Software Engineering Project
Hospital Management System

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Contents

Revision History

Revision	Date	Author(s)	Description
1.0	30.07.17	TK, AS, DAS, AB	Created.
1.1	12.08.17	TK	Added version history.
1.1	12.08.17	AS	Fixed "use case diagram".
1.1	12.08.17	TK	Added use case specification for "Give Prescription" and "Report to Doctor".
1.1	12.08.17	TK, DAS	Changed order of "Use Cases" subsections.
1.1	14.08.17	AS, AB	Created Sequence Diagram for main flow of use case "Report to Doctor".
1.1	14.08.17	DAS, AB	Created "Concepteual Class Diagram".
1.1	15.08.17	TK	Added Section "Classes".
1.1	15.08.17	TK	Added Image Captions.
1.2	22.08.17	DAS	Added Deployment Diagram.
1.2	22.08.17	AS	Architechture Layer Diagram.
1.2	23.08.17	TK, AB	Added Block Diagram.

1 Introduction

1.1 State of the Customer

The Customer is a Hospital, and currently, is completely dependent on a pen-and-paper process to perform all of its management. Our goal is to transfer this process to an electronic one and streamline it, further adding features that allow the patient to be more directly involved in their treatment process.

1.2 Current Problems

As stated above, the customer is still using a paper process for management. Due to the large number of patients and doctors, this has become very cumbersome on the customer for the following reasons:

1. Breakdown in communication: Due to the fact that everything is being done by paper, sometimes the different departments do not get their message across clearly due to human errors in spelling or handwriting, leading to the need to repeat work.

2. Theft: Due to the nature of the customer's business, no patient is turned away, and some are lying and claiming prescriptions and tests that were not written for them, costing the customer money, and due to the fact that the stock system is manual, the customer suspects that some things are taken out without permission. The customer would like to be able to control stocks better.

3. Stocks: Due to the fact that there is no active change in stocks, the customer often finds themselves out of necessary items.

4. Protocol and Chain of command: The customer has said that due to the high amount of personal interaction and the slow speed of the current system, Protocols are being breached often and the Chain of command is not being adhered to in order to provide care in a timely fashion.

5. Storage issues: Due to the large amounts of records they have, the customer is running out of physical space to store records of their operation. This will lead them to either rent an archive space or to destroy old records.

6. Pollution: Since the customer still uses paper, this paper will eventually have to be destroyed, which is currently through burning. The customer has stated that they would like to be more environmentally-friendly and cut waste.

2 Requirements

2.1 Functional Requirements

2.1.1 User Requirements

1. The system shall allow patients to sign up an account.
2. The system shall have a log in for all users of all types. For hospital staff, there will also be a specialized page for them to log onto work.
3. The system shall allow the patient to ask for appointments, communicate with his doctor, see the doctor's notes and prescriptions , and pay his bills via bank transfer or visa.
4. The system shall allow the receptionist to register patients, make appointments, and search for information about a patient.
5. The system shall allow the doctor to see patient details and stats,enter a diagnosis for a patient, give them prescriptions, nominate them for surgery, request tests from the laboratory, reserve the operation theater, and add special notes about the patient.
6. The system shall allow the nurse to see what the doctor's notes are for a patient, ask the pharmacy for medicine, update patient status, and page for a patient's doctor.
7. The system shall allow the pharmacist to withdraw medicine(based on doctor requests or prescriptions), maintain stocks(count current stocks and order new stock), view what standing prescriptions and past prescriptions the patient has, and produce stock reports.
8. The system shall allow the laboratory tech to see what tests were requested for a patient, enter the test results, and maintain laboratory stocks.
9. The system shall connect to the current accounting system at the hospital, and the accounting system will be able to see all relevant data to produce a bill and allow the patient to pay it as stated above. Patient billing data will also be produced based on the accounting system
10. The system shall allow the admin to manage all accounts(create/delete/update), modify all data, see all reports, view all bills, and see all stocks.

