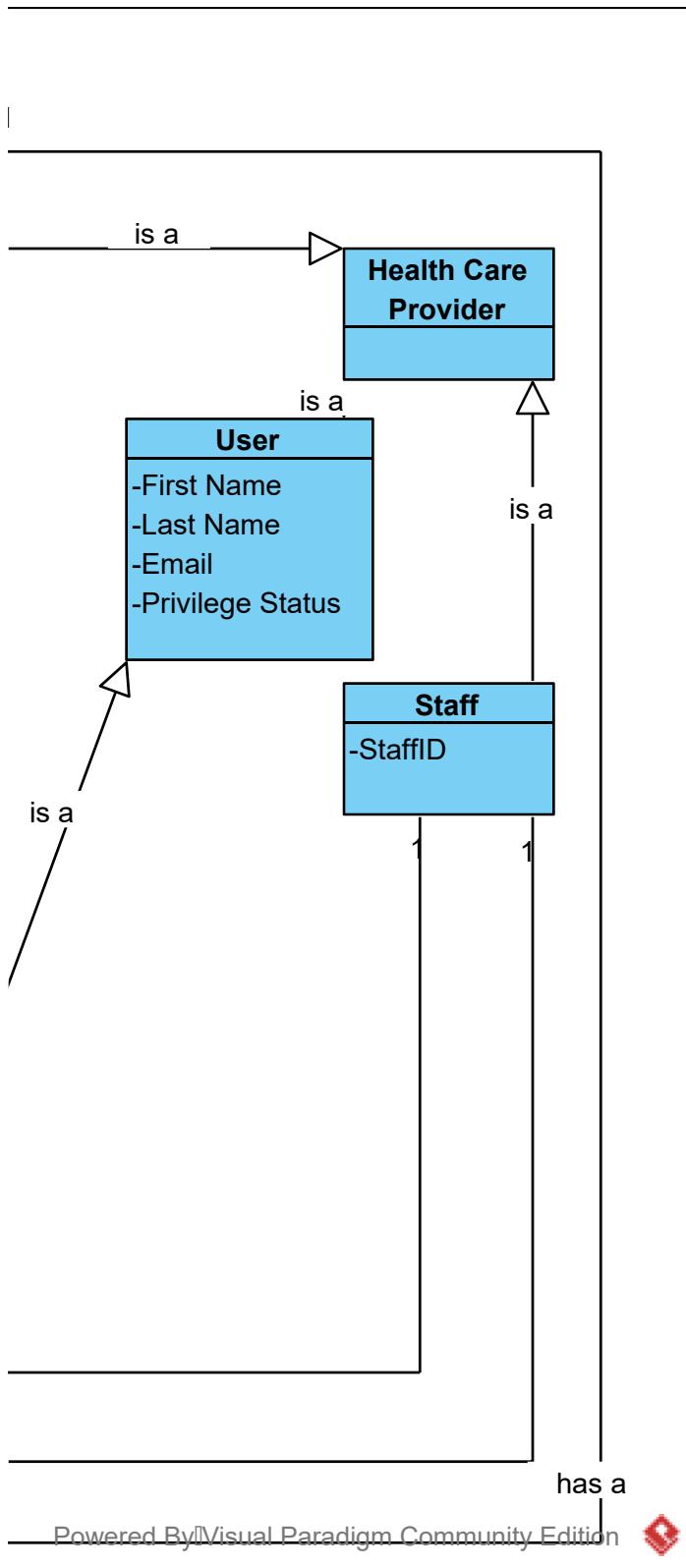


Traceability Matrix

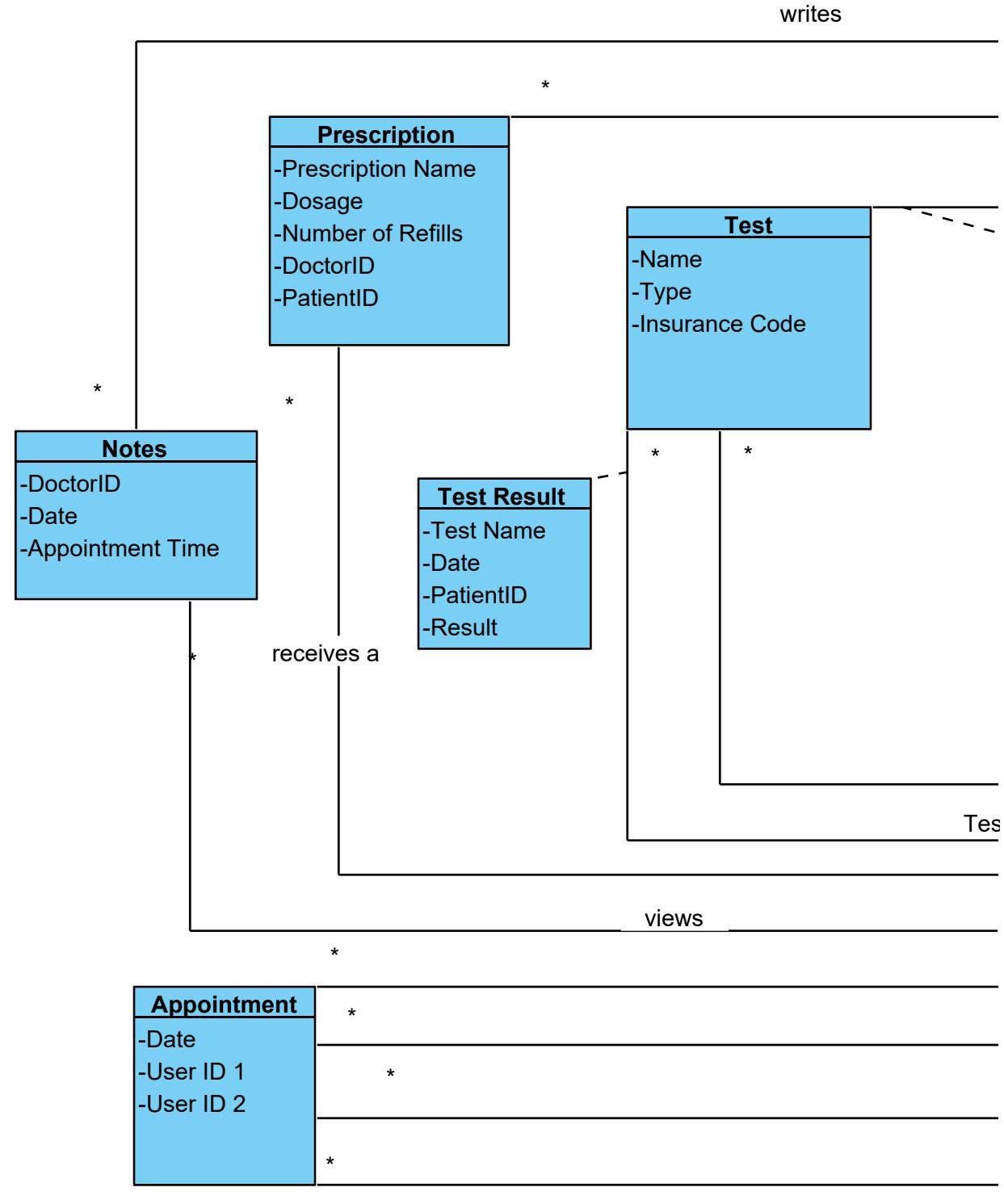
Class Diagram2







Class Diagram2



Billing

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Insurance agent
Supporting Actors	

Scenarios

Scenario

1. User selects display bill
2. System displays billing information to the user, including total cost and services rendered
3. User selects the day which the bill must be paid by
4. User selects send bill
5. System prompts the user for bill recipients
6. User selects the recipients to send the bill to
7. User selects the send bill button
8. System sends the bill to the specified parties
- 9.

Extensions

- 2.a. Invalid cost values are entered
 1. System signals error and rejects entry
 2. Staff responses to error
 - 2.1. Data for charging is saved in human readable format
 - 2.1.1. Office accountant manually enters data
 - 2.1.2. System recalculates and displays results
 - 2.2. Necessary data is not saved
 - 2.2.1. Accountant reports error
 - 2.2.2. Operation is put on hold until correct data is recovered
 - 2.b. Services rendered are not available
 1. System reports error
 2. Accountant responds to errors
 - 2.1. Services are locatable
 - 2.1.1. Accountant enters data by hand
 - 2.2. Services are not locatable
 - 2.2.1. Accountant reports error

2.2.2. Operation halted until correct data is recovered

- 3.a. Patient receives payment extension for extenuating circumstances
 - 1. User notes the extension and the reason for the extension on the bill
 - 2. System saves the updated due date
 - 3. System notifies the other bill recipients of the extension
- 6.a. Desired recipient is not listed
 - 1. User will select other
 - 2. System will prompt the user to enter the name and email of the recipient
 - 3. User enters in the recipient's information
 - 4. User selects add recipient
- 8.a. Bill is unable to be sent due to extenuating system errors
 - 1. System reports error
 - 2. System displays which recipients did not receive the bill
 - 3. User manually sends data
- #.a. System fails
 - 1. User will exit and restart the application

Details

Level	User goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Patient receives a service from a provider
Post-conditions	Listed recipients will receive the bill Bill due date will be saved
Author	Katie Wokwoek
Assumptions	User is a staff member

Diagnosis

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor enters patient to diagnosis
2. System fetches file
3. Doctor opens patient's file
4. System creates new diagnosis for patient
5. Doctor enters patient's diagnosis
6. System saves and stores diagnosis in patient folder and in other necessary files

Extensions

- 3.a. Patients file is unable to open
 1. Doctor restarts system
 2. System reports error and continues in clean state
- 3.b. Doctor does not have permission to access file
- 5.a. Patient has additional ailments and requires more than one diagnosis
 1. Doctor creates multiple diagnoses
 2. System records multiple diagnoses and stores data under same visit
- 6.a. Patient requests copy of diagnosis
 1. System provides available information
 2. Doctor prints or sends the information to the patient in a secure way
- #.a. At any time, System fails
 1. Doctor restarts system
 2. System reconstructs former state
 - 2.1. System detects anomaly
 - 2.1.1. Error is reported to doctor and IT and enters a clean state
 - 2.1.2. Doctor creates new diagnosis

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Visit Patient
Post-conditions	N/A
Author	N/A
Assumptions	N/A

Requirements

Different fields for different types of patient visits

Look up

Access

Input

Data consistency

Easy file sharing

Population health

Initial Visit (Record Info)

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Patient, Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Patient walks into doctor's office for their appointment
2. Patient checks in and identifies themselves with to the staff
3. Staff check to see whether customer health sheet is complete
4. Staff will check doctor's availability
5. Doctor is available
6. Patient is sent to doctor
7. Doctor evaluates the patient
8. Doctor documents encounter following the Provider Notes procedure
9. Doctor orders test following the Order Test procedure
10. Doctor diagnosis the patient following the Diagnosis procedure
11. Doctor prescribes medication following the Patient Prescribe procedure
12. Doctor refers patient to another provider following the Referral Letter procedure

Extensions

- 2.a. Patient cannot identify themselves
 1. Patient is refused
- 2.b. Patient cannot identify themselves but has an appointment
 1. Patient logs into the system
 2. Patient checks into appointment through the system
- 2.c. Patient is a walk in
 1. Patient makes an appointment with the staff members
- 3.a. Customer health sheet is not complete
 1. Staff asks the patient to fill out the health sheet
 2. Patient logs onto the system and completes the health sheet
- 3.b. Patient health sheet is empty/incomplete
 1. Patient logs into system
 2. Patient fills any empty/incomplete sections of health sheet

- 5.a. Doctor is unavailable
 - 1. Staff gives patient estimate as to when doctor will be available
 - 2. Staff asks patient to wait in waiting room
- 9.a. No test are needed
 - 1. Doctor skips the order test procedure
- 10.a. No diagnosis is made
 - 1. Doctor skips the diagnosis procedure
- 11.a. No prescription is needed
 - 1. Doctor skips the patient prescribe procedure
- 12.a. No referral is needed
 - 1. Doctor skips the referral letter procedure
- #.a. anytime system does not respond
 - 1. User will restart system

Details

Level	User goals
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential Verification
Post-conditions	Patient information is recorded.
Author	John Harrison
Assumptions	N/A

Requirements

- Doctor-to-Patient
- insurance code
- Patient – User Interface
- Input
- Data consistency

Login/Credential Verification

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Patient
Supporting Actors	

Scenarios

Scenario

1. User opens the application
2. System prompts client to enter their credentials
3. User enters their credentials
4. System checks e-mail username to see if an account is associated
5. Account is associated
6. System checks password to see if it matches the account password
7. Password is correct
8. System redirects User to their home page

Extensions

- 3.a. User does not yet have an account
 1. User selects option to create an account
 2. System redirects user to account creation
- 5.a. E-mail entered does not match an account
 1. System prompts user to re-enter credentials
 - 1.1. User re-enters credentials until correct
 - 1.2. User does not have an account
 - 1.2.1. User chooses to create an account
 - 7.a. Password entered does not match account password
 1. System prompts user to re-enter password
 - 1.1. User re-enters credentials until correct
 - 1.2. User does not have an account
 - 1.2.1. User chooses to create an account
 - #.a. The application fails
 1. User will exit and restart the application

Details

Level	User
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	N/A
Post-conditions	Patient gains access to the system
Author	John Harrison
Assumptions	Emails are used as user names

Requirements

Patient – User Interface

Look up

Input

Patient Database

Requirements

Different fields for different types of patient visits

Doctor Database

insurance code

Look up

Access

Data consistency

Easy file sharing

Order Tests

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor starts an order test.
2. System ask for a patient in need of test.
3. Doctor selects patient in need of test.
4. System fetches patient data.
5. Doctor selects test to perform.
6. System prepares order to be sent
7. Doctor approves lab order
8. Order is sent to the lab
9. Lab receives order successfully.

