INFO 2413 (A10)
Software Requirements Specification

Jlabs

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1. Introduction

1.1 Purpose

Clinical tasks require efficient and reliable record keeping to responsibly manage patient medical information and in turn provide proper medical treatment. An inability to do so can jeopardize a patient's treatment and health. Jlabs provides a structured web-based solution designed to assist small clinics with organizing their patient's personal information and monitoring the health status of their clients; primarily by storing the results of medical exams and producing reports based on them.

This Software Requirements Specification document defines the various requirements needed to create a structured and accurate system for Jlabs.The contents of this document are intended to assist project managers, developers, testers, and stakeholders in understanding the elements and functionalities of the system.

1.2 Scope

Jlabs is a web-based health monitoring system that clinics use to keep track of information on their patients. The system allows patients to monitor their own overall health through a web based application. Patients can view the results of their own medical exams. Staff input and edit exam data while administrators can generate reports. Doctors can view exam results for all patients, certain reports, and create health monitors.

This web application will allow patients to register and monitor their own results. It will approve all accounts for users who are registering with the system. The system will also onboard and delete all accounts when hiring new people. Our application will provide a form to create and change exam results. It will provide a feature that lets users select any exam result they want to monitor. When the infrastructure detects any abnormalities in exams, it will notify third party recipients about the issue with an email notification. Users with higher access can choose what they will like to monitor for recipients under care. Monthly and yearly reports give a testing summary of all users abnormal test results. It can also generate health predict reports, outlining various health issues in the next coming years. The system will produce this report from past exams looking back at their history. System can send email notifications and display new information on the web-portal. A search function will be present allowing users to search exam results based on various properties.

The limitations within our system are that people will not be able to book appointments or schedule exams. All exam bookings will be done by something else external to our system. The database can only receive and store their patient exam results. Our system can store these results only after appointments are done and that data is put inside the database. However, certain people will have the ability to modify what is on the exam results. People who do not have accounts with the clinic will not be able to access this application

1.3 Definitions, acronyms, and abbreviations

A. SRS (System Requirements Specification) - a document that clearly defines the requirements and expectations for a software system, including functional and non-functional requirements, constraints, and user needs.
B. Jlabs - is a name of the system described in SRS.
C. Authentication - a function that is verifying user identity using his personal information.
D. Patient - an outside user of the system.
E. Worker - a termine that refers to Doctors, Staff and Administrator that work in the clinic.
F. Staff - a personnel responsible for providing healthcare services in the clinic.
G. Administrator - a personnel responsible for managing the system used by the clinic.
H. Doctor - a physician who diagnoses and treats patients in the clinic.
I. Appointment - a functionality performed by another system. After which we expect a patient to have access to the system.
J. Exam - an assessment of the patient's condition, in the system exams are represented by different types.
K. Categories - a subtype related to the types of exams mentioned in "H."
L. Result - in the system they refer to information received from another clinic after exam completion.
M. Generation - in the system it refers to creation of the document from the received results.
N. Users account - personal information stored about the users and displayed on the website.
O. Smart Monitor - a smart function that will monitor patients results and report in case of abnormality.
P. Patients Prediction Report - a report that will use result information to create a prediction.

1.4 References

"IEEE Guide for Software Requirements Specifications," in *IEEE Std 830-1984* , vol., no., pp.1-26, 10 Feb. 1984, doi: 10.1109/IEEESTD.1984.119205.
keywords: {Software engineering;System analysis and design;software;requirements;specifications},

1.5 Overview

This SRS provides a clear and structured implementation guide for the JLABS application, which is the web-based health monitoring system for small clinics. It defines functional and non-functional requirements that will make the system functional, efficient and secure. This document is divided into the following key sections.

A. Section 2: Overall Description

   This section provides a broader overview of the system and its major functions. It defines how the system will interact with other services. It provides an understanding of how the system is supposed to perform for each kind of user. A use case diagram is included to visualize user interactions with the system.

B. Section 3: Specific Requirements

   These are the functional, non-functional and database requirements. The functional requirements identify what the system must perform. Non-functional requirements describe how the user experience of the system should be. Finally the design of the database, how all the data is going to be stored, organized and accessed.

