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NHS COVID 19 APP: FUTURE DIRECTION

Summary

We have been working on two parallel strands for the app – a V2 of the centralised approach not using the Google/Apple API; and a separate strand using their API. Extensive field trials have shown that the V2 is picking up only a small proportion of contact events on Apple phones; by contrast, the version using the Google/Apple API is picking up almost every contact event.

Neither version is at a point where it ready for national deployment. The V2 is not detecting a high enough proportion of contact events to be defensible. The Google/Apple version is not yet sufficiently discriminating in terms of either distance or duration. We **recommend** that we now:

- Move our efforts to the Google/Apple version of the app
- Work with Google & Apple to improve their API's ability to determine distance and duration
- Stop development of the centralised product
- Wind up the Isle of Wight phase pending the launch of the Google/Apple version of the app, and
- Continue to explore other potential technological solutions to contain the virus as part of the wider NHS Test and Trace R&D function.

Detail

1. Since 7 March we have been developing a contact tracing app, that originated as an NHSX project and now sits in the NHS Test and Trace programme. The primary approach has been to develop an app based on a centralised approach, with VMWare Pivotal as the main contractors. We launched a pilot of this app on the Isle of Wight on 5 May.
2. On 10 April Google and Apple told us (and announced) that they were developing an API to resolve technical issues around contact-tracing apps, following discussion with us and a number of other countries developing such apps. They also made clear that access to the API would require national health authorities to meet a number of conditions, including a decentralised architecture and no use of geolocation. We did a thorough

review of the advantages of the two approaches (attached), including the insight that can be extracted from a decentralised system, and the data that can only come from a contact graph showing the relationships between users.

3. On 6 May we started to develop a version of the app that met the Google/Apple requirements, which we currently have in MVP form, sufficient for testing performance (and Apple provided us with access to the app on 9 May, as it was not at that point publicly available). Following an initial 'tech spike', we awarded the contract to Zuhlke Engineering to develop the substantive version of the app making sure to learn the lessons from the development of the original app, including building a genuinely agile product with security and clinical assurance baked in from the start.
4. For the app to be effective in preventing the spread of the virus, it needs to have a sufficient degree of **precision** in its identification of those contact events that may have led to the virus being transmitted. This requires sufficient accuracy in detecting contact events, distance and duration. We have tested the performance of both apps on each metric, through repeated field tests:

Contact events:

- In the most recent field trial, the V2 app detected 69% of events of Android, and 4% of iOS events. This is because of a flaw in the operation of the app on iOS, which causes the device to transmit its identifiers, but not receive the identifiers of other devices. The team is doing its best to resolve this issue, but its attempts to do so thus far have not succeeded. The team is also confident of being able to raise the Android figure by c.5%, through solving issues around Huawei devices.
- the app based on the Google/Apple API ('GApple' app) detected 99% of events on both Android and iOS.

Distance:

- On simulated data, the new bluetooth distance estimation algorithm developed by Alan Turing Institute improves the V2 app's distance estimate from an average error of around 3.3m to an average error of 0.5m.
- the GApple app does not currently seek to detect distance, but rather gives a score based on signal attenuation (and recent research from both MIT and Trinity, Dublin has flagged a lack of accuracy and consistency in this function).

Duration:

- the V2 app samples approximately every 15 and 40 seconds. From our recent field trial the results showed variation across devices. Each field test lasted a little over 10 minutes, and whilst the app was successful in estimating this duration in certain encounters, the results varied considerably, giving a lower median duration across all encounters and device types (ie likely to give rise to false negatives).
- the GApple app typically samples every 3 minutes (with a minimum of every 5) and rounds up the duration to the nearest 5 minute. This meant the duration was typically logged as 15 mins rather than the actual 12-13 minutes. Across all device types this led to a more consistently accurate result than the V2 app, albeit with a few outliers where 20 and 25 mins were recorded (ie likely to give rise to false positives).

