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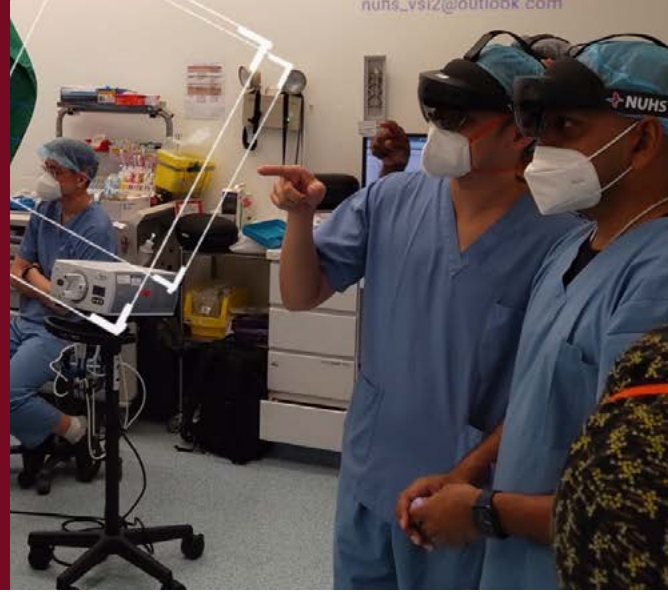
MNOs and Private Networks

Singtel supports National University Hospital on mixed-reality healthcare

Who:

National University Health System (NUHS), National University Hospital (NUH) Singapore, Singtel, Microsoft and health tech company apoQlar, supported by the Singapore regulator IMDA.

What:

Development of mixed reality (MR), holographic technology solutions through 5G technology to enhance clinical capabilities and enhance healthcare delivery and patient outcomes.

Spectrum:

Singtel acquired 100 MHz (3.45-3.55 GHz) in the 3.5 GHz band and 800 MHz of mmWave spectrum (26.7-27.5 GHz) through IMDA's Call for Proposal (CFP) process in June 2020. Singtel has deployed a nation-wide 5G Standalone network with over 95% coverage, comprising more than 1,300 outdoor locations and over 400 in-building and underground sites. The bespoke NUH network comprises an enterprise core with multi-access edge computing riding on public infrastructure.

Project requirement and use cases:

The overall objective was the development, deployment, and integration of mixed reality (MR) enhanced solutions into clinical medicine. Holomedicine is an emerging field which is becoming increasingly prominent in recent years. It leverages on MR to not only augment the physical environment, but also enable full interactions with a virtual world that is superimposed on the real world.

Mixed Reality technology uses transparent visors to project holographic renderings into the user's eyes, and as the images are projected to both eyes (as opposed to just one eye in most AR devices), it allows for the user to have a full stereoscopic perception of the image, including distance, depth, and spatial orientation. This allows for a variety of potential use cases and application scenarios including:

- **Pre-procedure planning** – improvements to pre-operative surgical navigation and visualisation, as well as use of holograms to customise implants

- **Surgical skills education** – enhancing surgical education and precision anatomy training for medical students

- **Intra-operative surgical navigation** – provision of real-time guidance to surgeons during an operation through overlay holographic scan images to ensure they always remain on target

- **Point-of-care imaging and reconstruction** – use of AI-based image diagnostics to reduce time and associated costs for processing ultrasound scans and avoid potential delays and patient distress

- **Point-of-care superficial vein mapping** – improving the venepuncture process for patients through use of MR headsets to identify potential superficial veins to obtain blood samples

- **Patient education and counselling** – explanation of the clinical procedures using the patient's own 3D data and simulations, allowing the patient to better understand their conditions and procedures.

- **Remote Collaboration** – promote cross-national boundary interactions with international partners, both for complex case discussions, and medical proctoring and assistance to inaccessible regions of the world

Solution:

The solution provided is an Integrated medical data network with end-to-end network infrastructure customisation and security enhancement. The high-speed wireless network is capable of supporting large amounts of real-time data transfer and analysis with edge computing capabilities. This was fundamental to meet the performance requirements and ensure the seamless functioning of various applications.

Singtel worked with NUHS to design and deploy a 5G indoor network using the 3.5 GHz band. The private network comprised 19 5G radio units across 10 operating theatres (including an advanced hybrid operating theatre and another capable of supporting robotics surgeries), and 3 inpatient wards at NUH. Singtel's 5G Standalone network, with edge cloud and network slicing capabilities, provides doctors and healthcare workers with guaranteed bandwidth and reliable performance requirements at all times. A dedicated core network facilitates real-time data monitoring and processing while maintaining security and privacy of patient data and medical records.

Benefits:

The deployment of a 5G private network has equipped NUHS with the capability to develop mixed reality modules and solutions that enhance the future of healthcare delivery in various ways.

The 5G network has also allowed NUHS to develop a customised data network that would allow a secured hybrid connection between the hospital intranet zone, and the internet zone through a secured private channel. This new network architecture opens the horizons to capabilities such as autonomous cloud robots, and remote assistance beyond the country.

In addition, NUHS is planning to leverage on 5G network slicing beyond the hospital premises, for example, remote patient monitoring and connected smart ambulances to enable real-time transmission of vital signs, remote diagnosis and quicker decision-making.