Solution Document

COVID19 Management System

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1. Introduction & Background

1.1 Purpose

The main purpose of this document is to give a detailed description of the requirements for the National COVID19 management system software in Wakanda. It will illustrate the purpose and complete declaration for the development of the system. It will also explain system constraints, interface and interactions with other external applications. This document is primarily intended to be proposed to a customer for its approval and a reference for developing the first version of the system for the development team.

1.2 Aim

The design description defined in this document serves multiple purposes:

- To describe the functional structure, data and algorithms to be implemented.
- To identify required system resources.
- To be used to assess the impact of requirement changes.
- To be used to verify compliance with requirements.
- To assist in producing test cases
- To aid in maintenance activities.

1.3 Scope

National COVID19 Management System(NCMS) helps to manage the existing healthcare system to face the ongoing pandemic situation.The system should involve citizens, hospitals, doctors and authorities in the country. Your job is to

model and implement a system that meets the requirements of the Ministry of Health.

At the moment none of the hospitals in Wakanda are full. In addition, a basic hospital has 10 beds. Every hospital in the country has its geolocation represented by X, Y coordinates. Every hospital has a chief physician - director who runs the hospital.

With the National COVID19 Management System (NCMS), the Department of Health plans to instruct its citizens that anyone showing symptoms of COVID19 should immediately register with NCMS using their home's geolocation coordinates. Once registered, NCMS will search nationwide for hospitals with available beds. If a bed is available, NCMS will assign the patient to a nearest hospital bed with a serial number (unique). This serial number with the hospital information (with bed number) is then sent back to the patient. At the same time, the serial number with the patient information should be visible to the hospital staff. When the patient arrives, doctors assess the severity and assign a level (low, medium, and critical) and go to the assigned bed. If no bed is available, NCMS will queue the patient with a serial number and notify the patient with the serial number and queue number. Once a patient is fully recovered, the director discharges the patient.

MoH authorities do the overall management of the healthcare system of the country. If the queue of patients (without beds allocated) exceeds 4 allocations, MoH will build another hospital in the district in which the majority of patients in the queue are from. If the number of districts is equal, then MoH will build the hospital in the district where the first patient in the queue belongs. The new hospital will be 10 unit lengths apart from the base hospital. Based on the statistics, MoH knows they will never want to build more than 5 hospitals in a district. Every new hospital will have 10 beds, and once built, all patients in the queue should be admitted to that hospital. Similar to a general patient admitting flow, in this case too, patients should be notified with the hospital information and the bed number along with the same serial number sent earlier.

Apart from the above requirements, NCMS should also show statistics to the public and MoH.

1.3.1 Intended Audience

- Ministry of Health (MOH) in Wakanda.
- Doctors and Medical staff
- All the citizens in the island Wakanda.

1.4 Product perspective

1.4.1 System interfaces

The application should run in the latest version of Chrome or Firefox browser on Windows, Linux and Mac.

1.4.2 User interfaces

The application GUI provides menus, toolbars, buttons, panes, containers, grids allowing for easy control by a keyboard and a mouse.

1.4.3 Hardware interfaces

No hardware interface is involved with this application.

1.4.4 Software interfaces

The application allows the registration and account creation through the interface for authorities, doctors and citizens in Wakanda.

The application should display the required information to the users.

1. MoH wants to see the patient statistics
    - Daily update - country level, district level, hospital level
    - Overall status until now
2. MoH checks hospitals and bed statistics
    - Daily update - country level, district level, hospital level
    - Overall status until now
3. Citizens should be able to see patient statistics
    - Daily update - country level, district level, hospital level
    - Overall status until now

The following figures show the simple GUIs for the system. [Figure 01, 02, 03, 04]

