COVID-19 Monitoring Application for Malaysian Armed Forces and National Security Council

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Abstract. The development of geospatial technology plays a significant role in online sharing of geospatial data and virtual updating. The National Security Council (NSC) and the Ministry of Health (MOH) are the two leading agencies responsible for handling Covid-19 pandemic in Malaysia. The government had stringently enforced various schemes and Standard Operating Procedures (SOP) to prevent the spread of the disease. As a support, the Department of Survey and Mapping Malaysia (JUPEM) through its Geospatial Defence Division (BGSP), has developed a Web Geographical Information System (GIS) application using its Defence Geospatial Information Management (DGIM) platform. A collaboration of geospatial data services has been made among government entities and security agencies in providing the latest information on COVID-19. JUPEM has also developed a Joint Common Operating Picture (JCOP) application for the NSC and Malaysian Armed Forces (MAF) to strengthen its efforts to monitor and to avoid spreading the virus any further.

1. Introduction
The World Health Organization (WHO) has declared Covid-19 as a Public Health Emergency of International Concern (PHEIC) on January 2020 and a world pandemic on March 2020. On 25th January 2020, Malaysia is not spared of this dreaded disease when its first case had detected from a Chinese tourist. Thereafter, it began its upward spiral in ever-increasing numbers. As is known, COVID-19 is spreading through water droplets from coughing or sneezing of the victim, touch, close contact and self-contaminated hands. As a preventive measure, the government immediately imposed Movement Control Order (MCO) to mitigate the spread of Covid-19 on 18th March 2020. Besides MCO, several Standard Operating Procedures (SOP) were introduced as preventive measures, including educating the public of the danger of Covid-19, usage of hand sanitising and facial mask, social distancing and other awareness to break the infection chain. All the confirmed patient are being isolated and treated in designated hospital while individuals returning from an affected country are being quarantined. Those who have been in contact with Covid-19 patients also tested and quarantined to break the spread.

2. COVID-19 Dashboard
As the national geospatial lead agency, The Department of Survey and Mapping Malaysia (JUPEM) via its Geospatial Defence Division (BGSP) took the initiative to develop a Web Geographical Information System (GIS) dashboard application to provide up-to-date and interactive information on COVID-19
cases in Malaysia. The information was gathered from related government entities, such as National Security Council (NSC), Ministry of Health Malaysia (MOH) and Malaysian Armed Forces (MAF). This Covid-19 Dashboard is currently being used by the NSC at their National Operation Management Centre (PPON) as a reference throughout their mitigation task. The Dashboard provides information on current and previous records and statistics on positive cases, recoveries, death, hospitals, quarantine stations, red zones, cases of spread and etc.

![Dashboard application](image)

**Figure 1.** Dashboard application.

3. **Joint Common Operating Picture (JCOP)**

BGSP further developed a web map application called Joint Common Operating Picture (JCOP) where shared data, statistics and analysis results from various agencies are displayed. This greatly helped NSC and MAF to prepare, plan and execute policies to fight the advancement of Covid-19. Figure 2 shown JCOP application with data from various agencies. A trial run has been carried out for area under Kajang sub-district. It has proven that JCOP can make fast and accurate predefined analysis. It gives a visual overview which helps operational planning by enforcement agencies.

![Joint Common Operating Picture application](image)

**Figure 2.** Joint Common Operating Picture application.
In addition, JCOP is capable of monitor the movement for Person Under Investigation (PUI) and Person Under Surveillance (PUS). PUI is individual having symptoms and risk being infected while PUS is individual having risks of infection. Monitoring of PUI and PUS are critical as these groups are considered having a high risk of being infected. Through this application, PUI or PUS can be closely observed and prevented from moving out of their confined areas.

4. Methodology
The development of the Dashboard and JCOP is in 3 phases.
   a) Phase 1: Data collection
   b) Phase 2: Data cleaning
   c) Phase 3: Development of applications

4.1. Phase 1: Data Collection
Data sourced from various agencies as listed in Table 1. The data can be a onetime submission or live streamed data in the form of web feature or map services. BGSP through its DGIM Portal using ESRI’s ArcGIS platform for data population and application development. As such, most of the data have been shared in shapefiles and geodatabase format. Nevertheless, some data are given in other formats, even in non-GIS format. These data have been converted to make them compatible.
### Table 1. Agencies and data provided.

