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StopCOVID NI

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1. Project Introduction

To augment efforts to reduce the risk of a renewed exponential rise in COVID-19 cases as we exit lockdown, the Department of Health NI, in partnership with NearForm and BigMotive, has developed a mobile app called StopCOVID NI. The app has built upon work already undertaken by the Department of Health in the ROI, in developing a proximity app solution, utilising the Google-Apple API. This approach was undertaken to ensure that there would be interoperability between the solutions operating in both jurisdictions, as the ability to reduce transmission between individuals travelling across the border represents a significant epidemiological imperative. The app will act in parallel to manual contact tracing processes and provide a useful additional tool in helping reduce transmission rates.

Stop COVID NI has been designed using the 'decentralised' contract tracing model supported by Apple & Google, where Privacy, Transparency and Consent are of utmost importance.

The app will support the NI Executive 'Test, Trace & Protect' strategy which is designed to break the chain of transmission of the virus by identifying app users with a confirmed COVID-19 result, and promptly alerting people who may have become infected through being in close contact for a long enough period of time in a way which protects user identities.

Members of the public will be asked to voluntarily download the app, and to enable the Exposure Notification Service during setup. This allows user devices to exchange anonymous ID keys with other devices that come into close proximity for a prolonged period of time. By doing this, the public can proactively help in delivering the goal of the contact tracing process, to reduce onward transmission of the virus by asymptomatic infected individuals, support the health service and in turn, hopefully help prevent a general reversal of the easing of the lockdown restrictions.

StopCOVID NI app has been built by the same development team, using the exact same system architecture, code, and design as the Republic of Ireland's contact tracing app called 'Fight Together', and can therefore give maximum protection to people of Northern Ireland and the Republic of Ireland through sharing anonymised data across the border North to South and vice versa.

Bluetooth is arguably one of the more accurate technologies that can aid with proximity identification. The condition that must be met for a valid contact trace to be stored by the app is when close sustained contact has been detected with another app user, either from Northern Ireland or the Republic of Ireland, within proximity of ~2Meters for a duration >15 minutes.

On this basis the Proximity Contact Tracing App supports the nationwide efforts to reduce the spread of COVID-19.

As the technology is largely shared with the COVID Tracker for ROI, the test results leveraged testing already performed by Expleo colleagues during the development of the COVID Tracker ROI app.

2.   Document Overview

This document will detail the testing that was executed as part of this project, the results of this testing and the overall findings/recommendations.

3.   UI Features and Functionality

3.1 Purpose

The objective of this test phase was to validate the design element of the app; look, feel, colour scheme, wording and use of text etc.

Testing also validated that screens are rendering correctly and that buttons, links and check boxes are working on various Apple and Android devices.

Lastly, this testing validated that the application's functionality was performing as per the Flow Maps and Wireframe requirements.

3.2 Activity

A suite of tests was developed for this test phase. The approach was to commence execution of the full suite and raise defects as they were uncovered. The development team would fix defects and then release in a batch. Once the new release was deployed to the test environment, the original test run was abandoned and the full test would commence on the new release. There were 35 releases in total.

Testing was executed using 14 different devices.

Number	Make	Model	Operating System	Version
1	Apple	iPhone 11	iOS	13.5.1

2	Apple	iPhone XR	iOS	13.5.1
3	Apple	iPhone 8	iOS	13.5
4	Apple	iPhone XS	iOS	13.5.1
5	Apple	iPhone 7	iOS	12.1.4
6	Apple	iPhone X	iOS	13.5.1
7	Apple	iPhone 6s	iOS	13.5.1
8	Samsung	Xcover 4s	Android	9
9	Samsung	Galaxy A20e	Android	9
10	Samsung	Galaxy Note10+	Android	10
11	Samsung	A40	Android	10
12	Samsung	A40	Android	10
13	Samsung	Galaxy S10	Android	9
14	Samsung	Galaxy A10	Android	9

The test suite was comprised of a pack of tests designed focusing on each screen as per below.

Number	Screen	Number of Tests
1	Settings	30
2	Miscellaneous	14
3	Add Test Result	51
4	Tracing	34
5	Setup	59

6	Updates	37
7	Tour	45
8	Loading	6

3.3 Results

A total of 150 defects were uncovered from this phase of testing. All defects have been fully resolved.

