Project Report

Team ID	**PNT2022TMID19660**
Project Name	**CONTAINMENT ZONE ALERTING APPLICATION**

1. INTRODUCTION

1.1 Project Overview:

Currently, there are several research works undergoing in the country to prevent Covid-19 cases from rising. Previously our country was importing medical kits like PPE (Personal Protection Kits),and mask from outside, but now it has been successful in developing these kits. Along with taking initiatives to fight this disease, our country has also taken steps to make people aware of the disease. The news and media have a great part in creating this awareness by informing the public about the preventive measures that can keep them away from infection. Awareness among the people to carry out all the preventive measures can immensely help to reduce spread of the virus. The country has created containment zones throughout the cities wherever Covid-19 cases have been reported to prevent further spread of the virus. These containment zones have been kept isolated from the outside public to ensure no contamination occurs outside. After more than 2 months of the lockdown, the government has relaxed some of the lockdown rules and has permitted reopening of government offices, bus and other road transportation facilities and shopping markets. People can move inside the city for work and other purposes. But the containment zones are still being kept isolated, and new containment zones are being formed wherever Covid-19 cases have been reported. These zones are highly contagious as droplets with virus coughed out from an unscreened asymptomatic patient can travel up to 8 m (Bahl et al. 2020). Though these containment zones are guarded by policemen, still there remains a chance that people might unknowingly step into them. In this situation where people can move in the city, these containment zones pose a risk of infection to these city dwellers. Therefore, informing people about the location of the containment zones can help them bypass and avoid these zones and thereby reduce the chance of community transmission. In this paper, we focus on developing a mobile based application to provide information regarding the Covid-19 containment zones in West Bengal. The application further tracks the user's location and provides notification alert if the user has entered a containment zone. The application also provides daily Covid-19 case statistics to the users to keep them updated. The application is developed on Android SDK and uses Firebase Cloud Firestore to store the location data. Android's geofencing client is used to create geofences around the containment zones and notification manager is used to provide notifications. The application also uses RESTful web services to show the

Covid-19 cases in West Bengal. We have tested our application with different users in different locations across West Bengal and it works efficiently and is able to attain our target.

Purpose:

The Android application shows the location of the containment zones to the users. It also notifies the user when he or she trespasses the boundary of a containment zone or stays in the containment zones

2. LITERATURE SURVEY:

2.1 Existing problem:

People doesn't have proper knowledge about containment zones since they do change daily and hard to keep updated and if they are not updated properly, they will lead to wide spread of disease.

2.2 References:

PAPER 1:

TITLE: Tracking the Covid zones through geo-fencing technique

AUTHOR NAME: Anto Arockia Rosaline R ,Lalitha R ,Hariharan G ,Lokesh

PUBLICATION

YEAR:2017

DESCRIPTION:

Following the tracking of a suspicious person, the geo-fenced layer is mapped out in the vicinity, and the virtual perimeter is then employed for the subsequent trapping procedure. As soon as the Covid monitoring team updates this geo-fenced layer, the public can view it. The idea of creating a virtual perimeter region is known as geo-fencing. Effective containment zone monitoring is made possible by this virtual perimeter monitoring technology. By utilising an automated system based on wireless infrastructure, it lowers operational costs. Additionally, it promptly alerts the law enforcement to find the offenders. As a result, it facilitates the inspection of containment areas and the monitoring of those who disobey governmental regulations. Users can receive updates from the Covid team on the alert zone. The Covid team has a number of modules for suspect tracking, hotspot fencing, etc. The Covid team must seek a service from the service network provider in the case of suspect tracking, and following authorization, they will offer the coordinates. According to our telecommunication legislation, it is illegal to share data; nonetheless, exchanging personal information without the individual's knowledge via any means is occasionally allowed with governmental approval for investigative purposes.

PAPER 2:

AUTHOR NAME: Geofencing 2.0: Taking Location-based Notifications to the Next Level

PUBLICATION

YEAR:2016

DESCRIPTION:

Sandro Rodriguez Garzon Bersant Deva The basic Android application that ved as the prototype Geofencing client was used. This client is primarily responsible for carrying out the geofencing server's ongoing location update strategy. This must be accomplished with little energy consumption because the Geofencing client is located on a mobile device. We made the decision to employ the low energy Geofencing features of the Android operating system to keep an eye on the safety zone. As a result, a safety zone is considered as a single circular geofence with a required exit on the mobile device. However, they discovered that there was occasionally a significant lag time between leaving the safety zone and receiving a notification from the system about the leave. In order to address this issue, a specific amount of the safety zone's radius is decreased. While the safety zone and how it is implemented have a significant impact on overall energy consumption, it is also important to make the right choice when it comes to a placement mechanism. In order to reduce power consumption without compromising the necessary position precision, they used a device-based smart combination of various positioning mechanisms introduced by. By temporarily deactivating placement when a device is not in motion, the Geofencing client also makes use of cutting-edge mobile sensing capabilities integrated into the Android operating system's activity recognition unit. Mobile users who live close to a geo-border fence's will find this to be of particular utility. If the Geofencing server notifies the Geofencing client about a geo- notice, the notification will appear right away.

PAPER 3

TITLE: Development of An Android Application for Viewing Covid19 Containment Zones Alerting.

AUTHOR NAME: India Ranajoy Mallik, Amlan Protim Hazarika, Sudarshana Ghosh Dastidar, Dilip Sing & Rajib Bandyopadhyay

PUBLICATION

YEAR:2019

DESCRIPTION:

The World Health Organization has declared the outbreak of the novel coronavirus, Covid-19 as pandemic across the world. With its alarming surge of affected cases throughout the world, lockdown, and awareness (social distancing, use of masks etc.) among people are found to be the only means for restricting the community transmission. In a densely populated country like India, it is very difficult to prevent the community transmission even during lockdown without social awareness and precautionary measures taken by the people. Recently, several containment zones had been identified throughout the country and divided into red, orange and green zones, respectively. The red zones indicate the infection hotspots, orange zones denote some infection and green zones indicate an area with no infection. This paper mainly focuses on development of an Android application which can inform people of the Covid-19 containment zones and prevent trespassing into these zones. This Android application updates the locations of the areas in a Google map which are identified to be the containment zones. The application also notifies the users if they have entered a containment zone and uploads the user's IMEI number to the online database. To achieve all these functionalities, many tools, and APIs from Google like Firebase and Geofencing API are used in this application. Therefore, this application can be used as a tool for creating further social awareness about the arising need of precautionary measures to be taken by the people of India.

PAPER 4:

TITLE: Aarogya Setu

AUTHOR NAME: National Informatics Centre, Ministry of Electronics & Information Technology, Government of India

PUBLICATION YEAR: 2014

DESCRIPTION:

The most popular containment zone alert application among the options currently in use in India is called Aarogya Setu. The Indian government created a mobile application to link the public with crucial health services. Its primary features include geo-location-based COVID19 data, user risk status, automatic contact tracing using Bluetooth, and much more. The movement of an infected individual is tracked using Bluetooth and GPS technology, and the system notifies the public of the locations the infected person has visited while designating those locations as vulnerable ones. It employs cellular triangulation to determine a person's location in the absence of GPS technology. While Aarogya Setu can track down contacts and notify those who have come into touch with someone who has COVID-19, it also actively keeps track of quarantine or containment zones and alerts users who enter them. The Terms of Use and Privacy Policy must be accepted at the time of registration when installing the application on any

Android or iOS mobile device, and ongoing use of the application denotes continued acceptance. Name, age, sex, occupation, phone number, overseas travel within the previous 28–45 days, and whether the user is a smoker are all pieces of information that the app gathers. This data is kept on a server that is under the jurisdiction of the Indian government. It is hashed and sent to the user's mobile application along with a special digital ID (DID). The user is recognised using the DID. In order for the user's mobile phone to exchange information with another device that has the app when it gets within range, the Bluetooth and GPS services must be turned on. Their individual IDs, along with the time and GPS location, are kept on the two phones when two users come into close proximity. The format in which this data is kept is encrypted. Only after a person tests positive is it posted to the government controlled servers of the app.

