Mobile Vaccination Web Application

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Abstract - *During the Covid-19 pandemic, vaccination was the prime requirement. As it is the best strategy to fight against it. Since then various methodologies have been implemented, one of them is Mobile Vaccination. Recipients can book a slot based on wards on the web app. They are also able to track their vaccination status. Two days prior to the vaccination drive, these registrations are fed into an algorithm and appropriate locations and number of vans are selected dynamically. The spot distribution is stored as vaccination drives which are then reflected to the public on the day of the drive. On the day of the vaccination drive, van will visit the mentioned spots, vaccinate the recipients and update vaccination status as well. This is how Mobile Vaccination WebApp works.*

Key Words: **Covid-19, Vaccination, Mobility, Microservice, Algorithm, REST API, Recipient, Vaccinator.**

1.INTRODUCTION

The lack of proper resources is the biggest concern in India when it comes to the COVID-19 vaccination. Most hospitals in India are overcrowded, putting patients in danger of becoming infected at the vaccination site, since social distance cannot be maintained. Furthermore, elderly and differently-abled people find it difficult to get to vaccination centers. Using mobile vaccination vans to vaccinate the community is one option to address this problem while maintaining a proper level of social distancing. However, once the vaccine vial is opened, a specific number of people must be immunized with a single dose. As a result, a safe, fully functional Web App is being developed to provide an efficient system that will ensure little vaccine waste while carrying out the mobile vaccination procedure in a methodical manner, hence resolving the aforementioned issue.

2. AREA DISTRIBUTION FOR SLOT BOOKING

A major problem for this project was how to divide the city for the vaccination. It was supposed to be of an intermediate size such that it would be convenient for traveling of recipient as well as vaccinators. If an area is segregated into large pieces then recipient has to travel a longer distance.

Now if the area is too short, then it will cause inconvenience to vaccinators. As they have to wrap up contents into the van, travel a short distance to another vaccination spot and set up the contents at that spot. This will be a wastage of time and eventually will impact the vaccination process.

Finally, it was decided that India already has an area distribution that appropriately fits the requirement i.e. Election Ward System. These were created to curb the longer queues at Voting Centre and can be reached within 5 mins of walking distance which were the ultimate goals for this project. Hence, an Election Ward System was finalized.

3. UNIFIED MODELING LANGUAGE
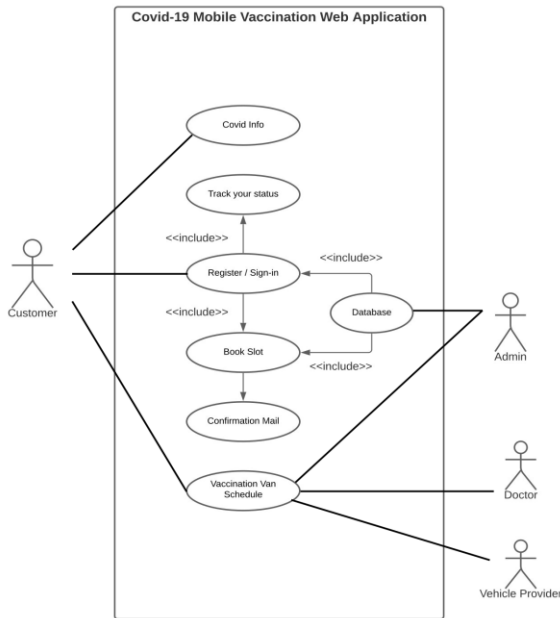
Fig -1 Use Case Diagram

4. VACCINE DRIVE CREATION THROUGH ALGORITHM

The algorithm is deployed by creating a micro-service. Also REST API has been used in order to achieve the desired performance. The number of registration from a particular location are stored as elements in the array.

- The array is sorted into descending order.

- Now select an element and check whether it is less than the vaccine van limit.

  (Vaccine van limit is the number of doses a particular van can hold).

- If yes then insert that into the route of that particular van.

- Keep on repeating this until all registrations are over and array is empty.

- The number of vans is dynamically decided by the algorithm.

Constraints: if a particular spot has registration below the specified limit (say 50) then the van doesn't visit that particular location.

4.1 Utilization of remaining doses

Solution 1 - Remaining doses can be given to offline vaccination centers at the end of every drive.

Solution 2 - At the end location of every drive a small queue of max 9 people can be formed to inject the remaining doses thereby utilizing it efficiently. As the vial generally contains 10 doses, so the worst case scenario would be to utilize the remaining 9 doses, therefore a queue of maximum 9 people is formed.

Vaccination drive status for the present day can be viewed by the public so just in case they miss their slot timing, they can reach the next location the van will be visiting to get their shot.

5. TECHNOLOGY USED

- Frontend : HTML 5, CSS 3, JAVASCRIPT 3, BOOTSTRAP 5.

- Middleware : Hibernate.

- Backend : Spring Boot, Spring MVC, Maven.

- Database / API : MySQL, Twilio API, CoWin API.

6. WORKING OF WEBAPP

Simplicity and user-friendly interface were the primary focus in designing the web app. It's broadly classified under 2 login interfaces

1. User Login

2. Staff Login

After the user logs in he/she can perform the below-listed operations :

- Add a member

- Remove a member

- Display individual member profile

- Check his / her vaccination status

- Book a slot.

- Access Covid-19 news and real-time figures through API.

After a staff member logs in he/she can perform the below-listed operations :

- Appropriate custom filter helps to filter registrations on the dashboard itself.

- Change vaccination status of an individual.

- Add new vaccines.

- Add new vehicles.

- Add new vaccination centers.

Note: Twilio API (real-time messaging service) has been used for implementing user login through OTP, whereas for staff members username and password credentials are provided. Hashing of passwords before storing them into the database has been implemented in order to increase security.
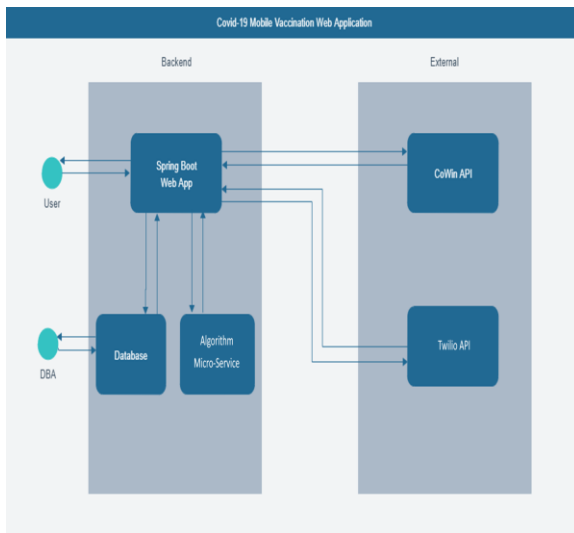
7. WEBAPP ARCHITECTURE

Fig -2 Web Application Architecture

8. CONCLUSIONS

The project will have a huge impact on society to limit and fight Covid-19 virus. It will reduce pressure on the government officials to plan the whole strategy in an optimized way thereby reducing human errors. In the upcoming future, our aim would be to obtain the Cowin authorized API key for this project which is currently inaccessible so that beneficiaries added can be verified and their current vaccination status can be fetched through authorized sources. It's currently inaccessible because the entity needs to prove that the developed project is a stepping stone and has a significant impact in fighting

against the virus. An added advantage is, it will be able to predict the time required to vaccinate the whole population based on the current pace of vaccination.

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