

## **Project Title**

Implementation of Singtel LTE Secure IPVPN Solution on NHGD Mobile Assets

## **Project Lead and Members**

- Terry Lei Fook Yuen
- Tan Chek Seng
- Raymond Chia Tzyh Hui
- Cantre Himmy Nino Cueto
- Ashish Kumar
- Tan Chia Ling
- Chong Chun Meng
- Cheow Joo Wee
- James Bataller Agraviador

## **Organisation(s) Involved**

National Healthcare Group Diagnostics

## **Healthcare Family Group(s) Involved in this Project**

Allied Health, Healthcare Administration

## **Applicable Specialty or Discipline**

Informatics, Diagnostics

## **Aim(s)**

This solution was found to be greatly beneficial even for peace time work on board the mobile assets. This solution enables seamless network segmentation between the user and medical VLANs further enhancing cybersecurity. Also, being a no log in and always on environment, allowed fast and unrestrained network connectivity for the radiographers and PSAs working onboard.

## **Background**

See poster appended/ below

## **Methods**

See poster appended/ below

## **Results**

See poster appended/ below

## **Conclusion**

See poster appended/ below

## **Project Category**

Technology

Digital Health, Cyber Security

Care & Process Redesign

Productivity, Manhour Saving, Access to Care, Turnaround Time

## **Keywords**

Radiological Data and Image Transmissions, Network Connectivity, Connectivity Innovation, IPVPN Wireless Technology, LAN Network Connectivity for X-Ray Transmission

## **Name and Email of Project Contact Person(s)**

Name: Terry Lei Fook Yuen

Email: [Terry\\_Lei@nhg.com.sg](mailto:Terry_Lei@nhg.com.sg)

## Implementation of Singtel LTE Secure IPVPN Solution on NHGD Mobile Assets



### INTRODUCTION

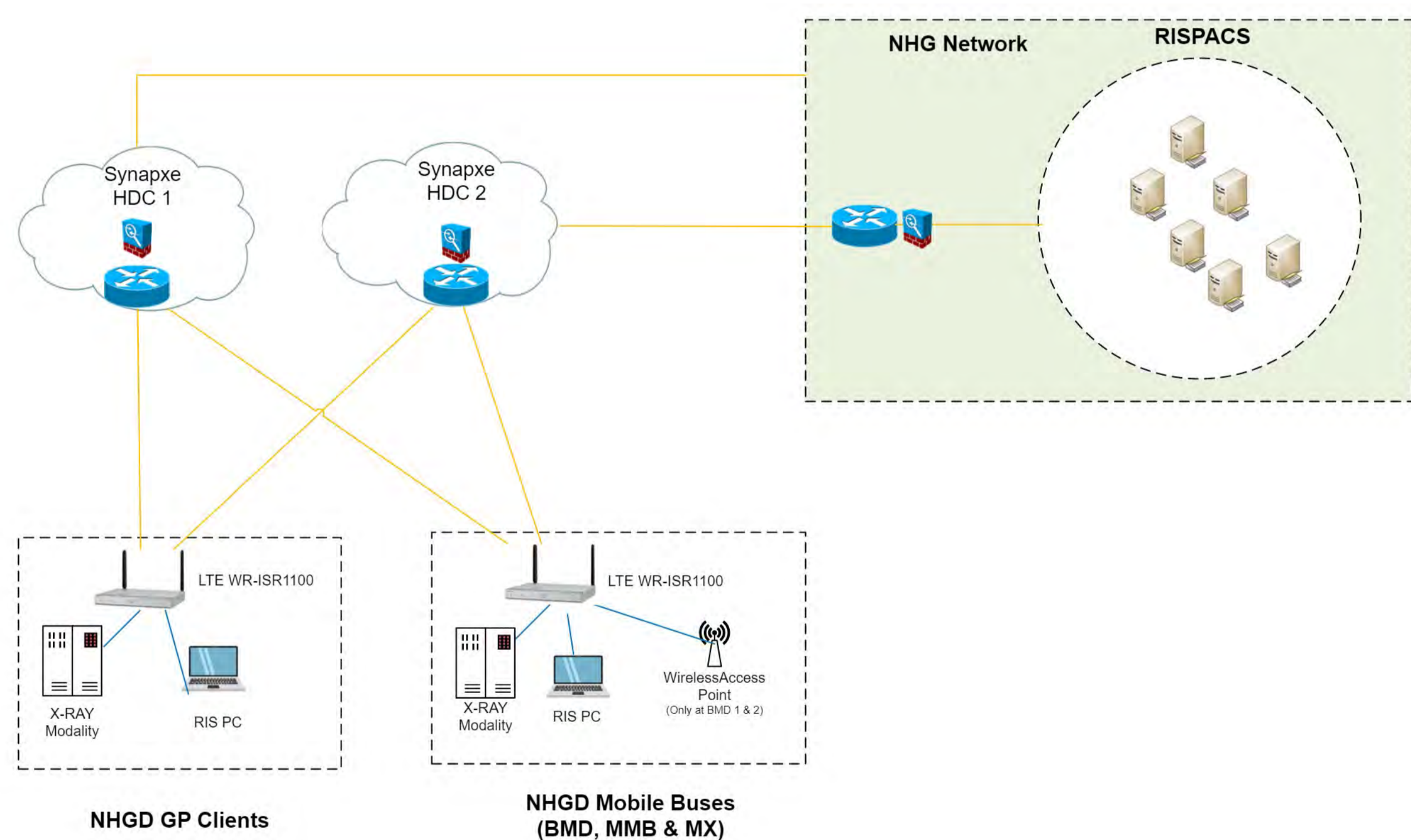
During the COVID-19 crisis, NHG Diagnostics (NHGD), with the support of colleagues from Synapxe, implemented a novel network connectivity solution to transmit radiological imaging data from our mobile X-ray trailer to the National Healthcare Group (NHG) RIS/PACS network which later became a standard connectivity solution for all NHGD mobile assets.

