5G RailNext : Private 5G Networks in Glasgow Underground

Douglas Allan, University of Strathclyde

https://uk.linkedin.com/in/douglasallan1

https://orcid.org/0000-0002-8426-0189

https://github.com/dallan92

5G RailNext Overview

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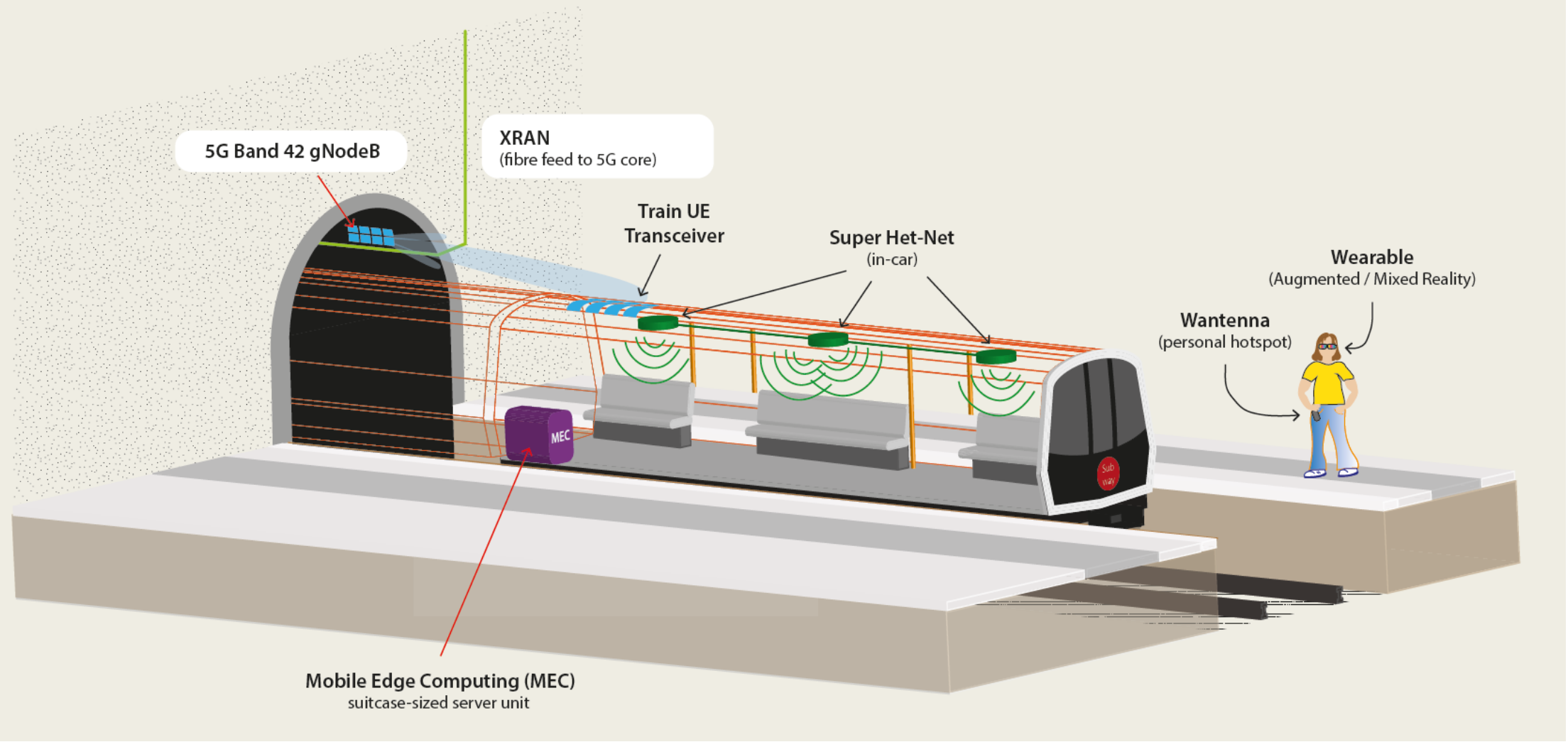
- International collaborative project with UK and South Korean partners co-funded by Department for Digital, Culture, Media & Sport (DCMS)
- **Aim**: Demonstrate 5G enabled internet connectivity and Augmented Reality (AR) applications for delivery of ‘infotainment’ and advertising content to passengers on subway trains

Co-funded by: Department for Digital, Culture, Media & Sport

Overall Network Architecture

- The network design can be described as a Mobile Hotspot Network (MHN) consisting of a 5G SA mobile network for platform to train connectivity which offloads to an on-board Wi-Fi network