On the final full test run on build 35, only 1 defect remained open. These defects were subsequently fixed, retested and sanity testing was completed against a production ready build on 4 devices (2 apple, 2 android) as regression.
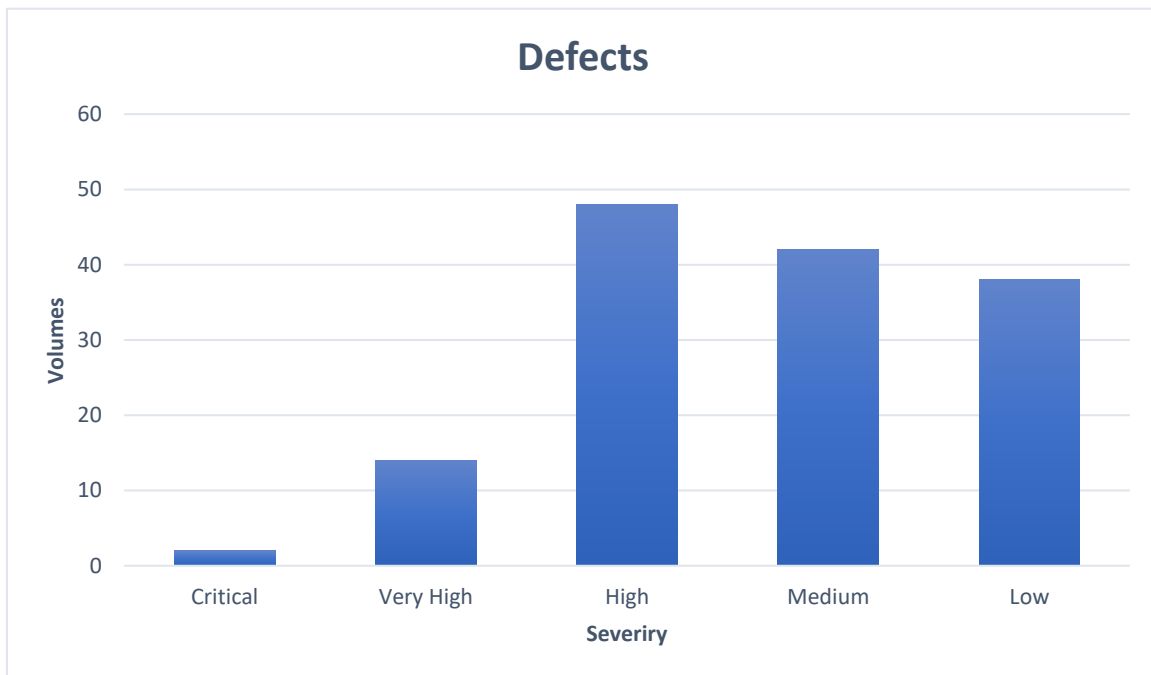
3.4 Findings

This application is as per the requirements of the wireframes and flows in both design and functionality.

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4. Contact Tracing

4.1 Purpose

The contact tracing testing for the StopCOVID NI app has leveraged from the testing executed for the COVID Tracker ROI application. As the technology for contact tracing is the same as the ROI app, an approach of a sanity test was taken on the NI app to validate that the same results across a sample could be realised. The ROI contact tracing testing returned a pass rate of 68.36%.

The testing completed by Expleo colleagues for the ROI app would then be leveraged to compliment the sanity testing completed for the NI app, as long as the pass rates for sample remain the same for each.

4.2 Activity

186 tests were executed from 6 varying distances (31 tests at each distance) starting at .5m up to 3m with .5m increments.

Positive and negative results were expected depending on the distance between the two test devices and results were considered as a pass or fail on this basis.

4.3 Results

Total accuracy of 70.56% was revealed through a pass rate of total tests. This is slightly higher than the score from the COVID Tracker ROI app.

As a benchmark, it is useful to consider the published achievements of the manual contact tracing process in England, (compared because COVID-19 prevalence is higher than in NI and the ROI at present), where 67% of people who tested positive, were reached, and were asked to provide contact details. Of the contacts identified, 85% were reached, and asked to self-isolate.

(https://www.gov.uk/government/publications/nhs-test-and-trace-statistics-england-28-may-to-3-june-2020/experimental-statistics)

4.4 Findings

The accuracy of contact tracing tests is sufficiently close to those uncovered in the COVID Tracker app to ascertain that previous testing can be leveraged. The solution is therefore deemed to meet the requirements.

5. Interoperability Testing

5.1 Purpose

To satisfy an all island approach to contact tracing, there is a requirement for the StopCOVID app to have interoperability with the application deployed in the Republic of Ireland. Testing had to confirm that Close Contact Notifications could be sent and received from one app to the other.

5.2 Activity

Testing replicated the contact tracing in the previous section, but on a lesser scale.

90 tests were executed divided through 6 distances from .5m to 3m. Half of these tests were executed using the ROI app as the "red" or "infected" app and the NI app receiving the notification and the other half vice versa.

5.3 Results

Pass rate increased to 75.77%.

Increase from contact tracing test phase expected because of fewer devices being used for testing.

5.4 Findings

Results comprehensively validated that the StopCOVID NI app has interoperability with the COVID Tracker app in ROI and vice versa.

