

AN ANALYSIS OF CONTACT TRACING APPS FOR CONTROLLING VIRAL DISEASES

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Abstract: Contact tracing has been established as Important tool to mitigate the outbreak of Infection. There is enumerable list of Procedures to for Contact tracing. There is broadly centralize & decentralized methods of doing the same, and several concerns over developing an application that has been discussed in the Content.

Keywords: COVID-19, Contact Tracing, WHO

I. INTRODUCTION

The Covid-19 outbreak, a viral disease, scientifically called SARS-CoV-2, became a reason for difficult situation for the whole world. The spread of COVID-19 had been in abundance and to stop the same various measures were being followed. Machine Learning (ML) and Cloud Computing can be deployed very effectively to track the disease, predict growth of the epidemic and design strategies and policies to manage its spread [1].

The contact tracing part of the epidemic is an important aspect to look upon for mitigation strategies. Hence, a cloud platform in such case will also be of benefit keeping in mind the security part. All this when deployed on a cloud computing platform can give more accurate and real-time prediction of the growth behavior of the epidemic.

The most difficult part about this pandemic is that we didn't have any previous data to work upon or do any predictive analysis in order to do some mitigating strategies.

WHO (WORLD HEALTH ORGANISATION) has also recently warned of more deadly pandemics in near future. So, a platform that we are trying to work for will be of great benefit for the healthcare systems and the society. Research in this field will be of great benefit as well. Hence, working towards this direction will give a large dataset for future generations to fight such viral infections.

Some major strategies that are implemented by ML and CLOUD are-

- Contact Tracing
- Predictive Analysis for future

II. CONTACT TRACING

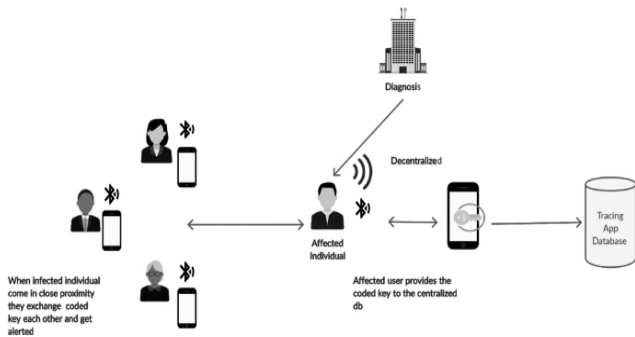
Contact tracing is the process of identifying all people that a COVID-19 patient has come in contact with in the last two weeks. You need a system to identify cases, a functioning laboratory, a system to feedback data, people to identify and follow-up with contacts, provide support if they need quarantine, and treat them properly. Such a system if automated can be of great help and benefit as it reduces human effort, time consumption and cost. So, an automated, secure and fast system can make the cloud platform more accessible and resource utilization will be maximum. A general contact tracing process is as follows:

1.2 A General Contact Tracing Process: -

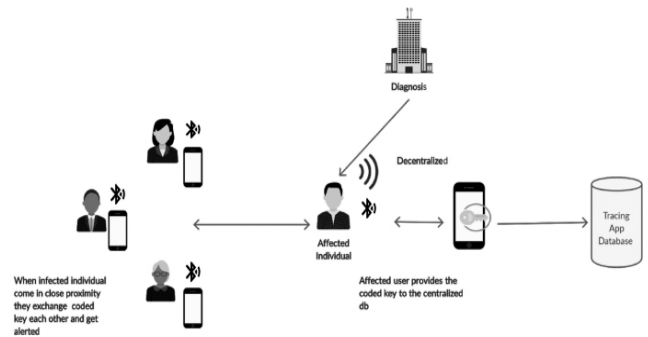
- The recent location history is being used to initiate the contact tracing process and hence, connections of those who were infected were being alerted before people interact further becoming a virus carrier. [2]
- This way the infected individuals were being able to follow measures such as self-isolation, social distancing, testing etc.
- With the help of smartphones, it became easier to track people because of the availability of technologies like GPS tracking, and Bluetooth Communication.
- A location graph of an individual could be created with the help of these devices, and when the device's
- user crosses in proximity to another device, it would create a correlated graph.
- By analyzing the device user's graph or map having Unique ID, gathered from the ones infected with the virus, it was easier to identify the people who were near or have interacted with the infected individual. This way tedious tasks of manual contact tracing were made easier.