Glasgow Subway

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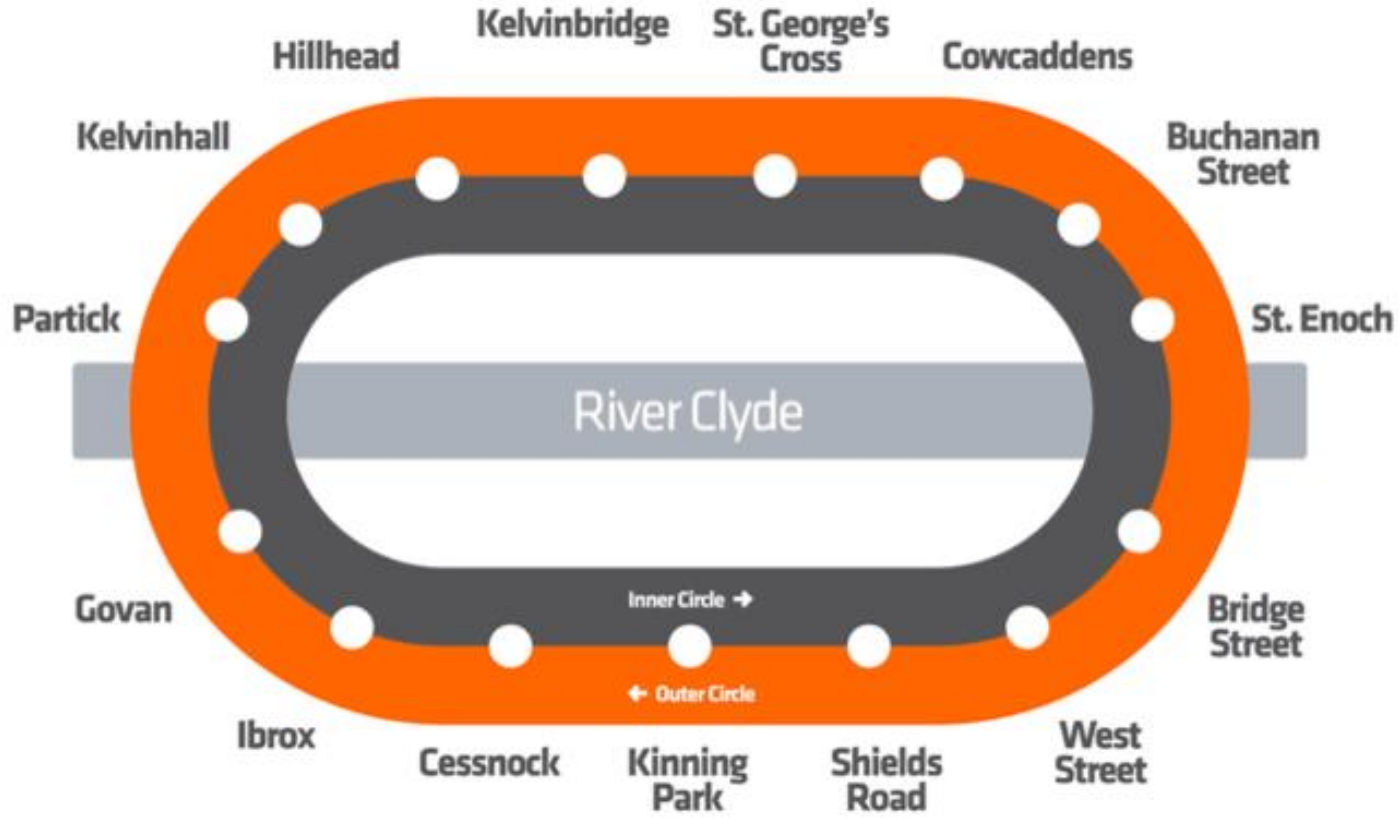
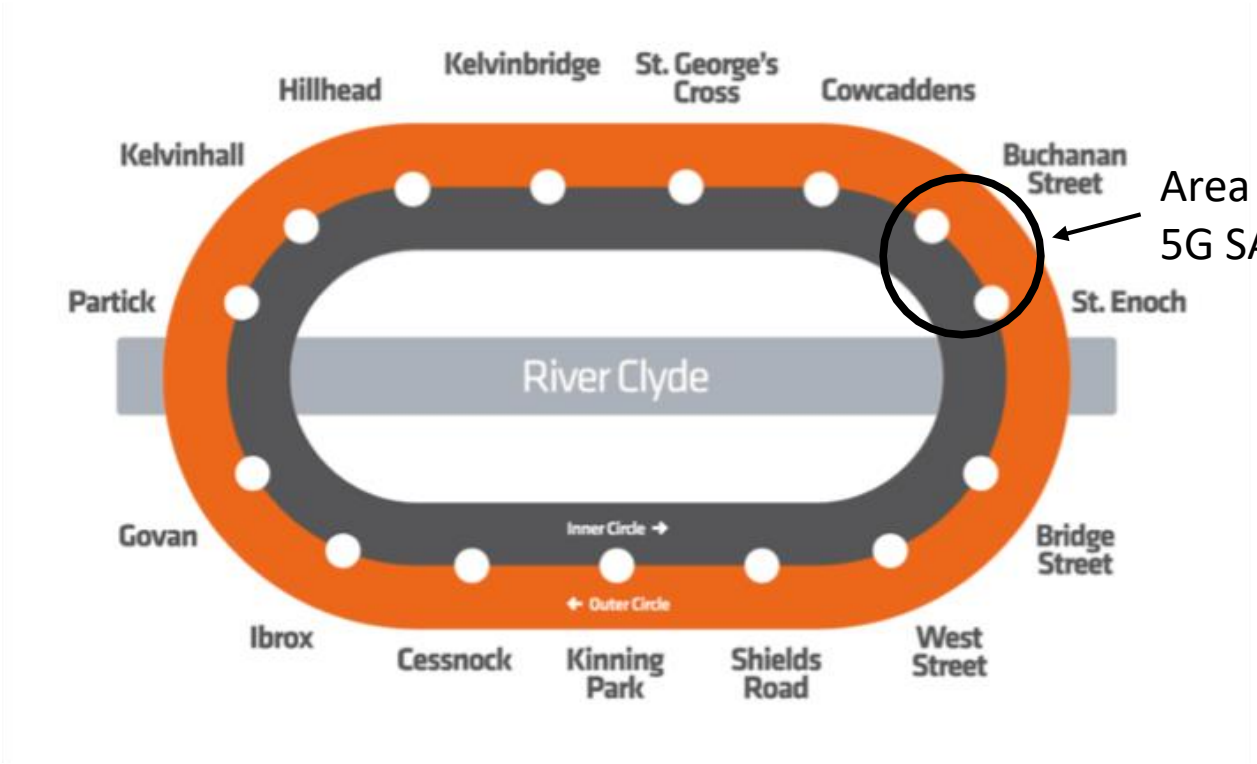
- Subway has 15 stations and two circular tracks covering areas both North and South of River Clyde

