Plasma Donor Application



Team Members:

Darshan Sasikumar Gowtham Sriram Kevin Nelson Pranavh Harish

Team ID: PNT2022TMID12996

Introduction

1.1 Project Overview:

A way in which one can help the COVID 19 affected people is by donating Plasma from recovered patients. With no approved antiviral treatment plan for the deadly COVID-19 infection, plasma therapy is an experimental approach to treat COVID positive patients and help them recover faster. The therapy is considered to be safe and promising. If a particular person is fully recovered from COVID 19 he/she is eligible to donate their plasma. In the proposed system, donors who need to donate plasma can donate by uploading covid-19 certificate and blood bank can view donors and can raise requests to donors and the hospital can register/login and can search for plasma, they can raise requests to blood bank and can get the plasma.

1.2 Purpose:

The proposed work aims to create an application and provide an interface with which donors can contact hospitals and hospitals can in turn find donors to meet the plasma requirements. This will allow hospitals to meet the demands of plasma for the patients undergoing treatment. Plasma from Covid recovered patients can be used to treat covid patients. This allows an easy way for donors to interact with hospitals and to donate plasma when needed.

Literature Survey:

S.No	<u>Title</u>	<u>Author</u>	<u>Abstract</u>	<u>Drawbacks</u>
1.	Instant Plasma Donor Recipient Connector Web Application	Ripathi S Kumar V Prabhakar A	One way in which we can help the COVID 19 affected people is by donating Plasma from recovered patients. With no approved antiviral treatment plan for the deadly COVID-19 infection, plasma therapy is an experimental approach to treat COVID positive patients and help them recover faster. The therapy considered to be safe and promising. If a particular person is fully recovered from COVID 19 he/she is applicable to donate their plasma. In the proposed system, donors who need to donate plasma can donate by uploading covid-19 certificate and blood bank can view donors and can raise requests to donors and the hospital can register/login and can search for plasma, they can raise requests to blood bank and can get the plasma.	• Tedious work. • Expensive. • Requires more man power. • Time Consuming.
2.	Plasma Donation Website using MERN stack	Neha Soni	The person who wants to donate his/her plasma needs to register in our application providing required information which are name, age, blood group, phone number, and location, etc. Patients who need plasma can also fill the form to request the plasma. • Internet: It would require an internet	Internet: It would require an internet connection for the working of the website. AutoVerification: It cannot automatically verify the genuine users.

			connection for the working of	
			the website. AutoVerification: It	
			cannot Patients can directly call	
			the donor by taking his/her	
			contact number from the	
			application. The user can also	
			view the total active cases,	
			recovered cases, vaccine	
			centres in their area, hospital	
			location, and helpline number.	
3.	Developing a	Aishwarya R	A plasma is a liquid portion of	It cannot auto
	plasma donor	Gowri	the blood, over 55% of human	verify user
	application		blood is plasma. Plasma is	genuineness. • It
	using		used to treat various infectious	requires an active
	Function-as-		diseases and it is one of the	internet
	aservice in		oldest methods known as	connection.
	AWS		plasma therapy. Plasma therapy	
			is a process where blood is	
			donated by recovered patients	
			in order to establish antibodies	
			that fights the infection. In this	
			project plasma donor	
			application is being developed	
			by using AWS services. The	
			services used are AWS Lambda,	
			API gateway, DynamoDB, AWS	
			Elastic Compute Cloud with the	
			help of these AWS services, it	
			eliminates the need of	
			configuring the servers and	
			reduces the infrastructural	
			costs associated with it and	
			helps to achieve serverless	
			computing. Situations like if the	
			donor count is very low, it is	
			very important to get the	
			information about the plasma	
			donors. Saving the donor	
			information and notifying about	
			the current donors would be a	
			helping hand as it can save time	
			and help the users to track	
			down the necessary	
			information about the donors.	
4.	Plasma	Jenny Shersten	Motivation for further plasma	Internet
			pidomid	