2.1. Problem Statement Definition:

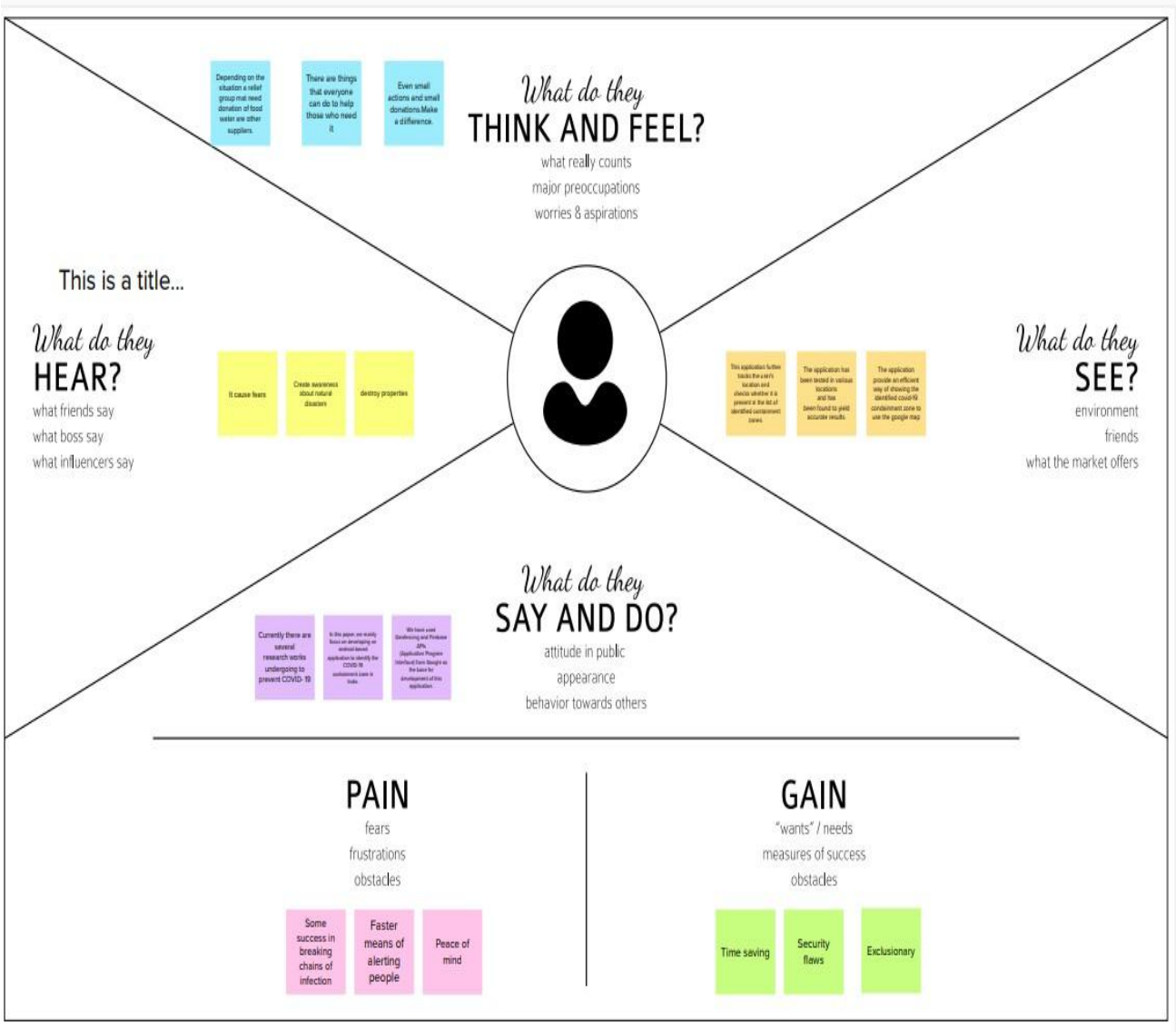
3. IDEATION & PROPOSED SOLUTION

S.NO	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	This application is intended to provide information about containment zones in a particular region by alerting people, through continuous monitoring of an individual's location. Key benefits of the application are monitoring people's activity and alerting them of their safety movements

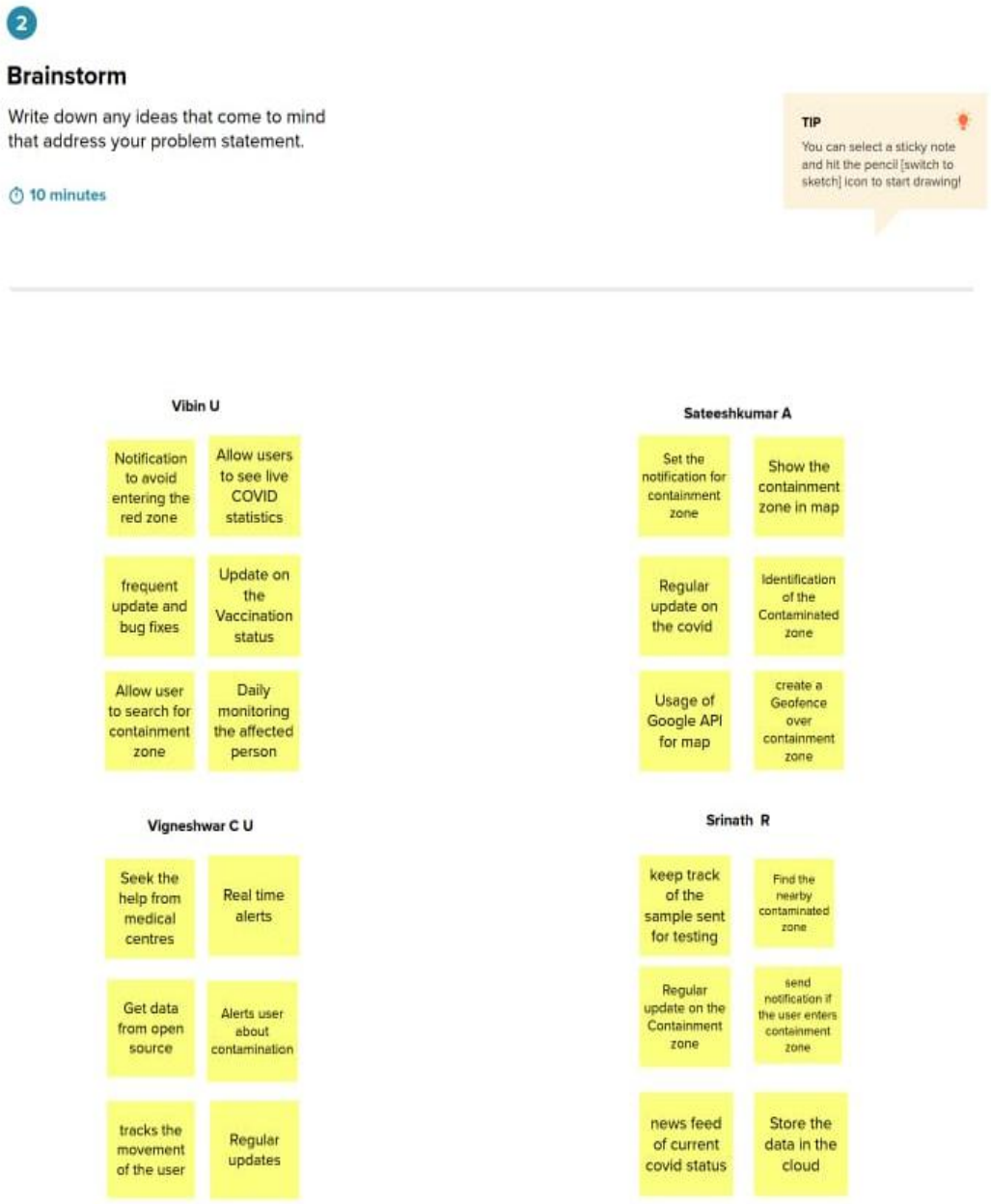
2.	Idea / Solution description	The project aims at building an application that provides information about the containment zones of a particular region by continuously monitoring an individual's location. Location of the individual must be stored in the Database. Alerts are sent using the notification service.
3.	Novelty / Uniqueness	The uniqueness of containment zone alerting app is it shows the particular area of the district before the 100m,and the user's location history is stored in database and this app provides the precautions measurements ,list of immunity boosters, location of the vaccination providing places . it also gives the list of the affected and admitted patients and detached patients ,percentage of affecting by covid19
4.	Social Impact / Customer Satisfaction	Social Stigma is discrimination against a particular group of people, a place, or a nation in the form of a negative attitude. Public health emergencies (such as COVID-19 pandemic) are stressful situations for people and communities. Fear and anxiety with a lack of knowledge about the disease can lead to social .
5.	Business Model (Revenue Model)	We are going to add personal health tracker in subscription basis .so they can manage their health efficiently.
6.	Scalability of the Solution	In this modern world even though the covid pandemic threat is about to end there are high chance of pandemic or endemic .so this application is very useful in that situation and we can use this application in seasonal diseases