5. All this means that at present, **neither approach is sufficiently precise to meet our minimum requirements** for a contact tracing app. For an app to embody our public health guidelines to the public, we need confidence on all three elements.
6. The challenge we are facing is whether we can get the V2 app to improve in detection of contact events or the GApple app to have more precision on distance. At this point, we judge it more likely that we can make progress on the GApple issue given that repeated attempts to improve the detection of contact events in the V2 App have been able to deliver improvements.
7. We have been discussing this with both companies, who are open to collaboration with us that would allow us to incorporate our distance algorithm either into the app we build on their API, or into their global back-end. We are standing up this collaboration with them at pace.
8. We are also keen to develop the app so it offers more direct value to the user and to NHS Test & Trace. The App has three key advantages over other parts of the programme: speed by instructing isolation in a matter of minutes, precision since it can measure contacts, distance and time better than a human & reach because it knows people the user never met. Our proposition concept is “PPE in your pocket, keeping you safe” providing the user with the maximum freedom at the minimum risk, and to incorporate features that make this a reality, including more personal risk measurement and information. This direction will provide the user tangible personal benefits to drive mass download and usage.
9. Our best assessments for the two timelines for the two approaches are as follows:
 - V2 approach: should be ready for national release by early July
 - Google / Apple approach: should be ready for national release by mid-August

International

10. Since late March, concerns about privacy, technical functionality, and standardisation have led a number of international partners to shift. Germany, Ireland, Italy, Austria, and Switzerland, have launched or are developing apps based on the Google /Apple API.
11. Most of the countries using a centralised model are reporting problems, particularly with iOS. Both Australia and Singapore have admitted that their app faces technical difficulties when running on iPhones. Australia published some results on Bluetooth encounters to suggest they had been able to make some incremental improvements on iOS performance (up to the 25-50% range).
12. We do not believe most of these apps have been subject to the level of intensive testing that we have done. We have not yet seen performance data for live apps using a decentralised model, and since they are predicated on *not* sharing user data, it will be difficult to evaluate their efficacy from their live operation.

Recommendation

13. On this basis we recommend that:
 - a. we shift our efforts to the Google/Apple track
 - b. we explain this decision and new timeline publicly (see comms section)

- c. we stand up intensive collaboration with Google & Apple to improve their API's performance on distance and duration
 - d. we stand down work on the V2 App and end the Isle of Wight trial
14. The resource invested in the development of the V2 App has provided valuable learning and technical understanding that will feed into the development of the Google/Apple app – most notably around the distance algorithm. We will conduct a full lessons learned of the work.

Comms

15. Given sensitivity of handling, we are providing an initial recommended view of communications management from within NHS Test and Trace. Our primary objectives are to:
- a) Retain and protect public trust and confidence in the service
 - b) Minimise negative backlash
16. Our recommended approach is to be open and transparent, clear that we have acted in the best possible way – and at pace – throughout and that we are acting in our citizens' best interests. We recommend that we share what we have learnt from the Isle of Wight and field trials to support. The international comparisons are helpful.
17. A full narrative would be developed by initial suggested framing would be:
- We need to get this right for the British Public. This isn't about launching tech for tech's sake – we need something that meets public health standards, as well as privacy and customer experience.
 - That is why we have undergone probably the most rigorous testing in the world – both with the Isle of Wight Pilot and in a series of field tests.
 - These tests have shown up a number of issues which we have been able to identify before launch. We have quite intentionally not launched a product that was not ready on to the public
 - This is new and difficult technology. Everyone is learning, and no one is finding this straightforward. A number of other countries have now encountered similar issues in their own apps, in many cases after launching them
 - When we started development there was no Google / Apple API. As soon as they announced it, we started parallel development work.
 - Based on what we have learnt, we have taken the decision to focus our efforts going forward on the Google / Apple approach. This does not mean we are lowering expectations for what standards must be met but we do believe that it is the most effective use of public resources.
 - This is a shared challenge. We are working with others all around the world – and that will continue. We have agreed with Apple that we will work together on incorporating into their API the progress we have made, on distance calculation in particular
 - Most importantly, NHS Test and Trace is live. When it is launched the app has the potential to help make it even more effective. But we are open for business today.
18. We propose a single announcement on Thursday AM which happens internally and externally at the same time. The second NHS Test and Trace stats publication will be released in tandem that allows the announcement to be anchored in the wider narrative and allows for extensive briefings to happen during the day ahead of the 5pm press

conference. A full communications plan will be developed but this will cover key audiences like

- Health / Science and Media correspondents
- Tech correspondents
- Key tech and business stakeholders
- Ethics and privacy stakeholders

19. Following sign-off of recommended approach, a full comms plan will be developed.

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