	Donation Ann		collection from donors for	Connection is
	Donation App			
			recipients, as well as fast	mandatory •
			communication with them. For	Reports are not
			both groups - always up-to-date	verified
			information and the ability to	
			follow statistics and data in the	
			city and in the country	
5.	Plasma-	Dheeraj Kotwani,	An Open-Source App which fills	No search filter
	DonorApp	Pragathi Verma,	the gap between the patients	available 🛭 Cannot
		Sitam Sardar,	and the Plasma Donors.	login through
		Vatsal		Chrome
		Kesarwani,		
		Nakul Sharma,		
		Nuh Koca ,		
		Harsh Rajgor		
6.	Blood bag: A	Ali, R. S., Hafez,	This aims to help users fulfill	Major UI
	web	T. F., Ali, A. B,	their needs for a safe and	Improvements 🛚
	application to	Abd-Alsabour, N.	reliable blood group by	Uses Donation
	manage all	•	searching for and locating a	Camps and is not
	blood donation		specific blood group and	instant access
	and		plasma donor. The paper	
	transfusion		illustrates the . Hence, we	
	processes.		proposed the Blood Bag web-	
			based application that is	
			connected to a centralized	
			database using SQL to gather	
			and organize the data from all	
			blood banks and blood	
			donation campaigns. The	
			proposed application organizes	
			and controls the whole critical	
			processes related to blood	
			donation, testing and storage of	
			blood bags, and delivering it to	
			the patient. The application is	
_			developed using C#.	
7.	Nearest Blood	Nayan Das, MD.	This paper details the dangers	☐ High
	& Plasma	Asif Iqbal	of not finding a suitable donor	Computational
	Donor Finding:		and the impact such a reliable	Requirements
	A Machine		can create. The purpose is to	Depends on API's
	Learning		build a platform with clustering	for database
	Approach		algorithms which will jointly	updation
			help to provide the quickest	
			solution to find blood or plasma	
			donor. The paper uses Machine	
	l		<u> </u>	

		learning techniques and makes	
		use of existing API's for faster	
		data retrieval. Closest blood or	
		plasma donors of the same	
		group in a particular area can	
		be explored within less time	
		and efficiently	
		-	

Ideation and Proposed Solution:

3.1 Empathy Map Canvas

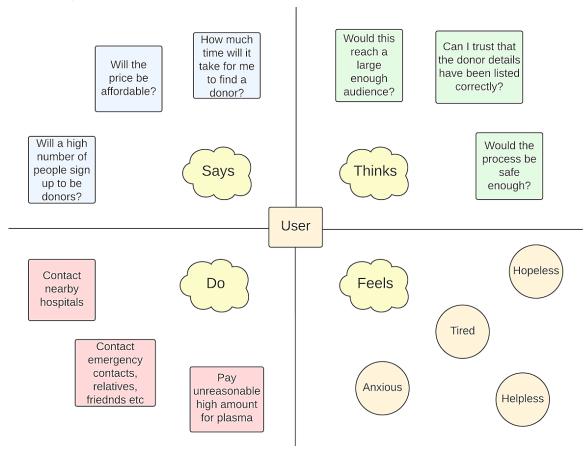


Fig 3.1: Empathy Map

An empathy map is a collaborative visualization used to articulate what we know about a particular type of user. It externalizes knowledge about users in order to 1) create a shared understanding of user needs, and 2) aid in decision making. Fig 3.1 depicts the empathy map of the proposed work.

3.2 Ideation and Brainstorming

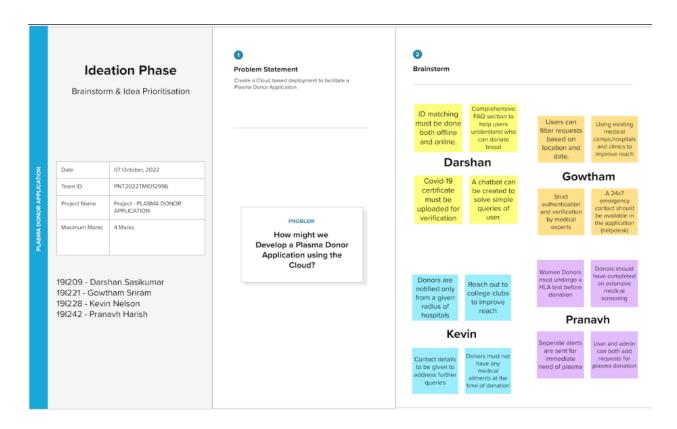


Fig 3.2: Ideation and Brainstorming Phase

Ideation is a creative process where designers generate ideas in sessions. The participants gather with open minds to produce as many ideas as they can to address a problem statement in a facilitated, judgment-free environment. Fig 3.2 depicts the ideation and brainstorm of the proposed work.