3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



3.2 Ideation & Brainstorming

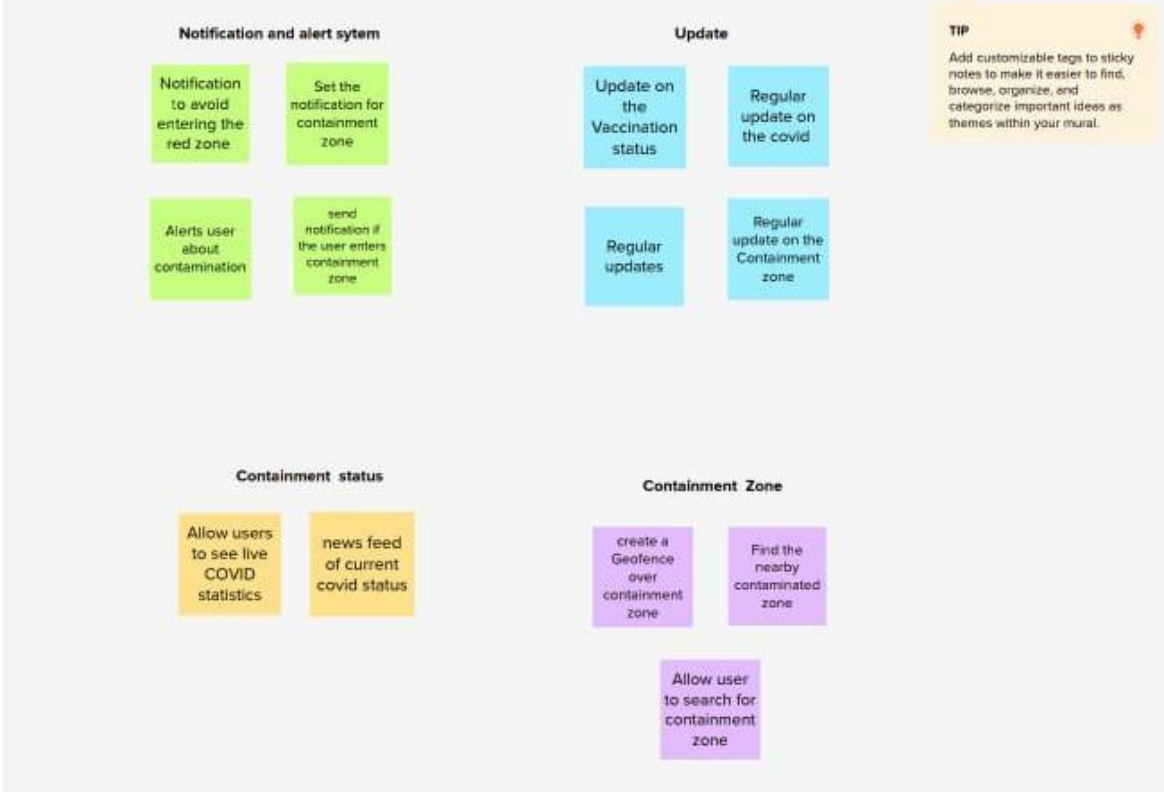


3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

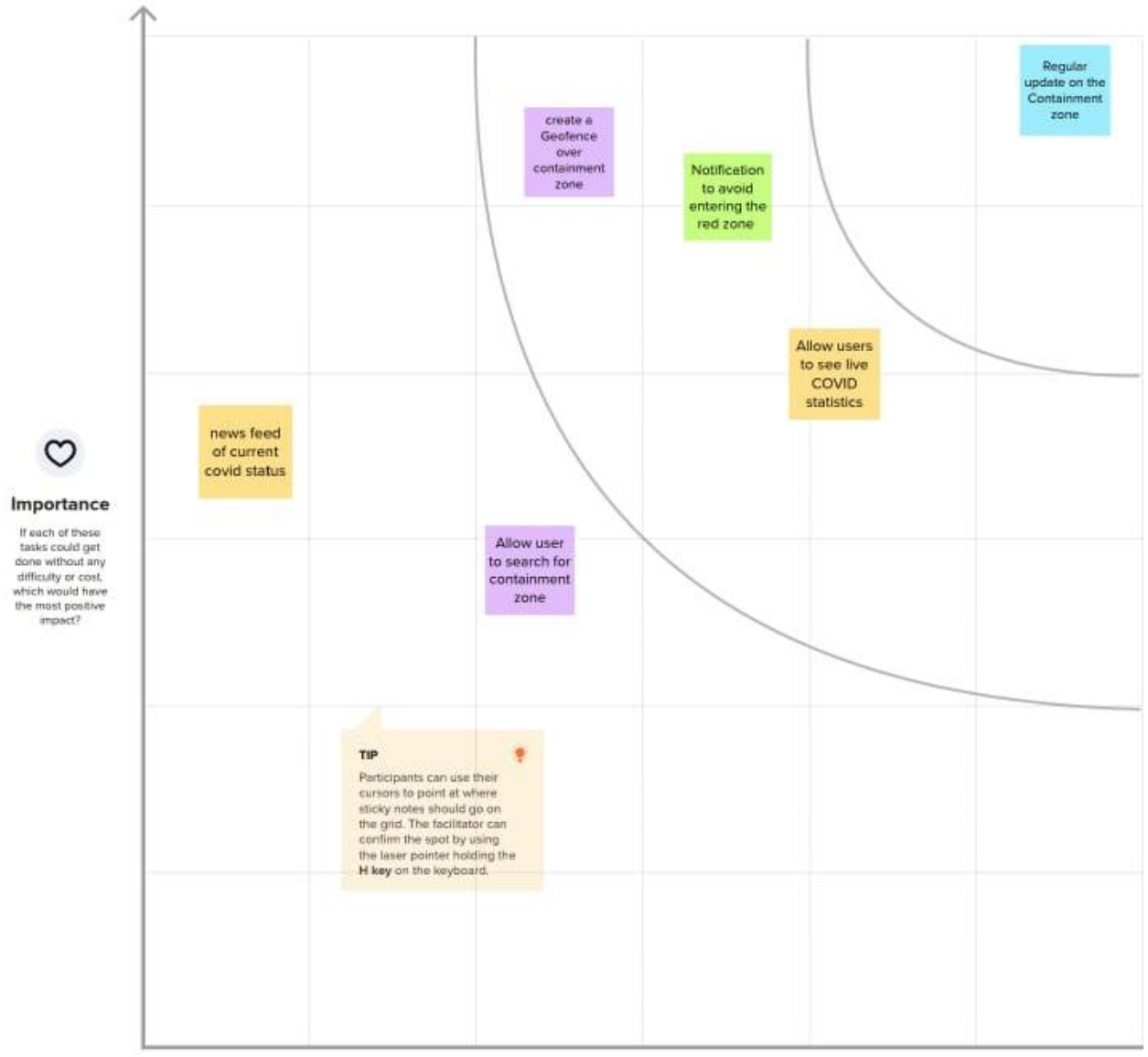


4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



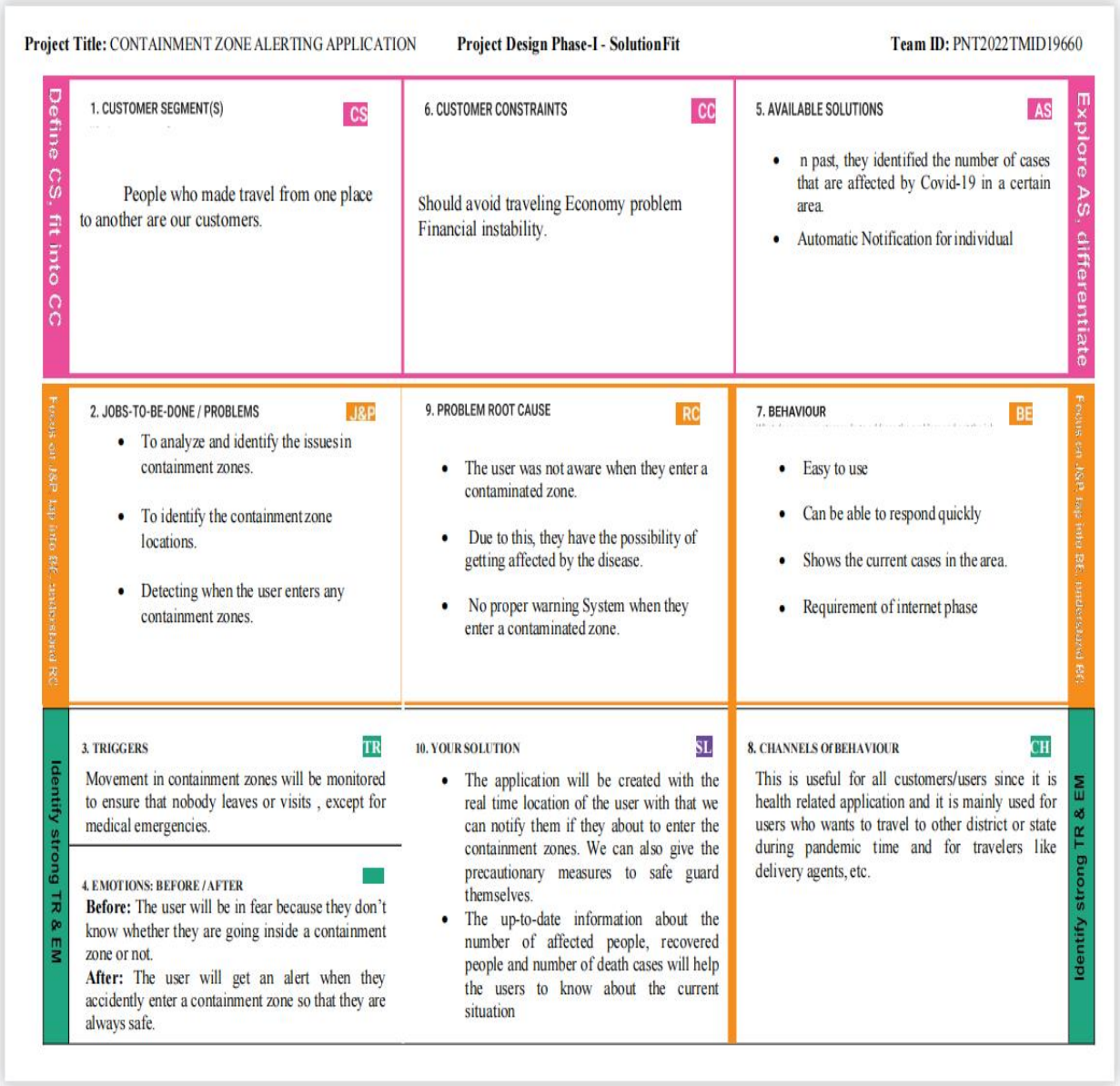
Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub- Task)
FR-1	User Registration	Registration through Gmail. Registration through mobile number.
FR-2	User Confirmation	Confirmation via Email. Confirmation via OTP.
FR-3	Authentication	It checking the confirmation of the password.
