VOL. 16, NO. 14, JULY 2021 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences
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TRAKER: MOBILE APPLICATION TO TRACK COVID-19 IN JAKARTA INDONESIA

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ABSTRACT

COVID-19 (coronavirus disease 2019) a newly discovered virus that infects humans and is categorized as a global pandemic. Including in Indonesia, everyday case of COVID-19 increases and gets worse. In this digital era, we always use mobile smartphones every day to do our activities, that is why Traker choosesa mobile platform for development. Traker is a mobile application to trace and record the activity of an infected person, also to show any information about COVID-19 to the community as we proposed in Jakarta city. Traker works both on Android and iOS and Traker uses GPS method solution to track down the infected. The proposed model was designed using Unified Modeling Language (UML) such as a use case diagram for figure out the business process in the systems whilst a class diagram was used to design the database model. Android studio was used to implement the systems where each displayed user interfaces as a print screen of the running prototype application.

Keywords: COVID-19, global pandemic, mobile application, information systems.

1. INTRODUCTION

In the past few months, the whole world has been busy trying to deal with a virus that has a pretty devastating effect if it is not handled as soon as possible. The virus itself is a pathogenic microorganism that can infect other living things. The virus can be classified as a living thing but can also be classified as a non-living thing because it can breed or replicate itself which is a characteristic of a living thing and it can also be crystallized which characterizes it as a non-living thing. The way the virus works is it infects living things so that they can breed inside their host.

The virus was first discovered in Wuhan, China in December 2019 and was known as COVID-19 (coronavirus disease 2019). This disease can be contagious and is caused by a virus that has been newly discovered and identified as Sars-CoV-2. This group of viruses can harm both animals and humans. As it is known, several types of coronaviruses have the potential to infect the human's respiratory system starting from coughing, flu, and it can build up to something more serious such as the *Middle* East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [1].

The emergence of the COVID-19 case was first presented with many patients suffering from severe pneumonia in Wuhan on 27 December 2019. After a few days, the patients encountered high fever and cough and worsened every day [2].

Later it was discovered that the liquid inside the patient's lung contained a virus similar to SARS and MERS [3]. Data from 1099 tested patients show that the most common clinical characteristics or symptoms from COVID-19 are fever and cough, diarrhea is uncommon, the median of incubation was 3 days and the virus is spreading rapidly from human to human but can't infect animals [4].

According to the WHO, the coronavirus or COVID-19 has become a global pandemic. A pandemic is an epidemic that has spread to several countries or continents and generally attacks a lot of people. As a result, this virus has caused a social panic that is experienced by many countries, including Indonesia. Up to the 1st of April 2020, there have been 198 countries that have been infected by the COVID-19 with 750.890 confirmed cases and 36.045 confirmed cases that resulted in death. According to Worldometer's data (31/3/2020), 3 countries that has the highest infection rates are Italia (101, 739 confirmed cases, 14, 620 recovered cases, 11, 591, death cases, and 3, 981 currently being treated), Spain (87, 956 confirmed cases, 16, 780 recovered cases, 7, 716 death cases, and 5, 231 currently being treated), and China (82, 545 confirmed cases, 76,052 recovered cases, 3, 314 death cases) [5].

Every single day, COVID-19 cases continue to grow around the world. Likewise, with Indonesia, until 27 Dec 2020 according to the ministry of health republic of Indonesia (www.kemkes.go.id), there are 713, 365 confirmed cases and in them, there are 583, 676 cases recovered, 21, 237 cases died, 69, 235 suspect and 41, 963 cases were treated. Based on the data above, Indonesia has a healing rate of around (583, 676/713, 365) 81.82% and a mortality rate of around (21, 237/713, 365) 2.98%. In Jakarta, there are 173, 929 confirmed cases, 156,798 recovered cases, 3, 182 death cases, 9, 439 suspects, and 4,

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510 treated cases. Based on the data above, Jakarta city has a healing rate of around (156, 798/173, 292) 90.48% and a mortality rate of around (3, 182/173, 292) 1.84%. The comparison of data between the city of Jakarta and the data of all cities in Indonesia shows the percentage of 24.29% confirmed cases, 26.86% recovered cases, 14.98% death cases, 13.63% suspect, and 10.75% treated cases. This can continue to get worse every day, plus until now there is no vaccine found to treat the COVID-19 infection [5].

Based on Population Data from the Ministry of Home Affairs through the Directorate General of Population and Civil Registration (Dukcapil), the total population of Indonesia as of 30 June 2020 was 268,583,016 people. So only 0.27% of Indonesia's population is exposed to Covid19 and 0, 0079% of the Indonesian population died because of this Covid19.