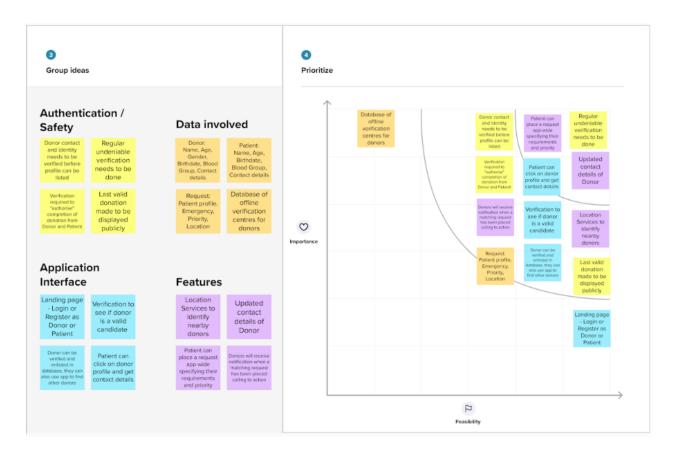


Fig 3.3: Group Ideas and Prioritisation

The ideas gathered in ideation phase are then gathered, and given a priority ranking, so as to select the high priority ideas during the implementation phase. Fig 3.3 depicts the group ideas and prioritisation of ideas.

3.3 Proposed Solution:

Our unified platform is aimed at all donors and requesters so they can communicate easily. Donors can be registered, verified and listed on the platform database. Patients or people in urgent need of plasma can use their location and other attributes to find a compatible plasma donor match right in time. Although this benefits the donors by offering them a universal location to list themselves, it poses a more significant impact to the patients who can find the resources they need in a way smaller timeframe. Patients and requesters don't have to be mentally pressured and frustrated about being able to find a compatible donor before it is too late.

Requirements Analysis

4.1 Functional Requirements

Following are the functional requirements of the proposed solution

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-
		Task)
FR-1	User Registration	Registration through Mobile Number
		Registration through Gmail
FR-2	User Registration	Confirmation via Email Confirmation
		via OTP
FR-3	User Validation	Donor - Check health conditions
		Patient – Check credibility of user
FR-4	Chatbot	Help the user understand the
		process and navigate the website
FR-5	Search	Patient enters details to search for
		compatible donors
FR-6	Request	Patient can send a donor request to
		obtain their plasma
FR-7	Email notification	Donor will get notified through email
		when a compatible patient places
		request
FR-8	Donation completion	Patient and Donor to confirm
		completion of donation

Table 4.1.1 Functional requirements

4.2 Non Functional Requirements

Following are the non-functional requirements of the proposed solution.

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	The user experience must be simple
		and the user must be able to
		perform all actions available on the
		platform
NFR-2	Security	The database layer and the logic
		layer are hosted using IBM services,
		hence the security of all data
		involved in the process is kept
		secure
NFR-3	Reliability	All processes involved in the
		platform must be uniform whenever
		accessed. It must also function
		without any bugs and errors
NFR-4	Performance	Immediate feedback from the
		platform is provided to user, so they
		are not discouraged to use the
		application
NFR-5	Availability	The application must be usable at
		all time, the database and servers
		need to be available and reachable
		anytime from anywhere
NFR-6	Scalability	The platform must adapt so that it
		can support a high volume of
		concurrent users. Meanwhile, the
		platform must also be loosely
		couples to ensure it can scale
		vertically too, by adding more
		functionality

