

COVID-19: The Internet of Things and Cybersecurity

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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 seventh edition of COVID-19: IoT and Cybersecurity.

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

Updates to the UK digital contact tracing response

Ireland's Health Services (HSE) have [confirmed](#) that their contact tracing app is based on the Apple and Google framework (decentralised) and will complete a development phase at the end of May before a 'large scale field test' before release. The Data Protection Impact Assessment (DPIA) 'will be made available in parallel with the field test'.¹

Northern Ireland are [developing their own decentralised contact tracing app](#) to ensure it works with the app being developed in the Republic of Ireland. The Health Minister said, 'We're part of the UK so we will have access to it whether we want it or not. It is up to anybody to download it.'² Deputy First Minister Michelle O'Neill has said that [she doesn't support centralisation of data](#)³ from a 'human rights point of view'.

The [messaging surrounding the roll out of the app](#)⁴ has begun to change, with the UK government now suggesting that tracing may happen 'separately to the app' and that the second phase of relaxing the lockdown could happen without the app being

Overview:

- Ireland is developing a decentralised contact tracing app. This may create interoperability issues at the border with Northern Ireland.
- In response, Northern Ireland have announced they will also develop their own decentralised app.
- The UK government has rejected calls to introduce new legislation to enshrine privacy protections around digital contact tracing.
- Academic research has progressed in creating privacy-preserving antibody certificates.
- The technology industry has also started approaching governments and businesses to provide digital certification solutions.
- The exposure notification service by Google and Apple has recently become available on Android and Apple phones.
- More 'smart wearables' are coming into the market to help people return to work.
- The Ada Lovelace Institute has released a report on data gathering in the workplace.
- Smart sensors are being trialled to measure temperature and monitor breathing to detect symptoms of COVID-19.

operational.

Dame Prof. Wendy Hall, the new Chair of the Ada Lovelace Institute, has [said](#) that 'the app on its own isn't effective, there's [expert] consensus on that'.⁵ The app would be useless without mass testing and large scale manual contact tracing.

There has been no update on the timing of the release of the app, which is currently estimated as 'June' nor more discussion about switching to a decentralised approach.

Extra legislation

The UK government has [rejected calls for new legislation](#)⁶ to enshrine privacy protections around digital contact tracing. In a letter on 21 May in response to legislation put forward by the Joint Committee for Human Rights, the Secretary of State for Health and Social Care writes, 'I do not consider that new legislation is necessary to govern contact tracing'.

There are [concerns](#)⁷ that businesses and employers could require the public and staff to download the app in order to return 'to normal'. While the NHSX has denied that this could occur, privacy experts believe this should be put into law.

Extra legislation around digital contact tracing has been steadily enacted across the world, with [Australia](#)⁸, [Switzerland](#)⁹, and [Austria](#)¹⁰ passing extra safeguards.

'Antibody certificates'

Note: This briefing will herein use the phrase 'antibody certificates' to refer to so-called 'immunity certificates', except when used in direct quotes. This is to reflect the lack of current evidence of immunity to COVID-19 with the presence of antibodies.

[Several governments](#)¹¹ have shown interest in the concept of digital certification of 'immunity' to help with reopening the economy. UK health secretary Matt Hancock said last week that the government was looking at [systems of certification to ensure people who have positive antibodies can be given assurance about what they can safely do](#).¹²

While it remains a controversial topic, an academic consideration of this process is needed to properly inform such a policy decision.

Research is underway to create privacy-preserving digital certification of antibody presence that can be rapidly deployed in the community once COVID-19 antibody testing, vaccines, and likelihood of immunity reach quality thresholds.

A [pre-print from a team at The Open University](#) states that paper certificates are 'too vulnerable to alteration or forgery' and that a digital option is preferred given that it is privacy-preserving, unforgeable, easy to administer, easily verifiable, scalable and cost-effective.¹³ The team have

developed a mobile phone app using a decentralised server architecture.

Another [pre-print, published today in a US-UK research collaboration](#), presents 'SecureABC: a de-centralised, privacy-preserving system for issuing and verifying antibody certificates'. The team also propose a 'framework of general principles and a set of security and privacy requirements for immunity passport systems.'¹⁴

There are societal issues that come with antibody certificates. An Ada Lovelace Institute [review](#) states that these interventions pose 'extremely high risks in terms of social cohesion, discrimination, exclusion and vulnerability'.¹⁵ The [general principles](#) set out by the SecureABC team include that 'wealth, location, and demographic profile' must not impact the ability to gain a certificate; that restricted access to movement or provision of services should be minimised; and that users control their data.¹⁶

[Draft legislation](#) has been proposed to ensure that neither the state nor private sector can 'discriminate in ways not necessary or proportionate to the legitimate social goal of controlling COVID-19'.¹⁷

Technology start-ups are also looking into certification systems

Some start-ups are 'considering how to adapt [their] existing anti-fraud systems for immunity passports'. One company [uses artificial intelligence to verify a photo ID, before comparing it with biometrics in the form of a video](#). Another start-up that is reportedly in talks with the UK government, offers 'single-use QR codes and digital holograms that prevent users from taking screenshots or photographs of other people's codes and attempting to use them as their own.' A system called V-Health passport which can be 'scanned from a greater distance than those of competitors, helping to effectively ensure social distancing' has also been proposed for use by the UK government.¹⁸

One problem [raised](#) about the influx of multiple antibody certificates is the interoperability between them. A common document format, which would allow a single scanning app to read data from different passports, could solve this issue.¹⁹

Technology updates

There has been [an update to the DP-3T white paper](#)²⁰ which analyses a system for secure and

privacy-preserving proximity tracing at large scale.