In this digital world, technology continues to advance day by day. Modern technology allows us to create applications that can amuse and make our daily basis life easier. Apps arethe use or application of a concept that is the subject of discussion. Applications can also be interpreted as a computer program created to help humans in carrying out certain tasks (Noviansyah, 2008:56) [6]. According to Executive Computer Dictionary, the application is a problem solving that is using a data application process technique, wherein general will be based on computational or processing on data desired or expected [7].

Definition of the application according to Kamus Besar Bahasa Indonesia (KBBI) is an application of a system design with the purpose of processing data with some provisions or regulations of programming language. An application is a program from the computer for carrying out and perform special tasks from users [8] and the application is utilization in a computer, instructions, or statements compiled so that the computer can process input into output [9]. A program in software with a computer with its purpose to facilitate work or certain tasks, such as the application, use, and addition of data needed.

The software application that is designed for specific tasks can be divided into two types [6]:

a) **Specialist software application:** A program with documentation that is integrated and designed to perform a specific task.
b) **Software package application:** A program with documentation that is integrated and design for certain types of problems.

GPS (Global Positioning System) is a system which is owned and managed by the United States based on satellite navigation also position monitoring with function to presenting position and velocity with three dimensional providing information to the users simultaneously about the time in the world without depending on the weather or zone. [11].

There are 5 steps about how GPS works logically, which are [12]:

a) Using “triangulation” calculation from the satellite.
b) In defining the range, GPS uses the travel time of the radio signal to calculate the “triangulation”.
c) High accuracy of time is needed for GPS to measure the travel time.
d) In measuring the range, GPS needs satellite position with an accurate height of its orbit.
e) GPS should be able to correct the signal delay during the time travel in the atmosphere until received on the receiver.

If any, the purpose of making the Traker application is as follows:

a) View and track the spread of the virus in Indonesia, particularly in Jakarta.
b) See the number of people that have been infected by the coronavirus and provide an accurate location of the infection cases.
c) Provide socialized education to the community about what is important, such as encouraging them to do social distancing, the symptoms of someone who has coronavirus, online surveys with doctors, etc.
d) Give means to its user to immediately report themselves if they are not feeling well and would like to go to the nearest hospital that provides the rapid test service for a checkup or to the closest rapid test post.
e) Provide emergency services for those who need medical attention and attending to them instead of them coming to the medical staff and hospitals.

2. PREVIOUS AND CURRENT RESEARCH

The COVID-19 (coronavirus disease 2019) was first acknowledged and announced its existence in December 2019. During the first months of the virus’ discovery, movements, treatments, medication and even knowledge on the virus itself were very limited and restricted. However not long after the virus was discovered, casualties started falling in and scientists and everyone who works in the medical field researches and tries their best to find the cure and create a vaccine for the virus. The World Health Organization (WHO) officially declared the virus as an outbreak and is considered to be a PHEIC (Public Health Emergency of International Concerned), on the 30thJanuary 2020 and soon after declared as a pandemic on the 11th of March 2020. The first reported cases were on the 17th of November 2019, in Wuhan, China however these reports were still considered unofficial and considered a normal illness instead of a life-threatening virus.

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The first research was done, and it was discovered that the symptoms of the virus include fever, cough, shortness of breath. The virus is generally not airborne but the virus itself could live up in the air for up to 3 hours and it will die if it doesn't find a host to infect.

The origin or cause of the virus is still vague, but it is suspected to originate from animals though it is not fully confirmed yet. It is later known that the virus particularly attacks the respiratory system and the effects could be mild, leading up to death. There has been huge progress in the research compared to the early stages of the discovery. Previously doctors and the medical field were still trying to find a way to prevent the disease from spreading even further, and it was soon discovered that the virus can infect humans through coughing, or sneezing particles that could land on other people. The virus will then proceed to attack the respiratory system of its host. Up until now, scientists and health experts are still trying to find the cure for the virus or at least a vaccine to prevent further infections worldwide though it is not guaranteed yet how long it will take. Next, we will discuss some of the latest application implementations to tackle COVID19 such as kawalCovid19 from Indonesia, CoronApp from Columbia, COVIDSafe from Australia, and stopCovidFrance from France.

a. KawalCOVID19 Application

The main purpose of this application is to give easier access to mobile users especially for people who use Android to obtain valid information regarding COVID-19 in Indonesia. The following images show what the kawalCOVID19 app looks like [13]:

Figure-1. Home view of KawalCOVID19 App.

b. CoronApp

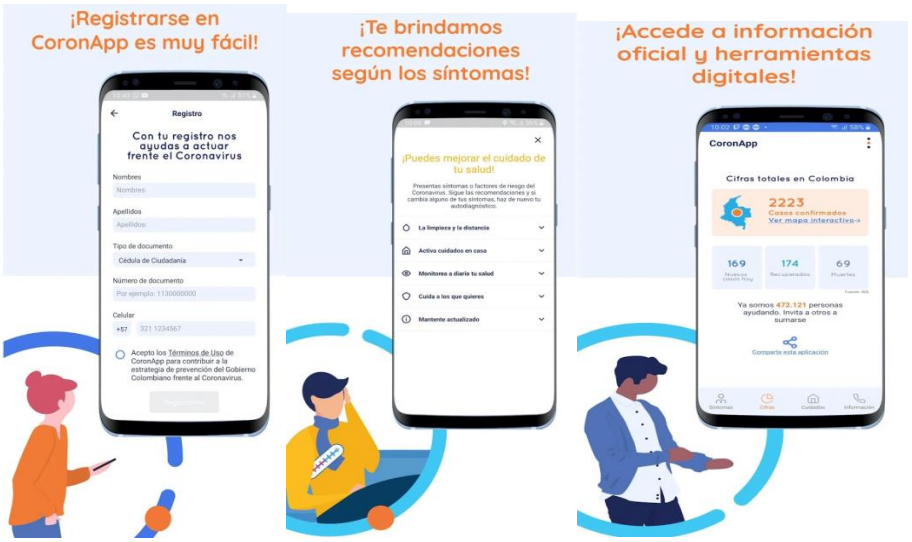

Figure-2. CoronApp from Columbia.

The Government of Columbia decided to use technology and innovation to face the COVID-19 pandemic. So, the application CoronApp was created and some its user interface can be seen in Figure-2. This application was created by the government of Columbia with the help of the National Institute of Health (INS) aiming to save as many lives as possible [14].

This application can help detect the areas that have been infected, and the closest people that have been diagnosed positive with COVID-19. Other than that, this application also facilitates real-time monitoring from data that has been gathered by the National Institute of Health (INS) so they can act fast and give support and encouragement to the local authorities, departments, and even the national ones. [15].

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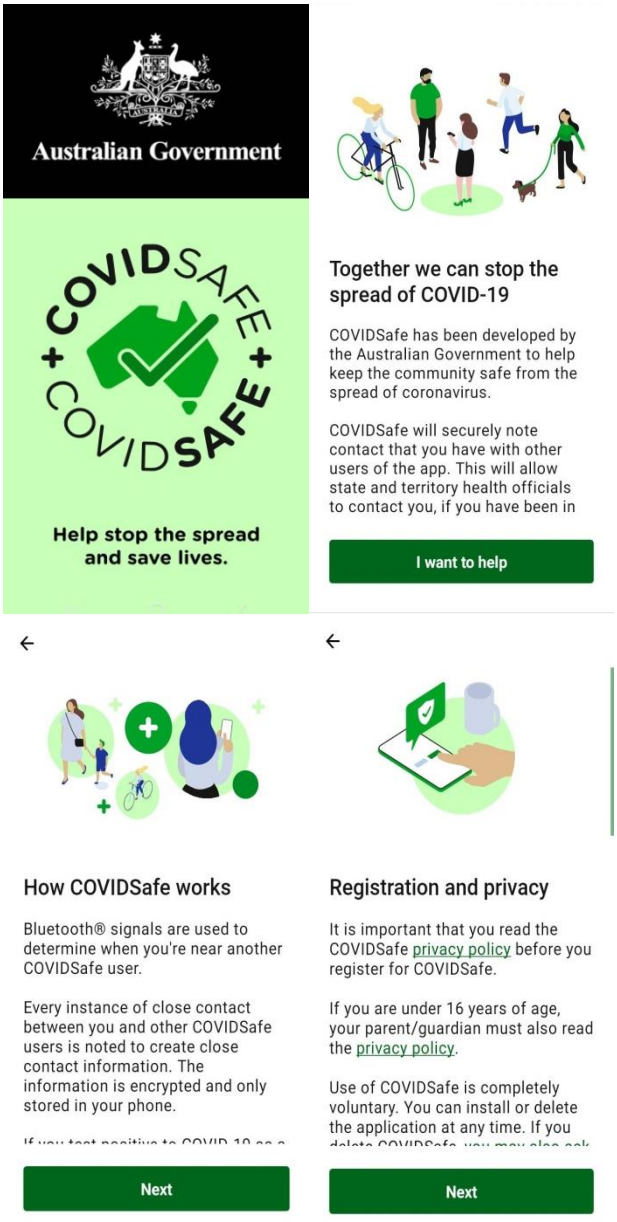
c. COVIDSafe