Table 4.2.1 Non-functional requirements

Project Design

5.1 Data Flow Diagrams:

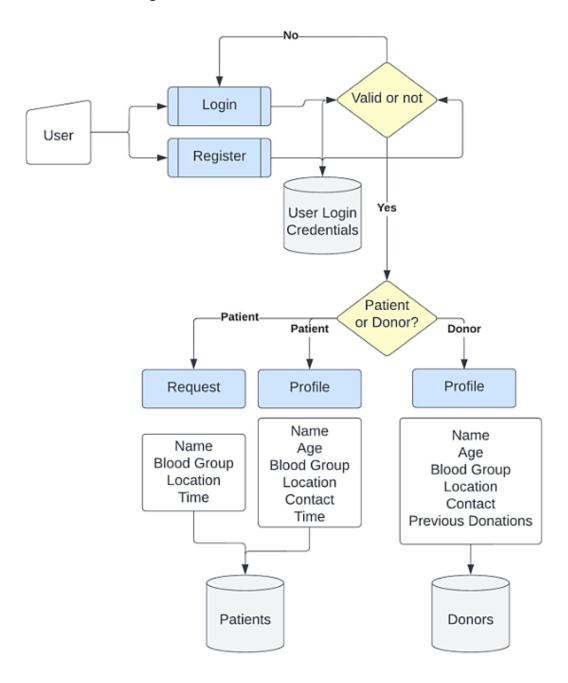
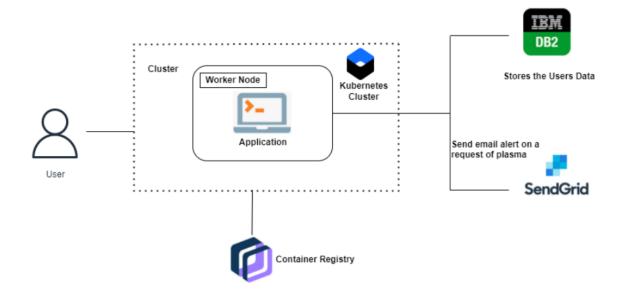


Fig: 5.1 Data Flow Diagram of Our Proposed System

5.2 Solution and Technical Architecture

The Deliverable shall include the architectural diagram as below and the information as per the Table 1 and Table 2:



S.No	Component	Description	Technology
1.	User Interface	User is presented	HTML, CSS,
		with a website to	JavaScript
		interact with the	
		platform, register,	
		login, and place	
		requests for plasma	
2.	Application Logic-1	Login, Register as a	IBM DB2
		patient or donor to	
		the application	
3.	Application Logic-2	Search for donors	IBM DB2
		by entering details	
		of plasma required	
4.	Application Logic-3	Chatbot to help	IBM Watson
		educate the users	Assistant
		and navigate	
		through the	
		platform	

5.	Database	Used for data	MySQL
		appending and	
		retrieval from	
		backend server by	
		users	
6.	Cloud Database	Database Service	IBM DB2
		on Cloud to store	
		details about	
		patients, donors,	
		and history of	
		requests and	
		donations made	
7.	External API-1	SMTP mail is used	SMTP
		to notify the donors	
		if users have made	
		requests for their	
		specific plasma or	
		compatible plasma	
8.	Infrastructure	Deployed on	Docker, Kubernetes,
	(Server / Cloud)	container registry	IBM Container
		after containerizing	Registry
		image	

Table 5.2.1 Components & Technologies

S.No	Component	Description	Technology
1.	Open-Source	Flask framework of	Flask, Kubernetes
	Frameworks	python is used to	
		build the web	
		application.	
		Kubernetes is used	
		to containerize the	
		application, deploy	
		and maintain it	
2.	Security	List all the security	Transport layer
	Implementations	/ access controls	security, IBM Object
		implemented, use	Storage
		of firewalls etc.	
3.	Scalable	A 3-tier architecture	Docker
	Architecture	is used, with	
		different layers for	
		the database, logic	
		and presentation	
4.	Availability	Justify the	Kubernetes
		availability of	
		application (e.g.	
		use of load	
		balancers,	
		distributed servers	
		etc.)	
5.	Performance	Design	Docker
		consideration for	
		the performance of	
		the application	
		(number of	
		requests per sec,	
		use of Cache, use	
		of CDN's) etc.	