An exposure notification service has recently become available on Android and Apple phones in countries who are working towards privacy-preserving solutions that abide by their [policies](#)²¹ such as [Germany](#)²² and [Switzerland](#)²³. Apple and Google have [delivered their exposure notification technology](#)²⁴ to health authorities in 22 countries and 'many' U.S. states.

A [limitation on the framework](#), noted by the developers of the German contact tracing app, is that the amount of time a mobile device 'listens' for a Bluetooth signal is [short](#), and with a 5 minute break in between. This may cause contact events to be missed. However, there is a balance with battery life, and the events that may be missed are likely to be short contacts which may not be clinically relevant.²⁵

What does digital contact tracing look like around the world?

Austria

Austria launched a decentralised app, [Stopp Corona](#)³³, which has been downloaded 600,000 times. The developers are currently [building in the Apple and Google framework for an update on 10 June](#). Several features of the current app, including the ability to manually record a contact and a colour coded alert system, are incompatible with the new framework.³⁴

Germany

Germany have published their [scoping document](#)³⁵, [architecture document](#)³⁶, [code of conduct](#)³⁷, and the [source code](#)³⁸ of their contact tracing app, 'Corona-Warn-App'. The team behind the app has published details on the implementation and the [lab test result verification process](#). The government estimates the app will be [available from mid-June](#).³⁹

Switzerland

Scientists at EPFL and ETH Zurich have developed the SwissCovid App which has been commissioned by the federal government. The app began its [trial phase](#) on 25 May.⁴⁰ The trial makes Switzerland the ['first country in the world to use API's from Google and Apple'](#).⁴¹ The

app's Data Protection Statement & Conditions of Use can be found [here](#)⁴². The general public will have access to the app once parliament passes necessary legislation at the start of June.

Italy

The [front end source code](#)⁴³ for 'Immuni' is based on the Google/Apple exposure notification framework has been released. The app is [exclusively managed](#)⁴⁴ by a public company the source code is released under a GNU Affero General Public License version 3. Detailed explanation of how the App works can be found [here](#).

Spain

The Spanish government has made the Secretary of State for Digitization and Artificial Intelligence (SEDIA) in charge of creating a contact tracing app that utilises the system provided by Apple and Google. Part of this plan involves launching a [pilot app](#) on the Canary Islands.⁴⁵ Technicians at SEDIA have been working with engineers and developers from various companies; computer scientists and cryptographers from the Swiss Federal Institute of Technology Lausanne (EPFL), and with creators of the DP3T protocol.

Qatar

Residents in Qatar are [required](#) to have the 'Ehteraz' contact tracing app on their phones when leaving the house.⁴⁶ The app requires many permissions to be downloaded, including [access to photos and videos](#).⁴⁷

Guatemala

Guatemala launched 'Alerta Guate' on 24 March. The app was originally described as an emergency alert service. It has since also been found to send the [user's exact location back to the developer](#). The [privacy policy](#)⁴⁸ allows third party advertisements and the retention of personal information for a decade. The app was removed from stores in mid-April due to [pressure](#)⁴⁹ about privacy; the developer's connections to two cyber-surveillance and defence firms; and mission creep.⁵⁰

Returning to the workforce

It has been [reported](#) that a number of UK companies would start testing a wearable device called Bump which is being developed by a UK advanced robotics [company](#). The device uses Radio Frequency (RF) to 'alert you with sound and lights when you're too close to another wearer'.²⁶ It does not track your movements. Wearers and site managers are able to access the systems analytics in the cloud. The device will be available for commercial use in June 2020.²⁷

On 19 May, the Ada Lovelace Institute published a [report](#) on digital monitoring and data gathering in the workplace. It warned that 'we could be sleepwalking into further surveillance without safeguards in place.' The Institute believes that the boundaries on data and workers' rights are shifted when data is being sent to your employer about your social distancing at work (e.g. tracking who you congregate with). Moreover, they worry about what will happen 'post-crisis if an employer decides to keep on monitoring'. These are currently unanswered questions that must be addressed. The 'inherent asymmetry of power between employer and employee creates distinct opportunities for abuse, breach of rights and discrimination'.²⁸

Symptom monitoring

On 21 May, [Heathrow Airport began trialling the suitability of thermal imaging cameras](#) to screen for passengers with raised temperatures. The trial will last for one month. The results of the trial could help determine if this equipment could form part of the Common International Standard for aviation in a world with COVID-19. The trial uses infrared sensors to monitor passengers and identify individuals who may have higher temperatures. No personally identifiable data of passengers or colleagues will be stored or collected.

A report in February by researchers at the London School of Hygiene and Tropical Medicine estimates that [46% of infected travellers would not be detected](#) (depending on certain factors) and that airport screening is 'unlikely to detect a sufficient proportion of 2019-nCoV infected travellers to avoid entry of infected travellers'.²⁹

[Smart helmets that monitor people for high temperatures](#) are being used by police, health staff and transport workers in China. The helmets use

thermal imaging to take temperature at a distance of two meters. In addition, the helmets can also recognise people using facial recognition and scan personal QR codes.³⁰

There have been concerns raised about the [effectiveness of temperature checking as a way of testing for the virus](#)³¹, as false positives (fever for other reasons) and false negatives (asymptomatic carriers) can be high. There are also questions whether police should have access to the technology.

In April, a privately-owned UK-based engineering company received funding from UK Research and Innovation to '[run a trial to collect data from Covid-19 patients](#)'. The company states that monitoring patients' breathing may be more accurate than taking someone's temperature in spotting the disease. Prior to the pandemic, the company completed a 12-month clinical trial and confirmed that the monitor could track differences in breathing down to an accuracy of a quarter of a breath per minute.³²

Endnotes

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