Extensions

- 3.a. Doctor closes window while selecting patient.
 1. Window closes, patient data remains unchanged
 2. Doctor may reopen window and select patient again
- 9.a. Lab does not receive test order
 1. Doctor may send order again

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential Verification
Post-conditions	Necessary test for patient is determined. Doctor sends test order. Lab receives order.
Author	N/A
Assumptions	N/A

Requirements

Doctor-to-Patient

Doctor Database

Time sheet

Orders

Interaction with a lab which will receive test orders

Patient Follow up

This use case details the EHR use of following up with a patient after their appointment in order to provide patients with information that they would need.

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor concludes visit with patient
2. System prompts doctor to enter follow up information.
3. Doctor enters follow up information as well as other information doctor wishes to share with patient
4. System bundles doctors follow up notes with prescription information and test information
5. System sends message to patient to view their follow up information
6. Patient clicks on follow up panel
7. Patient views doctors notes
8. Patient exits follow up panel

Extensions

- 3.a. Follow up information has not all been created yet
 1. System notes that this information needs to be collected and is still waiting
 2. System displays blank information for these fields
 3. Once information has been collected, system updates record with proper information
- 6.a. Follow up panel is not updated
 1. System prints error message
- 7.a. Doctors notes are not complete
 1. System notes blanks in results and fills in information as it comes in
- #.a. At any time user chooses to exit program
 1. System saves information needed and returns to main screen

Details

Level	N/A
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Visit Patient Diagnosis Order Tests Patient Prescribe Initial Visit (Record Info) Patient Lookup
Post-conditions	N/A
Author	N/A
Assumptions	N/A

Requirements

Doctor-to-Patient

Patient - User Interface

Patient Lookup

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor enters a patient name into search bar.
2. System retrieves patient information from database
3. Doctor selects on patient.
4. Patient information is displayed.
5. Doctor exits window.

Extensions

- 1.a. Patient has no record in database
 1. System displays no results.
 2. Doctor may search a new name

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential Verification
Post-conditions	N/A
Author	N/A
Assumptions	N/A

Requirements

Look up

Patient Database

Simple to use UI for Doctor

Results must display quickly

Patient Prescribe

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor determines prescription
2. Electronic prescription is created
3. Doctor stores details of prescription on patients file
4. System stores electronic prescription
5. Prescription is added to patients file
6. System prints out receipt or sends to corresponding pharmacy

Extensions

- 1.a. Patient does not receive prescription from diagnosis
 1. A prescription is not created
- 2.a. Electronic prescription does not generate
 1. Doctor closes system and restarts it
 2. Doctor reenters credentials and tries again
 - 2.1. If system still refuses to work, prior system state is loaded and necessary departments are notified
- 3.a. Patients file won't open
 1. Doctor closes system and restarts it
 2. If system still doesn't work notify necessary departments
 - 2.1. Store data on paper until system works correctly
- 4.a. System is unable to store electronic prescription correctly
 1. System state is saved
 2. Doctor is notified of error
 3. Doctor notifies correct department
 - 3.1. Data is saved on paper until system can save correctly
- 5.a. System stores patient data in wrong patient file

- 5.a. System stores patient data in wrong patient file
 - 1. System alerts doctor and IT of error
 - 2. Data is saved but removed from incorrect file
 - 3. Doctor reenters data or saves it on paper
- 6.a. Prescription is unable to be shared with pharmacy
 - 1. System lets doctor know error
 - 2. System restarts but saves current state
 - 2.1. Doctor's office manually calls in prescription if system is down for time being
- #.a. Anytime system fails
 - 1. Data is stored on paper to later be input to the system
 - 2. System is restart by IT
 - 3. System reconstructs to prior state
 - 3.1. If system detects anomalies in system, sends message to doctor and corresponding

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Patient Prescribe
Post-conditions	N/A
Author	N/A
Assumptions	N/A

Requirements

Different fields for different types of patient visits

Clinical Test

Orders

Access

Data consistency

Easy file sharing

Population health

Population Health

This use case calculates population health parameters for reporting to government agencies and for statistical purposes.

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Government Agency
Supporting Actors	

Scenarios

Scenario

1. User clicks on the population health parameter list
2. System displays a list of population health parameters for which the user can look for.
 - 2.1. Parameters include: Number of patients presenting with any particular condition, dates with a higher than normal number of patient visits, demographics of patients, vital signs, and test results for the population of patients.
3. System calculates results based on the parameters provided.
4. System displays results
 - 4.1. User can choose to adjust display options such as date ranges or graph coordinates.
 - 4.2. System will modify results to accommodate this
5. System allows for users to download/ save a copy of the results

Extensions

- 3.a. System fails to calculate results based on the parameters provided
 1. System prints an error message and returns to population health parameter list
- 4.a. System fails to display results
 1. System prints an error message and returns to the population health parameter
- 5.a. System fails to download correctly
 1. System prints an error.
- #.a. At any time the user can choose to leave this panel
 1. System will exit this panel without any data loss

Details

Level	N/A
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential Verification
Post-conditions	N/A
Author	Sam Shenoi
Assumptions	N/A

Requirements

Population health

All data is de-identified in order to protect patient privacy

Provider Notes

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Provider selects the Patient Visit tab
2. System prompts for chief complaint
3. Provider enters in the chief complaint into the box labeled "Chief Complaint"
4. System prompts for patient vital
5. Provider enters in patient's vitals into the appropriate input boxes
6. System ask for any notes
7. Provider enters in their notes from the physical exam into the input box labeled "Physical Exam Notes"
8. Provider enters in their recommendations for the patient's next steps into the "Next Steps" input box
9. System stores the providers notes

Extensions

- 3.a. If a complaint is not a reason for the visit
 1. Enter in the reason for the visit into the box labeled "Chief Complaint"
- 7.a. If no physical exam is need
 1. Enter in the conversations had between the patient and the provider
- #.a. After completing step 1, all other steps maybe done in any order

Provider Notes

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Provider selects the Patient Visit tab
2. System prompts for chief complaint
3. Provider enters in the chief complaint into the box labeled "Chief Complaint"
4. System prompts for patient vital
5. Provider enters in patient's vitals into the appropriate input boxes
6. System ask for any notes
7. Provider enters in their notes from the physical exam into the input box labeled "Physical Exam Notes"
8. Provider enters in their recommendations for the patient's next steps into the "Next Steps" input box
9. System stores the providers notes

Extensions

- 3.a. If a complaint is not a reason for the visit
 1. Enter in the reason for the visit into the box labeled "Chief Complaint"
- 7.a. If no physical exam is need
 1. Enter in the conversations had between the patient and the provider
- #.a. After completing step 1, all other steps maybe done in any order

Details

Level	N/A
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Provider already is within the patient's profile
Post-conditions	Information will be saved in the patient's file
Author	N/A
Assumptions	N/A

Details

Level	N/A
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Provider already is within the patient's profile
Post-conditions	Information will be saved in the patient's file
Author	N/A
Assumptions	N/A

Request patient information from another doctor

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Other Healthcare providers
Supporting Actors	

Scenarios

Scenario

1. System requests for other Doctor's name or id.
2. User enters in the doctor's information.
3. System displays the users found and asks whether the doctor the user are trying to access is correct.
4. User approves of the displayed information.
5. System retrieves the doctor information.
6. System prompts user for information that they want from the other provider.
7. User selects the information that they want from the other provider.
8. System displays the information requested from the other provider for confirmation from the user.
9. User selects confirm.
10. System send a request to the other provider asking for the desired information.

Extensions

- 2.a. User enters incorrect information
 1. Reply with an error message and to try again.
 2. User enters correct information.
 3. Go to 3 in main scenario.
- 4.a. User does not approve of the displayed information.
 1. Take user back to the number 1 of the main scenario
- 5.a. An error occurs retrieving the information
 1. Send error message to technician.
 2. Tell user to try again later.
- 7.a. Information desired is not an option
 1. User selects other
 2. System prompts user for the information

- 3. User enters in the desired information
- 9.a. Information displayed is not correct
 - 1. User selects restart
 - 2. Go to step 1
- 10.a. System cannot fulfil the request
 - 1. System displays error message to the user
 - 2. User can try again later
- #.a. The system fails
 - 1. User exits and restarts the application.

Details

Level	user goals
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential Verification
Post-conditions	N/A
Author	Alejandro Navarro
Assumptions	User is a doctor

Requirements

Different fields for different types of patient visits

Doctor-to-Patient

Doctor Database

Look up

Access

Easy file sharing

Schedule Patient

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Patient asks to schedule appointment
2. Staff asks patient for credentials
3. Patient provides correct credentials to staff
4. Staff asks patient which time is convenient for appointment
5. Patient gives staff valid time for appointment
6. Staff enters new appointment into schedule at requested time
7. Schedule updated with new appointment

Extensions

- 2.a. This is patient's first visit
 1. Proceed with first visit protocol
- 3.a. Patient provides incorrect credentials
 1. If patient does not have account, patient signs up for one
 2. Patient tries again until correct credentials are provided
- 5.a. Appointment time given is invalid
 1. Patient is prompted for a new, available time until correct time is provided.

Details

Level	User
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	N/A
Post-conditions	Patient appointment added to schedule
Author	John Harrison
Assumptions	N/A

Requirements

Different fields for different types of patient visits

Doctor Database

Time sheet

insurance code

Patient – User Interface

Input

View Schedule

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Patient
Supporting Actors	

Scenarios

Scenario

1. Ask whether user is a doctor or patient.
2. User enters type.
3. System then prompt user to enter id number and password.
4. User enters correct credentials
5. System fetches schedule information
6. Display schedule information.

Extensions

- 5.a. user is a doctor.
 1. Doctor information is fetched.
 2. Doctor schedule and information is displayed.
- 5.b. user is a patient
 1. Patient information is fetched.
 2. Patient schedule and information is displayed

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential VerificationSchedule Patient
Post-conditions	N/A
Author	N/A
Assumptions	N/A

Requirements

Different fields for different types of patient visits

Doctor Database

Time sheet

Patient - User Interface

Access

Data consistency

Easy file sharing

View Tests

This use case determines how a patient or a provider can view test results that were previously conducted.

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Patient
Supporting Actors	

Scenarios

Scenario

1. User clicks on view tests.
2. System displays list of test dates
3. User selects test date
4. System displays all of the test results of all tests associated with that test date
5. User unselects test date
6. System returns to previous state

Extensions

- 3.a. User selects view test results over time
 1. System displays a graph of each type of test results over time
 2. User decides to minimize the range of test results viewed
 - 2.1. System redraws graph to accommodate this
- #.a. At any time, user decides to exit test result panel
 1. System gracefully leaves panel without doing anything to the data

Details

Level	N/A
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Login/Credential VerificationOrder Tests
Post-conditions	N/A
Author	N/A
Assumptions	N/A

Requirements

- Easy to use
- Patient - User Interface
- Orders
- Look up
- Data consistency

Visit Patient

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Patient, Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor enters recording the patient's data and condition.
2. System fetches patient information
3. Doctor enters the patient's condition.
4. Doctor saves the file.
5. System stores information in patient database

Extensions

- 3.a. Doctor exits window while recording data
 1. System prompts to save the file before exiting
- 4.a. File fails to save correctly
 1. Information remains unchanged
 2. Doctor may attempt to save again

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Initial Visit (Record Info)Schedule PatientLogin/Credential Verification
Post-conditions	Record of visit is saved. Doctor is aware of the patient's condition and can diagnose accurately.
Author	N/A
Assumptions	N/A

Requirements

Window with fields for patient data followed by text boxes to enter information

Different fields for different types of patient visits

Doctor-to-Patient

Time sheet

Visit Patient

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Patient, Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. Doctor clicks to open up a window for recording the patient's data and condition.
2. Doctor asks the patient about his/her condition.
3. Doctor records information in the open window.
4. Doctor saves the file.
5. Doctor exits the window.