Before COVID-19, when the NHGD fleet of mobile assets operated off-site in locations physically remote from polyclinics, we relied on consumer grade mobile MIFI hotspots supported by VPNs to achieve network connectivity with NHG network for patients' data and image transmissions. The old connectivity solution required many steps and physical toggling of network cables/systems for successful network connectivity. It was also very unstable. As a result the service could only accommodate X-ray services with a longer X-ray-to-report turn-around times, such as elective health screenings. Even when the vehicles are deployed in polyclinics, where there was physical LAN connectivity, much manhour effort needed to be put in to constantly reconfigure, activate and deactivate the network connectivity for cybersecurity.

In the early days of the COVID-19 crisis, NHGD assets were deployed to support X-ray imaging at Expo and Tuas South Community Care Facilities (CCF). Quick X-ray to report turn-around times of 1 hour was expected to quickly deliver appropriate care to the COVID-19 positive patients. The team got innovative and implemented the Singtel LTE Secure IPVPN solution to allow X-ray images to be transmitted to the NHG local PACS and then to CPACS and NEHR, just like in any polyclinic setting while physical remote from polyclinics.

### METHODOLOGIES

The team innovated and built a new connectivity solution from the mobile asset directly into the NHG network without the use of hotspots and VPNs. The team used an enterprise grade Cisco LTE modem router to connect into the Singtel 4G LTE network using a secure IPVPN wireless technology to establish connectivity to NHG network. The established connectivity was always on once the NHG ADID secure log-in was performed, there were no extra VPN log ins.



Network Architecture of Singtel Secure LTE IPVPN Solution



Mr Huan Boon Kean, Mr Terry Lei and Mr Christopher Ong implementing solution in the CCF red-zone

### RESULTS

At the CCFs, the Implementation of Cisco 4G LTE Solution enabled networking connectivity enabling the end-to-end process of performing X-ray to having the X-ray reported at offsite reading centers to occur within 1 hour.

Beyond the COVID-19 pandemic, this solution was found to be greatly beneficial even for peace time work on board the mobile assets. This solution enables seamless network segmentation between the user and medical VLANs further enhancing cybersecurity. Also, being a no log in and always on environment, allowed fast and unrestrained network connectivity for the radiographers and PSAs working onboard.

This innovative solution has since been implemented as a standard form of network connectivity on board all NHGD mobile assets and in NHGD satellite locations where laying a physical network line is not physically or economically feasible. Even where physical network connectivity were available, the new solution was preferred and it saved 360 minutes of time per month in the work and rework of achieving LAN network connectivity. This solution was also spread to fellow NHG institutions for various uses.



Mobile BMD at Fuchun CC



Mammobus at Woodlands Galaxy CC

### CONCLUSION

The Implementation of SingTel LTE Secure IPVPN solution while born during the COVID-19 crisis has continued to prove its effectiveness in peace time for radiographers. It enabled manhour savings of more than 216 hours across the fleet over traditional MIFI and physical LAN connections. It could also potentially benefit other healthcare disciplines where fast and stable remote NHG network connectivity is mission crucial.

### Team Members

Terry Lei Fook Yuen (NHG CIO), Tan Chek Seng (NHG CIO), Raymond Chia Tzyh Hui (Synapxe), Cantre Himmy Nino Cueto (Synapxe) and Ashish Kumar (Kyndryl), Tan Chia Ling (NHGD), Chong Chun Meng (NHGD), Cheow Joo Wee (NHGD), James Bataller Agraviador (NHGD).