2. Overall Description

2.1 Product Perspective

Jlabs integrates with our in-house clinic system, connecting to:

A. company directory:To retrieve employee information
B. email servers: To create and send emails
C. authentication server: To manage user authentication and authorization.
D. patient exam databases: To access and update exam information, and its results
E. web servers: Jlabs is hosted on the web server, allowing users to access the system through a web browser.

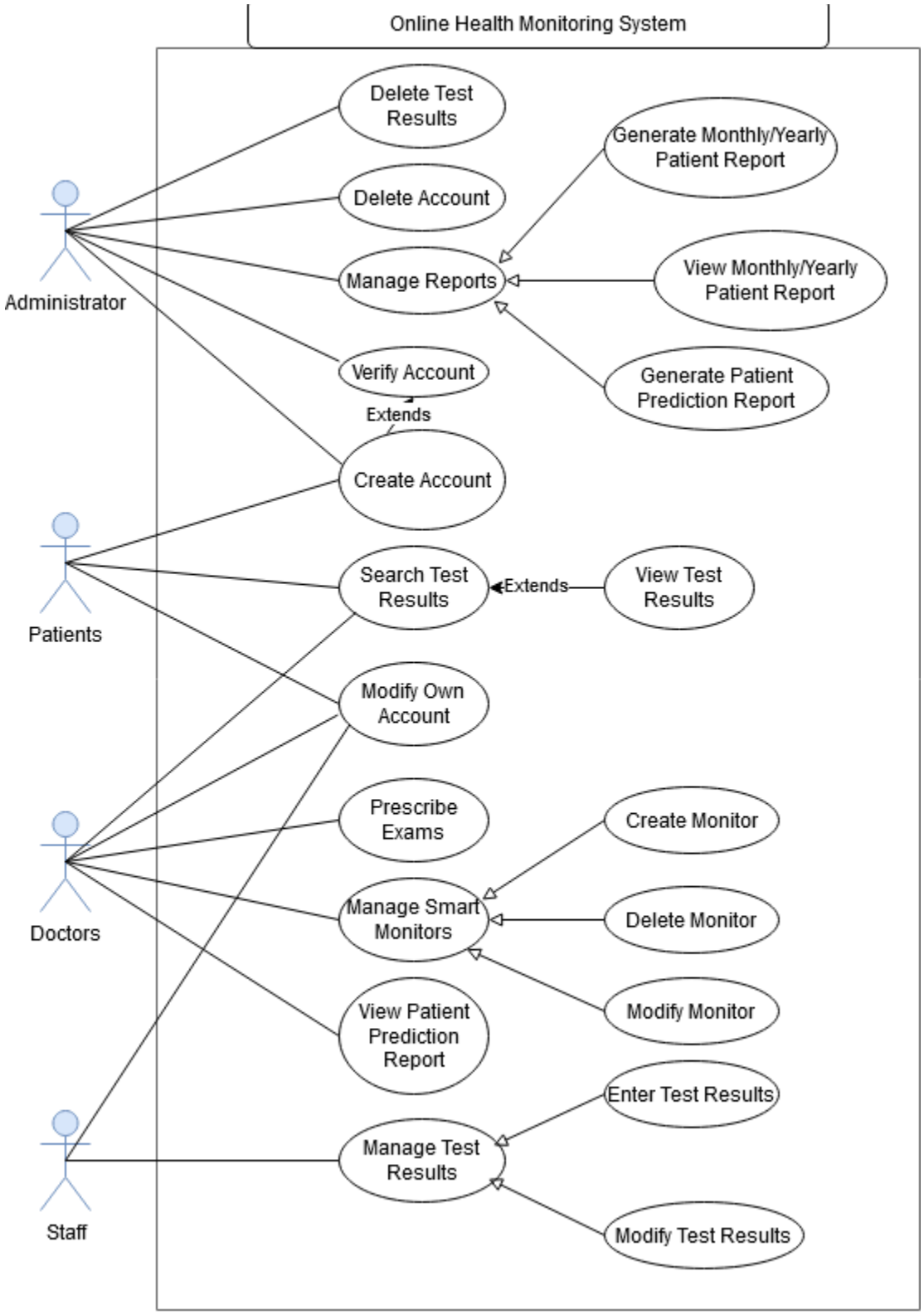
If any of these systems or services lack an API, our approach will be to develop custom in-house APIs with specifications and documentation to ensure seamless integration and functionality across all systems involved.