Extensions

- 3.a. Doctor exits window while recording data
 1. Doctor will be prompted to save the file before exiting
- 4.a. File fails to save correctly
 1. Information remains unchanged
 2. Doctor may attempt to save again

Details

Level	user goal
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Initial Visit (Record Info)Schedule PatientLogin/Credential Verification
Post-conditions	Record of visit is saved. Doctor is aware of the patient's condition and can diagnose accurately.
Author	N/A
Assumptions	N/A

Requirements

Window with fields for patient data followed by text boxes to enter information

Different fields for different types of patient visits

Doctor-to-Patient

Time sheet

Referral Letter

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Other Healthcare providers
Supporting Actors	

Scenarios

Scenario

1. Provider selects for a "Referral"
2. System prompts reason
3. Provider will select the reason for referral
4. Prompts for patient
5. Provider will select the patient is being referred to
6. System prompts for file
7. Provider will enter a name for the file
8. System will ask what type of file to create
9. Provider will select the type of file that they want generated
10. System creates file

Extensions

- 3.a. Multiple reasons for referral
 1. Provider selects all reasons for referral
- 5.a. Provider desired is not an option
 1. Provider selects other
 2. Provider types in the name of the provider into the system
- #.a. Provider wants to stop creating the file
 1. Provider selects cancel button

Details

Level	N/A
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Preformated referral letters loaded into the system
Post-conditions	Generate file for referral letter
Author	N/A
Assumptions	N/A

Referral Letter

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider, Other Healthcare providers
Supporting Actors	

Scenarios

Scenario

1. User will select the "Referral" button
2. System will prompt the user for the reason for the referral
3. User will select in the reason for the referral
4. User will select continue
5. System will prompt the user to select the provider to refer the patient to
6. User will select the provider to refer to
7. User will select continue
8. System will prompt the user for a file name
9. User will enter the file name to save the referral to
10. System will prompt the user for a location to save the file to
11. User will select a location to save the referral to
12. System will prompt the user to select the type of file to generate
13. User will select the the type of file to generate
14. User will select continue
15. System will display a confirmation page with the all of the entered information
16. User will select create
17. System will save the referral letter to the entered location

Extensions

- 3.a. If there are multiple reasons for referral
 1. User will select all reasons for referral
- 6.a. Provider that is desired is not an option
 1. User will select other
 2. System will prompt the user for the name of the provider
 3. User will enter in the name of the into the system's prompt
- 9.a. If the file name is not valid
 1. System will prompt the user to enter a valid file name

- 11.a. If the location is not available
 - 1. System will notify the user that the location is not available
- 13.a. Desired file type is not available
 - 1. User will select cancel
- 17.a. Error in saving the file
 - 1. System will display that there was an error in generating the file
- #.a. User decides not to finish creating the referral letter
 - 1. User will select cancel
- #.b. The system fails
 - 1. User will exit and restart the application

Details

Level	User
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	Pre-formatted referral letters saved into the system
	Desired file will be exported to the specified location
Post-conditions	Desired file will be in the specified format Desired file will have the correct name Desired file will be formatted correctly
Author	Jordan Hurt
Assumptions	Logged into the system User is a Doctor

Requirements

- Access
- Input
- Easy file sharing
- Simple to use UI for Doctor

Provider Notes

Information

Rank	Unspecified
ID	
Status	Unspecified
Justification	
Primary Actors	Health Care Provider
Supporting Actors	

Scenarios

Scenario

1. User selects the "Patient Visit" tab
2. System displays the patient visit form to the user
3. User enters the patient's chief complaints into the input box labeled "Chief Complaint"
4. User enters the vitals into the appropriate input boxes
5. User enters in notes from the physical exam into the "Physical Exam Notes" input box
6. User enters in their recommendations for the patient in the "Next Steps" input box
7. User selects the save button
8. System will display a notification that the information was saved

Extensions

- 2.a. Error in displaying the form
 1. System will display an error message
 2. User refreshes the page to reload the form
- 3.a. A complaint is not the reason for the visit
 1. User will enter the reason for the visit labeled "Chief Complaint"
- 5.a. No physical exam is needed
 1. User will enter in a summary of the conversations had between the provider and the patient
- 8.a. System is not able to save the information
 1. System will display an error message to the user
- #.a. The system fails
 1. User will exit and restart the application
- #.b. After step 1, all other steps may be done in any order

Details

Level	User
Complexity	N/A
Use Case Status	N/A
Implementation Status	N/A
Preconditions	N/A
Post-conditions	Information will be saved to the patient's file
Author	Jordan Hurt
Assumptions	User is already within the patient's profile User is a Doctor

Requirements

Input

Easy file sharing

Wireframes

O O O

EHR Staff Home Screen

[Home](#)[Logout](#)

Staff Name

Manage Billing

Scheduling

View Patient Records

< February 2017 >

Mo Tu We Th Fr Sa Su

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

	First Name	Last Name	Date of Visit	Bill Sent	Date Bill Sent	Bill Paid
John	Doe	12-34-5678	Yes	12-34-5678	No	
Bill	Gates	12-34-5678	No	n/a	n/a	
Tim	Horten	12-34-5678	Yes	12-34-5678	Yes	
Brad	Livingstone	12-34-5678	Yes	12-34-5678	Yes	
Linda	Livingstone	12-34-5678	No	n/a	n/a	
Pac	Man	12-34-5678	Yes	12-34-5678	No	
Super	Mario	12-34-5678	Yes	12-34-5678	Yes	
Sam	Smith	12-34-5678	Yes	12-34-5678	Yes	
Taylor	Swift	12-34-5678	Yes	12-34-5678	Yes	

Pac-Man

Patient Information

Name: Pac Man
 Address: 1234 Arcade Way
 Waco, TX 98765

Provider's Name: Dr. Bill Booth
 Primary Care Physician

Insurance Information

Name of Company: Namco Networks
 Coverage Type: Repair Level Insurance
 Group Code: ILOVP4CM4N
 Co-Pay: 10% - PCP Fees

O O O	EHR Staff Home Screen									
< Home			Logout							
Staff Name										
Office Schedule										
Manage Billing										
Scheduling	Dr. Cerny	Dr. Baker	Dr. Mauer	Dr. Song	Dr. Speegle					
View Patient Records	8:00	John Smith	Johny AppleSeed	<no patient>	Cinderella					
	9:00	<no patient>	Pac-Man	Pac-Women	<no patient>					
« February 2017 »	10:00	<no patient>	<no patient>	Luigi	<no patient>					
Mo Tu We Th Fr Sa Su	11:00	<no patient>	John Doe	Jane Doe	<no patient>					
1 2 3 4 5 6 7					Asher Catch'em					
8 9 10 11 12 13 14										
15 16 17 18 19 20 21										
22 23 24 25 26 27 28	12:00	Lunch	Lunch	Lunch	Lunch					

O O O	EHR Staff Home Screen					
Home						Logout
Staff Name						
Manage Billing		Office Schedule				
Scheduling		Dr. Cerny	Dr. Baker	Dr. Mauer	Dr. Song	Dr. Speegle
View Patient		8:00	John Smith	Johny AppleSeed	<no patient>	Cinderella
		9:00	<no patient>	Pac-Man	Pac-Women	<no patient>
< February 2017 >		10:00	<no patient>	<no patient>	Luigi	<no patient>
Mo Tu We Th Fr Sa Su		11:00	<no patient>	John Doe	Jane Doe	<no patient>
1 2 3 4 5 6 7		12:00	Lunch	Lunch	Lunch	Lunch
8 9 10 11 12 13 14						
15 16 17 18 19 20 21						
22 23 24 25 26 27 28						

Provider Request a Test View

< Home Logout

Patient Name

Sex - DOB MM-DD-YYYY PCP Dr. Rae Smith Allergies None

Patient Overview

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Test Name Date 12 May 2016

Reason for Test

Lab Select Lab for Test Fasting?

Note Generate Order

O O O

Provider View Test Results View

 [Home](#)[Logout](#)

Patient Name

Sex	DOB	PCP	Allergies
-	MM-DD-YYYY	Dr. Rae Smith	None

Patient Overview	Test Name	Date of Test	Last Viewed	Specimen
Patient Visit	Food Sensitivity	12-34-5678	12-34-5678	Blood
Prescribe	Complete Blood Count	12-34-5678	12-34-5678	Blood
Request a Test	Prothrombin Time	12-34-5678	12-34-5678	Blood
View Test Results	Basic Metabolic Panel	12-34-5678	12-34-5678	Blood

Food Sensitivity

.....

Provider Referrals View

< Home Logout

Patient Name

Sex	DOB	PCP	Allergies
-	MM-DD-YYYY	Dr. Rae Smith	None

Patient Overview

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Specialty

Select

Provider's Name

Select

Additional Notes

Reason for Referral

Diagnosis 1

Diagnosis 2

Diagnosis 3

Diagnosis 4

Other (enter below)

Input

Refer

Provider Prescribe View

Home Logout

Patient Name: Sex: DOB: PCP: Allergies:

- MM-DD-YYYY Dr. Rae Smith None

Patient Overview Medication Name:

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Medication Name:

Dosage: times a day for days

Day Week Bi-Weekly Month

Days Weeks Months

Notes to Pharmacist:

Print Prescription

OOO

Provider Patient Visit View

< Home Logout

Patient Name

Sex DOB PCP Allergies

- MM-DD-YYYY Dr. Rae Smith None

Patient Overview	Chief Complaint	Vitals
Patient Visit		Body Temp.
Prescribe		Pulse Rate
Request a Test		Respiration Rate
View Test Results		Blood Pressure
Referrals		Next Steps

○ ○ ○

Provider Patient Overview View

< [Home]

[Logout]

Patient Name

Sex

-

DOB

MM-DD-YYYY

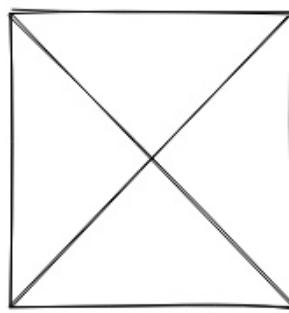
PCP

Dr. Rae Smith

Allergies

None

Patient Overview



Diagnosis

Current Medications

Item 1

Item 2

Item 3

Item 4

Next Appointment

Tests and Results

Item 1

Item 2

Item 3

Item 4

Patient History

```
***** ***** ***** ***** *****  
***** ***** ***** ***** *****  
***** ***** ***** ***** *****  
***** ***** ***** ***** *****
```

O O O

EHR Provider Home Screen



Logout

Provider's Name

Next Appointment at: MM--DD--YY HH:mm

Room: 123

Today's Schedule

February 12, 2017

View All My Patients

< February 2017 >

Mo Tu We Th Fr Sa Su

1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28

10:15	Diagnosis: mm mm mm mm mm	Reason for Visit: mm mm mm mm mm
Patient A		
11:15	Diagnosis: mm mm mm mm mm	Reason for Visit: mm mm mm mm mm
Patient B		
1:15	Diagnosis: mm mm mm mm mm	Reason for Visit: mm mm mm mm mm
Patient C		
2:15	Diagnosis: mm mm mm mm mm	Reason for Visit: mm mm mm mm mm
Patient D		

○ ○ ○

EHR View Test Results



[Logout](#)

Patient Name

Next Appointment at: MM--DD--YY HH:mm

Patient Intake Form	Test Name	Date of Test	Last View	Specimen
	Food Sensitivity	12-34-5678	12-43-5678	Blood
View Test Results	Complete Blood Count	12-34-5678	12-43-5678	Blood
	Lactose Intolerance	12-34-5678	12-43-5678	Blood
	Complete Metabolic Panel	12-34-5678	12-43-5678	Blood
	Food Sensitivity			
	Numerous small, dark, irregular spots are scattered across the entire surface of the skin, appearing as tiny dots or freckles. They are most prominent on the face, particularly around the eyes and mouth, and also appear on the neck, chest, and upper arms.			