COVIDSafe is the only application authorized by the Australian government as the contact tracking application. Where this application helps to find direct contact / near the COVID-19 case. Other than that, through this application people who may be infected or exposed to COVID-19 can be immediately contacted by state and territory health and officials. The information from this application can be accessed by the ministry of health officials if the user already tested and the result is positive, then approving their information on their phone will be uploaded. The information will be used to remind them to do quarantine or additional tests [16]. Figure-3 shows the interface of the application:



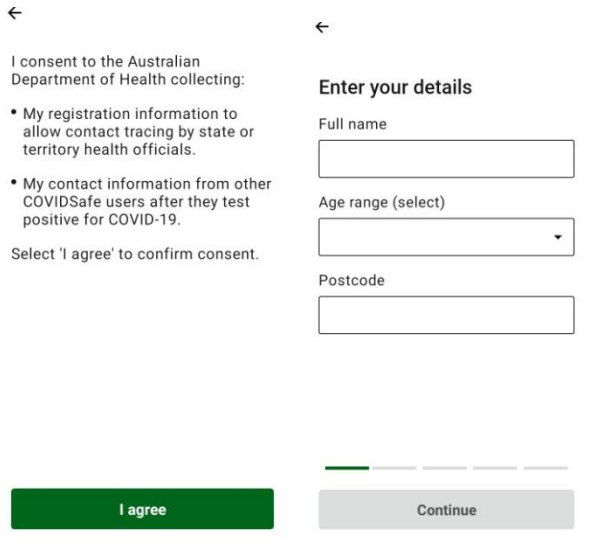


Figure-3. COVIDSafe App from Australia.

d. StopCovid France

This application is designed with a smartphone log to prevent second waves of infection and also reminds people if they are close or near to someone who has been diagnosed positive for COVID-19. Stop Covid France Application was made by France and it has a "centered" design, similar to the one Britain has, where they see by being "centered" they can provide more data to the experts in epidemiology for analysis and help in targeting infection warnings, and they are not limited by 2 technological companies such as restriction to obtain data location. On the contrary, Latvia, Italy, and Swiss created an application based on technology "decentralized" that has been developed with the help of Apple and Google, by seeing that it is better to protect the anonymity and privacy of its users. The following figures show the "centered" model and "decentralized" models. [17]:

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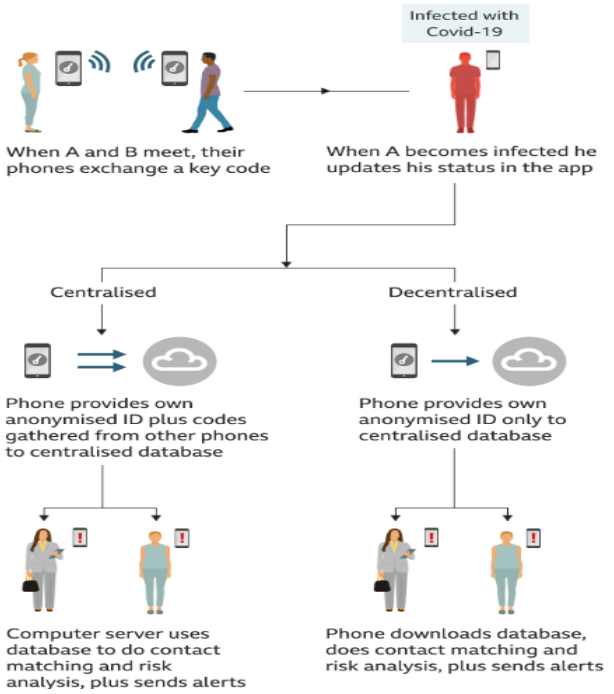

Figure-4. Model figure of StopCOvid France.

