Contact Tracing Interoperability Recommendations

Authors and Contributors: Ellie Daw, Scott Leibrand, Jenny Wanger, Andreas Gebhard, Nele Quast, Desmon Walker

May 1, 2020
Version 1.2

Purpose

The TCN Coalition supports apps who are building privacy-first, decentralized solutions for exposure notification in support of the fight against COVID-19. Experts have stated that contact tracing app usage must be 60% or greater[1] in order to be effective, which equates to an 80% adoption rate by smartphone users[2]. In order for the various apps to collectively achieve such adoption numbers, it is paramount that cross-application interoperability is achieved.

This document describes foundational recommendations that should be implemented by organizations to support interoperability. It does not enforce nor define architectural or technical specifications, but rather defines foundations which leaves such choices open for organizations and protocol coalitions to define to fit their needs.

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[1] "Our models show we can stop the epidemic if approximately 60% of the population use the app, and even with lower numbers of app users, we still estimate a reduction in the number of coronavirus cases and deaths." Digital contact tracing can slow or even stop coronavirus transmission and ease us out of lockdown from the University of Oxford Research.

[2] "The team estimates that 56% of the general population must use the app to halt the outbreak. Prof Fraser said that equated to 80% of all existing smartphone owners, based on data from Ofcom." Coronavirus: NHS contact tracing app to target 80% of smartphone users from the BBC.

User Experience

Interoperability should preserve the User Experience (UX) of each application that participates. Each app should be able to see compatible apps via Bluetooth, exchange the data prescribed in the implemented protocol, and check exposure via an API endpoint. The app should notify the user of potential exposures identically whether the potentially infectious user was using the same app or another compatible app. If a user needs to report symptoms or a positive test, they will do so via their own app's mechanisms, and other apps should retrieve that information.

To that end, the TCN Coalition recommends the following maximally flexible, minimally prescriptive approach to interoperability between compatible Bluetooth Low Energy (BLE) proximity-based contact tracing apps:

Between Compatible Implementations

Two apps implementing the same protocol are not automatically interoperable. In order to enable interoperability between compatible implementations, i.e. apps that implement the same protocol, our recommendations are as follows:

Common API Specification

In support of widespread adoption as a requirement for contact-tracing to slow the spread of COVID-19, it is important that various applications are able to interoperate and share private data. In order for this to be realized, each application must adhere to a common API to allow various organizations to fetch positive test keys.

We do not recommend mandating certain backend architectures or certain implementation styles. Organizations may develop their backends however they deem fit while making test result data available to other approved applications in an expected way.

For example, a TCN-protocol-compatible application may support the following API endpoint. This makes available the positive reports and allows other TCN-protocol-compatible apps to access the endpoint without specifying software design choices to do so.

Note: This is for illustrative purposes and is not an official reference for TCN-protocol API endpoints.

HTTP Method	Endpoint	Description
GET	/tcn/report	Returns a list of signed TCN-protocol reports ('rvk || tck_{j1-1} || le_u16(j1) || le_u16(j2) || memo') concatenated together for a given time interval number.

Similarly, an app compatible with the Apple/Google Exposure Notification API might support[3] a `diagnosiskeys` endpoint that returns the keys to be provided to the OS API for exposure matching.

Note: This is for illustrative purposes and is not an official reference.

HTTP Method	Endpoint	Example Output
GET	/v1/diagnosiskeys	[{"dayNumber":18375,"keyData":"c2l3NjU0ZGxma2hqdDQ1Ngo="},{"dayNumber":18376,"keyData":"MTEyMjU0ZGxma2hqdDQ1Ngo="}]

Detailed protocol specifications which define API endpoints, data formats, and other relevant information must be made available by each protocol so that organizations are able to implement adherent apps.

Approved App Registry

With all compatible apps implementing a common API, there must be a trusted registry of approved apps. This registry would make available a list of URIs of other approved applications who adhere to the common API specification. This provides availability of positive infection reports to the various compatible apps. Each member app will be responsible for fetching the reports from relevant endpoints in order to enable their application to perform exposure matching. Our recommendations do not enforce architectural choices such as whether to implement server-side download of reports or client-side download of reports. A common API and a registry are flexible enough to support both.

This approach does not dictate that every app must fetch reports from every other app, but rather makes approved app endpoints available. It is expected that some apps that allow self-reporting of symptoms will choose to use all other compatible reports. Other apps that only allow matching on signed reports of positive COVID-19 tests may choose to only match on reports from a subset of compatible apps, who may have established relationships with local, regional, or national health authorities to authenticate such reports. The app registry will provide information about how the included apps are generating their reports so that each development team can make its own choice regarding what information to include or exclude. For those on the Apple/Google protocol, such apps can choose to access all data from other apps and then filter by risk score in terms of deciding next steps.

Transparent Mission

In order for each application to make an informed choice about which other compatible applications it will choose to interface with, we recommend that each app at minimum makes available their mission and their reporting criteria. These items are in addition to the

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[3] https://github.com/bhushanRamnani/apple-google-diagnosis-server-aws

transparency about data collection, usage, and sharing that we recommend each protocol makes available.

Parallel Implementation of Incompatible Protocols

Different protocols for COVID-19 exposure notification are under development, and each may serve a different purpose. For example, there are protocols designed for use by public health organizations such as the protocol from Apple and Google[4], as well as protocols designed to be open-source for use by various entities such as TCN[5] and DP-3T[6]. In order to mitigate the risk of fragmenting the required 80% of smartphone users who must download a contact tracing app, or dampening the outcomes of one protocol's mission, our recommendations are as follows:

Allow Support for Multiple Protocols

Interoperability in support of multiple protocol missions can be achieved by implementing an app that is able to run multiple protocols in parallel. At minimum, this will require an app to be able to listen for bluetooth beacons from each protocol they support, and be able to perform the exposure matching operations for each protocol they support.

This will allow an app to display exposure alerts that are detected by any of the supported protocols. It will be up to each organization which protocol(s) will be supported by their app based on their mission and goals.

Further, we recommend that the various protocol teams collaborate in order to leverage common code components. Having this development effort occur in the open-source community will both enable global contribution and allow code availability for global teams. This will lessen the amount of duplicate code required to achieve such a goal within one single application.

Conclusion

In order to achieve the goal of slowing the spread of COVID-19 using exposure notification apps, interoperability is critical. Knowing we must attain 60% participation means that we cannot risk fragmenting the market of smartphone users with apps that are incompatible. The TCN Coalition believes the appropriate foundational approach to interoperability between various COVID-19 contact tracing apps includes having apps adhere to a common API, hosting an approved app registry, maintaining a transparent mission, and having the ability to support multiple protocols.

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[4] https://www.apple.com/covid19/contacttracing
[5] https://github.com/TCNCoalition/TCN
[6] https://github.com/DP-3T/documents