2.1.2 System Requirements

1. (a) Upon opening the appropriate browser page, there will be 2 buttons, one will be sign up, the other will be log in.
   (b) Upon opening the sign up page, the patient will be asked to enter their first name, last name, phone number, government ID number, email, and a password.
   (c) Upon successful sign up, the user will be transfered to the login page.
   (d) doctors, pharmacists, lab techs, and nurses are signed up by a special page available only to the admin and are assigned an account type.
2. (a) Upon opening the appropriate browser page, there will be 2 buttons, one will be sign up, the other will be log in.
   (b) Upon opening the log in page, the user will be asked to enter their email and passwords. Logins detected from inside the hospital LAN that are from the @hospital.com domain will be redirected to a page appropriate to the account type assigned to them (eg, doctors are taken to their homepage, nurses to another, etc). Patients will be taken to a dash. Staff will be taken to a page for them to log onto work. after they press log onto work, the time is sent to the HR system(that they currently use),then they are redirected to their main page.
3. (a) The patient dash is a screen where the patient is given the most relevant information about them.
   (b) The patient is shown any upcoming appointments, any outstanding prescriptions or bills, and any doctor orders.
   (c) There will be a button that allows the patient to create a new appointment with a doctor
   (d) There will be a button that allows the patient to start a chat with their doctor or call them via VOIP if they are available,
   (e) There will be a payment screen for any outstanding bills, which is done through a visa or a bank account transfer.
   (f) Additionally, there will be screens for a patient to view their billing history, diagnosis history, prescription history, and appointment history.
4. (a) the receptionist main page has the buttons and menus for the receptionist to
      i. Create a new user for a patient.
      ii. Search for an already registered patient.
      iii. Look at a patient's data.
      iv. Create an appointment for a patient.
      v. message and call other hospital staff.
   (b) sign out of work and log off.
5. (a) the doctor main page has the buttons and menus for the doctor to
      i. See their schedule.
      ii. Look at a patient's data.
      iii. Place their notes about the patient.
      iv. Create a new prescription for a patient.
      v. Request a test for a patient.
      vi. Nominate a patient for surgery and reserve the operating theater.
      vii. message and call other hospital staff.
   (b) sign out of work and log off.
6. (a) the nurse main page has the buttons and menus for the nurse to
      i. Look at a patient's data.

ii. Read the doctor's notes about a patient.
iii. Request Medicine for a patient.
iv. Update the patient's status, in that, the time they were checked in, what ward they are in, what time they were given medicine, if they are deteriorating or doing fine, and if they have given them something other than what the doctor has ordered.
v. Emergency page the doctor assigned to the patient(on their pager, not on the system).
vi. message and call other hospital staff.

(b) sign out of work and log off.

7. (a) the pharmacist main page has the buttons and menus for the pharmacist to
   i. Look at a patient's data.
   ii. Read the doctor's notes about a patient.
   iii. withdraw medicine for a patient from the stock based on their prescription . The amount available in stock will go down accordingly. if the stock is at a critical level(less than 15 % of normal stock), then the pharmacist will be notified.
   iv. Place orders for new stock, and send them to purchasing department .
   v. Produce stock reports, which are a list of every medicine available by its brand name, current stock, and date. Each entry in the list has a sublist of the time and amount of every withdrawal, along with which patient it was withdrawn for and which pharmacist withdrew it.
   vi. message and call other hospital staff.

   (b) sign out of work and log off.

8. (a) the lab tech main page has the buttons and menus for the lab tech to
   i. Look at a patient's data.
   ii. Read the doctor's notes about a patient.
   iii. See what tests the doctor has ordered for a patient.
   iv. Withdraw items used in tests(eg test tubes, litmus paper, etc), and be notified whenever the number is below a threshold(less than 15% of the normal stock).
   v. Enter the results of the tests he has performed. Each test will have its own page depending on the test. we are currently working together with the lab techs to create the form needed to be filled out for each test.
   vi. Produce stock reports, which are a list of every perishable item used in tests available by its brand name, current stock, and date. Each entry in the list has a sublist of the time and amount of every withdrawal, along with which patient it was withdrawn for and which technician withdrew it.
   vii. Order stock and send it to the purchasing department.
   viii. message and call other hospital staff.

   (b) sign out of work and log off.

9. (a) The accounting system shall be connected to this system by means of the available API.
   (b) Patient billing data in this system is based on the data in the accounting system.
   (c) This system allows a patient to pay via visa or bank transfer.
   (d) Note: Cash and cheque payments go through the present accounting system and not this one.