Table 5.2.1: Application Characteristics

5.3 User Stories

User type	Functional Requireme nt	User Story Number	User Story/ Task	Story Points	Priority	Team Members
Patient, Donor		USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	5	High	Gowtham Pranavh
Patient, Donor	Registration	USN-2	As a user, I will receive a confirmation email which will successfully complete my registration procedure on the application	5	High	Kevin Darshan
Patient, Donor	Login	USN-3	As a user, I should be able to login with my existing credentials and my profile should be retained	5	High	Gowtham Darshan
Patient	Request creation	USN-4	As a patient, I can create requests for plasma donation for donors to see and respond to	10	High	Gowtham Darshan Kevin Pranavh
Donor	Donor creation	USN-5	As a donor, I should be able to enter my details and other health related information to show interest in donating plasma	5	High	Kevin Gowtham
Administrator	Request verification	USN-6	As a admin, I must verify the validity of each requests to ensure resources are not wasted, by contacting patient or hospital	5	High	Darshan Pranavh
Donor	Donor acceptance	USN-7	As a donor, I can accept requests that match my details and contact the patient or hospital to initiate donation	10	High	Gowtham Darshan Kevin Pranavh
Patient, Donor	Contact details sharing	USN-8	As a user, the donor contact will be shared to patient, and patient contact to donor for further communication	10	High	Gowtham Darshan Kevin Pranavh
Patient, Donor	Chatbot	USN-9	As a user of the application, I can avail guidance on how to use the app and the functionalities from the chatbot	4	Medi um	Gowtham Kevin
Patient	Contact us	USN-10	As a user, I should have the option to provide feedback and contact the support team to convey the issues experienced while using the app	4	Medi um	Darshan Pranavh

Table 5.3.1 User stories

Project Planning and Scheduling

6.1 Sprint Planning & Estimation

<u>Milestone</u>	<u>Description</u>	<u>Date</u>
Literature Survey	Literature survey is important to the project because it helps in understanding the progress of the concept we are working on. It also identifies the best works of some of the experts that went in this field, and what their shortcomings were. This helps us fine tune our product further.	17 Sep 2022
Empathy Map	Empathy map is a visual representation of how the target audience, users, would perceive, understand and interact with our product.	17 Sep 2022
Brainstorming	This can be utilised to introduce new topics and ideas and see how feasible or ground breaking they are.	17 Sep 2022
Proposed Solution	The solution is made with all the requirements and the needs of the audience in mind.	19 Sep 2022
Problem-Solution Fit	We go through the solution again to verify if our product actually aligns with the customers mindset and needs. We can identify how well a certain aspect would work as a part of the product.	19 Sep 2022
Solution Architecture	The solution involves all the processes involved, similar to a flowchart, it shows in relation with other tasks how to whole application works	19 Sep 2022
Customer Journey	This document takes us through the process of discovering, entering, using and leaving the product from the perspective of a customer. It helps us see the end user experience clearly.	03 Oct 2022
Functional Requirement	These requirements describe how the methods of the application and the user experience intersect.	03 Oct 2022

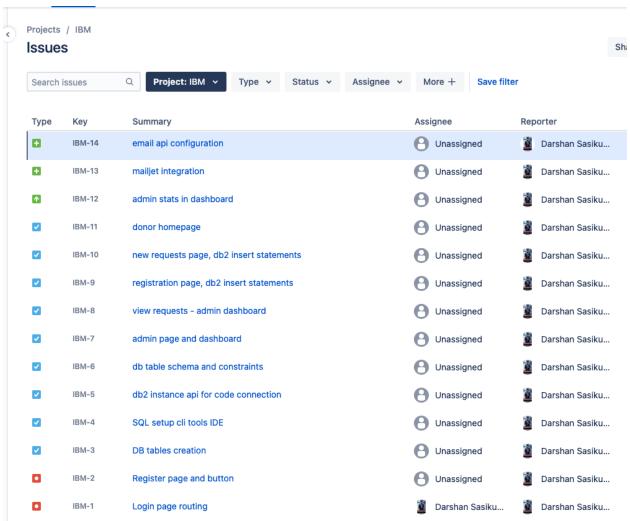
Data Flow Diagrams	The diagrams are pictorial visualisations of the transfer, storage and retrieval of data involved in the application flow	03 Oct 2022
Technology Architecture	The development of the architecture involves deciding the tools and technologies that the team has chosen to use for designing the product.	03 Oct 2022
Sprint Delivery Plan	The delivery plan helps efficiently plan and set targets to work towards. Tasks can be split into separate sprints and user stories can be given priorities to increase productivity	19 Oct 2022