6. Accessibility Testing

6.1 Purpose

The Web Content Accessibility Guidelines are an internationally recognised set of recommendations for improving web accessibility for people with a range of disabilities. The purpose of this phase of testing was to firstly ensure app compliance with these guidelines and secondly, to demonstrate compliance and transparency with adherence to the Web Content Accessibility Guidelines.

6.2 Activity

A test pack was designed based on the guidelines and executed across every screen in the StopCOVID NI application. This pack was executed in full with a 100% pass on final cycle. A report was created based on this test phase and shared with the RNIB.

6.3 Findings

The StopCOVID NI is fully compliant with the Web Content Accessibility Guidelines.

7. Performance Testing

7.1 Purpose

Validate that the predefined functions could accommodate possible throughput of circa 1m tests within an hour.

7.2 Activity

Load testing performed on the following functions:

- CT01_POST_Register

- CT03_GET_ListExposures

Throughput 1million within an hour.

7.3 Results

Response times are in Seconds	Test 04 10/07/2020 1744- ROI Test Set Up			
Transaction/User Journey Step	**Avg**	**90%**	**Pass**	**Fail**
CT01_POST_Register	0.33	0.52	977207	0
CT03_GET_ListExposures	0.30	0.49	977215	0

7.4 Findings

Performance of the app will comprehensively satisfy the performance requirements.

8. Security Testing

8.1 Purpose

Information Security testing or penetration testing was executed against the application and supporting AWS backend services, to ensure that the technology is sufficiently robust to protect Security, Privacy & Confidentiality, Integrity and Availability of the app and to ensure the app is able to withstand attacks attempting to compromise the technology integrity.

8.2 Activity

The project teamed up with a security test partner, ITGuarded Ltd, an NCSC approved CHECK company offering penetration testing of IT systems to identify potential vulnerabilities and recommend effective security countermeasures. ITGuarded hold industry sector cyber security and information assurance best practice senior certifications. A security test plan was developed by ITGuarded, in close collaboration with NCSC, to validate the security and integrity of the StopCOVID app.   Application testing included both Android and iOS versions of the STOPCOVID NI, the operation of the app on Apple and Google mobile devices, and the communication between the application and the AWS backend.

On-device testing was carried out to test the installation, registration/setup, sharing of ENS Bluetooth beacons between devices, and the communication between the app and backend services. Tests were carried out to ensure the application does not impact the security of the mobile device, or the device user by requesting unnecessary device permissions or user information and that the app honours any change in user settings. This stage of testing also included mobile device file system checks to determine any storage or placement of unencrypted user-related data for the app. Web application testing protocols were also used to test the API's that manage communication between the application and the AWS backend. This included intercepting and manipulating the traffic to test for web app and API vulnerabilities through all of the application and backend communication. AWS back end testing was conducted to determine if there were any weaknesses in permissions, access restrictions and/or vulnerabilities leading to privilege escalation, service disruption and information disclosure.

8.3 Findings

There were no vulnerabilities to report for the StopCOVID NI application, for on-device operation, for communication using Bluetooth Exposure Notification Services (ENS) between devices that are in close Bluetooth proximity while the ENS is running, and for communication between the application on the mobile device and the application-backend hosted on the supporting AWS tenancy.

Testing confirmed that the application functions securely on the Apple and Android devices and reflects the decentralised communication privacy requirements of the Apple/Google exposure services. The application does not request any device permissions beyond the use of the Apple/Google Exposure Notification Service. The StopCOVID NI application does not store any of the device data insecurely.

Registration and enrolment to use the app does not communicate any personally identifying information, nor does the deployment of settings information, such as the content of the Terms & Conditions and Privacy Information screens.

ITG carried out a review of the AWS tenancy currently hosting the infrastructure, this was carried out by penetration testing against the publicly accessible elements and carrying out a high-level review of the AWS configuration with root level privileges.

ITG has confirmed that no vulnerabilities were found testing the publicly accessible infrastructure, by testing all IP addresses and DNS names in scope, along with further IP addresses uncovered during the build review. This combined with the best practice being evidenced with the application testing, ITG can confirm the publicly accessible components of the COVID-19 Contact Tracing application to have a strong security posture.

Summary

Each of the test areas within this document set out to determine if a specific set of predefined requirements had been comprehensively met to satisfy an overall requirement of the StopCOVID NI application being fit for purpose.

Through the testing that was subsequently executed in each area, it can be determined that the application is fit for purpose, with a recommendation from Expleo, the test partner to proceed to launch.

This test approach was designed by Expleo and reviewed by colleagues in the Department of Health NI, NearForm and BigMotive. A review of the test plan and approach was also conducted by Dr. Vahid Garousi, Associate Professor from Queen's University Belfast who advised that the approach was of reasonable quality.

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