Following are the approaches for contact tracing:

Centralized Approach-



Decentralized Approach-



- A centralized approach is based on Bluetooth technology and GPS.
- Initially, the user is required to register with the server within the application.
- Each device is assigned a temporary ID that is generated by the server. The temporary key is encrypted using a secret key and it is sent to other devices.
- Whenever a person is in proximity to infected individual devices exchange their temporary ID with the help of Bluetooth.[4]

- Decentralized architecture involves minimal activity of the server in the contact tracing process. This architecture mostly operates at the users’ device only.
- This technique makes the users’ data safe and private by generating random identifiers at the users’ mobile and processing the alert process for exposure on the devices instead of the centralized server[7].
- Once the person tested positive for Covid-19, they can upload their coded key to a central server.
- This is in contrast to the centralized architecture where the complete details of the user are uploaded.[4]

As the individual is confirmed as positive for Covid-19, the associated health workers upload the encounter messages to the central server, or the user can also upload their details to the server directly[6].

Table 1 shows an analysis of various apps used in different countries to perform contact tracing. Furthermore Figure 1 explains the major concerns that a certain population mentioned about the contact tracing apps.

The centralized server maps the temporary ID in the messages to individuals to identify at-risk contacts, who are more likely to catch the virus.

Table 1 Overview of the existing contact tracing solutions

Country	App name	SSL	Transparency	Centralized/decentralized	Access control
India	Arogya Setu	N/A	Yes	Centralized	Location access,bio data
Singapore	TraceTogether	N/A	Yes	Centralized	Microphone, location, camera, storage, Wifi Connection, and Media access
Australia	CovidSafe	N/A	No	Centralized	Location access, Connects personal data to the server
Canada	CovidAlert	No	No	Centralized	Location access, Personal data connected to the health authority
Dubai	DXB Smart App	N/A	No	Centralized	Microphone, location, camera, storage, Wifi Connection, and Media access
United States	CovidWise	No	No	Decentralized	Microphone, location, camera, storage, Wifi Connection, and Media access
Pakistan	COVID-19 Gov PK	No	No	Centralized	Location access
Vietnam	Bluezone	N/A	No	Centralized	Microphone, location, camera, storage, Wifi Connection, and Media access
Malaysia	Mytrace	Yes	Yes	Centralized	Microphone, location, camera, storage, Wifi Connection, and Media access
Saudi Arabia	Covid-19KSA	N/A	No	Decentralized	Location access, Personal data connected to the health authority
UK	NHS Covid-19	N/A	No	Centralized	Network access
Netherlands	CovidRadar	N/A	Yes	Decentralized	Location access, Personal data connected to the health authority



Figure 1. Major concerns over Contact Tracing Applications

With all the information about contact tracing, we conclude all the information that explains contact tracing, its functioning, and all the aspects of contact tracing have been developed. Further we cover the other aspects for the cloud platform that we aspire to design.

2. Role of Cloud Computing during Contact Tracing[5].

Cloud Computing makes the process of Contact Tracing safer, accurate and Privacy Preserving can also be maintained. A cloud platform shall provide computation capability to contact tracing to get accurate results[8]. Also, the storage of such a huge data becomes easy and data is also readily available for further processes.

3. Predictive Analysis for Future over Cloud-

Based on the big data collection of patients’ symptoms and behaviors, further analysis can be done to know how much the epidemic can be spread and how can others behave in order to curb the spread of any viral disease. The communities dealing with Data Science and Machine Learning are working really hard to improve the prognosis of the epidemiological models and inspect the information over Twitter so that some concrete management strategies can be developed[10]. Also, it would become easier to assess the impact of policies which have been made to curb the spread of the virus. To make it easier for the people and scientists etc. to work in this direction various datasets related to Covid-19 have been released as open source. Hence, research tending to move towards a pandemic simulated cloud platform will not only help in understanding pandemics well, but also will serve the society in order to avoid lockdowns and falling economies around the world. The healthcare system will also be benefitted and will less likely to collapse and also will understand the pattern of the pandemics in a better way. Public health measures can be well applied and even general public can understand how to change their behavior to combat any viral disease or outbreak[9].