StopCovid can be downloaded on Android or iOS. The work system in the application is using Bluetooth with user code being exchanged and can be automatically saved, also designed to change regularly, so the user will have remained anonymous. If the user has any symptoms of COVID-19, the medical team and lab will give the patient a QR code, so the user will be tracked on their phone. The information is an alert for anybody who is in the 1-meter range near the infected, this information will trace the past 14 days [18]. Figure-5 shows the User Interface of the application [19]:

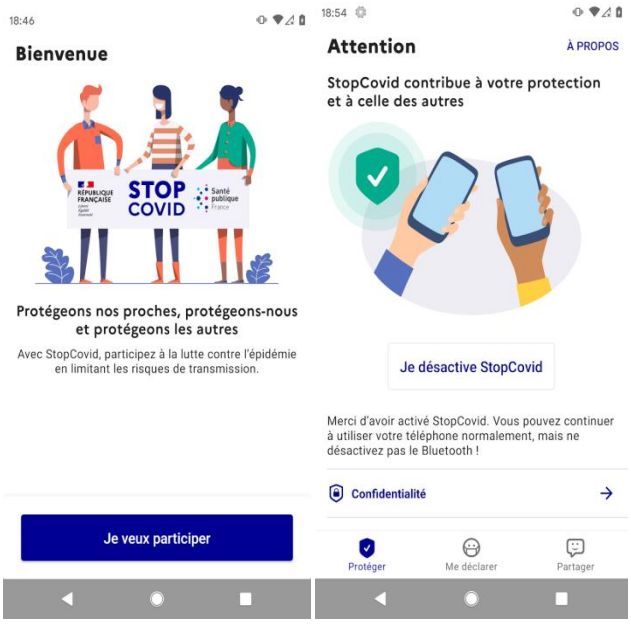

Figure-5. StopCovid France application.

3. IMPLEMENTATION

In order to raise the awareness and knowledge of citizens of Indonesia regarding the COVID-19 Virus in Jakarta, Indonesia, we decided to create an application called Traker. The main functionality of the application is to constantly update the data about the COVID-19 including the number of casualties, the number of infected people, the number of people who have recovered, and also other educational materials such as how to keep ourselves safe from the virus, important numbers that we can dial, etc.

Traker is an application to trace and record the dissemination of coronavirus in Indonesia, this application is devoted to viewing the data in the DKI Jakarta region. Traker chose the Jakarta region because Jakarta is the epicenter of this coronavirus epidemic in Indonesia. Not only that, but Jakarta also is the busiest city in Indonesia.

Traker application is available for mobile platforms such as iOS and Android with main features to trace the development of coronavirus infection with

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accurate data and location. Furthermore, activities of the positive patient of COVID-19 will be traced through GPS in the past 2-3 weeks before the patient is proven to be positive coronavirus, people with close relation toward the patient like family or people who interact with the patient and location visited will be watched thoroughly. GPS (Global Positioning System) is a satellite-based radio positioning, where users can measure the distance from the desired satellite to the antenna as well as with a high degree of accuracy, able to calculate the parameters of position, time, velocity [20]. In general, the GPS tracking technique can be used on smartphones with GPS features and to detect objects in real-time, this technique uses the location of latitude and longitude. This GPS tracking method will be combined with Global System Mobile (GSM) with the carrier frequencies used by the network to broadcast system information [21]. The information broadcast can be about COVID-19 or alert people with ODP (Orang Dalam Pengawasan) status periodically.

Traker application also provides socialization toward the community about important things about COVID-19 like how it spread, or about what to do if someone doing the activity outside their house, about social distancing, and Indonesian government rules like Large-Scale Social Restrictions (PSBB) policy as the main rule especially in the red zone beside the strict rule, PSBB still allow economic activity such as marketplace to be run [22].

Traker also providesa medium for the user to give a report immediately if someone or themselves feeling not well or sick and wanted to check in the nearest hospital or post that provides rapid test and swab test. Traker provides emergency service for anybody who needs medical authorities to come to the user location immediately.

Software Requirement for developing Traker system:

a) **Flutter:** Flutter is a framework that works both for Android and iOS platforms, Flutter is supported by Google. Flutter will be used to design the user interface of Traker [23].
b) **JavaScript:** JavaScript can be compiled inside the user's browser, so, JavaScript can easily be accessed. JavaScript will be used to make the Traker website and mobile application interactive [24].
c) **CSS:** CSS allows us to style the visual of the website (the presentation).CSS will be used to styling the Traker web application in the browser [25].
d) **PostgreSQL:** PostgreSQL is an enterprise-class relational database management system. PostgreSQL is also an application, not just a database. PostgreSQL can be run on multiple programming languages. PostgreSQL will be used to maintain the Traker database [26].