2.2 Product Functions

F. Jlabs supports four different user types who can interact with the system: Administrator, Patients, Staff, and Doctors. All users will need to log into the system before interacting with it, authenticated by providing both a username and password.
G. Patients may register their own account; however, administrators must verify them before they can be used. Administrators create all Staff and Doctor accounts. Only an administrator can delete accounts.

H. Once created, users can modify the details of their own accounts. Different account types will have different kinds of details and permissions.
I. Doctors will prescribe exams to patients after they have an appointment, these appointments are not handled by our system. Multiple exams may be prescribed at once for a patient, including multiple of the same type.
J. Once an exam is completed, staff will input the results into the system. Staff may also edit the results of an exam if needed. Only an administrator may delete exam results entirely.
K. Doctors and patients may both search and view test results. Patients may only search for and view their own results while doctors can search for and view results from any patient. Searches can make use of several different properties.
L. Doctors also have the ability to create, modify and delete smart monitors. The smart monitors will look for abnormal test results of a given patient as defined by the doctor who created the monitor. Whenever a test result is created or modified, these monitors will check them and if the result is abnormal, will notify the doctor with an email.
A. Administrators are responsible for generating reports. They may create and view both monthly and yearly reports summarizing all patient health issues and outcomes over the given timeframe. Administrators also create patient prediction reports based on test results in the system, these reports may be viewed by doctors and will be sent to them by email when generated.

2.2.1 Use case diagram



general use case diagram.

3. Specific requirements

3.1 Functional requirements

3.1.1 Login requirements

A. Users can visit a web page and enter account information: email and password.
B. System can validate the input and start a session.
C. Users can manually log out from the application.

3.1.2 Registration requirements

A. Patients can create their account including name, contact email, contact phone number, date of birth.
B. System can send email notifications to the administrator for approval.
C. Administrators can approve or reject the registration request.
D. System can send notification of their registration status via email.
E. Administrators can create employee accounts that will include name, email, phone number,image and working ID.
F. System can assign roles and permissions based on their job functions.
G. System can send an email with login credentials upon account creation.
H. Users can modify their own accounts.
I. Administrators can delete user accounts.

3.1.3 Exam Assignment requirements

A. Doctors can select the type of exam from a predefined list: blood test, urine test, ultrasound, X-ray, CT scan and ECG
B. Elements in a exam list can have several categories, blood test have: Routine Hematology, Coagulation, Routine Chemistry, Renal Function, Liver Function, Pancreas Function, Endocrinology, Tumor Markers
C. System prescribes the exam.
D. Exam details are displayed to the patient.

3.1.4 Exam Results requirements

A. Staff can enter and modify results into the system that are received from external clinics.
B. Doctors can view and search for results of any patient, by patient' name, by patient's name plus exam date, by patient's name plus exam item, and by abnormal results;

C. Patients can view and search for their own results by exam date, by exam item and by abnormal results
D. Administrators can delete exam results.
E. System should provide options to download results.

3.1.5 Smart Monitor requirements

A. Doctors can set up, modify and delete what they would like to monitor by creating a “smart monitor” function.
B. System can send email notification to doctors when abnormal results are detected in a smart monitor function.

3.1.6 Report generation requirements

A. Administrators can generate monthly and yearly reports by choosing year and month
B. System can generate reports in Excel format.
C. Administrators can generate prediction report in December that will show the trends based on the exam results
D. Administrators can save, download, or email reports directly from the system to doctors.
E. System would display a prediction report to the doctor the moment it is saved by the administrator.

3.2 Non-functional requirements

3.2.1 Performance Requirements

A. Search Operations: ≤ 5 seconds for up to 500 records.
B. Report Generation: ≤ 10 seconds for up to 1000 units; prediction reports ≤ 30 seconds.
C. Support up to 500 concurrent users with response time < 5 seconds.