Hence, summarizing the above passages, we reach to an inference that a cloud computing platform completely dedicated to a viral disease like Covid-19, requires many functionalities

and out of those the major ones are, contact tracing, database security and predictive analysis based on the database. The further report describes the literature survey and the topics done in the direction of this particular research.

III. CONCLUSION

The reason behind Covid-19 spread is majorly close social interaction. For this contact tracing can play a major role in containing the spread and also help the health workers to track down the virus carriers. Mobile devices have become a very common device among people all over the world, and hence contact tracing software on these platforms can become an ideal weapon for healthcare workers. Therefore, several contact tracing techniques have been developed by governments, international organizations, and other parties to mitigate the virus spread. However, there is an increasing concern regarding the collection and use of data and its security. The paper analyzes a huge set of contact-tracing techniques implementing different security and privacy measures. However, the deployment of these techniques over a cloud can enhance this process. From the research, it is concluded that using encryption standards and random cloud storage for protecting the collected data, the process can be made more secure and accurate. Also some work towards load balancing can improve cloud performance as well. The cloud platform aimed for the purpose shall be a revolutionary platform in order to control pandemics in future without compromising with users’ security. The social network or the graph formed by the BLE can also be analyzed to make the contact tracing process more feasible and accurate as it depends on mathematical models. Hence, the cloud platform shall involve a better contact tracing approach.

REFERENCES

- [1] Alashhab, Ziyad R., et al. “Impact of coronavirus pandemic crisis on technologies and cloud computing applications.” *Journal of Electronic Science and Technology* (2020): 100059.
- [2] Sandhu, Rajinder, Harsuminder K. Gill, and Sandeep K. Sood. “Smart monitoring and controlling of Pandemic Influenza A (H1N1) using Social Network Analysis and cloud computing.” *Journal of Computational Science* 12 (2016): 11-22.
- [3] Aman, Azana Hafizah Mohd, et al. “IoT amid COVID-19 pandemic: Application, architecture, technology, and security.” *Journal of Network and Computer Applications* (2020): 102886.
- [4] Kumar, Adarsh, et al. “A drone-based networked system and methods for combating coronavirus disease (COVID-19) pandemic.” *Future Generation Computer Systems* 115 (2021): 1-19.
- [5] Thompson, Harrison, et al. “Using Service-Oriented Architecture to Navigate the COVID-19 Pandemic for Knowledge-Based SMEs.”
- [6] Gautam Thakur, Kevin Sparks, Anne Berres, Varisara Tansakul, Supriya Chinthavali, Matthew Whitehead, Erik Schmidt, Haowen Xu, Junchuan Fan, Dustin Spears, and Elton Cranfill. 2020. COVID-19 Joint Pandemic Modeling and

Analysis Platform. In Proceedings of the 1st ACM SIGSPATIAL International Workshop on Modeling and Understanding the Spread of COVID-19 (COVID-19). Association for Computing Machinery, New York, NY, USA, 43–52.

- [7] Whaiduzzaman, Md, et al. “A privacy-preserving mobile and fog computing framework to trace and prevent covid-19 community transmission.” *IEEE Journal of Biomedical and Health Informatics* 24.12 (2020): 3564-3575.
- [8] Sowmiya, B., et al. “A Survey on Security and Privacy Issues in Contact Tracing Application of Covid-19.” *SN computer science* 2.3 (2021): 1-11.
- [9] Pham, Quoc-Viet, et al. “Artificial intelligence (AI) and big data for coronavirus (COVID-19) pandemic: A survey on the state-of-the-arts.” (2020).
- [10] Cho, Hyunghoon, Daphne Ippolito, and Yun William Yu. “Contact tracing mobile apps for COVID-19: Privacy considerations and related trade-offs.” *arXiv preprint arXiv:2003.11511* (2020).

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