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EHR Patient Home Screen

[Logout](#)

Patient Name

Next Appointment at: MM--DD--YY HH:mm

Patient Intake Forms

[View Test Results](#)

Current Diagnosis

mmmm mmmm mmmm mmmm
mmmm mmmm mmmm mmmm
mmmm mmmm mmmm mmmm

Current Medications

Prescription	Dosage
Acetaminophen	1 pill 2xs a day
Doxycycline	2 pills a day for 10 da..
Tamiflu	2 pills a day for 10 da..

Current Providers

Provider Name
Dr. Cerny
Dr. Booth
Dr. Baker
Dr. Song
Dr. Donahoo
Dr. Fendt
Dr. Hamerly
Dr. Maurer
Dr. Speegle

○ ○ ○

EHR Patient Intake Forms

[Logout](#)

Patient Name

Next Appointment at: MM--DD--YY HH:mm

Patient Intake Form

View Test Results

First Name Middle Initial Last Name

DOB Address

Phone City State ZIP

- Cell Phone
 Home Phone
 Work Phone

Emergency Contact

Name Phone Number

Allergies

List all Allergies Here

Medical History (select all that apply)

Lifestyle
 Alcohol Tobacco
 E-Cigarettes Exercise

Allergies
Appendicitis
Cancer
Diabetes
Heart Disease

○ ○ ○

EHR Login Screen

Login

Username

Password

CShare

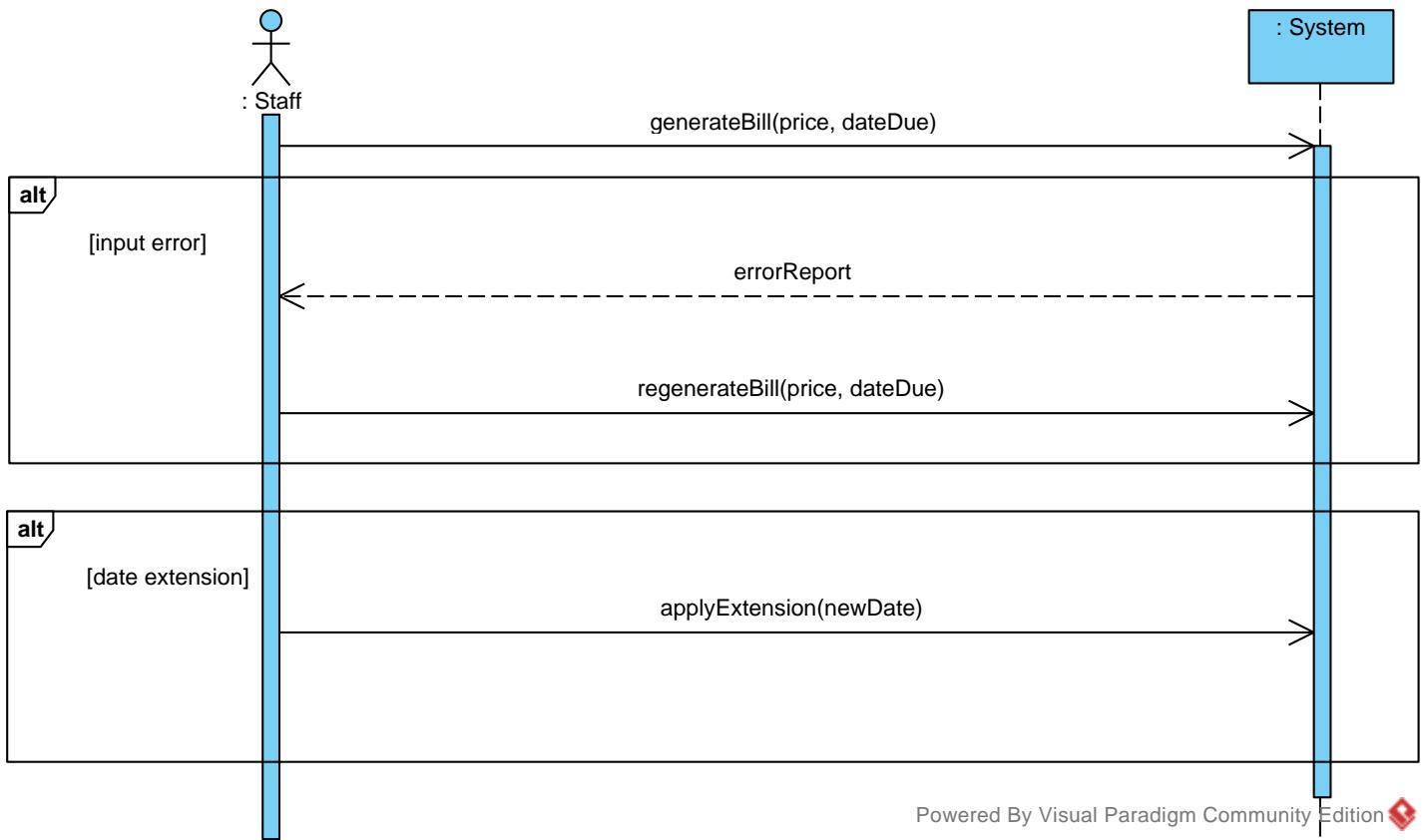
Gantt Diagram

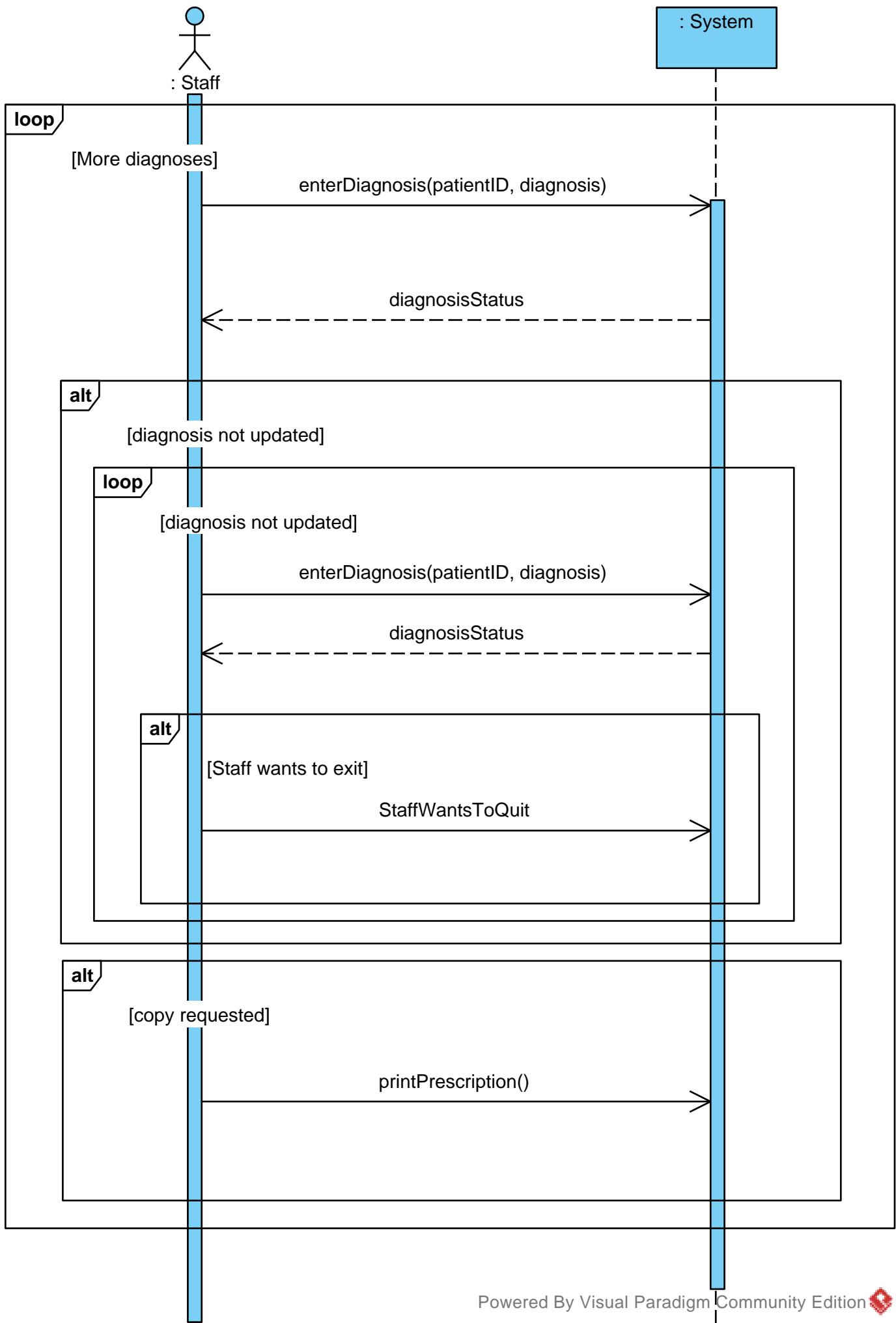
Feb 9, 2020

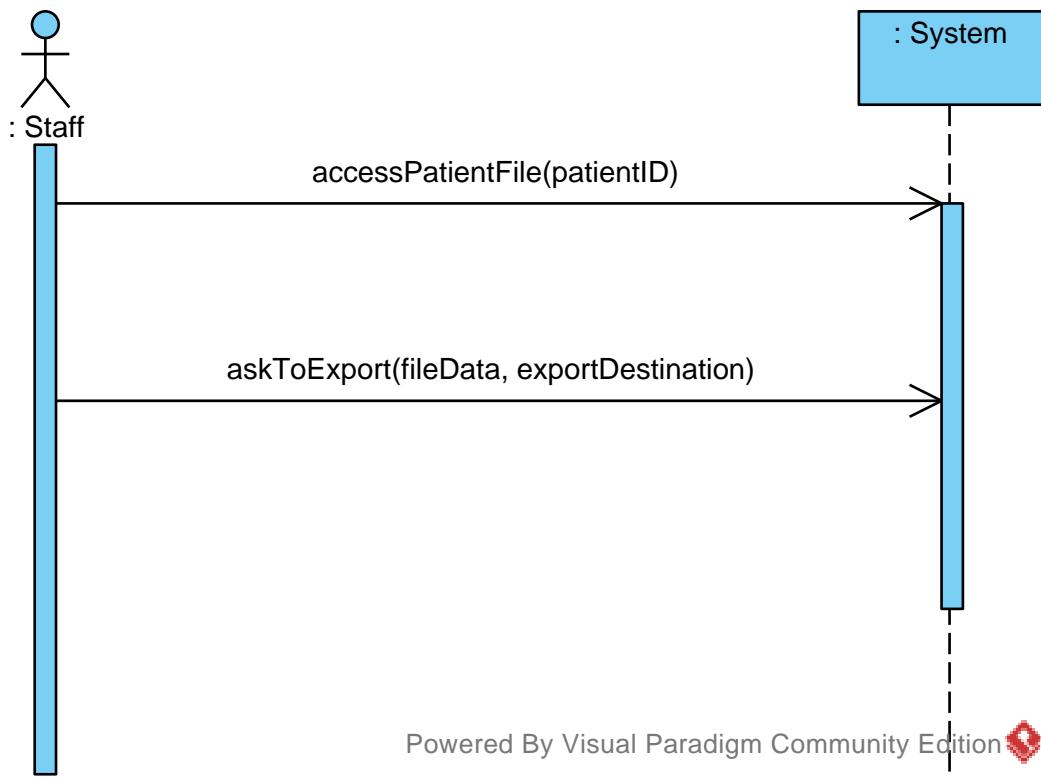
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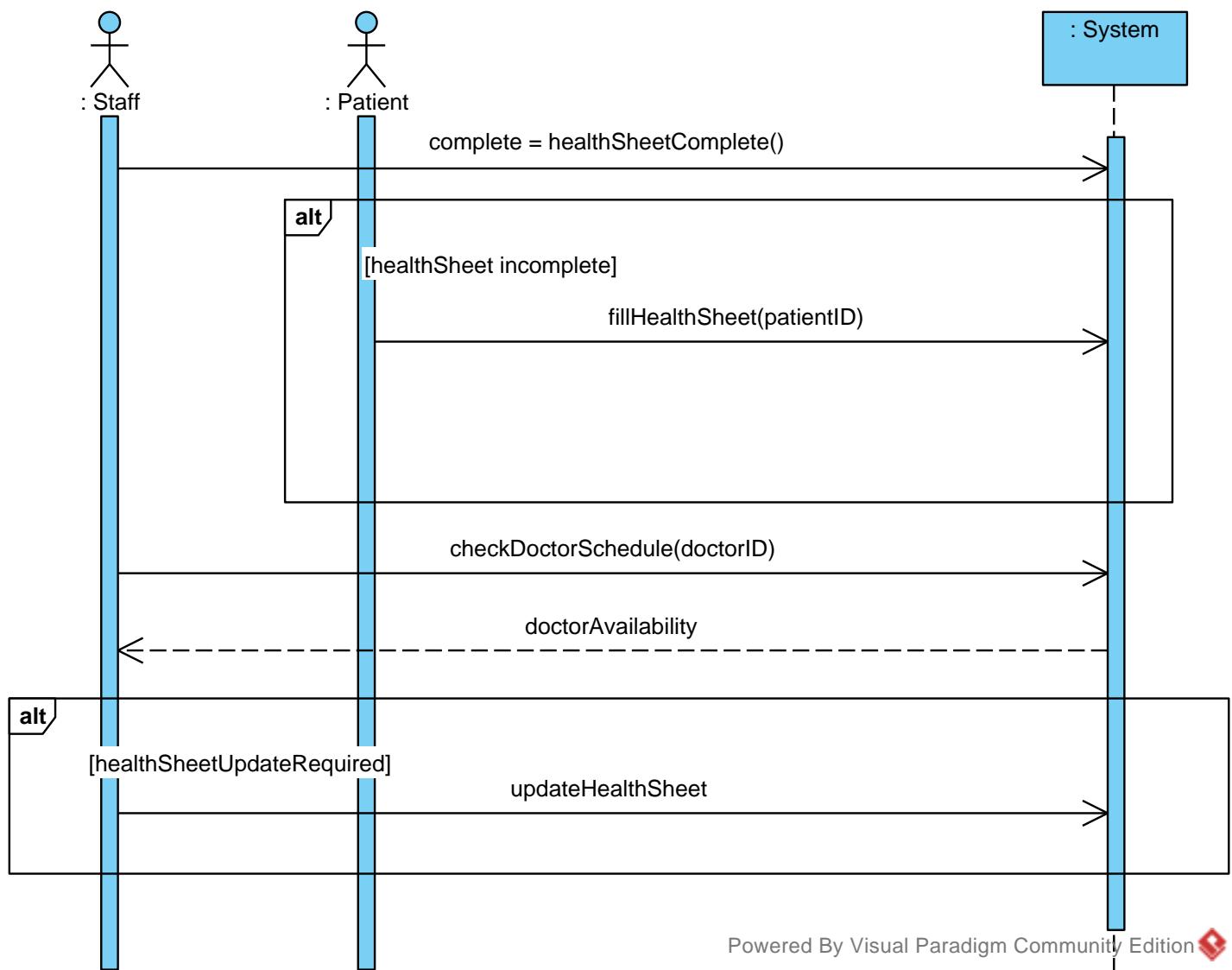
Tasks