FR-4	Business rule	For subscriber's we give first 3 day's free trail. For unsubscriber's the user needs to watch some advertisement for knowing the zone alert for first 3 day's. **FR No. FR No.**

4.2 Non-Functional requirements

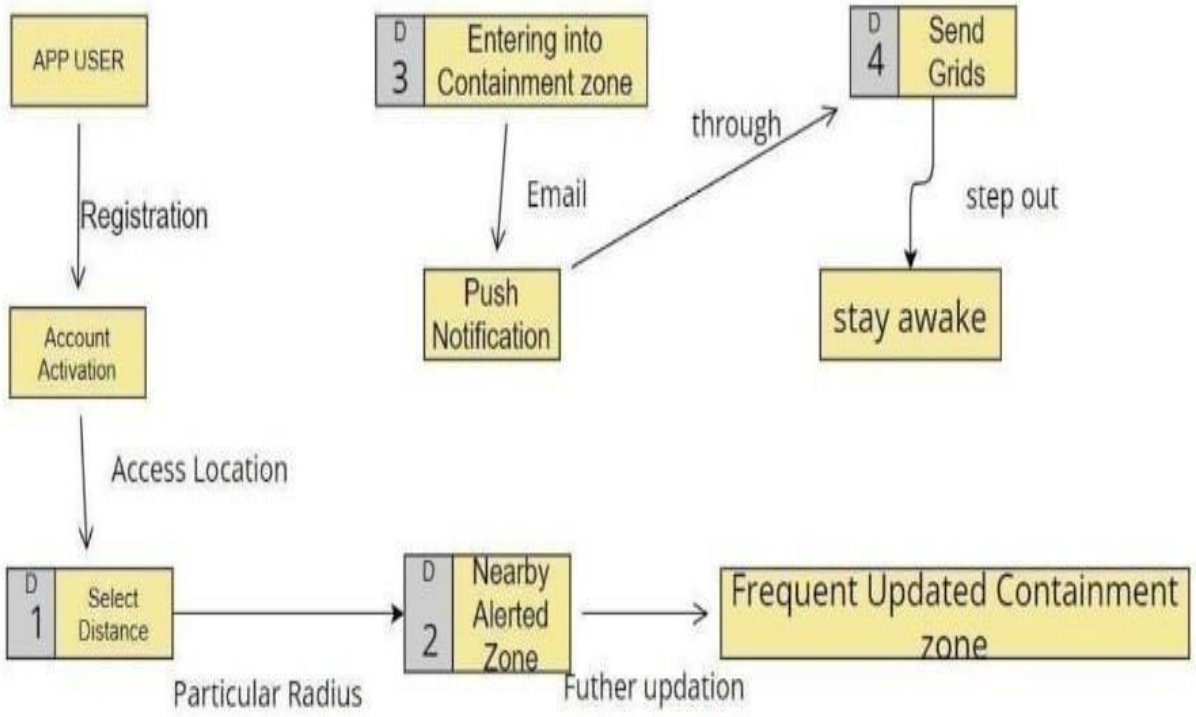
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Providing recommendation link by using customer preference .
NFR-2	**Security**	The software team will issue some strong security code for the user's.
NFR-3	**Reliability**	The database update process must rollback all related updates when any update fails.
NFR-4	**Performance**	The loading speed of the server is quick and fast.