6.2 Sprint Delivery Schedule

	Functional	User		C4		Team
Sprint	Requireme	Story	User Story/ Task	Story Points	Priority	Members
	nt	Number		Politis		Members
Sprint 1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	5	High	Gowtham Pranavh
		USN-2	As a user, I will receive a confirmation email which will successfully complete my registration procedure on the application	5	High	Kevin Darshan
	Login	USN-3	As a user, I should be able to login with my existing credentials and my profile should be retained	5	High	Gowtham Darshan
Sprint 2	Request creation	USN-4	As a patient, I can create requests for plasma donation for donors to see and respond to	10	High	Gowtham Darshan Kevin Pranavh
	Donor creation	USN-5	As a donor, I should be able to enter my details and other health related information to show interest in donating plasma	5	High	Kevin Gowtham
	Request verification	USN-6	As a admin, I must verify the validity of each requests to ensure resources are not wasted, by contacting patient or hospital	5	High	Darshan Pranavh
Sprint 3	Donor acceptance	USN-7	As a donor, I can accept requests that match my details and contact the patient or hospital to initiate donation	10	High	Gowtham Darshan Kevin Pranavh
	Contact	USN-8	As a user, the donor contact will	10	High	Gowtham

	details sharing		be shared to patient, and patient contact to donor for further communication			Darshan Kevin Pranavh
Sprint 4	Chatbot	USN-9	As a user of the application, I can avail guidance on how to use the app and the functionalities from the chatbot	4	Medi um	Gowtham Kevin
	Contact us	USN-10	As a user, I should have the option to provide feedback and contact the support team to convey the issues experienced while using the app	4	Medi um	Darshan Pranavh

6.3 Reports from JIRA



Bug tracking template of Jira Atlassian was used to keep track of new features, completion of the tasks, improvements, features, bugs and assign them to team mambers appropriately.

Coding and Solutioning

The application is based on the Flask framework of python used to develop web applications. The design of the pages are done using HTML, and CSS for styling them.

We used an IBM DB2 service to host the database to store all the information related to the application.

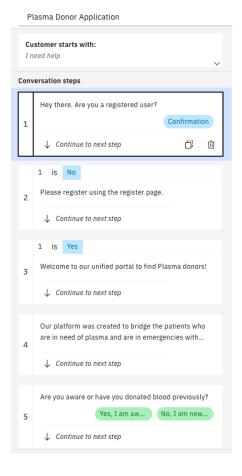
Container registery service was used to store and publish the containerized application, and Kubernetes to host this application on the cloud.

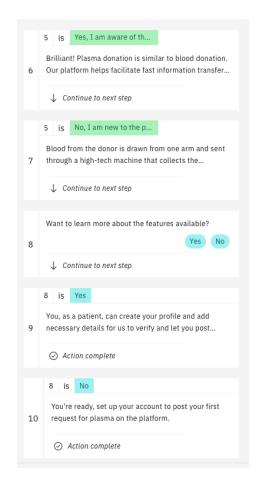
The mailing service which we are using is called the SMTP mailing package, it is used to share communication to users of the application, including donors and recipients.

- admindashboard.html
- adminlogin.html
- bgprequests.html
- dashboard.html
- o index.html
- login.html
- o newdonor.html
- o newrequest.html
- o register.html
- userprofile.html
- userrequests.html
- viewalldonors.html
- viewallregs.html
 - Admin dashboard view number of donors, patients and requests live
 - Admin login Admin access to the application
 - BGPrequests Requests made by patients
 - Dashboard User can register as donor, request plasma, view past requests, view admin requests

- Index landing page
- Login main login page, admin can click on admin login and enter credentials
- New Donor Form details for donor registration
- New Request Form details for requesting plasma from patient side
- Register creating a new account
- User Profile shows details of the user account entered in forms
- User requests see past requests placed by patient account
- View all donors admin can see all donors registered on platform
- View all requests admin can view all requests placed for plasma

The landing page (index.html) also houses our own chatbot created to assist users by simulating a conversation with a virtual support assistant.





