CONTAINMENT ZONE ALERTING APPLICATION
A PROJECT BASED LEARNING REPORT

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Abstract: 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.

Contact tracing is known to be an effective technique for detecting and monitoring persons who may have been exposed to individuals infected with any communicable disease. While a good number of contact tracing schemas are existent today (eg., in-person and phone interviews, paper forms, email and web based questionnaires and smartphone apps), they often require active user participation and might miss certain COVID-19 transmission.

The 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 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.

Key words: COVID-19, Containment, Convolutional Neural Network & Deep Learning

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Introduction:

Since the outbreak of Covid-19 pandemic, lots of preventive measures have been automated by the technical Industry. One of the important measures is to isolate Covid prone zones from normal zones. For this, we seek technical support to create an alert system which makes the user aware of the containment zones by facilitation the integration of the geolocation of the containment areas with a mobile app through cloud so that real time alerting could be made possible. For the updation and storage purposes for the respective zones we use cloud support to make the application complete.

The purpose of the application is to monitor the locations of user continuously and provide alert while trespassing a containment zone. Furthermore, the application is intended to provide information about Covid-containment zones in a particular area. The prime objective of the project is to build an application that provides information about the containment zones of a particular region in order to make the people aware of containment zones in real time. Key benefits of the applications are monitoring people's activity and alerting them of their safety movements.

Without widespread public awareness and proactive measures taken by the populace, it is very challenging to stop the community transmission even during a lockdown in a densely populated nation like India. There were several containment zones spread out around the nation, and they were classified into red, orange, and green zones, accordingly. The red zones represent infection hotspots, the orange zones represent some infection, and the green zones represent an infection-free area. It is not a really easy task to inform every citizen of the country of every Covid Containment Zone. Even if it is done, the statistics and the zone details would change every now and then. Also, people cannot remember all the containment zones announced in the news or radio. A solution has to be brought not only to keep the people informed of Containment Zone, but also to assist them in staying away from the zones. When a person travels to a place, it is highly unlikely that he or she knows if it is a containment zone or not. There arises a confusion if the person should enter the zone or not.

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.

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 COVID-19 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 andnotify those who have come into touch with someone who has COVID-19, it also 4 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.

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.

Containment zones and monitoring violators who are trespassing into it using firebase and Geofencing:

In this study, the authors concentrated on creating a mobile application to deliver details about the Covid-19 containment zones in West Bengal. The programme also keeps track of the user's whereabouts and sends an alarm if the user enters a containment zone. To keep users informed, the application also offers daily Covid-19 case statistics. The application is made with the Android SDK, and the location information is kept in the Firebase Cloud Firestore. The containment zones are surrounded by geofences made using the Android geofencing client, and

notifications are sent using the notification manager. To display the Covid-19 cases in West Bengal, the application also makes use of Restful web services. They tested their app with a variety of users in various West Bengal areas, and they discovered that it operated effectively and helped them reach their goal.

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

The basic Android application that served 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. People travel to different places unaware of the fact that it is a COVID-19 containment zone and hence don't take necessary precautions. As a result, the people getting inside a containment zone are at a higher risk of getting affected by the disease.

Android Sign-in:

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. 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. The application updates the location of the areas in google map which are identified to be containment zone. The application also notifies the users if they entered into the containment zone and upload the details of the user in the database.
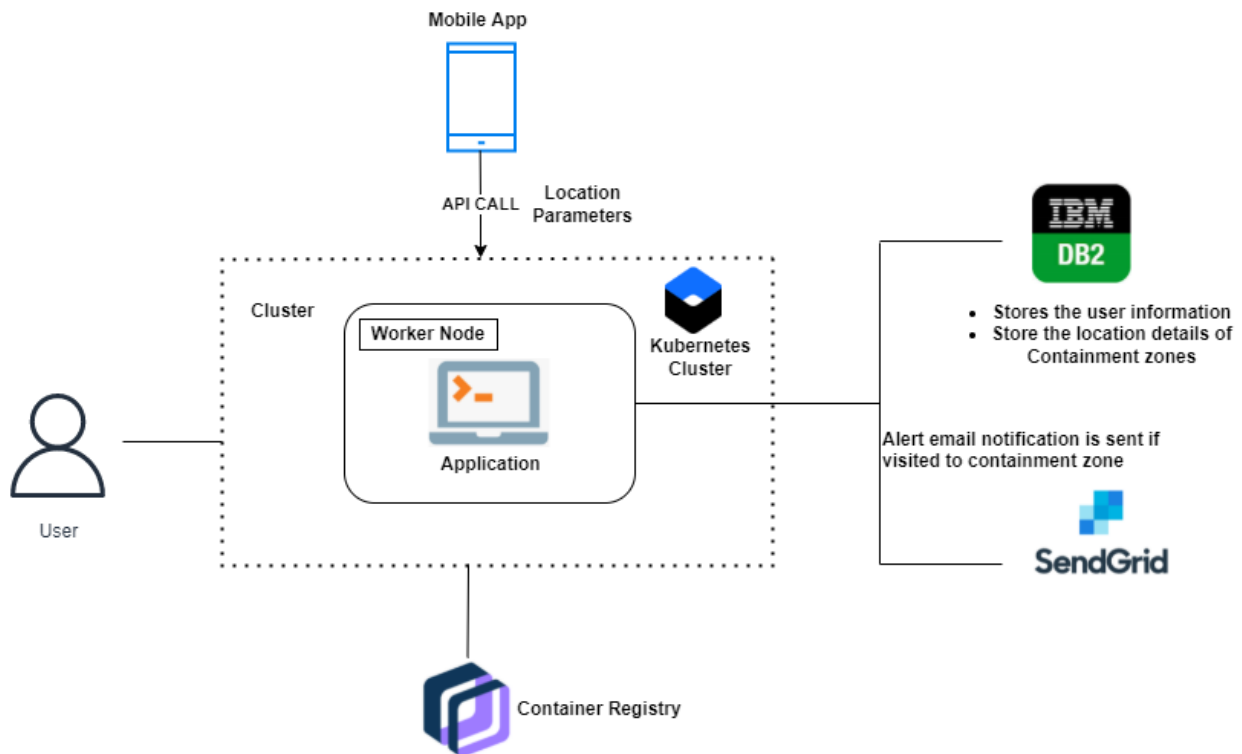
Fig.1. Technical Architecture:

Alert Notification:

This issue affects [detail the impacted areas, services, or systems]. Users may experience [describe the symptoms or effects, such as access restrictions, data loss risk, service unavailability, etc.]. The potential implications of this issue include [mention any broader consequences, such as security risks, operational delays, etc.]. A critical issue has been detected involving [specific system/service]. The nature of this alert pertains to [describe the nature of the problem, e.g., unauthorized access attempt, unexpected system shutdown, scheduled maintenance, etc.]. This issue affects our customer data management system. Users may experience access restrictions, and there is a potential risk of data loss. The breach could lead to significant security risks and operational delays. The following measures are being taken:

1. Investigating the cause of the breach.

2. Implementing temporary security measures.

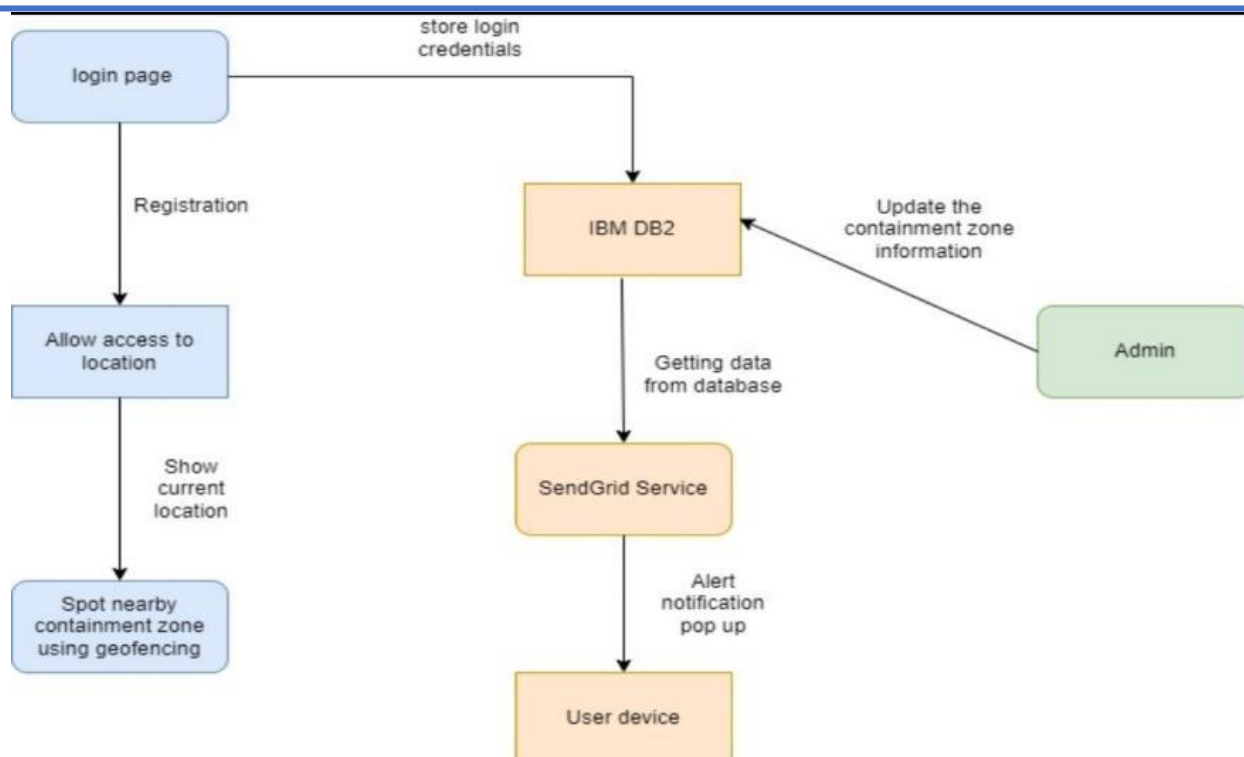3. Restoring the system to full functionality, expected within the next 24 hours.

Fig.2. Data Flow Diagram:

Database Schema:

A database schema is a logical blueprint of how data is structured and organized within a database. It includes definitions for tables, columns, data types, primary keys, foreign keys, indexes, and relationships. Tables are the primary structures that store data. Each table consists of rows and columns, where each column represents an attribute of the data, such as an integer, varchar, date, etc. For instance, a Users table might have columns like UserID (integer), Username (varchar), Email (varchar), Password (varchar), and CreatedAt (datetime). Rows in a table represent individual records. For example, a row in the Users table could be (1, 'john_doe', 'john@example.com', 'hashed_password', '2024-07-21 14:00:00'). A primary key is a unique identifier for each row in a table, ensuring each record can be uniquely identified. For example, UserID in the Users table serves as the primary key. A foreign key is a field in one table that uniquely identifies a row in another table, establishing a relationship between the two tables. For example, the Orders table might have a UserID foreign key that references the UserID in the Users table, creating a link between users and their orders.

Indexes are used to improve query performance by providing quick access to rows. An index on the Email column in the Users table can speed up searches by email. Relationships between tables can be one-to-one, one-to-many, or many-to-many. For example, a one-to-many relationship exists between the Users and Orders tables, where one user can have multiple

orders. Views are virtual tables created by querying data from one or more tables, presenting data in a specific format without storing it.

To protect data within this schema, several technical measures are essential. User authentication involves strong passwords and multi-factor authentication to verify identities. Authorization through role-based access control (RBAC) ensures users have the least privileges necessary to perform their tasks. Encryption protects data both at rest and in transit. Data-at-rest encryption, such as AES-256, secures stored data, while data-in-transit encryption, like TLS/SSL, secures data transferred between clients and servers.

Regular backups are critical for data recovery, and should be securely stored and periodically tested. Database auditing logs all access and changes to sensitive data, enabling the detection of unauthorized actions. Ensuring the secure configuration of the database server includes disabling unnecessary services, closing unused ports, and applying security patches promptly.