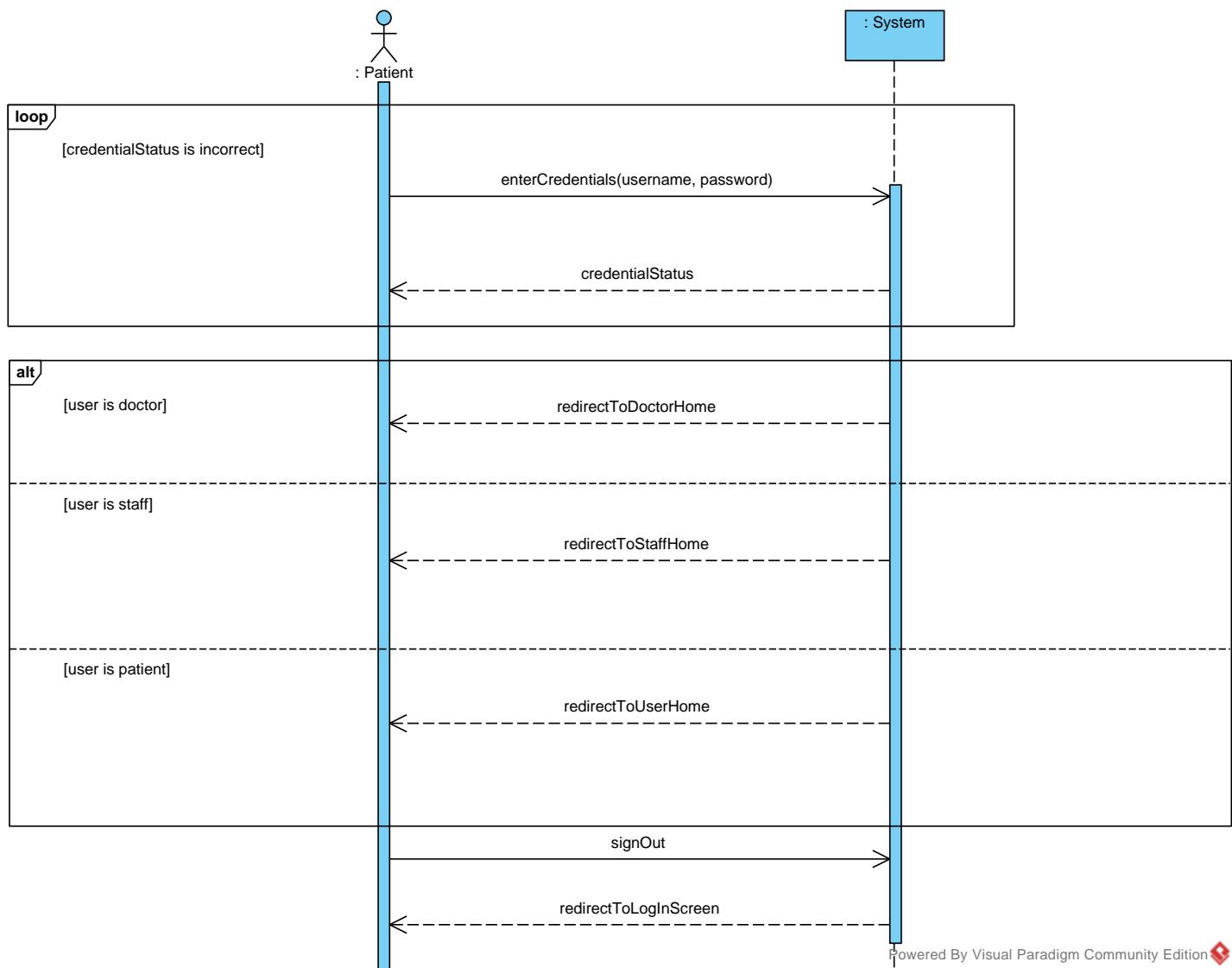
Name	Begin date	End date
Iteration 1	1/31/20	2/11/20
Requirements	1/31/20	2/11/20
Use Cases	1/31/20	2/11/20
Operations	1/31/20	2/11/20
User Interface sketches	1/31/20	2/11/20
Domain Model	1/31/20	2/11/20
SSD	1/31/20	2/11/20
Iteration 2	2/12/20	3/24/20
Diagrams	2/12/20	2/21/20
Git	2/21/20	3/24/20
Maven	3/2/20	3/24/20
GUI	3/9/20	3/24/20
Prototype 2	3/9/20	3/24/20
Testing	3/16/20	3/24/20
Iteration 3	3/25/20	4/30/20
Maven	3/25/20	4/30/20
Git	3/25/20	4/30/20
GUI	3/25/20	4/30/20
Prototype	3/25/20	4/17/20
Testing	4/17/20	4/30/20