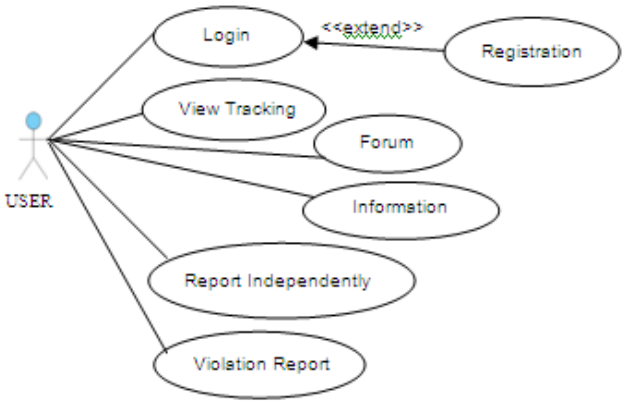

Figure-6. Use case diagram of traker.

Figure-6 shows the use case diagram which has some use case activities such as login, registration, view tracking, forum, information, report independently, and violation report. This use case diagram is related to the class diagram in Figure-7 which is a table database model design and the user interface for all use case activities shows in the next figures. When the user wants to use the systems, then they should do the login and if they are a new user then they should do the registration by inputting user data such as name, address, NIK as Indonesian national citizen number, or extension as Nomor Induk Kependudukan in Bahasa, gender, date of birth, phone email and password as shown in class user in Figure-7.

In Figure-6 the user can see their position in their mobile phone location by view tracking. All users can communicate among them using the forum and use case information that shows any information related to the Covid19 information. Moreover, the user also can do reports independently regarding Covid19's health condition and reporting violations regarding any activities that violate the Covid19 protocol.

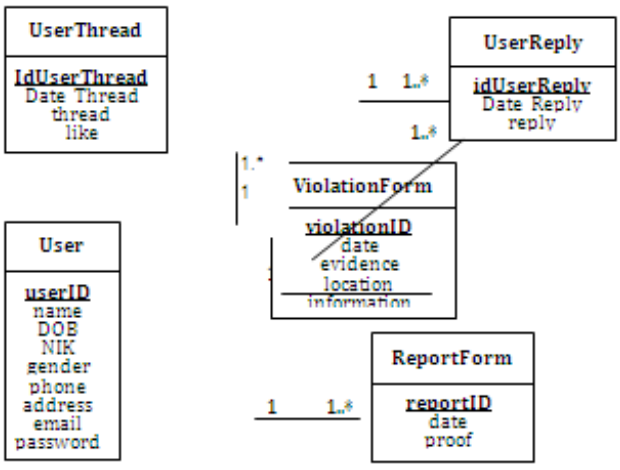

Figure-7. Class diagram of traker.

The class diagram of Traker consists of 5 classes as seen in Figure-7, such as User, UserThread, UserReply, ViolationForm, and ReportForm. These 5 classes are 5

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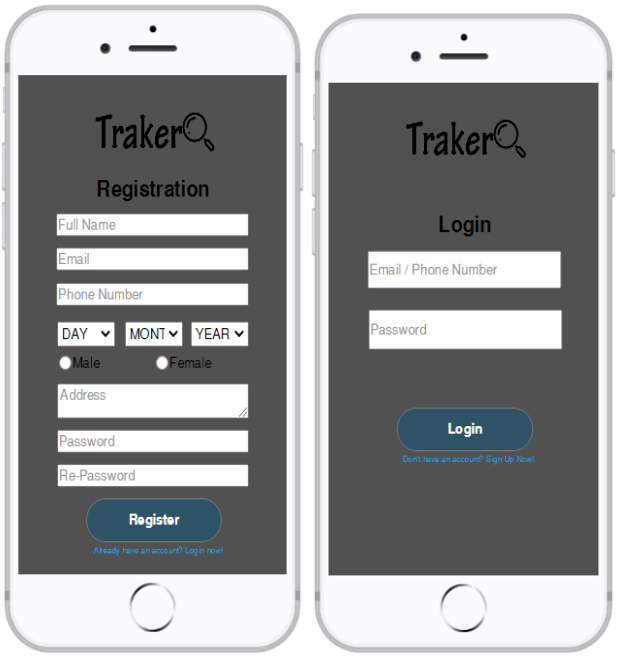
tables database which related to the business process as seen in the use case diagram in Figure-6. Classes UserThread and UserReply are used for forum purposes where each thread in class UserThread can have one to many association reply in class UserReply. Moreover, the user can raise much thread in class UserThread and the user can reply much thread which has relation one to many associations to class UserReply.

Furthermore, class ReportForm is a class that records any report independently raised by the user as seen in the use case diagram in Figure-6 and class Violation Form is a class that records any user's violation report as seen in the use case diagram in Figure-6. The next figures are the User Interface (UI) which views the presentation as screen communication for the user.