3.2.2 Security Requirements

A. Sessions automatically log users off after 30 minutes of inactivity.
B. Authorizations and permissions are given based on roles of the users entering the system.
C. All identifying information is encrypted and allowed to be viewed with special permissions.
D. The system logs any logins that have an IP that is located outside of the country of the office and flags them as malicious.

3.2.3 Scalability Requirements

A. The system allows and has the ability to handle up to 500 users.
B. The system can handle up to 15 concurrent accesses to the same data.
C. The system allows 50 user exam results to be saved and viewed upon request.

3.2.4 Availability requirements

A. The system allows users to access the web portal 24/7.
B. The system shall implement a fault tolerance mechanism to ensure automatic recovery from failures, maintaining 99% uptime.

3.2.5 Data Integrity Requirements

A. All logon entries are validated and authorized.
B. Before information is sent into the system, it must be checked to be of the correct format.
C. The system must keep an audit trail of all critical actions performed by users (ex: login attempts, exam data modification, and report generation) to ensure accountability and traceability. This log must be accessible only to administrators for security reviews.

3.2.6 Usability Requirements

A. Users must be able to take up to 5 clicks to get to the intended place.

3.2.7 Backup Requirements

A. All system data, including user records and exam results, from the last 72 hours shall be backed up in case of a system crash.

3.2.8 Language Requirements

A. The system must support several languages, allowing users to switch between English and other languages (ex: French or Spanish) for the interface.

3.2.9 Mobile Requirements

A. The system must be fully responsive and accessible on mobile devices. Key functions like viewing health records and logging in should work on smartphones.

3.2.10 Data Consistency Requirements

A. The system must ensure that all data remains consistent across modules. For example, if a patient's information is updated in the profile section, this change should be updated within 5 seconds in exam results and report generation modules.

3.2.11 Operating System Compatibility Requirements

A. Major operating systems like Windows, macOS, and Linux should be able to run the system within 5 seconds without faulty performance and errors. The system must have a failure rate of less than 1% during typical user operations across all supported operating systems.

3.3 Logical database requirements

3.3.1 Patient Accounts Table

A. Types of information:
Patient formation is: health ID, name, email, phoneNumber, DOB, status(pending, verified)
B. Frequency of use:
Patient account will be accessed when logging in, authenticating, creating an account, deleting account, modifying account.
When Patient account is verified by Worker with userType(Administrator)
C. Accessing capabilities:
Users like Patient will have editing capabilities, and Administrator that should have a capability to delete and edit the table
D. Data entities and their relationship:
Patient data will be inside exam table and it's data will be used to fill out contents of the report, prediction reports and smart monitor
E. Integrity constraints:
The PK userID is the identifying the uniqueness of the table
F. Data retention requirements:
It would be used in reports and should be stored for historical reasons.
Patients will be able to check which clinic they visit often in the long term.

3.3.2 Workers Accounts Table

A. Types of information:
Worker information includes: workingID, name, email, phoneNumber, image, Worker with userType(administrator, staff, doctor)
B. Frequency of use:
Workers' accounts will be accessed when logging in, authenticating, or modifying accounts.

When a Worker with UserType(Doctor) is accessing the account, they will prescribe an exam to patients, check the results of all their patients, and use the smart monitor for their patients.
When a Worker with UserType(Staff) is accessing the account, they will input the exam results of their patients when exam results are coming back to the clinic.
When a Worker with UserType(Admin) is accessing the account whenever they generate and access yearly reports and generate health predict reports for doctors.

C. Accessing capabilities:
Doctors, staff, and administrators are able to access their own respective accounts that have appropriate UserType.
D. Data entities and their relationship
When a Worker with UserType(Doctor) will interact with Exam Table, Predict Report, and Smart Monitor.
E. Integrity constraints:
The PK workerID is the identifying the uniqueness of the table
The Worker with UserType will consist of values that identify users.
F. Data retention requirements:
It would be used in reports and should be stored for historical reasons.
They need the workers for payroll requirements.