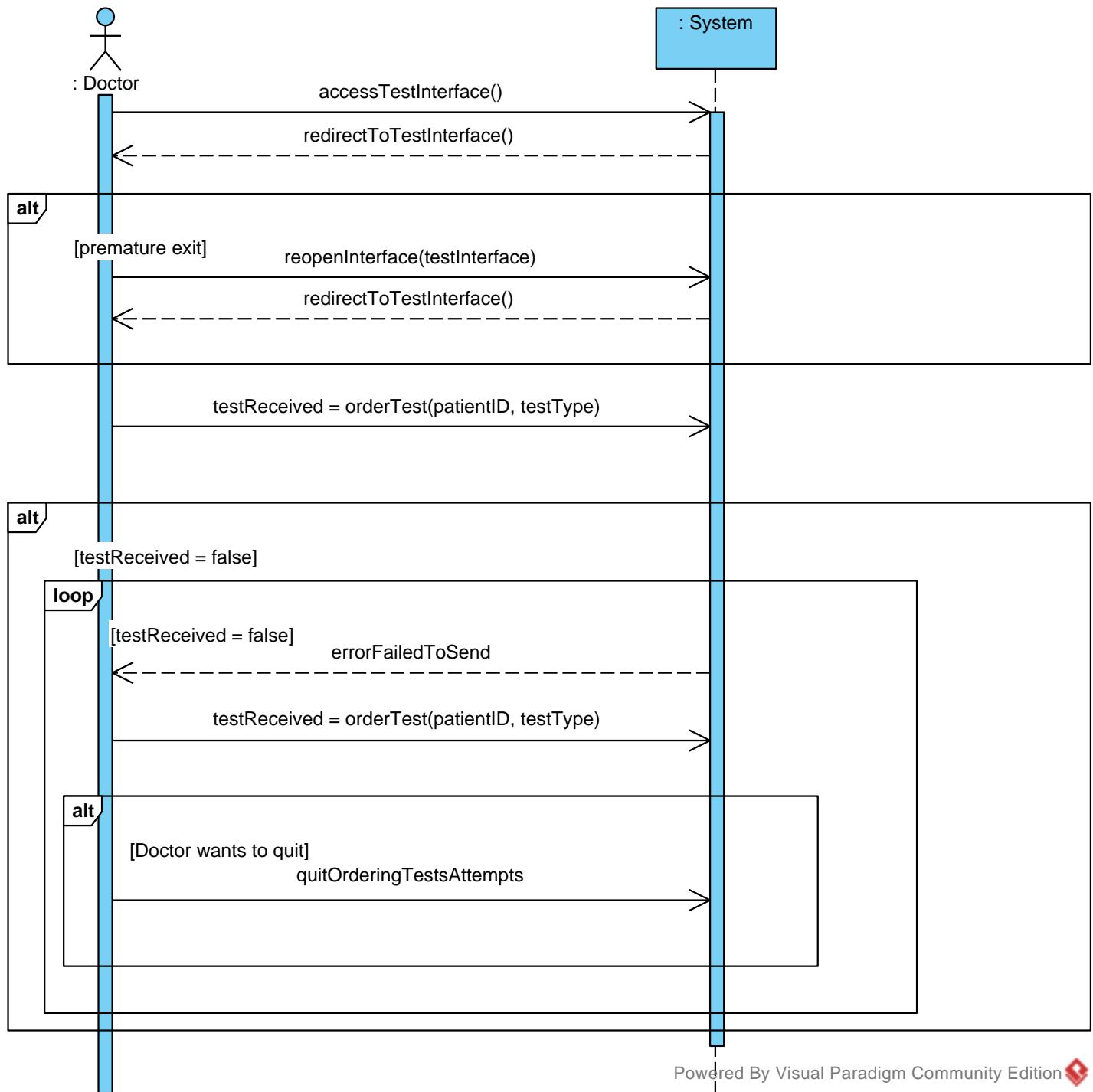


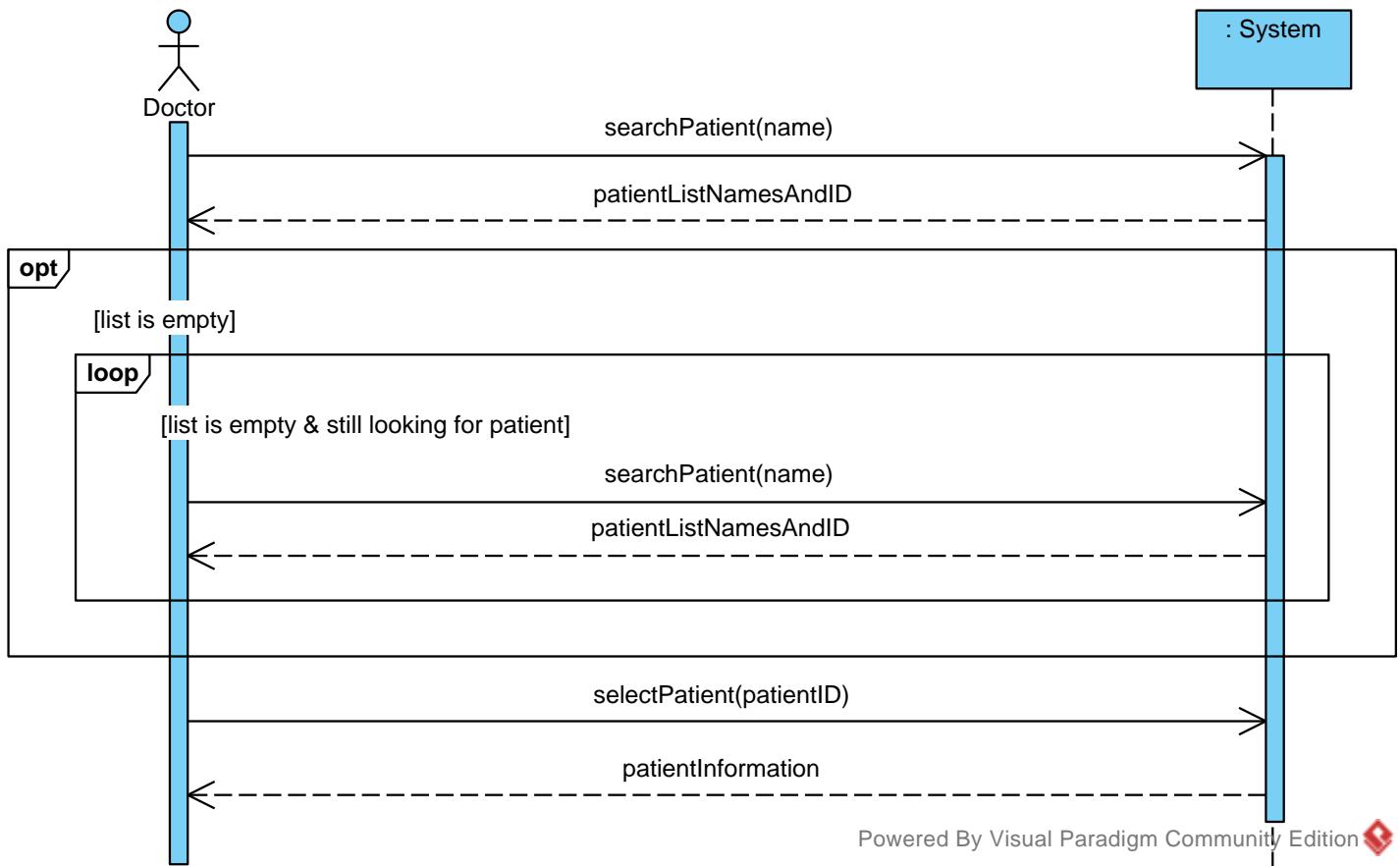


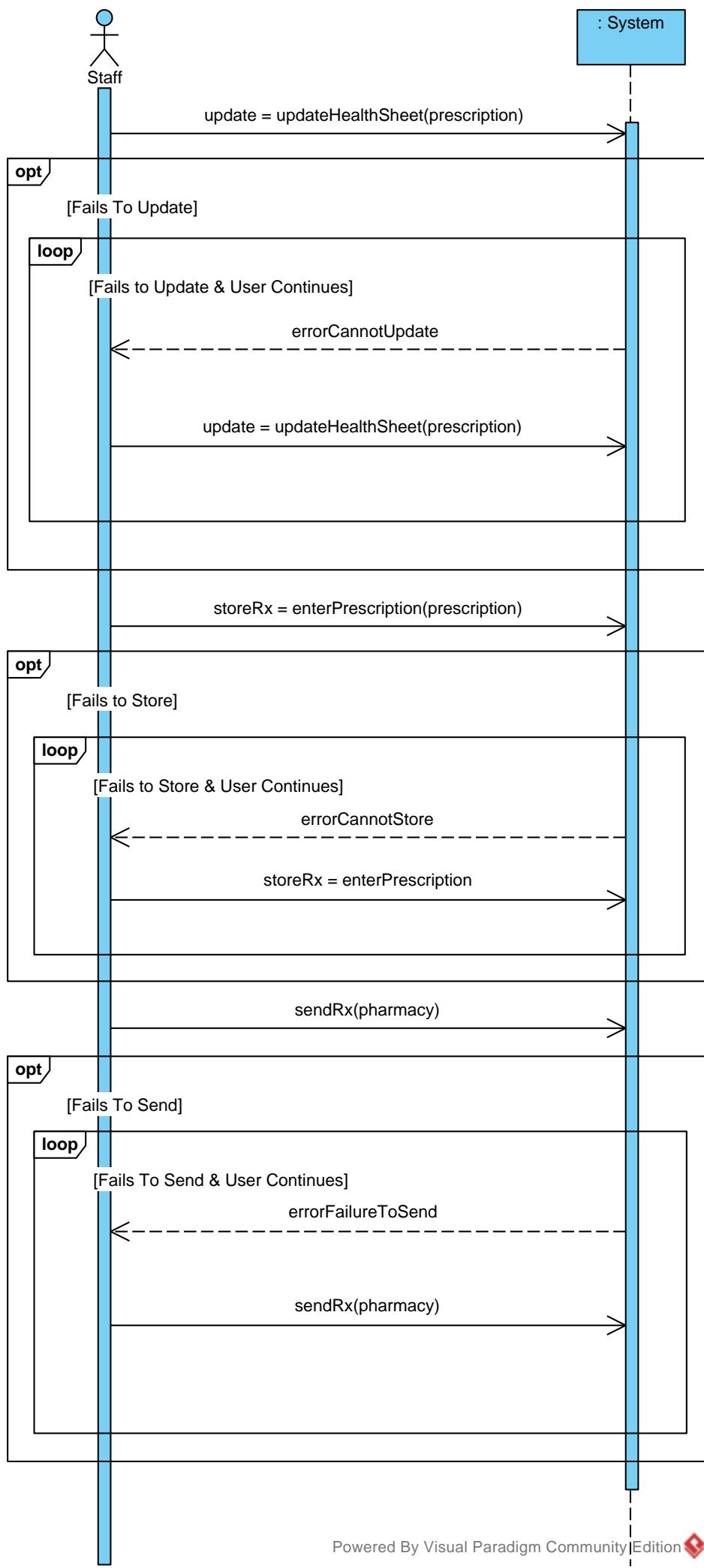




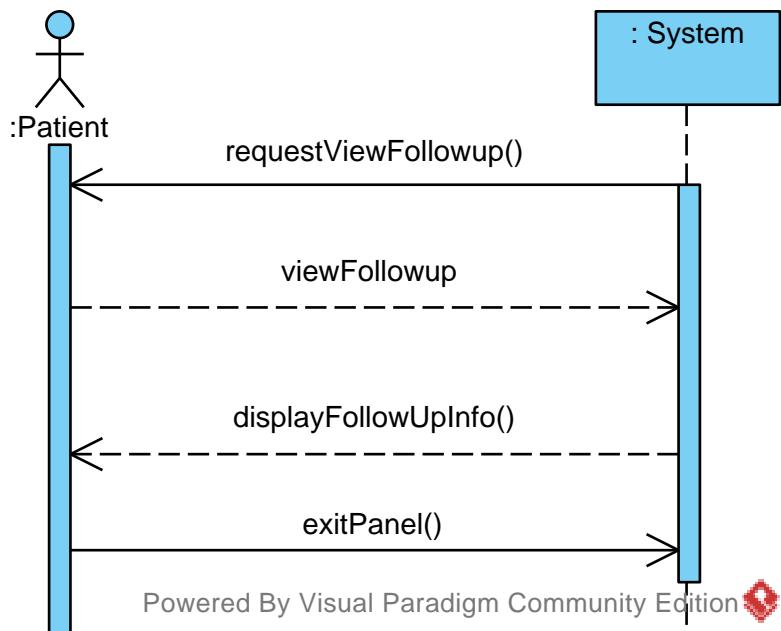




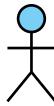




Patient Follow Up



Population Health



:Healthcare Provider

: System

getPopulationHealth()

displayPopHealthParams()

selectParams(Parameters)

displayResults()

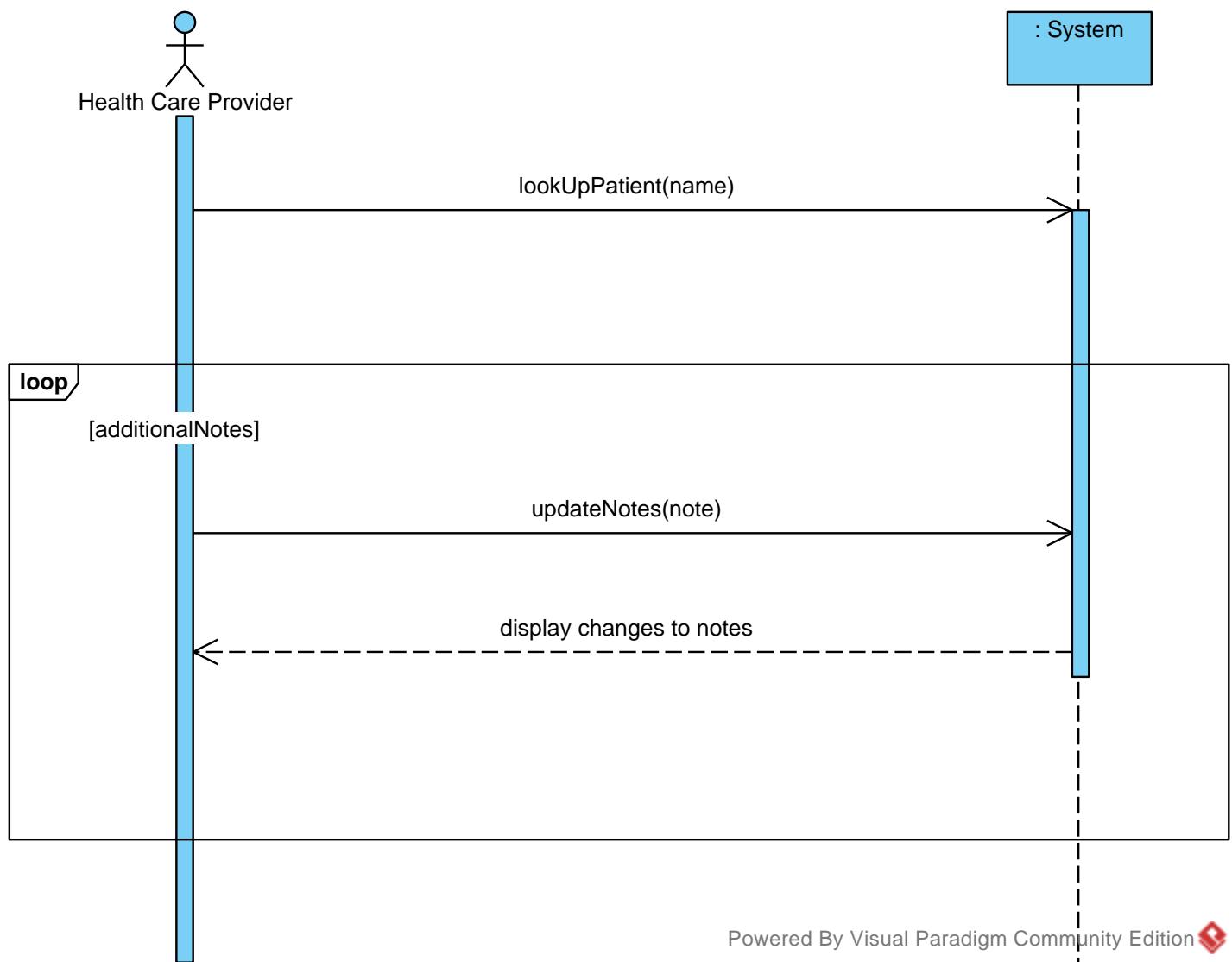
opt

[User chooses to adjust display options]