Figure-8 (a) is the registration page for users to register and make an account. The registration form needed the user's full name, email, phone number, day of birth, gender, address, and password. Later, users can log into their account using an email or phone number and password as seen in Figure-8(b).

Figure-10(a) shows the tracking page based on GPS of their mobile phone position and shows the interface of tracking function which show COVID-19 growth in Indonesia, especially in Jakarta and total infected and red zone in Jakarta will be shown to the user. This tracking system uses the Application Programming Interface (API) from the ministry of health of the Republic of Indonesia which can be accessed on https://data.kemkes.go.id/covid19/api.html. Figure-9 shows the list of unique identifiers (UiD) that can be used to retrieve the Indonesian Covid19 data such as UiD=SlMC7W5vVRw for the number of active cases, UiD=TAqRuO1R1eI for the number of death cases, UiD=U7BaEXUa1Ii for the number of positive cases, etc. Moreover, Figure-10(b) shows the forum which a tool communication among the user which discusses any comments regarding the application and the COVID19 information, where the user can raise a topic as a thread and many replied can be raised among the users.



(a) (b)

Figure-8. (a) Registration page menu, (b) Login page Menu.

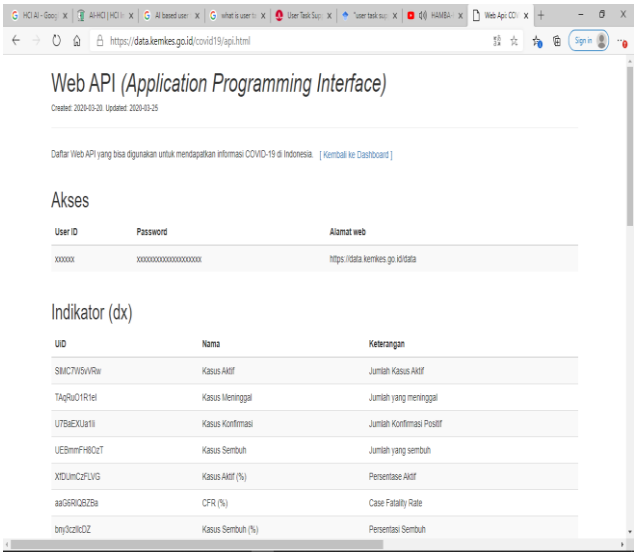


Figure-9. Application Programming Interface (API) on https://data.kemkes.go.id/covid19/api.html

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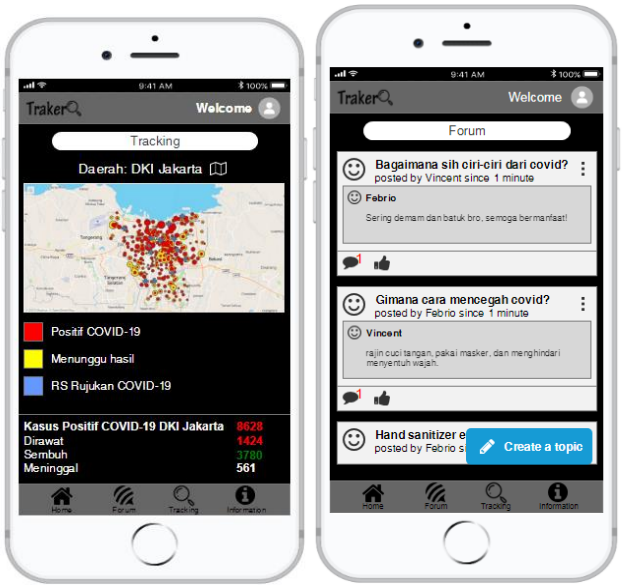
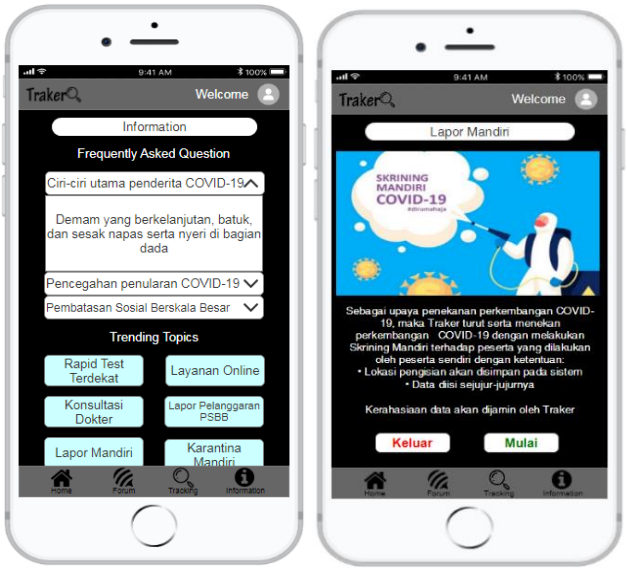


a) (b)

Figure-10. (a) View Tracking page menu, (b) Forum page menu.