10. (a) The admin page has a button that takes the admin to the database management interface(eg PHPmyadmin). all modification of data will be done manually from there.
    (b) The admin page has buttons that lead to a page where new staff are signed up and assigned an account type.
    (c) The admin page has menus that allow the admin to see all reports in the hospital.
    (d) message and call other hospital staff.
    (e) sign out of work and log off.

2.2 Non-Functional Requirements

1. The system shall be secured, With all passwords at least hashed and traffic being encrypted with at least https.
2. The system shall guarantee patient-doctor confidentiality by ensuring that only authorized persons see specific data related to their work only.
3. The system must not take more than 1 day of training to learn to use.
4. The system must be responsive; No request shall take more than 2 seconds to be processed.
5. The system must have an uptime of at least 99.9 %.
6. The system must implement the API's for visa and bank payments and the API's for the accounting and HR softwares.
7. The system must have integrated VOIP and Pager capability.

3 Use Cases

3.1 Use Case Diagram

Figure 1: Use Case Diagram

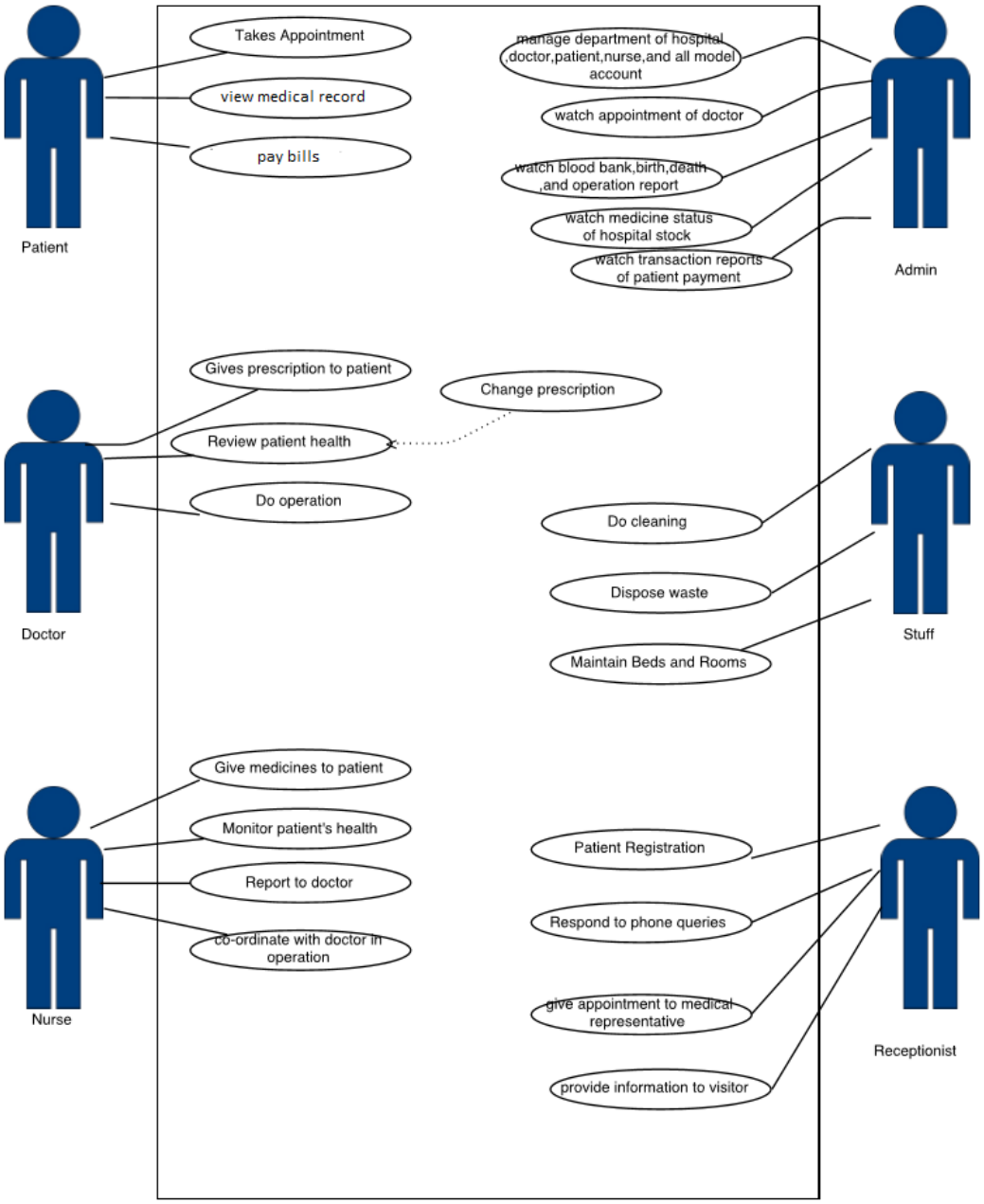
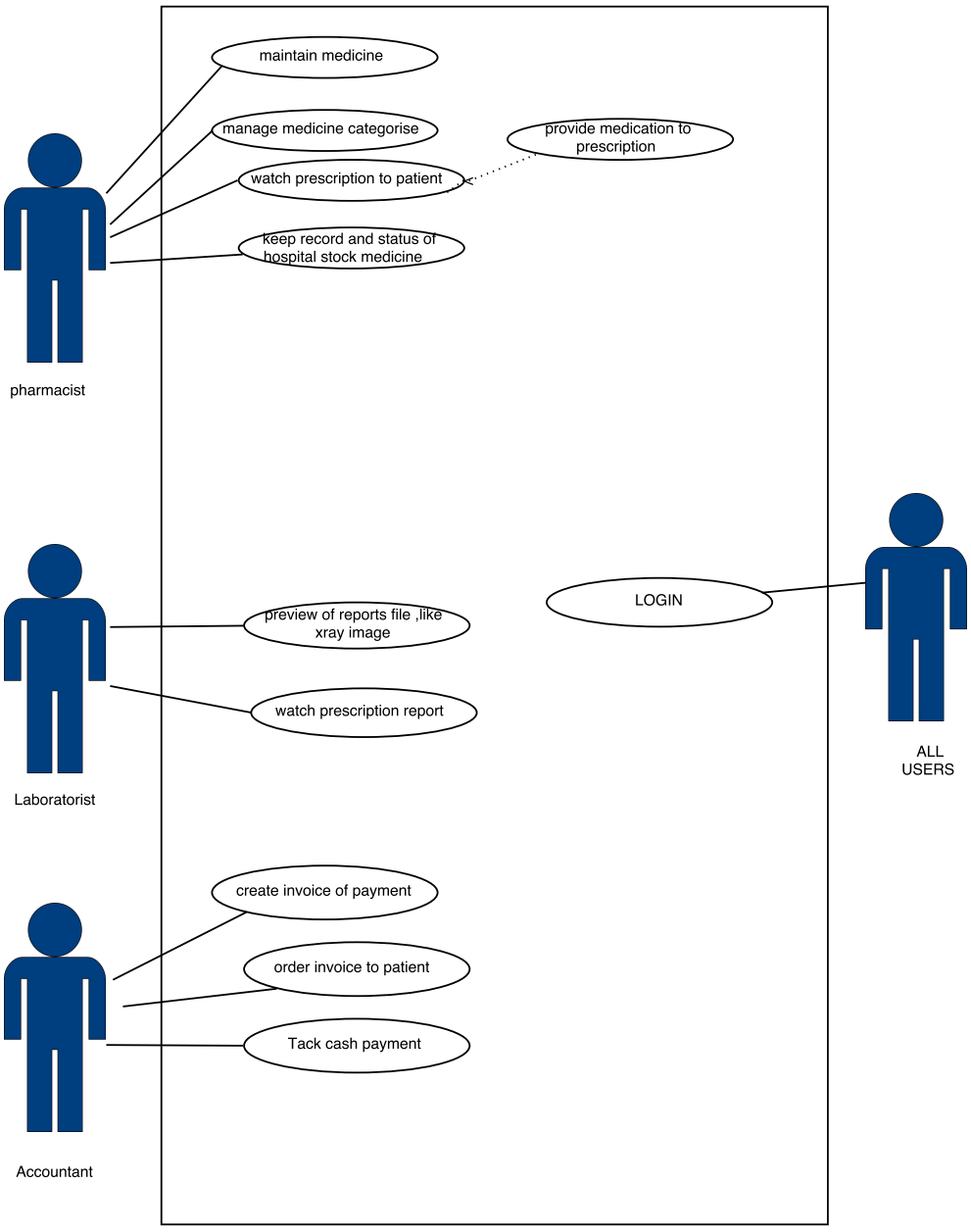


Figure 2: Use Case Diagram(conts.)