Input validation and sanitization protect against SQL injection by ensuring only properly formatted data enters the system. Database firewalls monitor and filter database traffic, blocking malicious activities. Following the principle of least privilege ensures users, applications, and processes have only the necessary permissions, minimizing potential security breaches. Data masking techniques obscure sensitive information in non-production environments, preventing unauthorized access during development and testing.
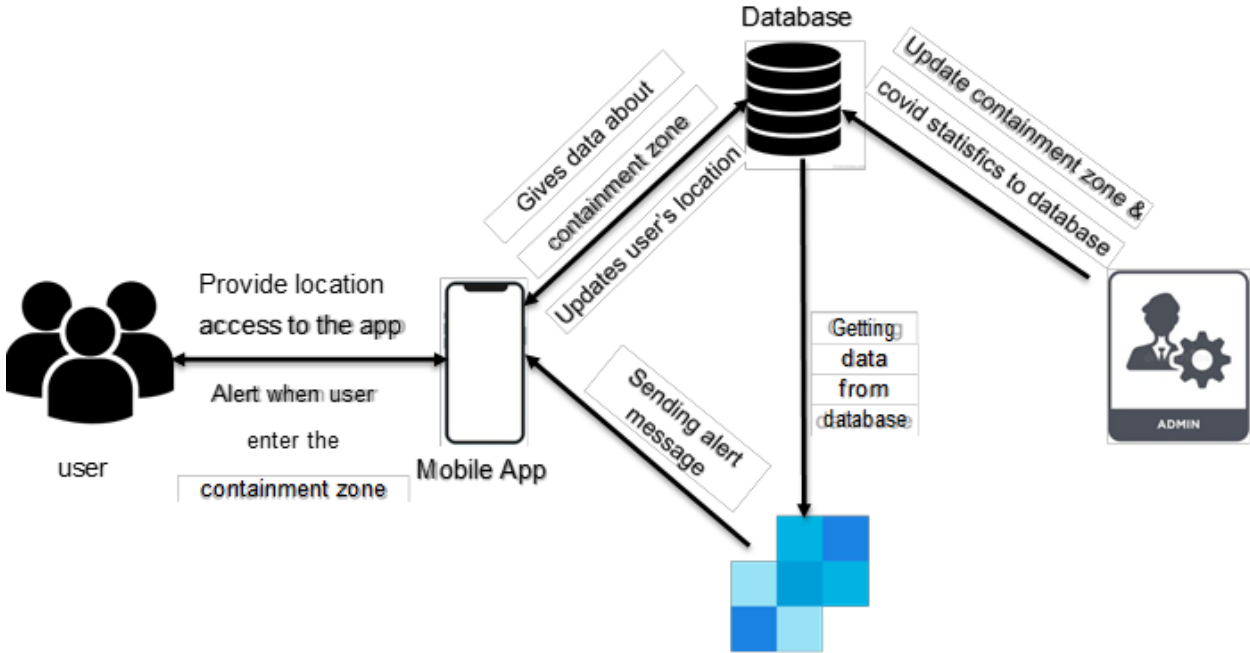

Fig.3. Solution and Technical Architecture:

Conclusions:

The COVID-19 pandemic continues to affect the way of life of everyone. The contact tracing apps are likely to play a vital role in aiding health authorities quickly identify individuals that may have been exposed to the virus. The imminent interest and adoption of tracing app technology will improve the tracing capability of health authorities; however, as this paper highlighted, it is not as silver bullet. These application still face many concerns from users, data protection agencies and researchers. Users of the application can quickly view the designated Covid-19 containment zones on a Google map. With the worrisome rise in Covid-19-affected cases around the globe, this developed application might be used as a tool to raise more public awareness.

This application keeps track of the user's location and determines if it appears on the list of designated containment zones. If a user enters or is within a Covid Containment Zone, an immediate alert notification is given to the user.

The application delineates the containment areas and emphasizes the necessity for additional precautions to be taken in the fight against COVID-19. The application has been tested in various locations and has been found to yield accurate results.

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