5.PROJECT DESIGN Data Flow Diagrams

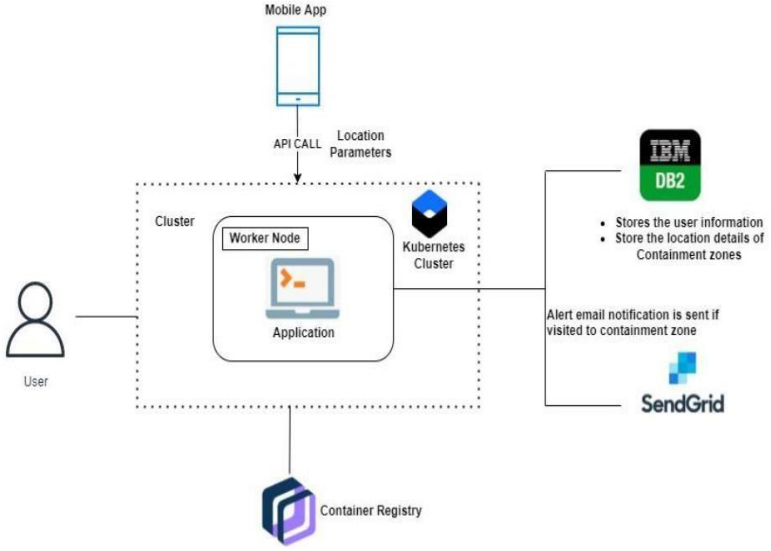
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Data flow diagram:

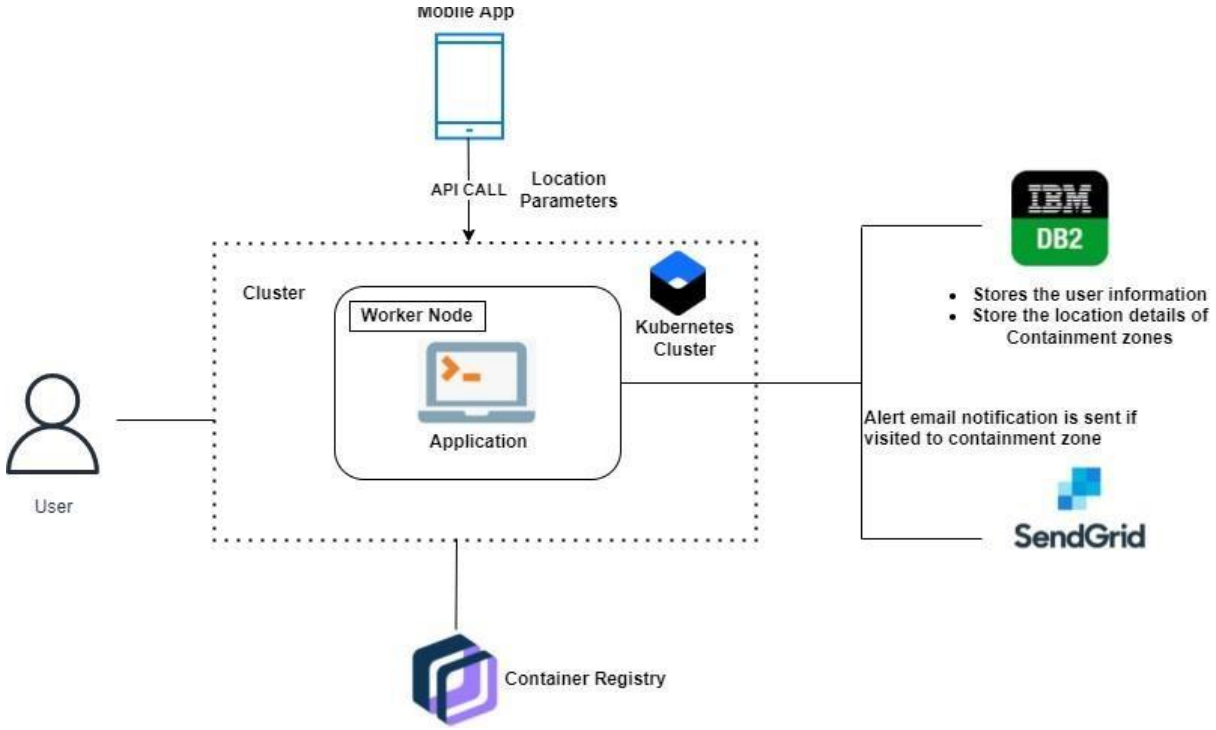


5.1 SOLUTION ARCHITECURE

Solution Architecture:



TECHNICAL ARCHITECTURE:



5.2 Table-1: Components & Technologies:

S.no	Component	Description	Technology
1.	User Interface	Mobile Application	HTML, CSS, JavaScript.
2.	Application Logic	Logic for a process in the application	Javascript
3.	Database	Data Type, Configurations etc.	Firebase, ibm cloud
4.	Cloud Database	Database Service on Cloud	IBM Cloud
5.	File Storage	File storage requirements	Local Filesystem and IBM cloud
6.	Infrastructure (Server / Cloud)	Application Deployment on Cloud Local Server Configuration	Local and Cloud Foundry

Application Characteristics:

S.no	Characteristics	Description	Technology
1.	Open-Source Frameworks	GitHub	Internet hosting service
2.	Security Implementations	Application security: Veracode.	Network automation
3.	Scalable Architecture	It provides the room for expansion more database of smart bins added additionally can be updated.	Cloud storage
4.	Availability	As the system control is connected to web server it is available 24*7 and can be accessed whenever needed.	Server, Appleixe, reple
5.	Performance	Performance is high it uses 5mb caches	Wireless Sensor Network

5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN - 6	As a User , Can I manually plot the alerted zone for my convenience only.	It can be viewed in the user dashboard	Low	Sprint - 2
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	User account activities can be viewed in dashboard.	High	Sprint - 2
			Confirmation code has been send through the registered mail id ,phone number			
	Location Access	USN - 2	As a User , I can viewed into the page , if there is any condition to access the location	Location can be turned through Control center.	High	Sprint - 2
	Contaminated Zones	USN - 3	Is it accurately show off the alerted zone If I Entered into the zone the messages are properly received through email.	Alerted messages are send by sendgrids through the registered mail id	High	Sprint - 3
Administrator	Frequent Updates	USN - 4	Admin are necessary to updates the recent containment through their portals and these seen through the app.	It can be accessed by Geo fencing.	Medium	Sprint - 4

6. PROJECT PLANNING & SCHEDULING

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers,research publications etc.	19 OCTOBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	18 OCTOBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	18 OCTOBER 2022

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	**Registration**	USN-1	**USER:** I can register for the application by entering my email, password, and confirming my password.	3	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
		USN-2	**USER:** I will receive confirmation email once I have registered for the application	2	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
	Login	USN-3	**USER:** I can register for the application through Facebook	3	High	

Sprint delivery

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	**Dashboard**	USN-4	**USER:** I can register for the application through Gmail	5	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
		USN-5	**USER:** I can log into the application by entering email & password	5	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
	Service	USN-6	**ADMIN:** I need to update the containment zones.	5	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A

Sprint	Functional Requirement (Epic)	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint-3	**Service**	USN -7	**ADMIN:** I need to differentiate the containment zone based on the intensity of infection.	3	Low	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
		USN-8	**ADMIN:** I need to provide precautionary measures When they travel.	3	Medium	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
		USN-9	**ADMIN:** I need to provide the information about the nearby hospitals.	3	Low	Vibin U Vigneshwar C U Srinath R Satheeshkumar A

Sprint	Functional Requirement (Epic)	User Story Number	User Story/Task	Story Points	Priority	Team Members
SPRINT-4	**Service**	USN -10	**ADMIN:** I need to alert the user when they enter the containment zone through email or SMS.	5	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
		USN -11	**ADMIN:** I need to provide medical recommendations by collaborating with hospitals.	3	Medium	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
	Data Collection	USN -12	**ADMIN:** I need to store user details on the cloud.	5	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A
		USN -13	**ADMIN:** I need to collect details about covid19 cases from verified sources.	5	High	Vibin U Vigneshwar C U Srinath R Satheeshkumar A

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	30 Oct 2022	20	31 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	06 Nov 2022
Sprint-3	20	6 Days	06 Nov 2022	12 Nov 2022	20	13 Nov 2022

Sprint-4	20	6 Days	13 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

We have a 6-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit
(story points per day)