3.2 Use Case Specification

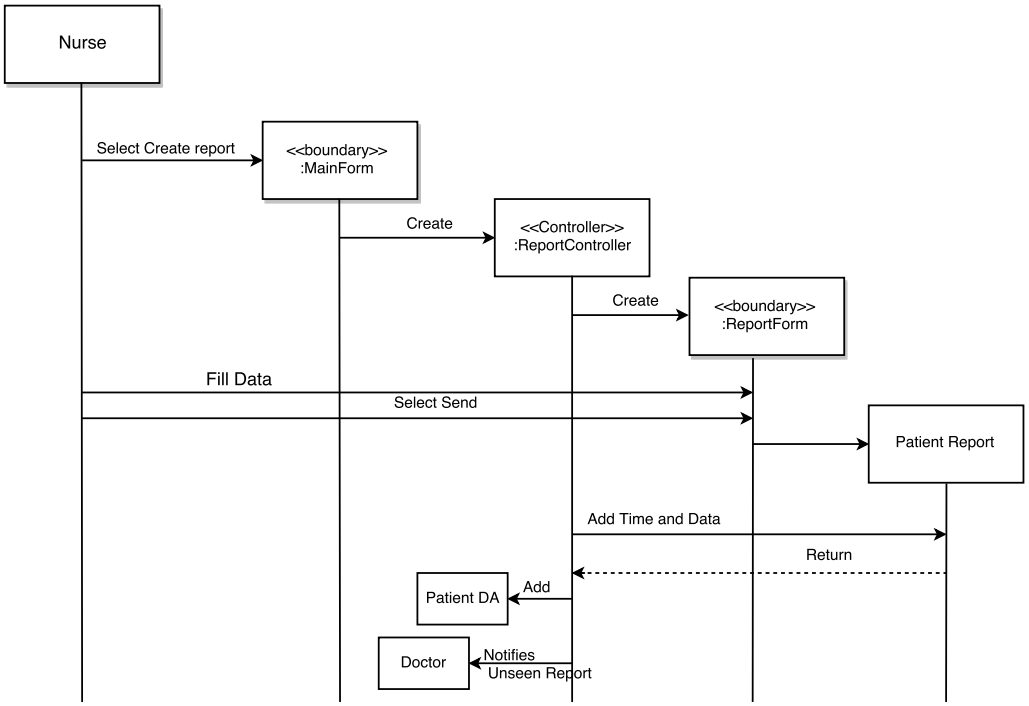
3.2.1 Give Prescription

- Primary Actors :
  1. Doctor
  2. Patient
- Preconditions :
  1. Patient has an account on the system.
  2. Doctor is logged on and has a selected a patient file.
- Basic Flow of Events :
  1. The Doctor selects the "Add Prescription" option.
  2. The System shows a new prescription form.
  3. The Doctor selects the drug, the amount and enters his special notes.
  4. The Doctor selects "Add".
  5. The Systems checks if the patient has any allergies to the selected medicine.
  6. The Systems checks if the patient has any outstanding prescriptions for the selected medicine.
  7. The System adds a new prescription for this patient.
  8. The System Prints a copy of the prescription for the patient.
- Alternative Flows :
  1. The Doctor selects "Cancel" :
     (a) The system goes back to the patient file.
  2. The Patient has an allergy to the selected medicine :
     (a) A Message is displayed saying "Patient has allergy, Please check selected medicine"
     (b) The System returns to the "Add Prescription" form.
  3. The Patient has an outstanding prescription for the selected medicine :
     (a) A Message is displayed saying "Patient has outstanding prescriptions, Please check selected medicine" .
     (b) The System returns to the "Add Prescription" form.

