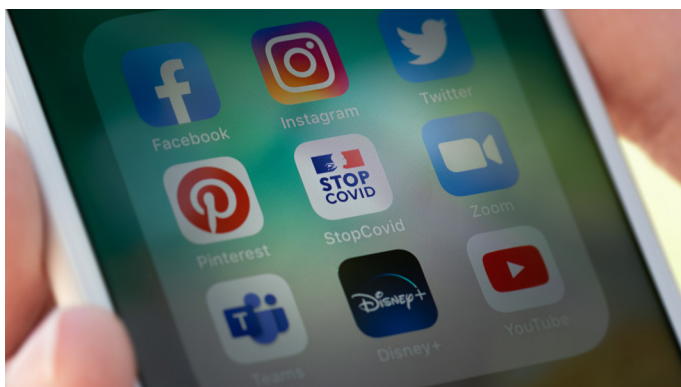


COVID-19: The Internet of Things and Cybersecurity

Prepared by Fredrik Skippervold and Dr Catherine Wheller



The COVID-19 pandemic has inspired a range of Internet of Things (IoT) innovations to help stop the spread of the virus. This is the eleventh edition of COVID-19: IoT and Cybersecurity.

Past editions are found on the [PETRAS website](#).

The UK's approach to digital contact tracing has switched from a centralised system to working within a decentralised system

On 18 June, a day after NHSX's Matthew Gould and Geraint Lewis (lead managers) decided to step back from the project, the BBC [reported](#)¹ that work on the NHSX's centralised contact tracing app would shift to working with the privacy-preserving [exposure notification framework](#)² developed by Apple and Google. Simon Thompson - a former Apple executive - is joining to manage it. With respect to the timing, the Minister for Innovation at the Department of Health and Social Care has said, 'We are seeking to [get something going for the winter](#), but it isn't the priority for us at the moment'.³

Dr Michael Veale from the DP3T group welcomes the change despite it being 'heavily and unnecessarily delayed'.⁴ The Ada Lovelace Institute has also [praised the decision to delay the app's launch](#), stating that 'pausing now to reconsider the best path is not only necessary to allow for readjustment to address problems, but critical to preserving future public trust and confidence in public health approaches that involve technology'.⁵

Overview

- The UK's approach to digital contact tracing shifted from a centralised app to working within the framework set by Apple and Google
- The move has been praised, however, experts say that the move was unnecessarily delayed
- Reports note that there are still technical complications with estimating distance
- Android phones and iPhones in the UK now have access to the COVID-19 notification setting
- Ireland will shortly release its app subject to government approval
- EU Member States have agreed to technical specifications on interoperability
- The French app may be collecting more data than previously announced
- Women's support charities warn that contact tracing apps could be turned into tools for domestic abuse
- Amnesty International has published a technical analysis of contact tracing apps
- The Ada Lovelace Institute has begun monitoring the use of systems for verifiably sharing private health data relevant to public health concerns
- UK's Centre for Data Ethics and Innovation has published a 'system-wide view of how AI and data are being used across the UK'

This switch does, however, bring complications to distance calculations. In the government's [press release](#) on 18 June, the Department of Health and Social Care admits that 'there is still more work to do on the Google/Apple solution which does not currently estimate distance in the way required'.⁶ The BBC [reported](#) that 'in some instances, it could not differentiate between a phone in a user's pocket 1m away and a phone in a user's hand 3m away'.⁷

Following a recent update, new COVID-19 notifications [have appeared](#)⁸ on Android phones and iPhones in the UK.

Ireland is almost ready to deploy its decentralised app

Ireland's health authority has made plans to submit a memo to the government this week and 'subject to approval' would [release their contact tracing app shortly after](#)⁹.

The app has been designed to support UK mobile numbers, which means that visitors from Northern Ireland and Great Britain can use it when in Ireland. The app has undergone two trials, with the An Garda Síochána police force and on a [commuter bus](#). The bus trial found that metal in the vehicle's structure and fittings caused problems with reliable proximity-detection.¹⁰

The Health Service Executive has [pledged to publish the app's source code](#), along with technical documentation and a Data Protection Impact Assessment, before any launch.¹¹ An [open letter](#)¹² signed at the end of April by the civil society representatives, scientists, and academics calls for public scrutiny of these documents.

Technical specifications for interoperability agreed in the EU

Most Member States in the EU have launched contact tracing apps to complement manual contact tracing. The majority of these apps are decentralised, with the risk computation performed entirely on the phone, rather than on a central server.