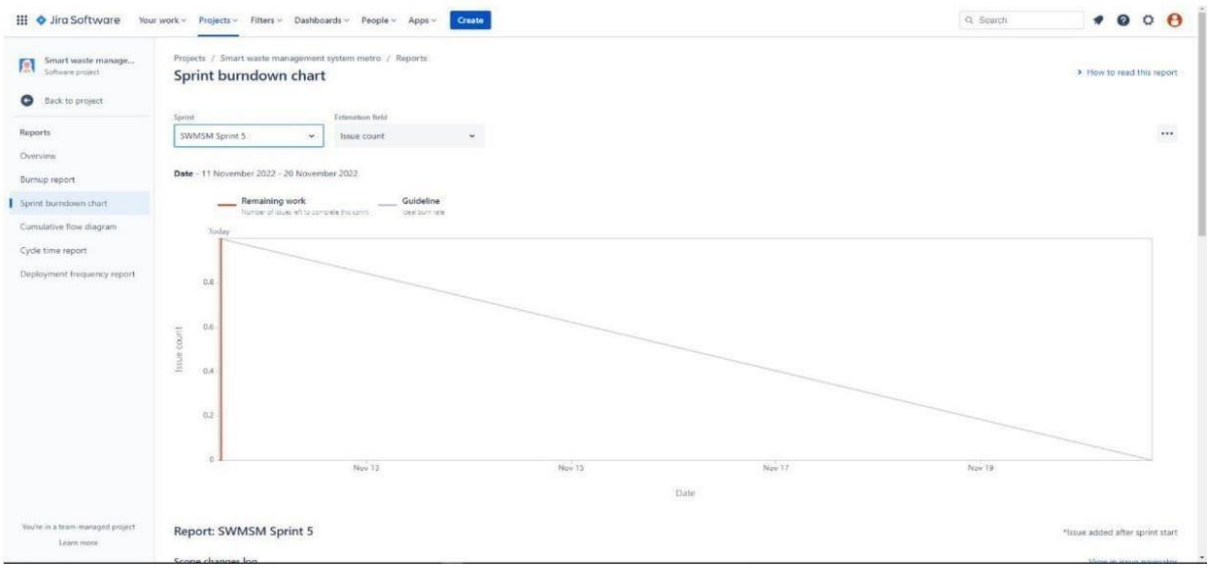
$$AV = \frac{\text{sprint duration}}{\text{Velocity}} = \frac{20}{6} = 3.33$$

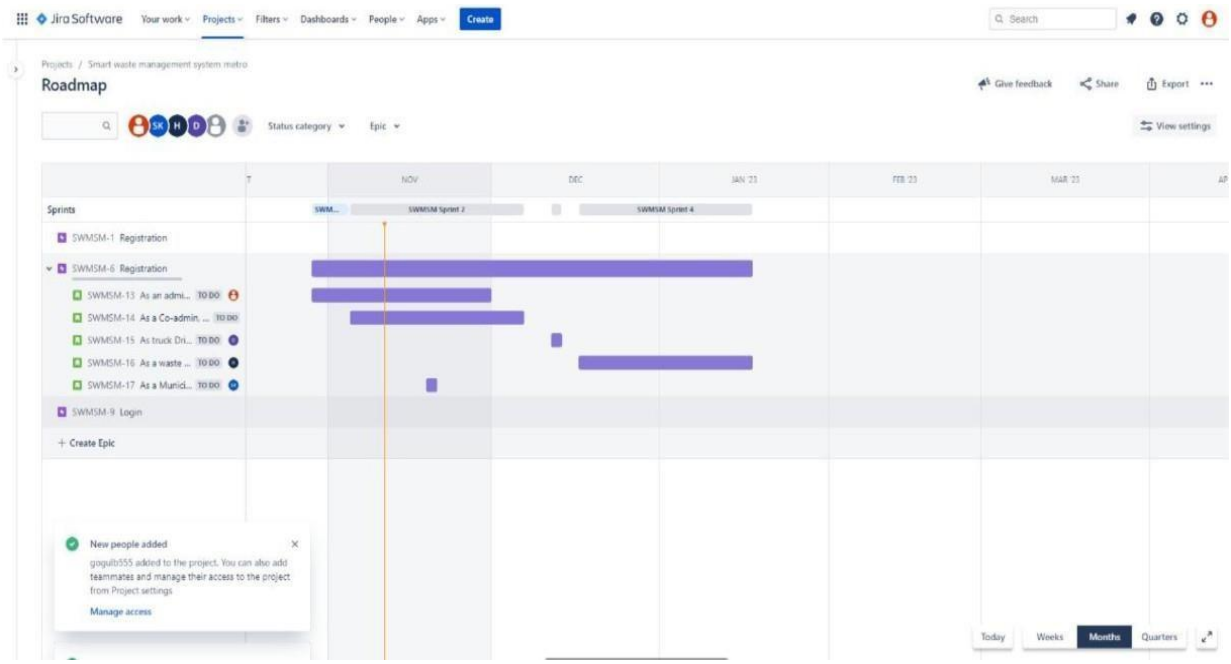
Burndown Chart:

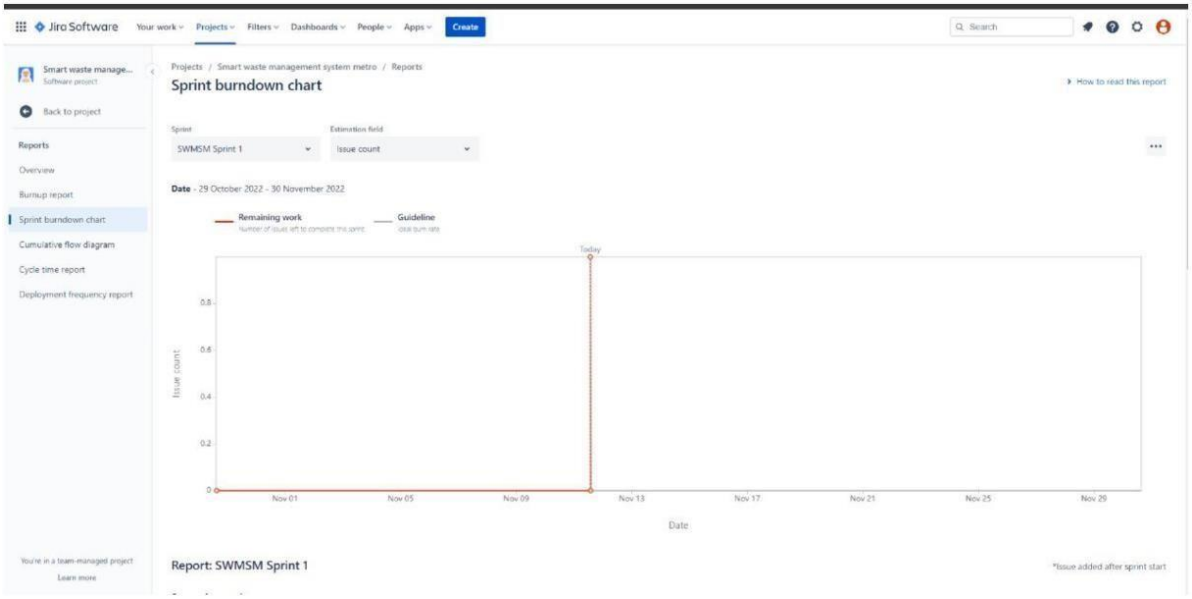
A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum.
However, burn down charts can be applied to any project containing measurable progress over time.