3.2.2 Report to Doctor

- Primary Actors :
  1. Nurse
  2. Doctor
- Preconditions :
  1. Patient is assigned to the nurse and the doctor.
  2. Nurse has logged in and selected the Patient's file.
- Basic Flow of Events :
  1. Nurse selects the "Create Patient Report" option.
  2. The System shows a new report form.
  3. The Nurse enters the patient vitals, status, and her notes.
  4. The Nurse selects the "Send Report" option.
  5. The System adds the time and date to the report.
  6. The System adds the report to the patient file.
  7. The System notifies the doctor that he has an unseen report.
- Alternative Flows :
  1. The Nurse selects "Cancel" :
     (a) The system goes back to the patient file.

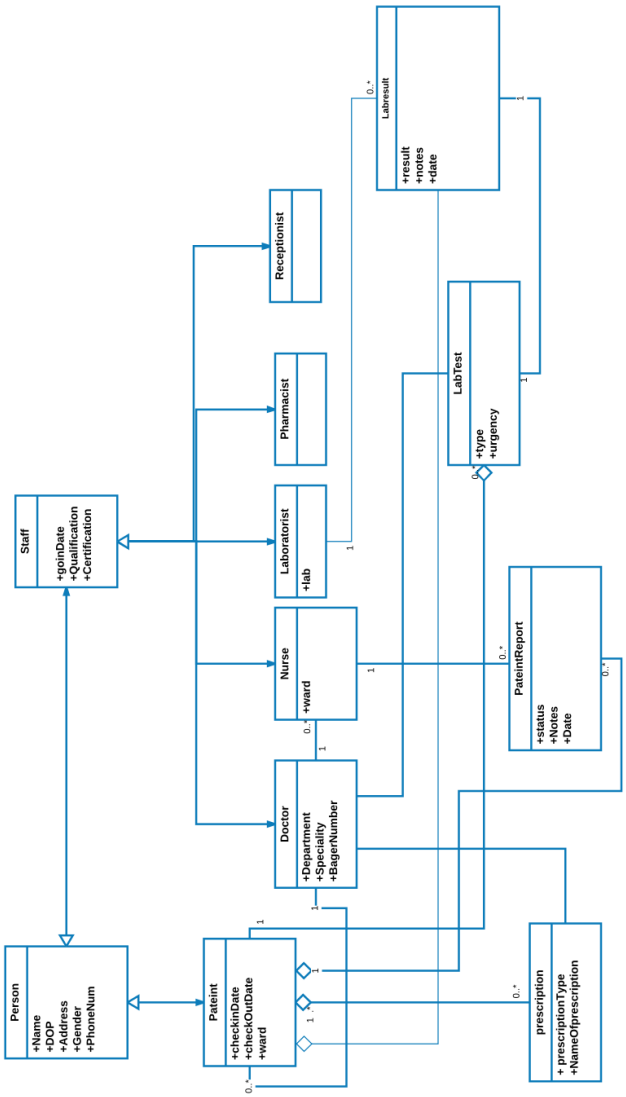
Figure 3: Sequence Diagram for Report to Doctor



4 Classes

Below is the concepteual class diagram for the system. [1]

Figure 4: Conceptual Class Diagram

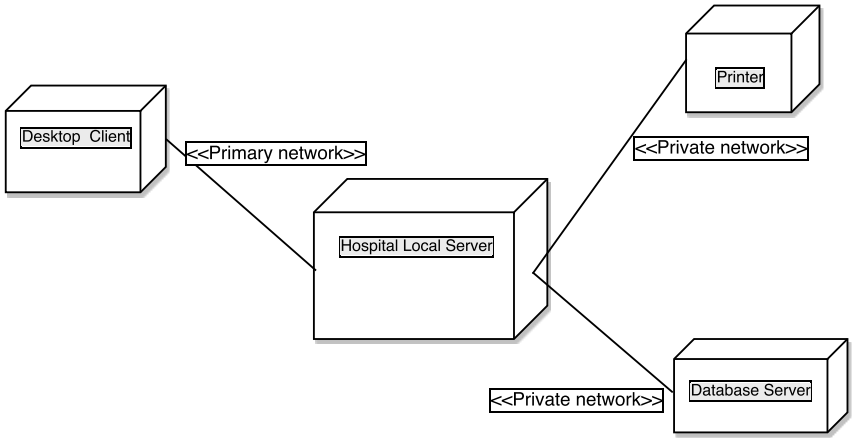


[1] We are not sure we need this section, but it felt wrong having the conceptual class diagram without a section related to it