Figure-11 (a) isthe information page, in these page users can view frequently asked questions and information about COVID-19, government rules toward large-scale social restrictions, or recognized as Pembatasan Sosial Berskala Besar (PSBB) in Bahasa, and any trending topics. Meanwhile, Figure-11(b) is the report independently page that can be used for the user to report independently regarding their Covid19 health condition and this is responsible for each Jakarta resident in participating in the response to the spread of covid19. This independent report will be used by health workers such as doctors and nurses, includes the Covid19 handling task force in handling and spreading Covid19.



(a) b)

Figure-11. (a) Information page menu, (b) Report independently page menu.

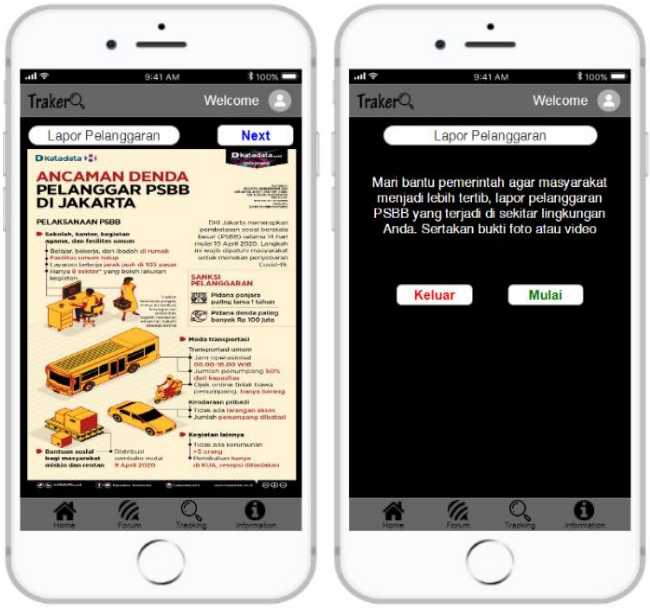


Figure-12. Violation report page menu.

Figure-12 shows the menu where the user can raise a report regarding the violation of large-scale social restrictions or recognized as Pembatasan Sosial Berskala Besar (PSBB) in Bahasa. Any mass gathering activities that could create new covid clusters19 and increase the spread of new ones can be reported by accompanying a photo or video and include the location, date, and time of the incident along with a description of crowd violations and mass gathering.In addition, users can also report any problems that occur in communities around the city of Jakarta, including health problems related to the spread of Covid19. Reporting includes if a person with suspected Covid19 violates self-isolation by disobediently carrying out independent isolation which can lead to an increase in the spread of Covid19 in the communities around where they live in the city of Jakarta.

4. CONCLUSIONS

From this report, we know that COVID-19 is the newly discovered virus that affects the world in many countries and across the continents. The virus is very fast to infect someone and can be dangerous for anyone who has a critical disease before they get infected. The main medium transmission from this virus is from the saliva when the infected cough or sneeze, that is why it is so important to practice social distancing and washing our hands regularly. That is why we want to introduce Traker mobile application for people in Indonesia to keep providing accurate information about coronavirus update in Indonesia, also the feature in Traker hoped can be very useful for the paramedic team and government to prevent coronavirus infection and to stop the virus growth.

Coronavirus type Sars-CoV-2 is the newly discovered virus in 2019 that infects humans; the first transmission happened in December 2019, in Wuhan, China. Sars-CoV-2 or called COVID-19 now is

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categorized as a global pandemic. The main reason for Traker to be developed is to help Indonesia, especially in Jakarta as the epicenter to stop the dissemination and prevent the case from getting worse. Traker provides the best method to trace and record COVID-19 growth by tracking the patient. By using Traker, COVID-19 is easier to be watched and prevented.

ACKNOWLEDGMENTS

This work is supported by the Research and Technology Transfer Office, Bina Nusantara University as a part of Bina Nusantara University's International Research Grant contract number: No.026/VR.RTT/IV/2020 contract date: 6 April 2020.

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