6.3 Reports from JIRA

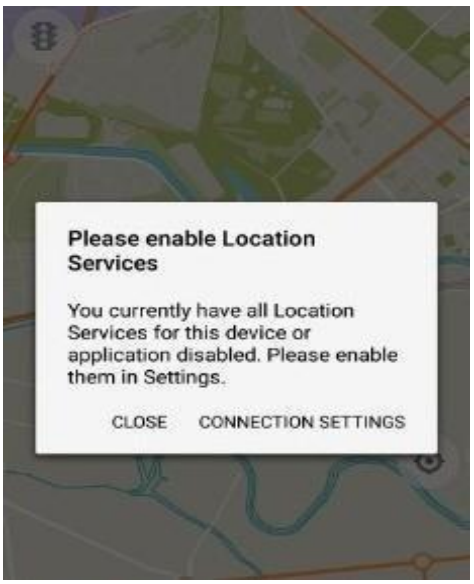
BURNDOWN CHART

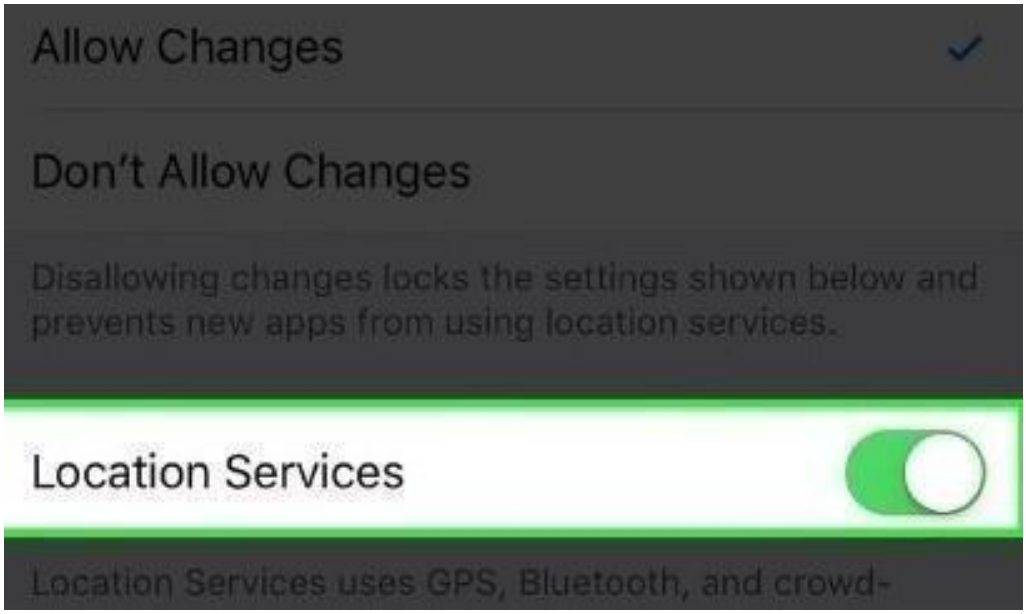




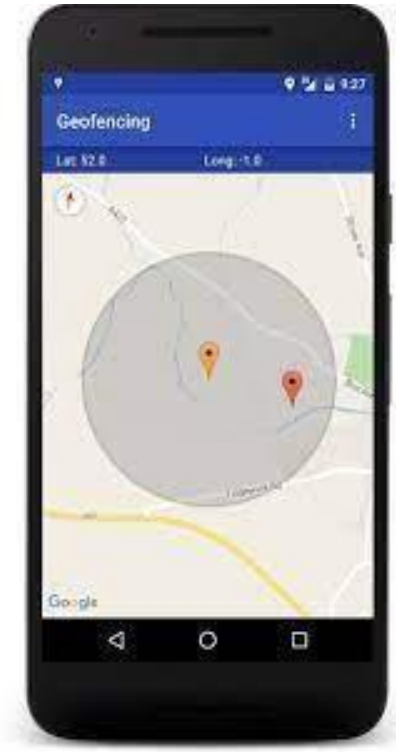


Mobile Application



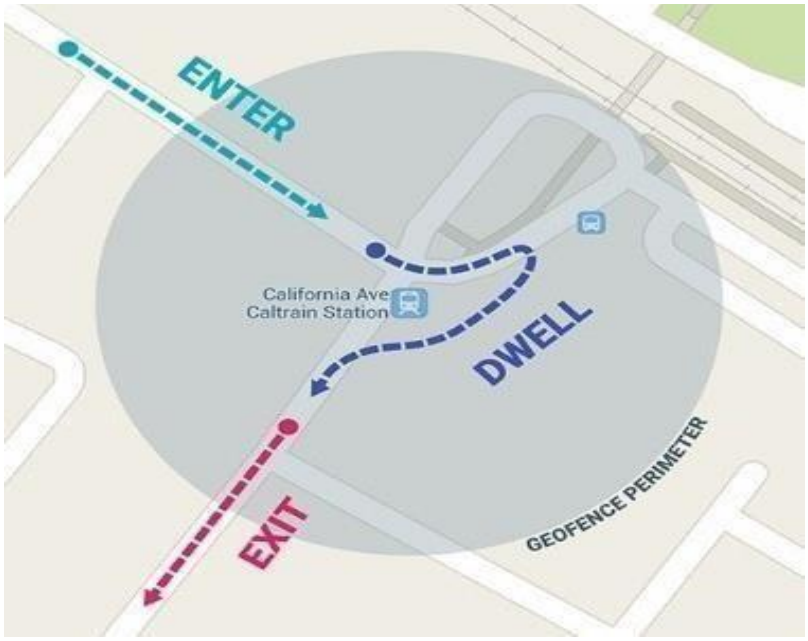


GEOFENCE IN ANDROID APP :




5554:Nexus_5_API_23
Geofencing
Lat: 52.0
Long: -1.0


Remind me there
Park
Teatro Colseo
Pizza Restaurant
Shopping Mall
Buenos Aires
Perú
Choose the radius
600 meters
CONTINUE