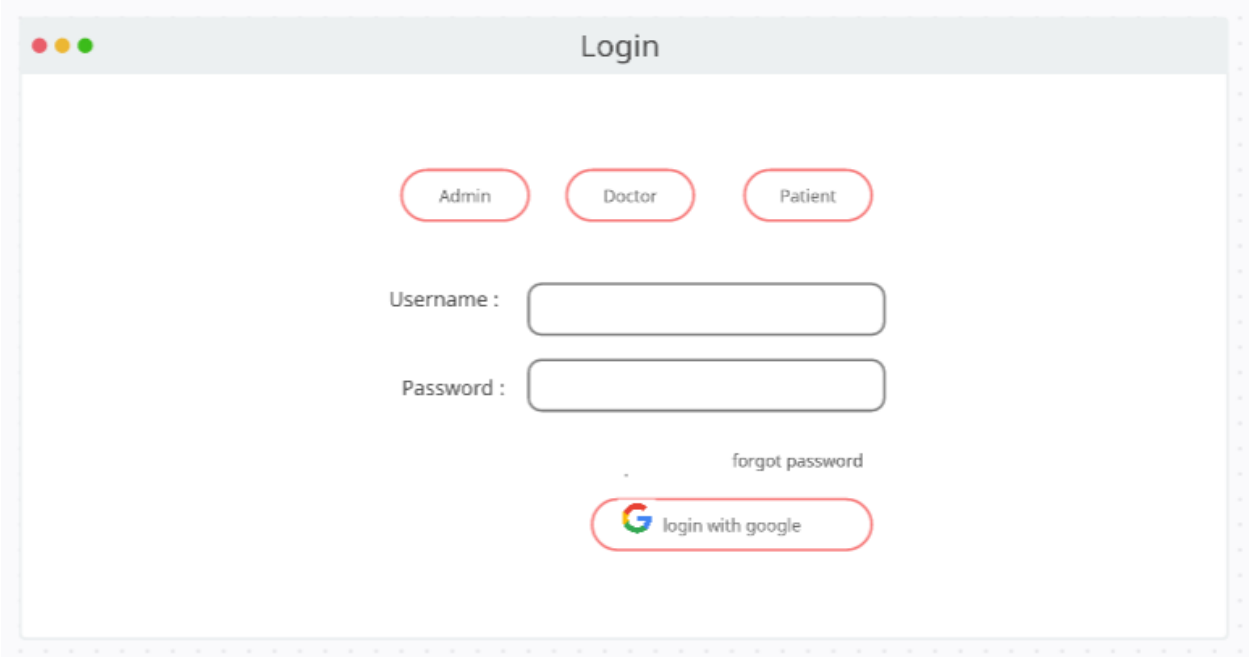

Figure 01

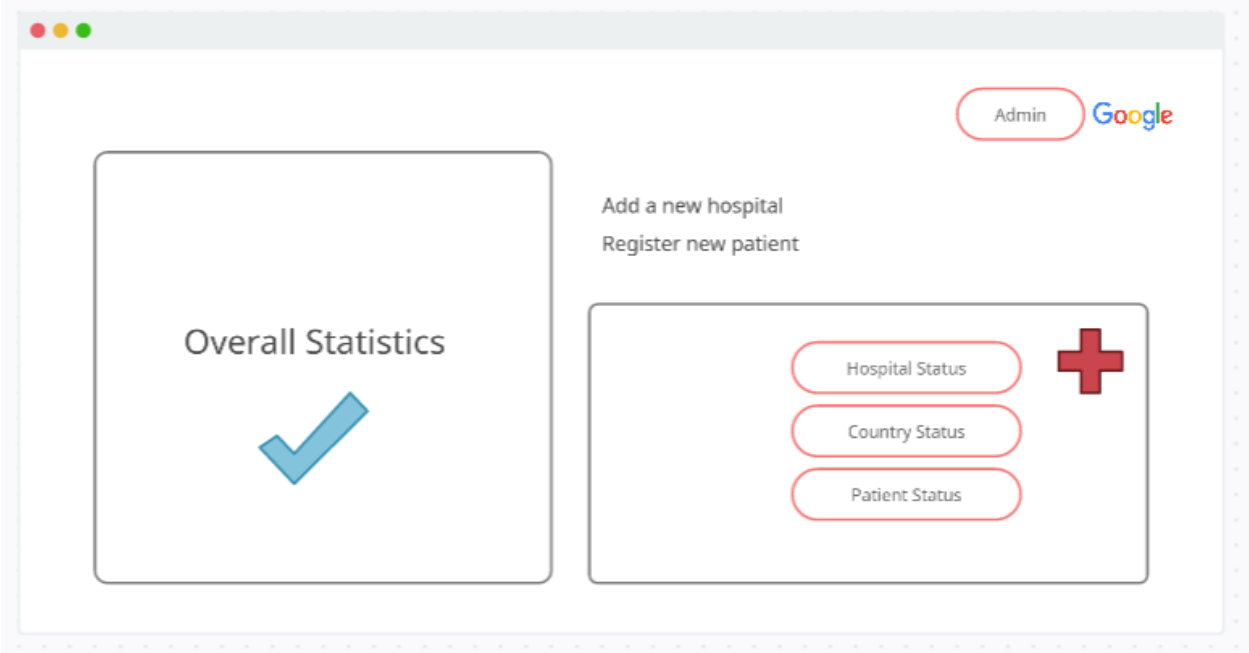

Figure 02

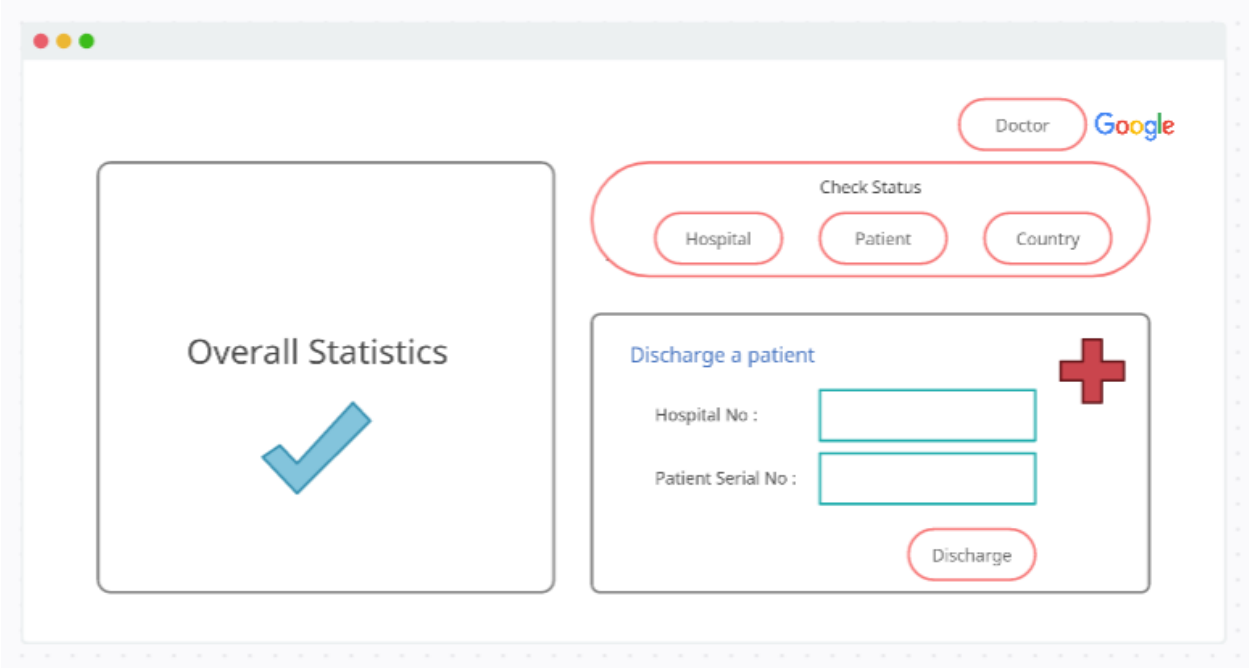

Figure 03

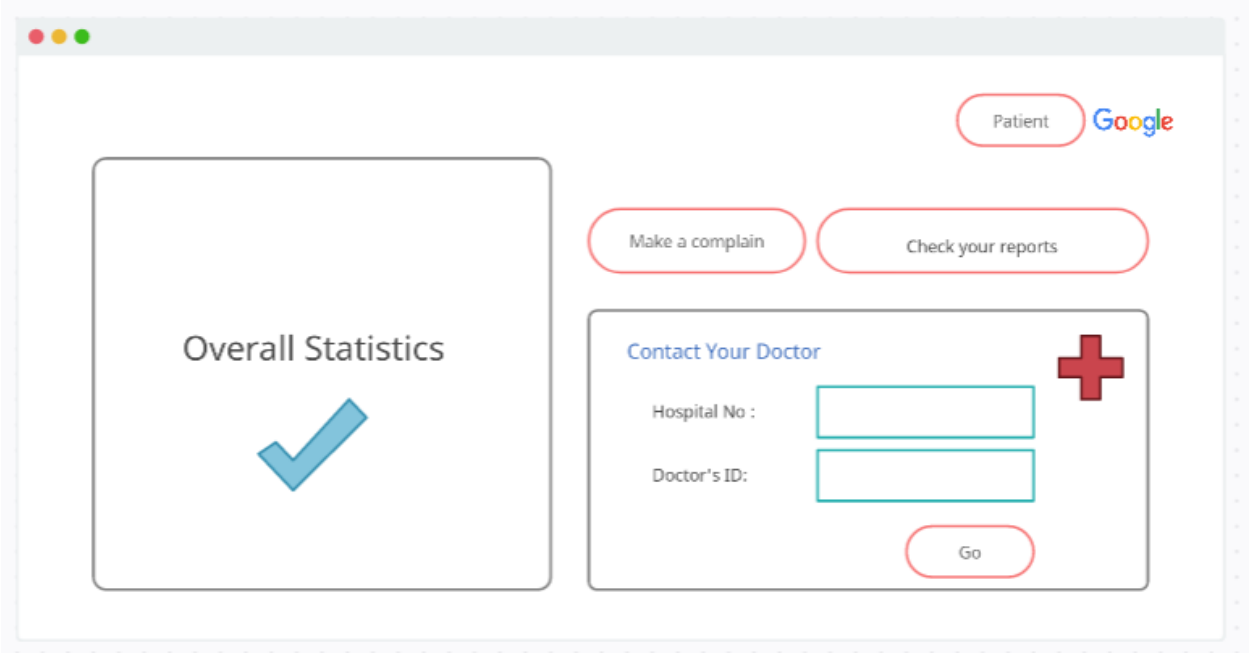

Figure 04

1.4.5 Communications interfaces

The application should allow communication between the following parties

1. Authorities and Hospitals
2. Citizens and Authorities
3. Patient and Hospitals

1.4.6 Memory constraints

The application should store the previous histories and statistics. Also, the previous patient history reports to check on a requirement.

1.5 Product functions

1.5.1 High level use case diagram

This provides the high level use cases of the system and the relationships between actors and use cases.

- Primary actors - Citizens, Patients
- Secondary actors - Hospitals, Doctors, Authorities