3.3.3 Exam Table

A. Types of Information
Exam will include: examID, date, health ID, workingID, examItem(blood test, urine test, ultrasound, X-ray, CT scan and ECG), category(Routine Hematology, Coagulation, Routine Chemistry, Renal Function, Liver Function, Pancreas Function, Endocrinology, Tumor Markers)
B. Frequency of Use:
When Worker with UserType(Doctor) will need to create exams for their patients.
C. Accessing Capabilities:
Worker with UserType(Doctor) will be able to change, edit and delete the exam table.
D. Data Entities and Relationships:
There will be a relationship where Results will use Exam table PK.
E. Integrity Constraint:
The PK examID and combination of healthID and workingID is the identifying the uniqueness of the table.
F. Data retention requirements:
Exam information will be used in results and should be stored for historical, legal, insurance reasons.

3.3.4 Exam Results Table

A. Types of Information
Results will consist of: resultID, examID, results, abnormal, date

B. Frequency of Use:
When Worker with UserType(Doctor) will need to search and view all patients results.
When Worker with UserType(Staff) needs to input and modify all exam results of their patients.
When Patients need to search and view their own exam results.
When Worker with UserType(Admin) will need to delete the exam

C. Accessing Capabilities:
Staff need to be able to change the patient's exam results table.
Doctors are able to get all patients exam results.
Patients are able to get their own test results.
Admins need to be able to delete the table.

D. Data Entities and Relationships:
There should be a relationship where the Exam table will have exam ID FK, to represent to which exams these results are related.

E. Integrity Constraint:
The PK will be the resultID, where that will represent uniqueness of this table

F. Data retention requirements:
Exam information will be used in reports, and should be stored for historical, legal, insurance, diagnosis reasons.
All data will be retained in regards to the type of exams doctors need to check for patients, when patients need to look back at the information about their exams, when staff need to make changes later to the patient's exam results.

3.3.5 Smart Monitor Table

A. Type of Information
Smart Monitor should have: monitorID, workingID, examID, upperBound, lowerBound, status(send, notSend)

B. Frequency of Use:
When Worker with Usertype(Doctor) will use the smart monitor to decide what they will like to monitor for patients. They will receive email notifications when things start to become abnormal.

C. Accessing Capabilities:
Only the Worker with UserType (Doctor) will have capabilities to create, delete and edit the smart monitor table.

D. Entities and Relationships:
Smart monitor will interact with exam results information and will have a FK of workingID and examID

E. Integrity Constraints:
monitorID(PK) will be the thing that identifies the table and ensures its uniqueness.

F. Data retention Requirements:
It should be retained for historical and diagnostic reasons.
The data that this function retains will be in regards to what was abnormal in the patient, abnormal data to help come up with a diagnosis for the patient, use this data to help quickly mitigate the critical health conditions patients experience.

3.3.6 Exam Report Table

A. Types of Information:
   Exam will consist of: reportID, workingID, date, results, abResultPercentage
B. Frequency of Use:
   When Worker with UserType(Administrator) needs to generate monthly/yearly reports, which shows a summary of all patients results.
C. Accessing Capabilities:
   Only Worker with UserType(Administrators) can create and delete reports.
D. Entities and Relationship:
   Exam table has a relationship with Administrators via (FK)workingID, that represents who created this report.
E. Integrity Constraints:
   reportID that is used as a PK ensures the uniqueness of this table.
F. Data retention requirements:
   reportID
   reports should be retained for historical and diagnostic reasons.
   Administrators will keep this result just in case there is an increased number of abnormal testing results; to be able to determine why there is an increased number of abnormal testing and find ways to resolve the problem and will track what health issues that people face long term.

3.3.7 Predict Report Table

A. Types of Information:
   Predict reports consists of: predictID, workingID, examID, date, prediction
B. Frequency of Use:
   When Worker with UserType(Administrator) needs to generate a patient's health predict report for a Worker with UserType(Doctor).
C. Accessing Capabilities:
   Only Worker with UserType (Administrator) have access to create a predict reports table every December.
   Only Worker with UserType(Doctors) can only view the predicted report if they have the proper workingID.
D. Entities and Relationship:
   Predict report table will interact with workingID FK of a Doctor and examID FK to interact with exam results information.
E. Integrity Constraints:
   predictID serves as a PK that ensures uniqueness of the table.
F. Data retention requirements:
   This report should be stored for historical and diagnostic reasons.
   That data will be retained to help doctors predict what health issues a patient might face next year, and help to decide what kind of health issues they will like to monitor for patients.