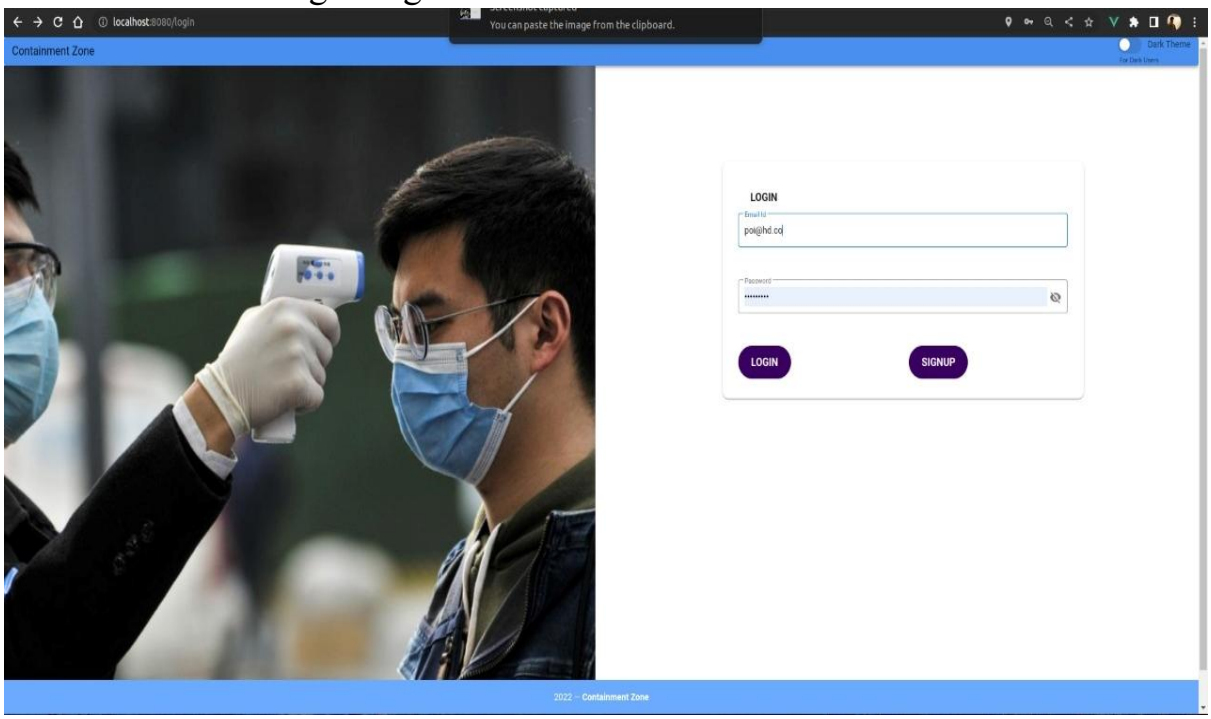


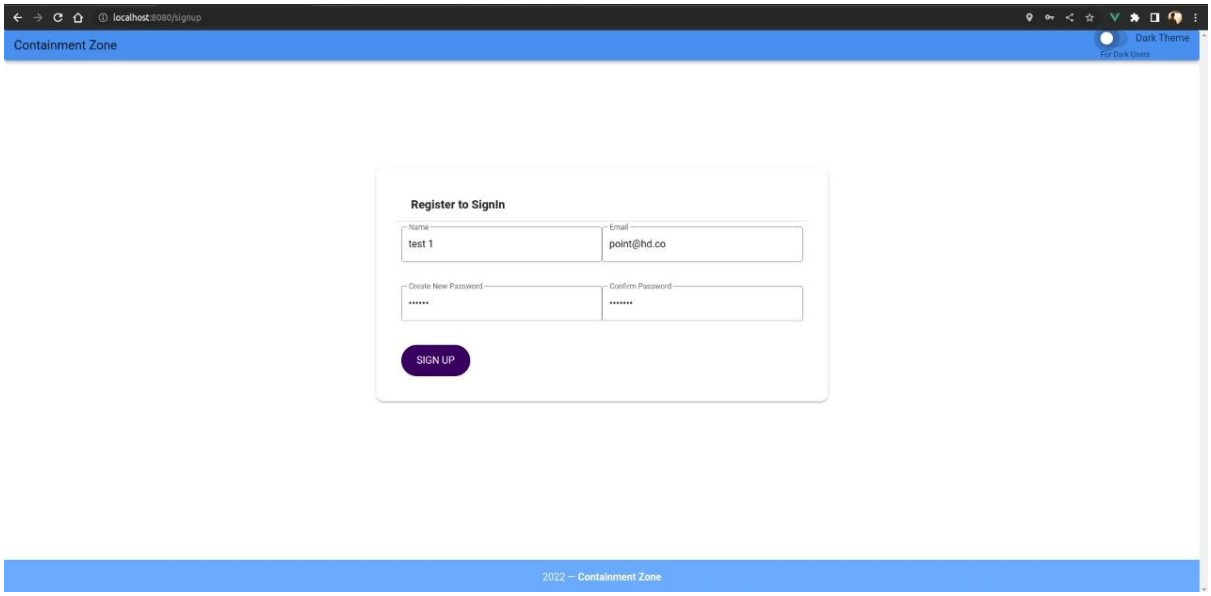
8.RESULTS:

UI Interact with Application:

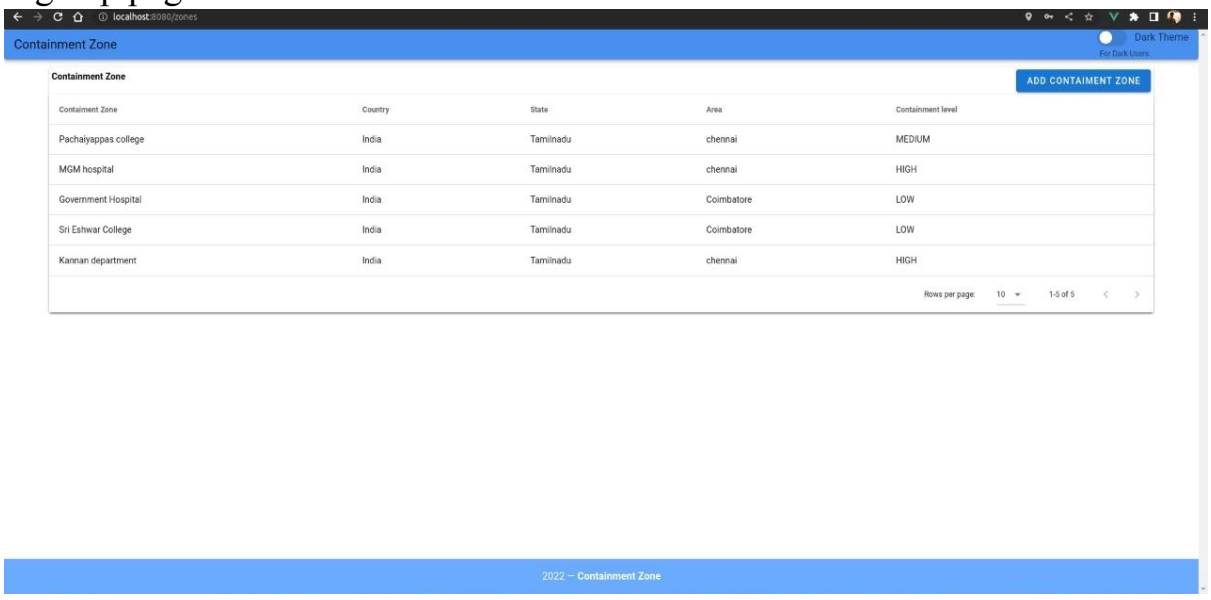
Admin App:

Login Page:

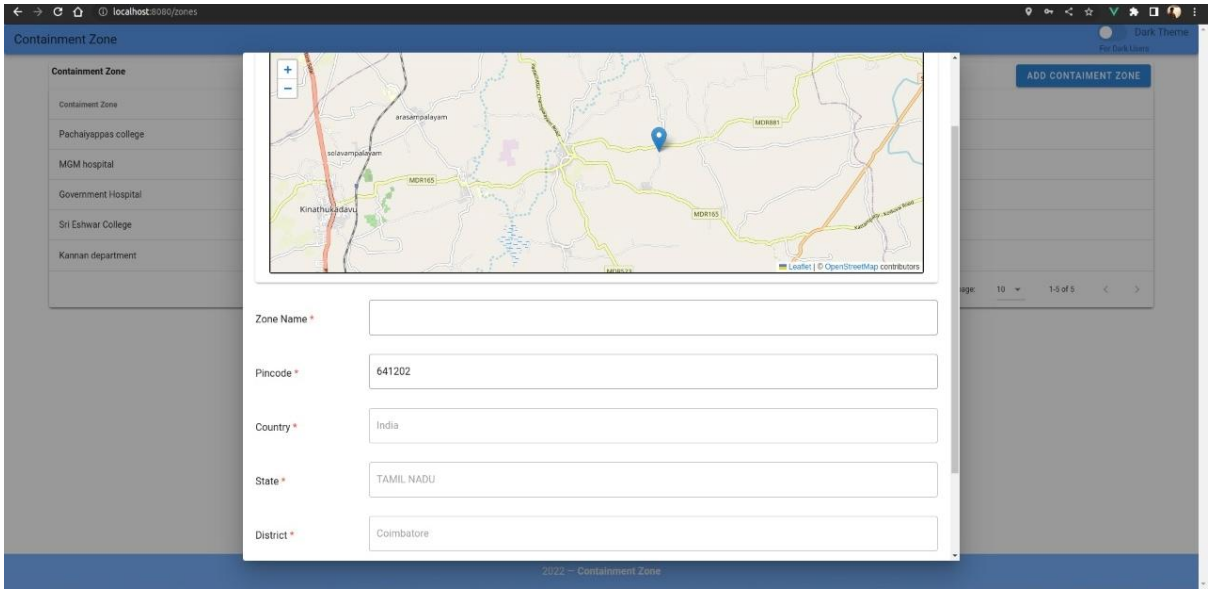




Sign up page



List of Containment Zone



Adding Containment Zone

9. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- People can be alerted before entering containment zone.
- Further spread of virus can be reduced considerably.

DISADVANTAGES:

- Accuracy of application depends on the number of data given to the application.
- Application's accuracy is directly proportional to the number of data given to the application
- about the infected patients.

10.CONCLUSION

This application is intended to provide information about containment zones in a particular region by alerting people, through continuous monitoring of an individuals location. Key benefits of the application are monitoring peoples activity and alerting them to their safety movements.

11.FUTURE SCOPE

Although we tried to cover almost all of the aspects during our developmental phase, however we were forced to leave some aspects because of lack of time as well as monetary and other reasons. Just like in the field of software development where there are always some shortcomings and room for improvement our application can be enhanced further:-

- The application can include various government organization to help act faster.
- The dataset obtained from the application can be used for predictive analysis to determine prone areas and include special method for tackling the problem in those areas.
- Emergency signal in case of network failure and internet connection loss.
- Tackling victim's movements.
- Improved Google positioning system's precision.
- The client part of application can be integrated in a single intelligent device.

For analysis purpose, we could use machine learning (ML) algorithms as well as data mining applications. There is a sub branch of machine learning known as time series analysis (TSA), which could be used to predict and analyze the data obtained through this application. Time series analysis is used to predict crop production as well as sales in different quarter.

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-4938-1658743817

Video Demo Link: https://youtu.be/U630A5icuWE