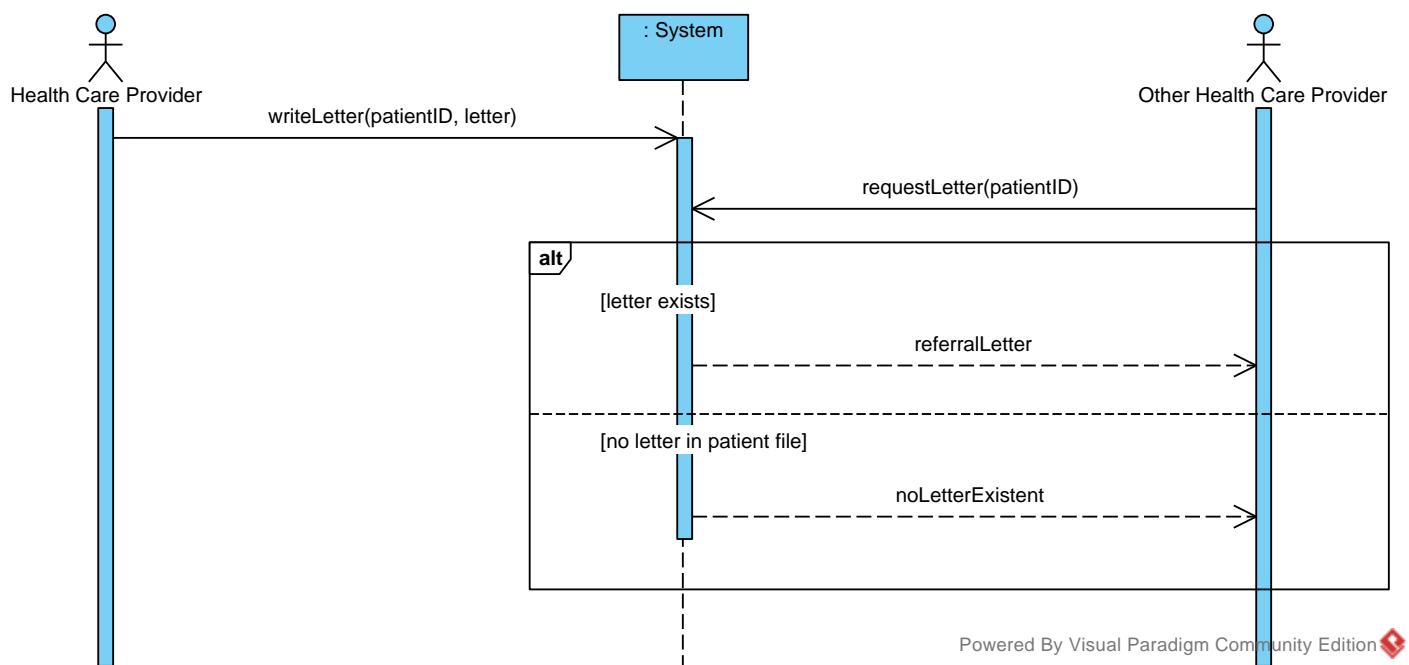
editGraphProperties()

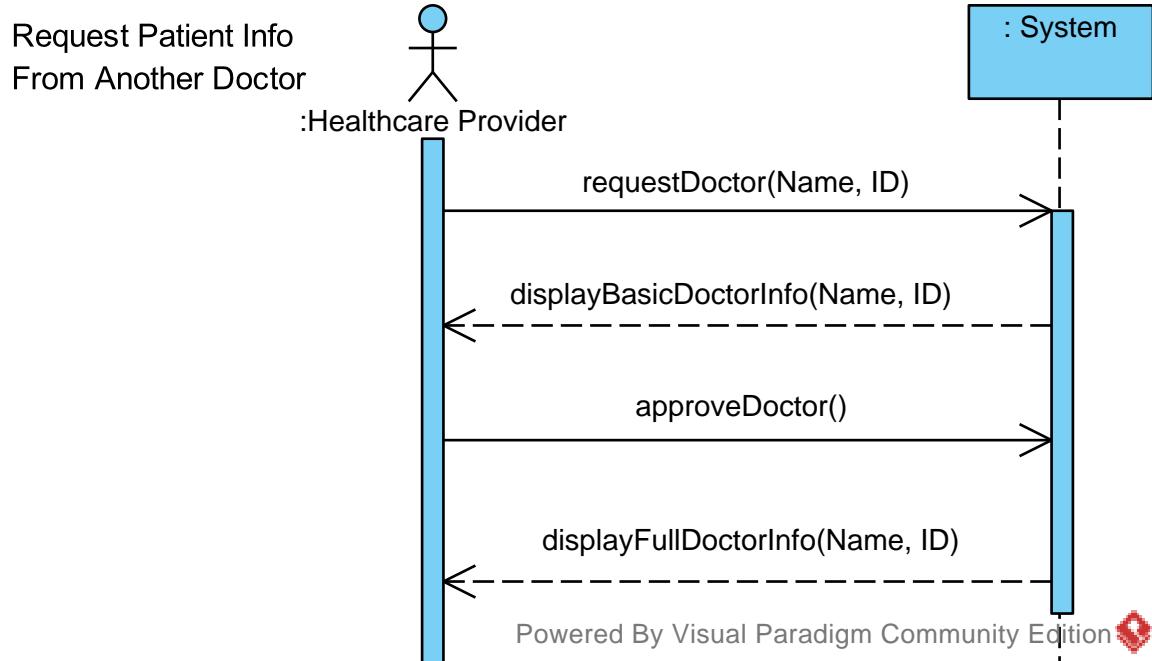
displayResults()

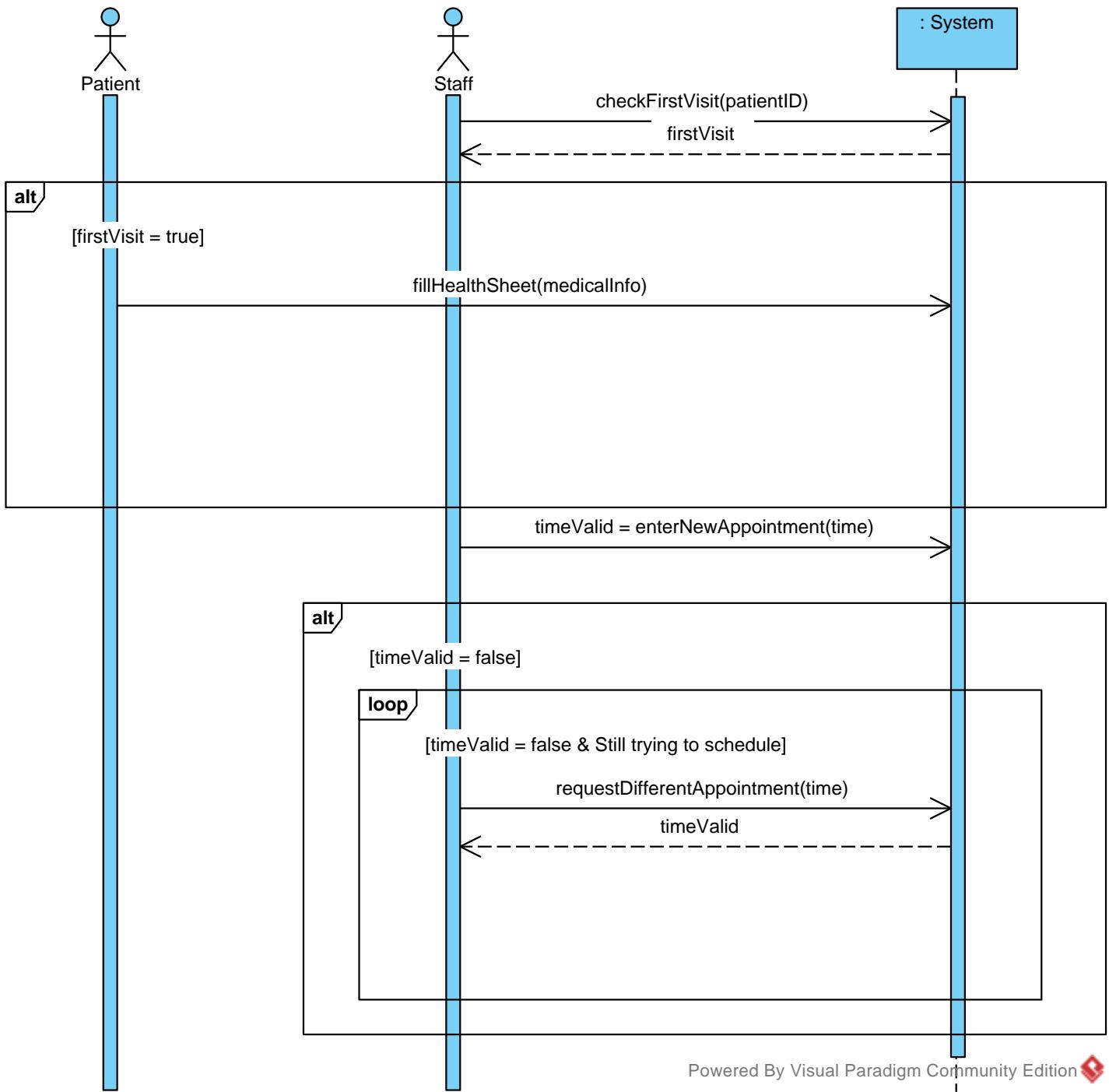
Powered By Visual Paradigm Community Edition 



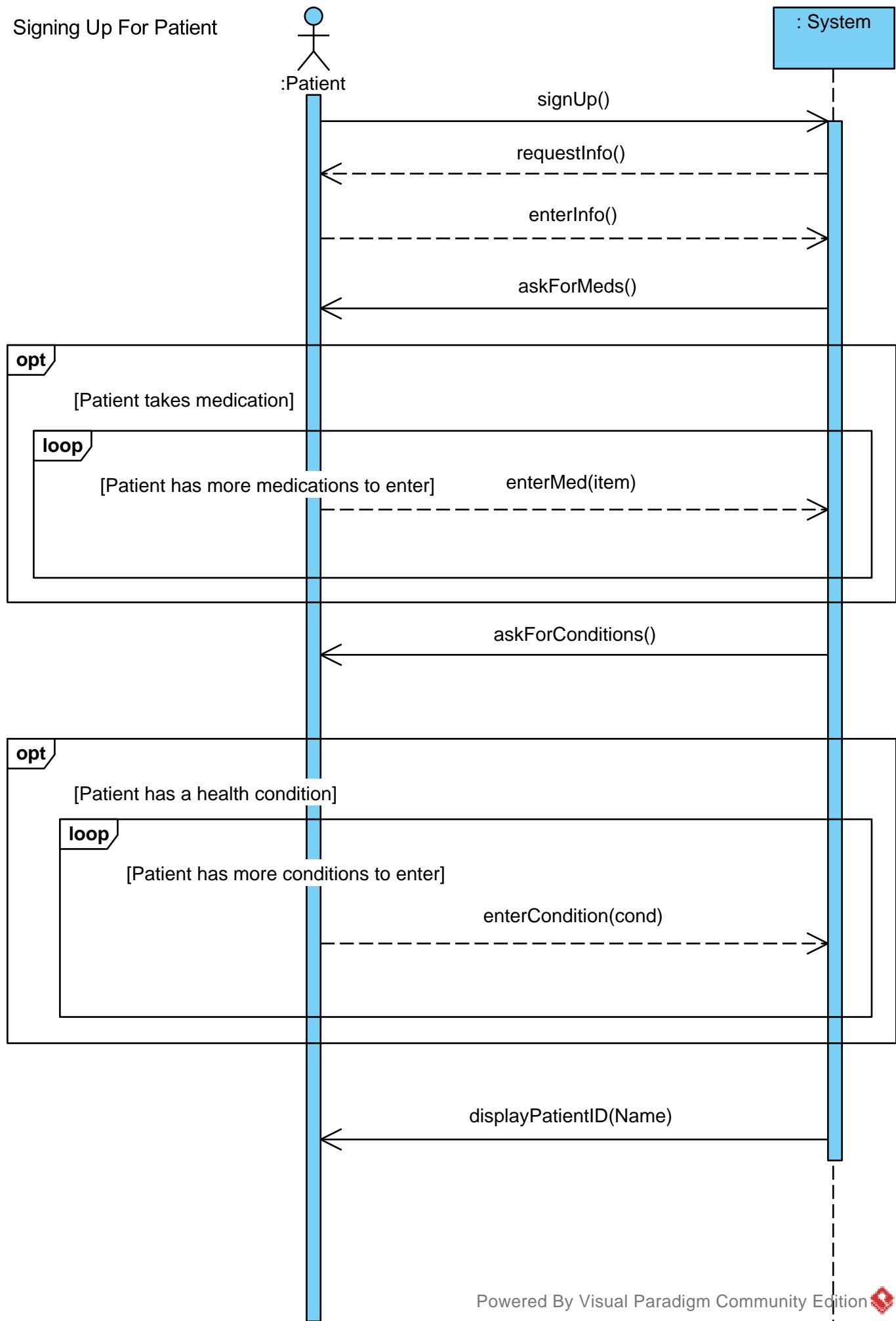
Powered By Visual Paradigm Community Edition 