Database Schema

Donor

```
create table donor(
username varchar(20),
ame varchar(20),
age integer,
gender varchar(1),
phone varchar(10),
addr varchar(40),
city varchar(20),
state varchar(20),
blood varchar(5),
don date
)
```

Users

```
1 create table users (
2 username varchar(20),
3 email varchar(50),
4 password varchar(20)
5
```

Requests

```
create table requests(
username varchar(20),
pname varchar(20),
phone varchar(10),
paddress varchar (40),
city varchar(20),
state varchar(20),
blood varchar(5)
)
```

Approved requests

```
create table approved(
pname varchar(20),
phone varchar(10),
state varchar(20),
blood varchar(5)
)
```

Admins

```
create table admins(
username varchar(20),
password varchar(20)
)
```

Testing

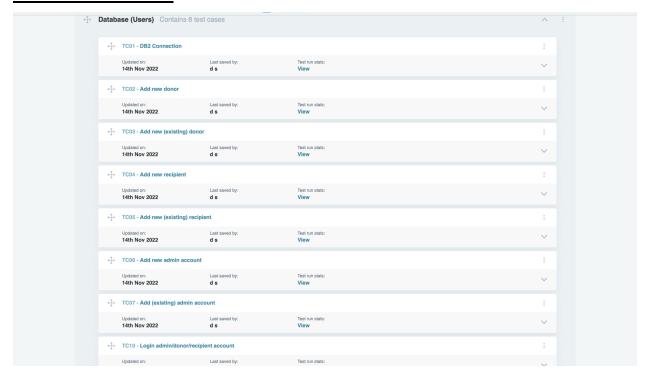
Testing was managed on a platform called Testlodge. This website helps us create test suites and individual test cases for accounting purposes. We can describe individual test cases, their pass and fail criteria. These test cases can be then assigned to individual team mebers for them to carry out the test and report the result on the platform.

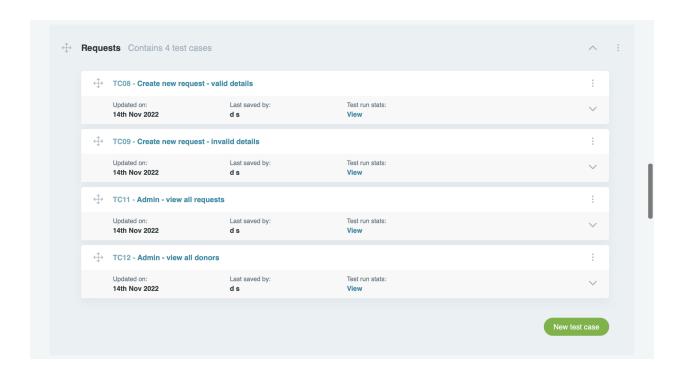
We performed unit testing, integration testing and acceptance testing on our final application.

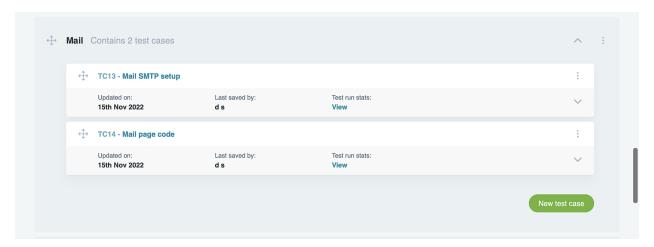
Unit testing was done by creating testcases for individual modules to work in separation from the rest of the application. Each of the html pages, their scripting and their input and output was tested.

Integration testing was performed to check if a complete logical process can be done without any errors in the workflow. As some of our functions and features work together, they need to be assessed if the testcases pass.

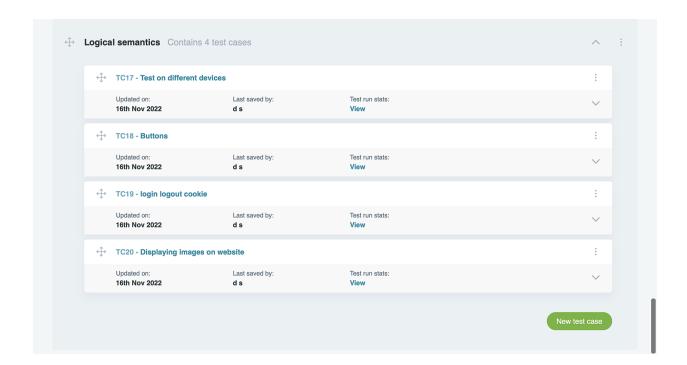
8.1 Test cases:











8.2 Acceptance Testing:

Acceptance testing is testing the overall service flow and checking if each logical function works with all ranges of input from the perspective of an end user. This is similar to blackbox testing, as the user doesn't know the internal functioning of the application. They only provide their input and we need to validate if the necessary output has been acquired as a result.