| No | Agency                                                                 | Data Provided                                                                 |
|----|------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| 1  | Defence Geospatial Division (BGSP), JUPEM & Malaysia Center for Geospatial (PGN) | Geospatial: Boundary & Localities, Point of Interest (POI) – Education, Emergency, Community etc |
| 2  | Ministry of Health Malaysia (MOH)                                      | Statistics & Information of COVID-19 (Positive, PUI & PUS)                     |
| 3  | Malaysian Administrative Modernisation Management Planning Unit (MAMPU) | CityDash Application (Big Data Analytics) Mobile Advertisement ID (MAID)      |
| 4  | National Disaster Management Agency (NADMA)                            | Statistics & Information of Quarantine Centre                                  |
| 5  | Department of Statistic Malaysia (DOSM)                                | Information of Population Demography, (Statistics, Profession, Age, Race etc) |
| 6  | Election Commission of Malaysia (SPR)                                  | Information of Localities & Statistics of Voters                              |
| 7  | National Registration Department (JPN)                                 | Individual Information                                                        |
| 8  | Ministry of Higher Education (MOHE)                                    | IPTA, IPTS, Staff, Students Information                                        |
| 9  | Ministry of Education Malaysia (MOE)                                   | Schools, Teachers & Students Information                                       |
| 10 | Ministry of International Trade and Industry (MITI)                   | Approved Business, Companies that applying for Operation                      |
| 11 | Companies Commission of Malaysia (SSM)                                | Registered Companies                                                          |
| 12 | Inland Revenue Board of Malaysia (LHDN)                               | Individual & Registered Companies Information                                 |
| 13 | Employees Provident Fund (EPF)                                        | Employer-Employees Information                                                |
| 14 | Department of Social Welfare (JKM)                                     | Complaint Report MCO, Welfare Care Centre                                     |
| 15 | Volunteers Department of Malaysia (RELA)                               | RELA members                                                                   |
| 16 | eKasih, Unit Penyelarasan Pelaksanaan (ICU)                            | Group of B20                                                                   |
| 17 | Immigration Department of Malaysia (JIM)                               | Foreign Teacher - Tahfiz School                                                |
| 18 | Kajang Municipal Council (MPKJ)                                       | Land Use, List of Park, Business Premises, Factory, Public Markets, Tahfiz School |
| 19 | Ministry of Transport (MOT)                                           | Used of Public Transport, MRT Route                                            |
| 20 | SMART Selangor                                                         | SMART Route                                                                    |

Figure 4 shows the conceptual data collaboration to achieve a sharable content from various agencies through DGIM portal.
4.2. Phase 2: Data Cleaning
Data cleaning is the process of preparing data for analysis by removing or modifying data that is incomplete, irrelevant, duplicate or improperly formatted. In this stage, coordinates systems of data have been standardised to conform to the national datum of GDM2000. The data cleaning process involved lots of manual intervention before a uniform set of data is prepared and ready for use.

4.3. Phase 3: Development of Application
As mentioned earlier, the development of Web GIS Dashboard and JCOP is using ESRI’s ArcGIS platform. Firstly, a web map with various feature layers is created. Then, the data layers hierarchy and their corresponding cartographic symbologies and enhancements are applied. Lastly, the Dashboard and JCOP web map application are created using built-in tools in ArcGIS Portal. The design, layout and content of the Dashboard and JCOP are customised to suit the requirement of NSC and MAF accordingly.

5. Results
The developed Dashboard and JCOP are proven as effective mediums to disseminate geospatial information in a single platform. The applications facilitate collaboration, sharing and integration of data among various agencies in sharing and assessing online data. This has subsequently reduced manpower, energy and time consumption in our fight against Covid-19. NSC has harnessed JCOP’s capabilities in planning for a more effective strategy to combat the pandemic. The police and MAF are tasked to man and guard roadblocks and locked down areas during this pandemic. JCOP has been a very useful tool for them to organise and monitor their strategies and manpower.

Figure 4. Data collaboration with other organizations.
6. Discussion
The development of Dashboard and JCOP applications bring many advantages and benefits to its user especially NSC and MAF. Nevertheless, few issues have to be ironed out to ensure its efficiency. Among the issues brought up are data privacy and human right. As we know, JCOP application shares PUI and PUS location data. It could lead to intrusion of personal data and interference of personal privacy. This brings up the question of breach of personal data privacy under the Personal Data Protection Act 2010. Next, the data could be abused for harmful intentions. The fear of data abuse for other criminal purposes and sale for benefits arises. Officers who handle such data must have high integrity, righteous, honest and able to protect it from exploitation.

7. Recommendations for Improvement
Covid-19 Dashboard and JCOP application has been functioning well and it provides accurate and up-to-date data. As an improvement, it could be integrated with MySejahtera. MySejahtera is an application developed by the government to assist in controlling the transmission of Covid-19 which allow self-assess by the user. At the same time, it helps MOH to get the early data for a quick response.
Therefore, the integration of these applications will be value-added and enrich each other in providing more comprehensive and informative information.

8. Conclusion
The development of the application was well-received by all the agencies involved in the fight against Covid-19. The challenge to share information derived from different data formats among agencies, which were critical, was overcame so that accurate analysis can be achieved. Prior to development of this platform, different agencies will have to work on different working platforms. With the existence of these applications, the discrepancies were addressed and data sharing efficiency has been accomplished. It has been proven, without doubt, and highly recommended that the Covid-19 Dashboard and JCOP application are used extensively to counter the Covid-19 threat. These applications have also shown that data from various agencies can be integrated into one platform and provide a clearer picture to the top management in for their decision-making process.

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