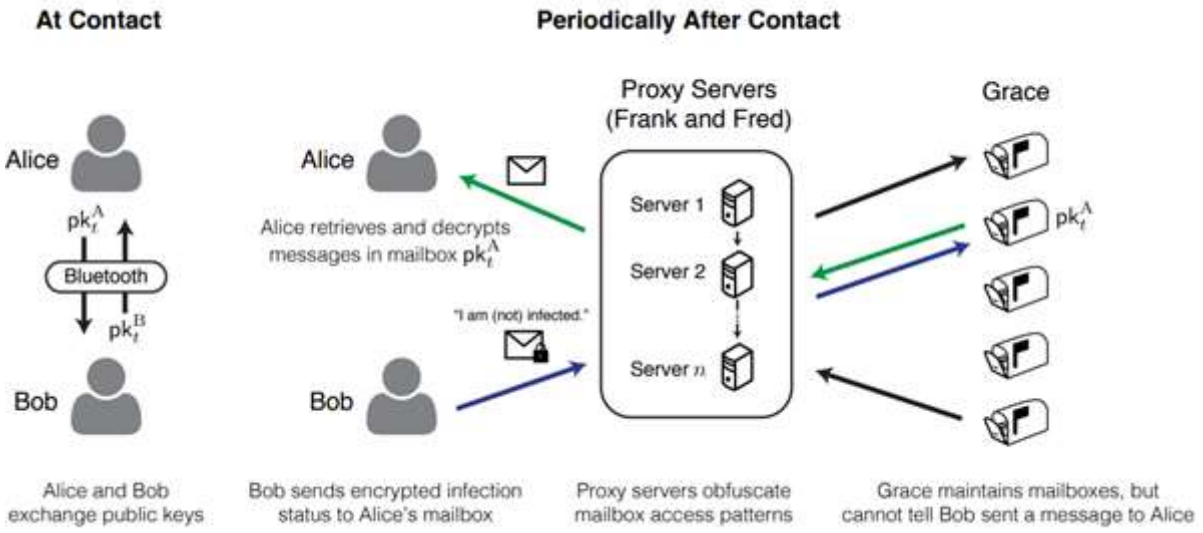
Notes Literature – Ries

Looking at the state-of-the-art technology of mobile applications in order to fight the spread of the COVID-19 pandemic, there is one development in particular which seems to be heading in the same and right direction as this very project. There are several mobile applications which are trying to tackle the spread of the COVID-19 pandemic and therefor make us of contact tracing [b]. The mobile application TraceTogether is possible the best mobile contact tracing application related to the current pandemic [a].
Not only contact tracing is of great importance, privacy is of equal value, perhaps even more. TraceTogether, however, has serious privacy concerns with respect to the Singapore government [a]. The app shares data by exchanging tokens between nearby phones via a Bluetooth connection. Should an individual be diagnosed with COVID-19, the health organizations will ask the user to release their data, which consists out of this list of tokens gathered from nearby phones [a].

Figure 1 : Overview of contact tracing based on private messaging systems. When Alice and Bob are near each other they exchange public keys as tokens. They then periodically encrypt (using each other's public key, followed by the public keys of the proxy servers) a message indicating their infection status, and send it to the proxy server. They also periodically query the proxy server for messages posted to the mailboxes corresponding to their public keys to find out whether they have been exposed to the virus [a].



When infected however, the app provides little to no privacy [a]. Their privacy is violated in several ways. Cho, Ippolito and Yu (2020) discussed three notions of privacy: (i) privacy from snoopers, (ii) privacy from contacts, and (iii) privacy from the authorities [a]. Privacy from the authorities is the largest issue being discussed and of the most value to the project regarding privacy.
TraceTogether is mainly relying on the high trust of the Singapore inhabitants in the government. When the data is being shared with the government, mobile phone numbers of all individuals with whom the infected user has been in contact with, can be retrieved by the authorities themselves. Neither the infected user, nor the other individuals, have any privacy from the government [a].
According to Cho, Ippolito and Yu (2020), there is no such way as perfectly privacy from the authorities, however the best way to guarantee the highest privacy is by making use of a possible private messaging system [a], in which the information of the user is being kept from the authorities. Introducing a messaging system which sends messages which make several stops before reaching any of the authorities. The users will be able to decrypt messages from other users by using a public key which have been exchanged while in contact with each other. The message is directly send to proxy servers which will obfuscate

mailbox access patterns so any information regarding the user who send a message to another user is discarded [a]. See figure 1 for a visual representation of the scenario presented above. As long as one of the servers is breached, the message cannot be linked to a specific sender [a].
Ultimately, in order for the app to go 'viral', it requires the users trust and enthusiasm to install the app. "App adoption must have a higher 'transmission rate' than the virus itself" [a]. By mixing in non-governmental entities, such as an academic institution or hospitals, it may increase the users trust and thereby "lower the bar for adoption" [a].

Knowing when two mobile application users have been in contact with each other can be achieved by using a Bluetooth connection. Ionescu et al. (2014) have investigated the use of Bluetooth Low Energy (BLE) [c]. In their study, BLE is used in order to retrieve lost objects by making use of tags and readers [c]. The system uses StickNFind beacons [c], which sends out a data signal every one hundred milliseconds when paired with another device. In context of contact tracing [b], this may not be as convenient as in the current implementation. However, there could be more investigation into the possible uses of BLE in combination with contact tracing and how this might be more efficient than the method used by the TraceTogether [a] mobile application.

The mobile application should be ready to hit the mobile app stores and therefor it must have lowered the bar for adoption [a]. One way in order to make the application more attractive for download, is to make use of a user-friendly interface. Díaz, López and Fons (2001), introduced a new methodological approach for requirements engineering [d].
By making use of Use Case Models (UCMs) and Message Sequence Charts (MSCs), the method functions as a support tool for Unified Modelling Languages (UML) [d]. Use Case Models are especially of value, as they constitute a complete course of interaction that takes place between an actor and the system [e]. The approach captures requirements of the user using UCMs by using a functional style [d].

Any actual data and numbers regarding the spread of the current COVID-19 pandemic can be found on [f].

Referencing:
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[c] Ionescu, G., de la Osa, C. M., & Deriaz, M. (2014). Improving distance estimation in object localisation with bluetooth low energy. SENSORCOMM, 2014, 45-50.
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