5 Architechture

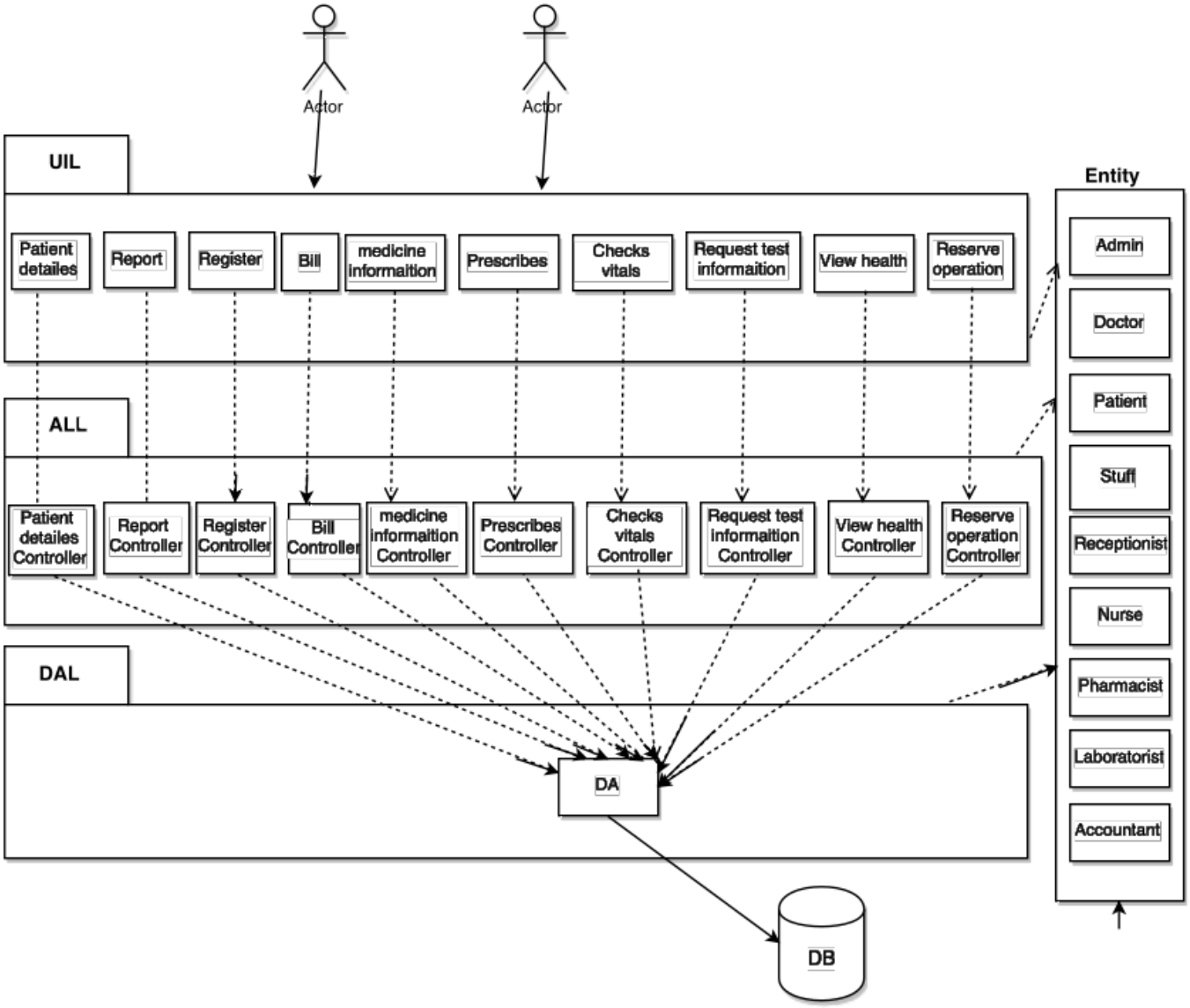
5.1 Deployment Diagram

Figure 5: Deployment Diagram



5.2 Architechture Layer Diagram

Figure 6: Architechture Layer Diagram



5.3 System Block Diagram

Figure 7: System Block Diagram