On 16 June, with [support](#)¹³ from the European Commission, Member States have agreed to [technical specifications for interoperability](#)¹⁴ that will allow digital contact tracing to take place across Member State borders. This means that users travelling between countries do not need to download multiple country-specific apps.

The Commission has proposed a ready-to-implement [Federation Gateway Service](#) to connect all the backends behind the different national apps. The Federation Gateway Service is compatible with the DP3T system.¹⁵

However, EU Member States which have chosen to develop apps that store data centrally, such

as France, may not be interoperable. The [vice-president of the EU Commission told the French parliament](#) that, 'It's somewhat more tricky to develop the technical standards for interoperability between decentralised systems...and the centralised system that France has been aiming for'.¹⁶ The French development team is working on it, according to the CEO of Inria and there are [plans to implement a proof of concept](#) to be released during the first half of July.¹⁷

The French app is facing further issues

The French contact tracing app StopCovid has been activated 1.8 million times. Over the past three weeks, [only 68 StopCovid users have declared a positive COVID-19 diagnosis to the app](#). From these cases, the server received 205 interactions, and sent 14 notifications.¹⁸

The technical function of the centralised French app, StopCovid is [different from what was announced by the government during development](#). The government announced that the app would only send information on contacts where the exposure was within three feet for more than 15 minutes. A cryptography researcher has found that the application is sending more data back to the central server than expected, including when two people cross paths at several meters and for less than 15 minutes. There are possible political, legal, administrative, and technical issues here, as the validated application is not the one that is currently available for download.¹⁹

RAPT, the Paris metro authority began [testing its CCTV software to detect how many people are wearing face masks on its transport system](#)²⁰ on 6 May. The [start-up involved](#)²¹ stated that the technology will not be used to fine people who are not wearing masks, and instead will allow monitors to access a dashboard showing a proportion of riders believed to be wearing masks. The French government body in charge of privacy has raised concerns that this technology could be used to identify people, and that the data would come under the remit of the GDPR. The experiment was [temporarily suspended](#) on 12 June to address these concerns.²²

COVID-19 contact tracing apps could be turned into tools for domestic abuse

A joint [white paper](#)²³ by women's support charities in the UK warn that [if strong privacy protections are](#)

[not built into contact tracing apps, domestic abuse could be exacerbated](#). Risks include ‘perpetrators [who] may make fraudulent claims that they have been in contact with survivors in order for them to be asked to self-isolate unnecessarily’ and who ‘may also pose as contact tracing staff and make contact with victims [or] survivors requesting they self-isolate or requesting personal information.’ Apps that require location services to be turned on, even if not collecting location data, could risk exposing the location of a survivor if a perpetrator has installed spyware onto a survivor’s phone.²⁴

Amnesty International’s technical analysis of contact tracing apps

Amnesty International [published](#) its [Security Lab](#)²⁵ findings on 16 June after a detailed technical analysis of 11 countries’ contact tracing apps. The report concludes that Bahrain’s BeAware Bahrain, Kuwait’s Shlonik and Norway’s Smittestopp apps ‘stood out as among the most alarming mass surveillance tools assessed by Amnesty, with all three actively carrying out live or near-live tracking of users’ locations by frequently uploading GPS coordinates to a central server’.²⁶

Norway puts its app on pause

Amnesty International [notified the Norwegian Ministry of Justice and Public Security, the Norwegian Institute of Public Health and the country’s data protection agency of the Security Lab findings](#)²⁷ prior to publication. On 15 June the Norwegian Institute of Public Health [announced](#) that ‘all data collected by the Smittestopp app will be deleted and further collection will cease after a notification of a possible, temporary ban from the Norwegian Data Protection Authority’.²⁸ The head of Amnesty International’s Security Lab is happy with the decision in Norway and urges ‘the Bahraini and Kuwaiti governments to also immediately halt the use of such intrusive apps in their current form’.²⁹

Bahrain adds in an ‘opt out’ function to its app which links contact details with a reality TV show

Bahrain’s contact tracing app, [BeAware](#)³⁰, was linked to a national television show ‘Are You at Home?’. 10 phone numbers collected from the app were randomly selected every day using a computer programme, and those numbers were called live on air to check if the app users were at home. If you were home you won a prize. Although

initially mandatory, Bahrain’s Information and eGovernment Authority [has made it possible to ‘opt out’ from participation in the show](#).³¹ Officials say that [11,000 individuals have been alerted through the app](#) and prioritised for testing, of which more than 1,500 have tested positive.