Load testing was performed on the hosted application using Jmeter. Jmeter is an application used for testing web applications and websites performance metrics. HTML GET requests are simulated with thread groups on Jmeter to test throughput, deviation, load etc.

Chapter 9 Results

9.1 Software Test metrics

- 1. Test design efficiency = Number of tests designed /Total time
 - 25 Tests designed / 10 Hours = 2.5 Tests designed per hour
- 2. Passed Test Cases Percentage = (Number of Passed Tests/Total number of tests executed) X 100
 - 25 passed Test cases / 25 Test cases x 100 = **100**%
- 3. Failed Test Cases Percentage = (Number of Failed Tests/Total number of tests executed) X 100
 - 0 failed Test cases / 25 Test cases x 100 = 0%
- Schedule slippage = (Actual end date Estimated end date) / (Planned End Date Planned Start Date) X 100
 - (19/11/2022 17/11/2022) / (17/11/2022 10/09/2022) x 100 = 3 days / 70 days x 100 = **4.28**%

9.2 Performance metrics

Our project uses the IBM Lite plan for all the cloud services like DB2, Watson Assistant, Container Registry, Kuberenetes which provides minimal access and performance for free of cost.

There are performance constraints for the deployed application. All requests by the user must be processed and rendered on screen before 5 seconds of initiation. If this is not possible due to errors from any side, a buffering screen must be displayed.

Database needs to be online at all times to facilitate information transfer whenever a user logs on and accesses the platform.

Advantages & Disadvantages

The vision of this project is to provide a unified platform where all the requests and information can be shared for higher visibility and faster correspondence. By using an application to serve both donors and patients who are in need of plasma, we are bridging the gap in between them. Donors can register themselves so they may be contacted when a certain request is placed. Patients can also place a request on the platform so their needs can be fulfilled as soon as possible.

Disadvantages of this platform include a transparency about sensitive information provided by both patients and donors. Administrators who are responsible for managing requests would be able to see information regarding the users health. Verification also needs to be implemented to make sure that the credibility of both patients and donors are upheld, to increase the reliability of the platform for public usage.

Conclusion

In conclusion, we have created an application and provided an interface with which donors can contact hospitals and hospitals can in turn find donors to meet the plasma requirements. This will allow hospitals to meet the demands of plasma for the patients undergoing treatment. Plasma from Covid recovered patients can be used to treat covid patients. This allows an easy way for donors to interact with hospitals and to donate plasma when needed.

In existing solutions, requests are accepted from patients and are batch processed. They are not tended to in real time. Existing solutions also feature only work with accounted plasma that is already present in a blood bank, but our solution is available to the public to share real time information and obtain plasma as quickly as they need it.

Donors who need to donate plasma can donate by uploading their details and blood bank can view donors and can raise requests to donors and the hospital can register/login and can search for plasma, they can raise requests to blood bank and can get the plasma.

People need not have feelings of anxiety and fear that they might not receive the help they seek. Using our platform they can gather information about the donors available near them and compatible so the donation can be done.

Such an application will be beneficial to the public who currently don't have a common and dedicated platform to share such emergencies and contact details.

Future Scope

There is scope for more features to be integrated in our application for a better user experience and more efficient process.

A messenger service can be included on the platform for the donors and patients to enable direct communication without the need for a medium.

Verification using any photo ID can be done as to automate the process by integrating government service to increase the credibility and reliability of the application.

A ticketing system can be used to collect, track and manage user queries and problems they face during the usage of the application.

Although the app is already cross platform supported due to it being a website, a mobile application can be designed and published for users to have instant access to our application on their smartphones.

Chapter 13 Appendix

Github link: https://github.com/IBM-EPBL/IBM-Project-16927-1659624974

Demo link: https://www.youtube.com/embed/3qSXd0qArak