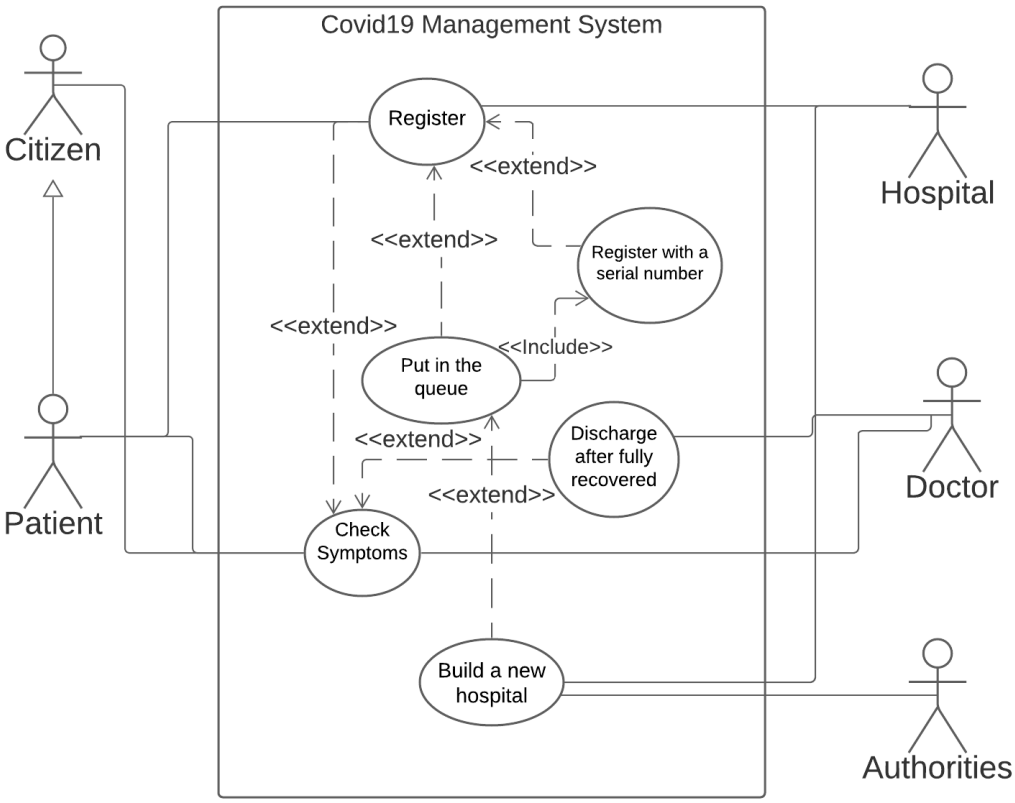

Figure 05

1.5.1 Class diagram

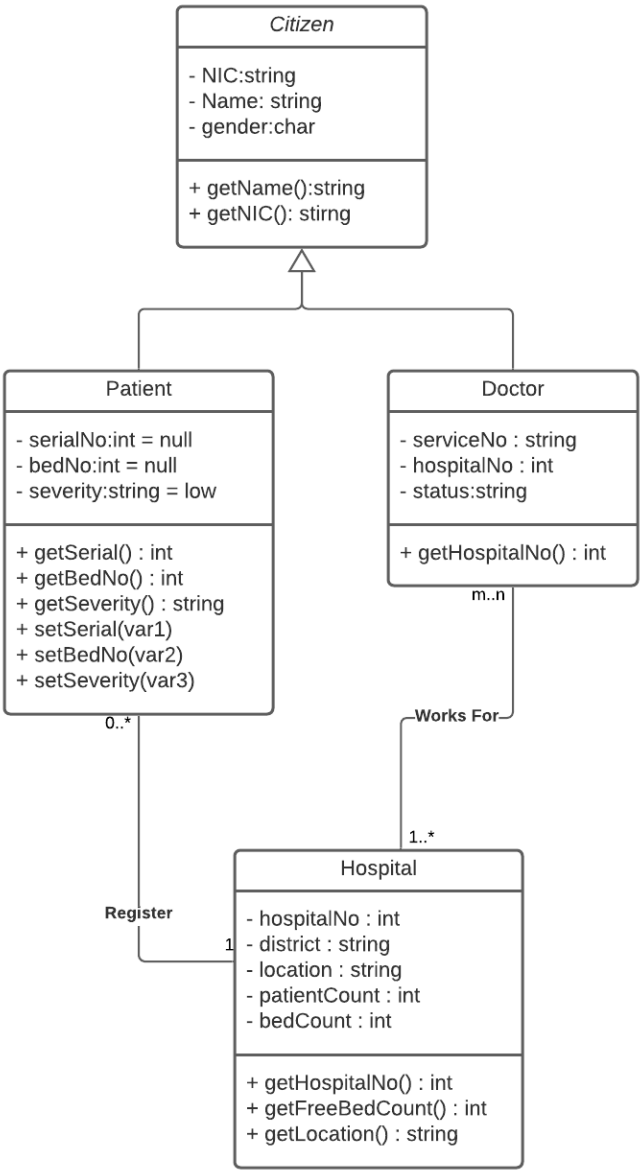

Figure 06

1.5.2 Activity diagram

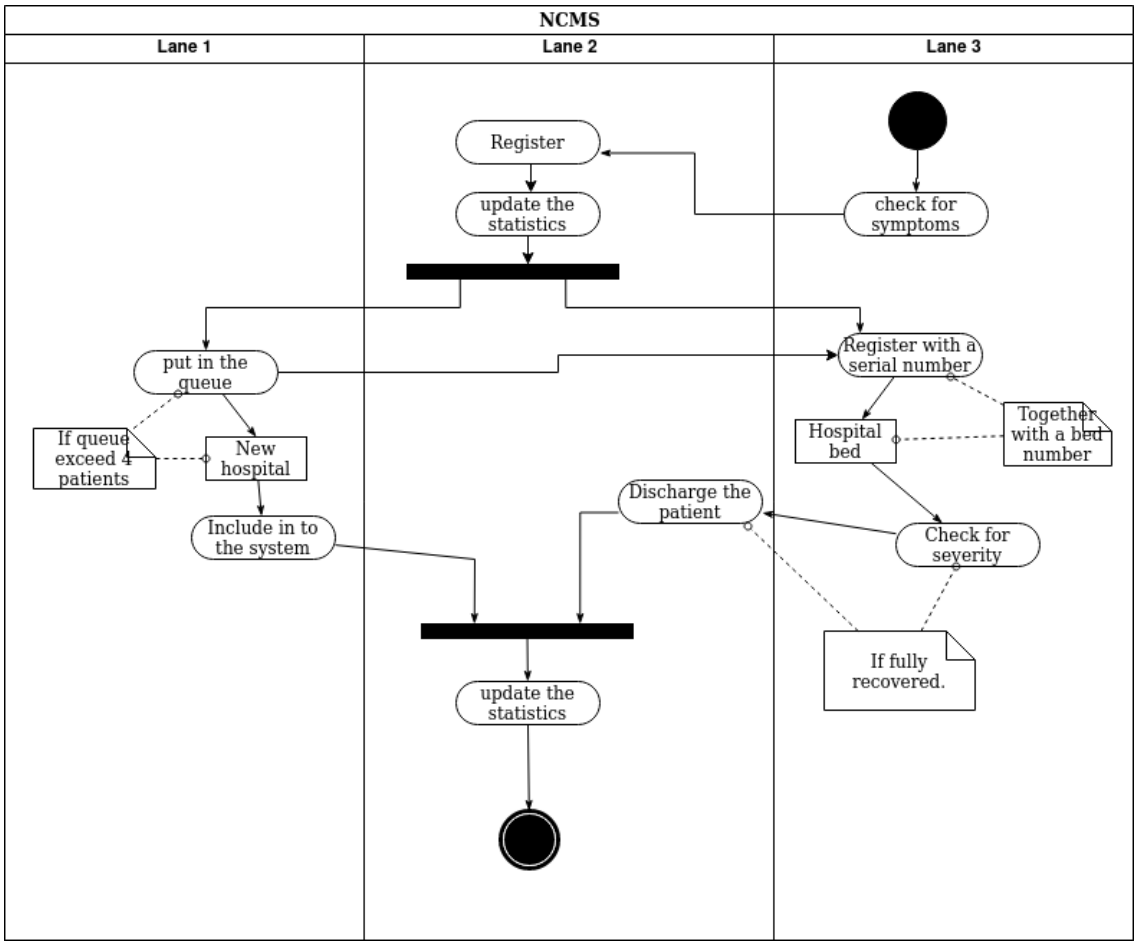

Figure 07

1.6. Assumptions and dependencies

System should not fail in a dependency problem and the system should work with the newest versions of the frameworks. The system should work with the available resources.

2. Requirements

2.1 Functional requirement

- Functional requirement 1

  ID: FR1

  TITLE: User should be able to login to the system

  DESC: Users can login to the system as a doctor, administrator or patient.

  CLASS: Citizen

- Functional requirement 2

  ID: FR2

  TITLE: Doctors must be able to contact and diagnose patients.

  DESC: Doctors must be able to contact the patients and diagnose their symptoms and categorise them according to the severity (low/ moderate/ critical).

  CLASS: Doctor, Patient

- Functional requirement 3

  ID: FR3

  TITLE: Register a patient via the application

  DESC: A Doctor must be able to register a patient for a hospital if there are available beds, otherwise should be put in the waiting list.

  CLASS: Doctor

- Functional requirement 4

  ID: FR4

  TITLE: Doctors and medical staff in a particular hospital must be notified about the arrival of new patient

  DESC: When a patient is registered to a hospital the relevant doctors and medical staff must be notified with the patient serial number and the particular bed number.

- Functional requirement 5

  ID: FR5

  TITLE: Discharging a patient.

DESC: Doctors must be able to discharge a patient when the patient is fully recovered.

CLASS - Doctor

- Functional requirement 6

  ID: FR6

  TITLE: Users must be able to see the statistics.

  DESC: Users must be able to see the daily statistics in order to have a better acknowledgement about the current status.

  CLASS: Citizen

- Functional requirement 7

  ID: FR7

  TITLE: MoH must be notified about the requirement of new hospitals.

  DESC: MoH should be notified with the daily statistics about the current status on country level, district level, hospital level and the overall status until now. They should be given an overall prediction about the requirement of a new hospital.

- Functional requirement 8

  ID: FR8

  TITLE: Administration must be able to add the details of a new hospital to the system.

  DESC: Administration must be able to add the details of a new hospital to the system with the location details.

- Functional requirement 9

  ID: FR9

  TITLE: All the patients in the queue must be registered to the newly built hospital.