The [digital protection co-ordinator](#)³² for the human rights group Front Line Defenders, [states his concerns](#) that ‘if privacy is violated in a country like Norway, I can resort to regional tools such as the European Court of Human Rights and European Committee of Social Rights. But in our region there is not any such tool. On the contrary, resorting to local authorities may present an additional risk’.³³

Kuwait introduces restrictive quarantine restrictions using an app and a bracelet

Both the Bahraini and Kuwaiti apps require users to register with a national ID number, making it very easy to link personal information to an individual.

Both apps can also [pair with a Bluetooth bracelet](#) which is used to make sure the user remains in the vicinity of the phone, in order to enforce quarantine measures.³⁴ The Kuwait app, [Shlonik](#)³⁵, regularly checks the distance between the Bluetooth bracelet and the device, uploading location data every 10 minutes to a central server. The Ministry of Health can contact users if a breach of quarantine is detected, and ask the user to send a live photo to check the user’s location. These [measures have been put in place](#) as Kuwait begins repatriating citizens from abroad³⁶.

Canada has announced trials of a decentralised contact tracing app

On 18 June, Canadian Prime Minister Justin Trudeau [announced a decentralised contact tracing app](#), COVID Alert, utilising the Apple and Google API. The app is built on [COVID Shield](#)³⁷, an [open sourced tool](#)³⁸ developed by a group of volunteers from Shopify. The app will be deployed in Ontario first, with current estimations of a release date of 2 July. The app will undergo a security review by BlackBerry. The Federal Privacy Commissioner’s office said it is still waiting for more information about the app.³⁹

Germany Corona-Warn-App update

The German [Corona-Warn-App](#) became available for download last week. The app uses the Apple

and Google API. It has been [downloaded 12.2 million times](#) as of 23 June.⁴⁰

The project overview, general documentation, and white papers can be found on [GitHub](#)⁴¹.

Spain app update

On 17 June authorities in Spain announced they will [trial a new app on La Gomera](#) in the Canary Islands, before deciding whether to roll it out nationwide. La Gomera is a small island with approximately 22,000 inhabitants. The app will be decentralised and follow the standards set by Apple and Google.⁴²

Monitoring progress on antibody certificates

On 22 June, the Ada Lovelace Institute launched a page to [monitor systems for verifiably sharing private health data relevant to public health](#)⁴³ (for example, health status apps and digital antibody certificates). The page will be updated on a regular basis.

The Parliamentary Office of Science and Technology is producing rapid-response content on COVID-19. They released an [analysis on antibody tests for COVID-19](#)⁴⁴ on 16 June which includes an analysis on immunity certificates. [The Scientific Pandemic Influenza Group on Behaviours \(SPI-B\) provided recommendations](#)⁴⁵ to the government to maximise the benefits of antibody testing while minimising potential harms.

How has COVID-19 changed how AI and data are used across the UK?

The UK's Centre for Data Ethics and Innovation has published a 'system-wide view of how AI and data are being used across the UK' called the [AI Barometer Report](#). The report includes a section on 'How has COVID-19 changed the Outlook?' and includes information on how AI has supported the immediate healthcare response, the public health response, mitigating the effects of lockdown, and building future resilience. The report notes technical trends and states that 'it will take some time for evidence to emerge of how beneficial or problematic particular approaches have been in responding to the impacts of the pandemic'.⁴⁶

How to 'do ethics with urgency'?

Researchers at the Centre for the Study of Existential Risk argue the importance of using ethics with urgency in a new *Nature Machine Intelligence* [article](#). The authors suggest that ethics with urgency must at a minimum incorporate: (1) the ability to think ahead rather than dealing with problems reactively, (2) more robust procedures for assuring the behaviour and safety of AI systems, and (3) building public trust through independent oversight.⁴⁷