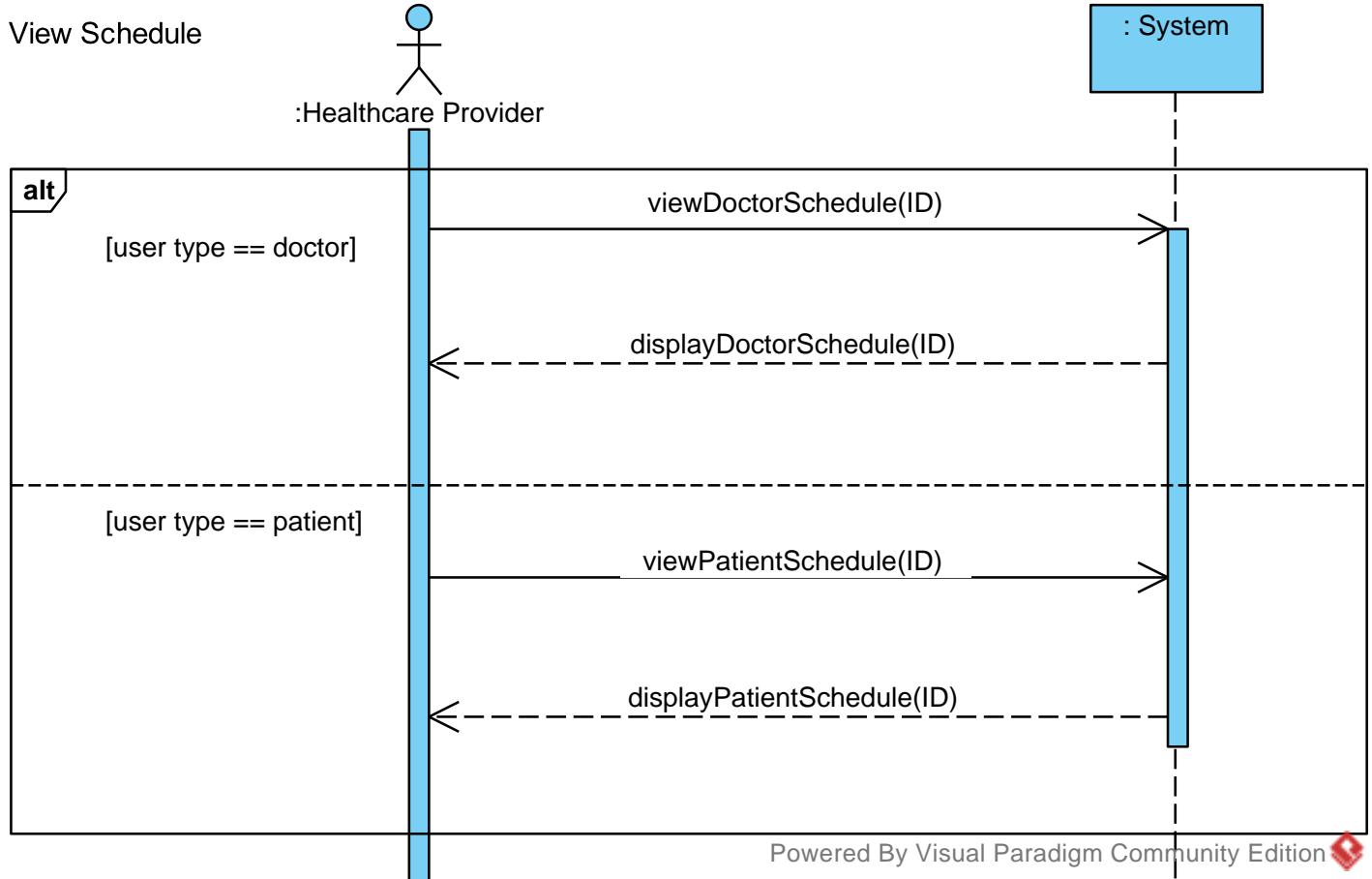




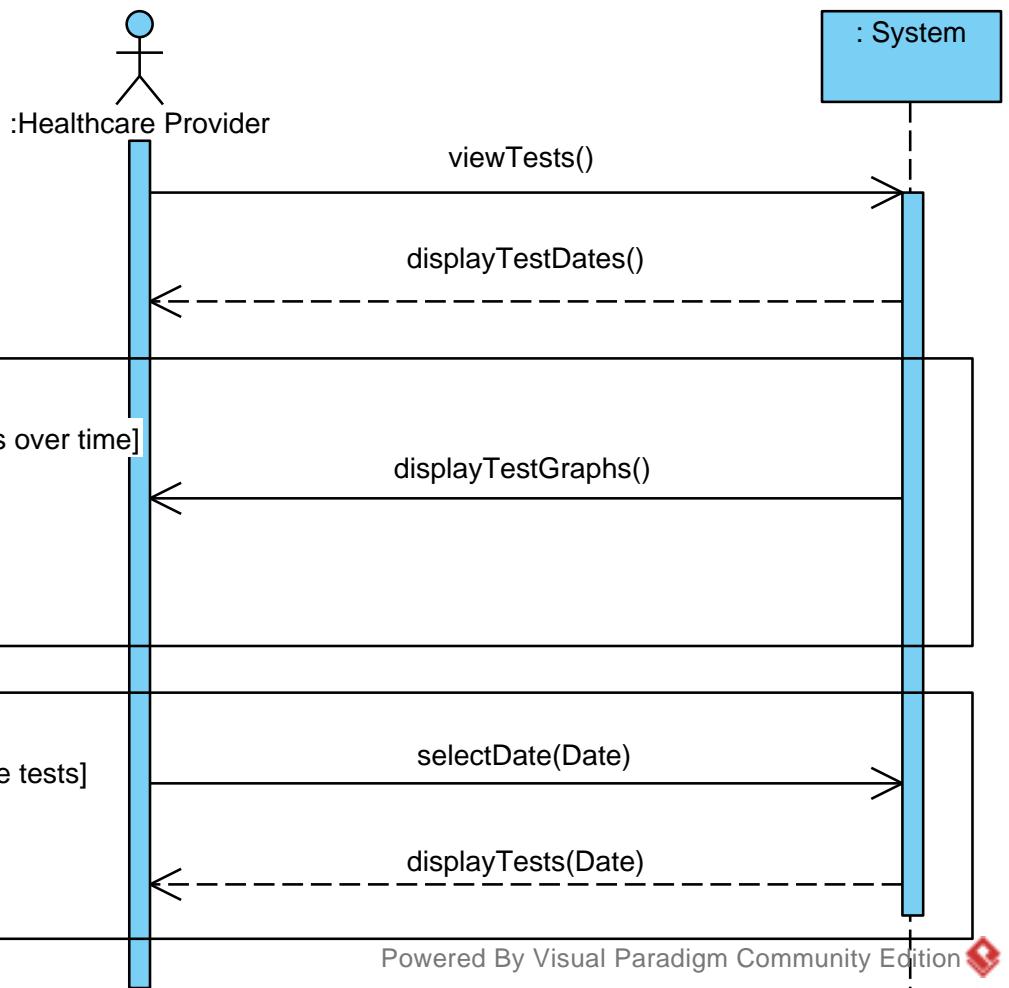


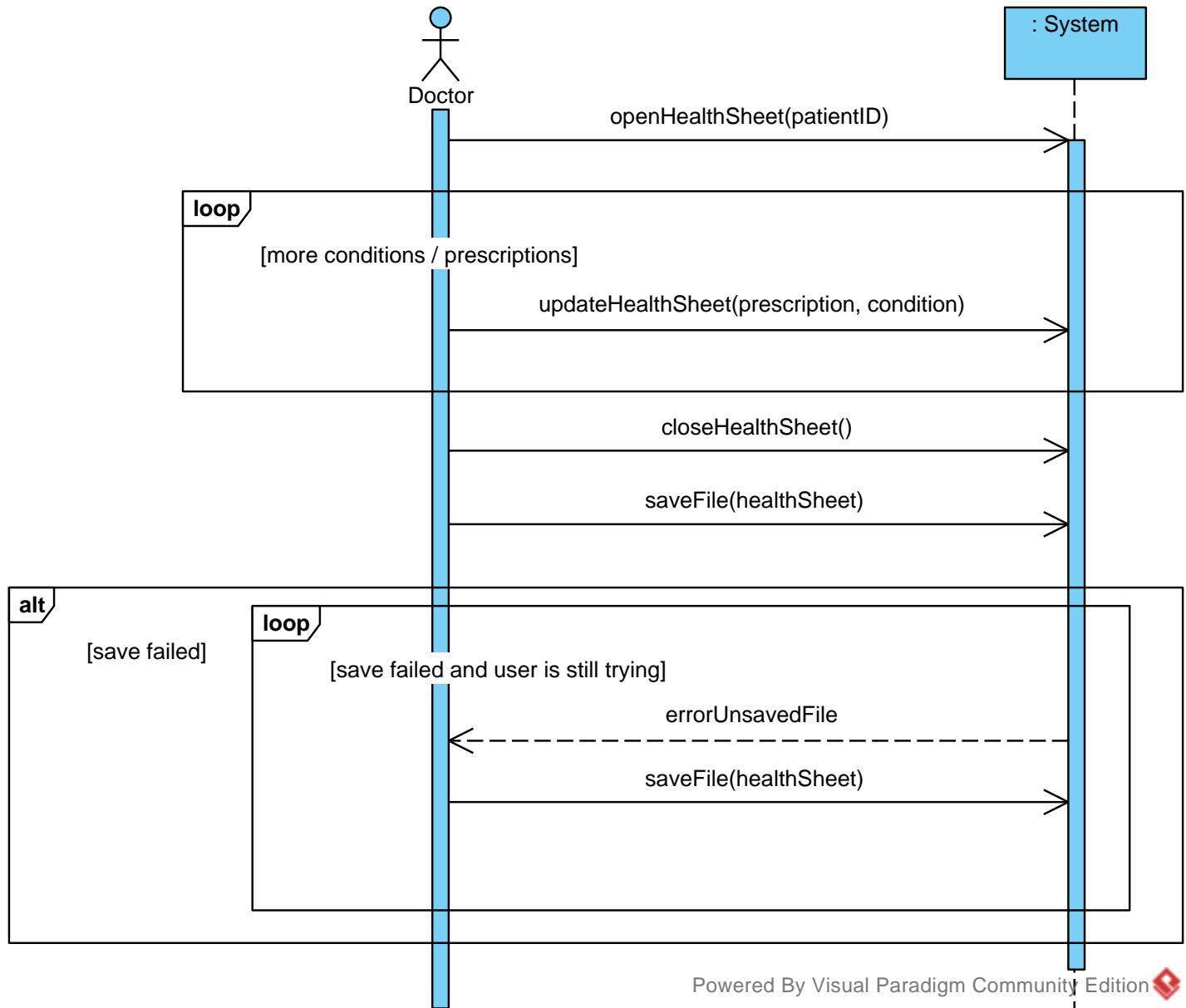
Signing Up For Patient





View Tests





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4 Glossary

EHR. Electronic Health Record System. A system that assists **health care providers** organize **patient** information, correctly assign **insurance codes** for health care billing, and manages a **medical practice's** schedule.

Health care provider. A person or group of individuals who deliver a **health care service** to a **patient**. May comprise of **doctors** and **staff**.

Health care service. A service in which a **patient** receives some attention toward a specific ailment or medical problem from a **health care provider**.

Patient. A person who is suffering from some specific ailment or medical problem and seeks medical attention.

Doctor. A healthcare provider who specifically treats a **patient's** ailment or medical problem. Works as part of a **medical practice**.

Staff. Auxiliary health care professionals who assist **doctor's** treat a **patients** ailment or medical problem. Main responsibilities include assigning **insurance codes** for health care billing. Works as part of a **medical practice**.

Medical practice. A group of healthcare providers.

Insurance codes. A code corresponding to a specific ailment or medical problem used for medical billing purposes with medical insurance companies.

References

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