  DESC: Once a new hospital is added to the system all the patients are in the queue should be registered in the new hospital with the same procedure.

- Functional requirement 10

  ID: FR10

  TITLE: Include the authentication and authorization details for doctors.

  DESC: MoH should be able to add the authentication and authorization details of doctors to the system.

- Functional requirement 11

ID: FR11

TITLE: Citizens must be able to communicate with the doctors

DESC: Citizens must be able to communicate with the doctors and arrange time to diagnose for COVID19.

- Functional requirement 12

  ID: FR12

  TITLE: Patients must be able to create a complaint or a request about the systematic problems.

  DESC: Patients must be able to create a complaint or a request about the systematic problems for the authorities.

- Functional requirement 13

  ID: FR13

  TITLE: Doctors must be able to check the previous details of the patients.

  DESC: All the required data about patient history reports must be saved into the system to check for the doctors in a requirement.

2.2 Non functional requirement

- Non Functional requirement 1

  ID : NFR1

  TITLE : Check for authentication and authorization while a doctor login to the system

  DESC : Users should be checked with the there Registration IDs, and Hospital ID while trying to log in as a Doctor

- Non Functional requirement 2

  ID : NFR2

  TITLE : Data should be transmitted over a secure protocol

  DESC : All the data transferred should be encrypted with a secure encryption mechanism before transferring through the network.

- Non Functional requirement 3

  ID : NFR3

  TITLE : Data should be transmitted over a secure protocol

  DESC : All the data transferred should be encrypted with a secure encryption mechanism before transferring through the network.

- Non Functional requirement 4

ID : NFR4

TITLE : System should be portable and compatible

DESC : System should have a proper structure that allows portability and compatibility.

- Non Functional requirement 5

ID : NFR5

TITLE : System should have enough reliability, availability and maintainability

DESC : System should have enough reliability, availability and maintainability and the system should be accessible 100 percent during the pandemic situation.

3. Verification

There should be a proper protocol to verify the authentication and authorization when creating an account for a doctor or an administrator .

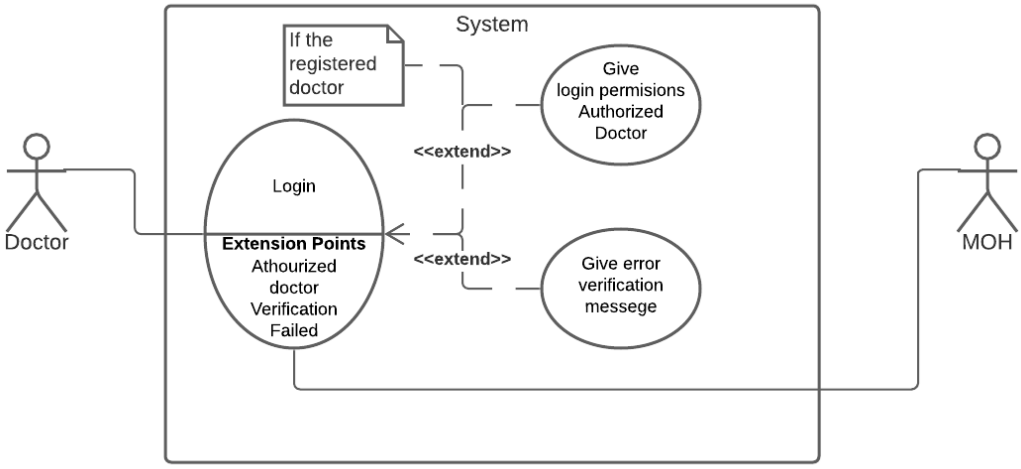

Figure 07

4. Security

The system should be secured with a proper mechanism. System should be able to control denial-of-service (DDoS) attacks. All the data transferred should be end to end encrypted with a secure encryption channel. Use secure standards. Aes ofb encryption mechanism would be sufficient.

The following requirements should be considered.

- Authentication and password management.
- Authorization and role management.
- Audit logging and analysis.
- Network and data security.
- Code integrity and validation testing.
- Cryptography and key management.
- Data validation and sanitization.

5. Database Requirements

The database management system should be implemented using MySql.

6. References

01. Software design pattern [18/04/2021]
02. Advanced_Encryption_Standard [18/04/2021]
03. Information security [18/04/2021]