Endnotes

- 1 <https://www.bbc.com/news/technology-53095336>
- 2 <https://www.google.com/covid19/exposurenotifications/>
- 3 <https://www.bbc.co.uk/news/technology-53083340>
- 4 <https://www.bbc.com/news/technology-53095336>
- 5 <https://www.adalovelaceinstitute.org/turn-it-off-and-on-again-lessons-learned-from-the-nhs-contact-tracing-app/>
- 6 <https://www.gov.uk/government/news/next-phase-of-nhs-coronavirus-covid-19-app-announced>
- 7 <https://www.bbc.com/news/technology-53095336>
- 8 <https://conversation.which.co.uk/technology/coronavirus-app-settings-screen-software-framework/>
- 9 <https://www.bbc.co.uk/news/technology-53137816>
- 10 <https://www.scss.tcd.ie/Doug.Leith/pubs/bus.pdf>
- 11 <https://www.rte.ie/news/coronavirus/2020/0530/1143516-covid-app-hse/>
- 12 <https://www.iccl.ie/news/hse-app-experts-and-public-need-to-see-details/>
- 13 https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1043
- 14 https://ec.europa.eu/health/ehealth/key_documents_en#anchor0
- 15 https://ec.europa.eu/health/sites/health/files/ehealth/docs/mobileapps_interoperabilitydetailedelements_en.pdf
- 16 <https://www.france24.com/en/20200617-france-s-covid-19-tracing-app-hard-to-link-to-others-eu-official-says>
- 17 <https://techcrunch.com/2020/06/23/french-contact-tracing-app-stopcovid-has-been-activated-1-8-million-times-but-only-sent-14-notifications/>
- 18 <https://techcrunch.com/2020/06/23/french-contact-tracing-app-stopcovid-has-been-activated-1-8-million-times-but-only-sent-14-notifications/>
- 19 <https://www.numerama.com/tech/631458-stopcovid-a-ete-lance-alors-que-meme-la-cnll-ne-savait-pas-comment-lapp-fonctionnait.html>
- 20 <https://www.bloomberg.com/news/articles/2020-05-07/paris-tests-face-mask-recognition-software-on-metro-riders>
- 21 <https://www.datakalab.com/detection-de-masque>
- 22 <https://uk.reuters.com/article/us-health-coronavirus-france-privacy/french-watchdog-warns-against-covid-19-smart-surveillance-idUKKBN23O2T7>
- 23 <https://www.womensaid.org.uk/recommendations-for-the-hidden-harms-action-plan/>
- 24 <https://www.forbes.com/sites/thomasbrewster/2020/06/19/warning-covid-19-contact-tracing-apps-could-be-turned-into-tools-for-domestic-abuse/#2b8486e8e736>
- 25 <https://www.amnesty.org/en/tech/>
- 26 <https://www.amnesty.org/en/latest/news/2020/06/bahrain-kuwait-norway-contact-tracing-apps-danger-for-privacy/>
- 27 <https://www.amnesty.org/en/latest/news/2020/06/norway-covid19-contact-tracing-app-privacy-win/>
- 28 <https://www.fhi.no/en/news/2020/niph-stops-collection-of-personal-data-in-smittestopp/>
- 29 <https://www.amnesty.org/en/latest/news/2020/06/bahrain-kuwait-norway-contact-tracing-apps-danger-for-privacy/>
- 30 <https://apps.bahrain.bh/CMSWebApplication/action/ShowAppDetailsAction?selectedAppID=321&appLanguage=en>
- 31 <http://www.iga.gov.bh/en/article/iGA-Adds-Opt-Out-Feature-to-BeAware-App-Making-Participation-in-Are-You-at-Home-TV-Show-Optional>
- 32 <https://twitter.com/mohdmaskati>
- 33 <https://www.bbc.com/news/world-middle-east-53052395>
- 34 <https://www.amnesty.org/en/latest/news/2020/06/bahrain-kuwait-norway-contact-tracing-apps-danger-for-privacy/>
- 35 https://play.google.com/store/apps/details?id=com.healthcarekw.app&hl=en_GB
- 36 <http://www.arabtimesonline.com/news/shlonik-how-are-you-app-monitors-home-quarantined-people/>
- 37 <https://www.covidshield.app/>
- 38 <https://github.com/CovidShield/rationale>
- 39 <https://www.cbc.ca/news/politics/contact-tracing-app-1.5617121>
- 40 https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/WarnApp/Warn_App.html
- 41 <https://github.com/corona-warn-app/cwa-documentation>
- 42 <https://uk.reuters.com/article/us-health-coronavirus-spain-apps/spain-to-trial-coronavirus-tracing-app-on-holiday-island-idUKKBN23O2S8>
- 43 <https://www.adalovelaceinstitute.org/our-work/identities-liberties/a-public-health-identity-health-status-apps-immunity-certificates-and-biometrics/>
- 44 <https://post.parliament.uk/analysis/antibody-tests-for-covid-19/>
- 45 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/888570/SAGE22_20200401_SPI-B_Antibody_Testing_-_Realising_Benefits_and_Minimising_Harms_S0094.pdf
- 46 <https://www.gov.uk/government/publications/cdei-ai-barometer>
- 47 <https://www.nature.com/articles/s42256-020-0195-0>

The information contained in PETRAS Landscape Briefings is subject to change and may have been posted by staff, students and those associated with PETRAS acting entirely in a personal capacity. PETRAS takes no responsibility for the consequences of error or for any loss or damage suffered by users of any of the information published on any of these pages, and such information does not form any basis of a contract with readers or users of it.