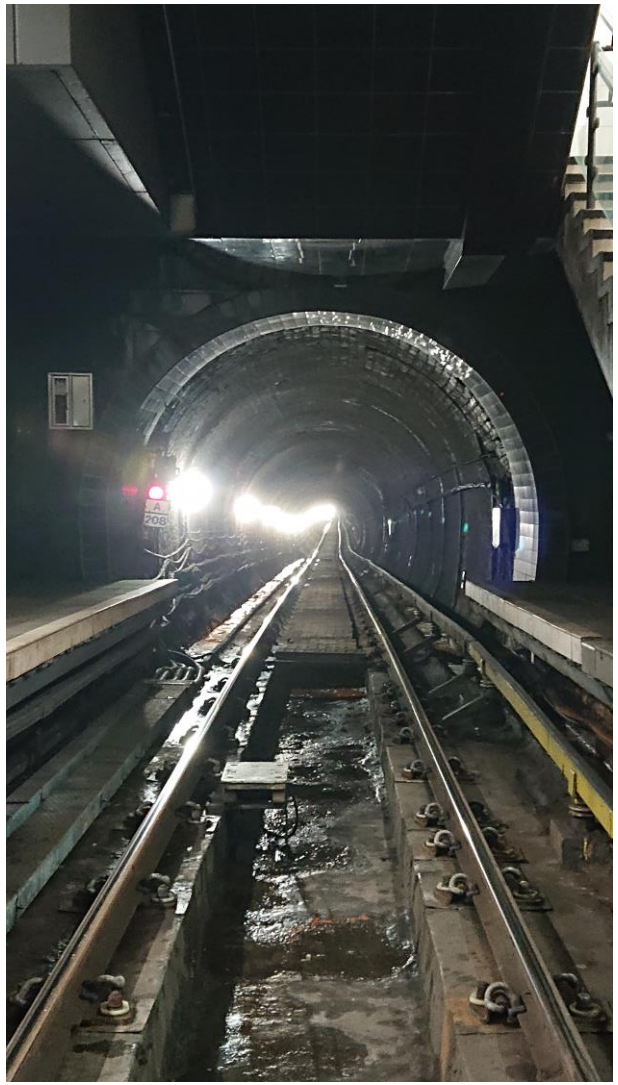


Private 5G Network in Glasgow Subway

- 5G SA network deployed to provide wireless connectivity to train(s) travelling on outer circle between Buchanan St. and St. Enoch's stations
- The track connecting these stations is approximately 500m



Area covered by 5G SA Network



Tunnel between Buchanan St. and St. Enoch's

Network Design

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On Train

End User Devices

Wi-Fi

On-Board Cisco Wi-FI AP

Ethernet

Intel NUC acting as gateway between 5G SA and Wi-Fi Networks

USB3.0

SIM8200-EA Modem (Based on Qualcomm x55)

RF Cables

Alpha Wireless AW3374 2x2 n78 Omni Antenna

Single Cell 2x2 20MHz @ 3.5GHz

One of UK's first 5G SA deployments in a public environment

SPT Network & Wider Internet

Ethernet

Buchanan St Equipment Room

Intel i7 Baseband Unit (BBU) running Amarisoft 5GPC and gNB software stacks

CPRI

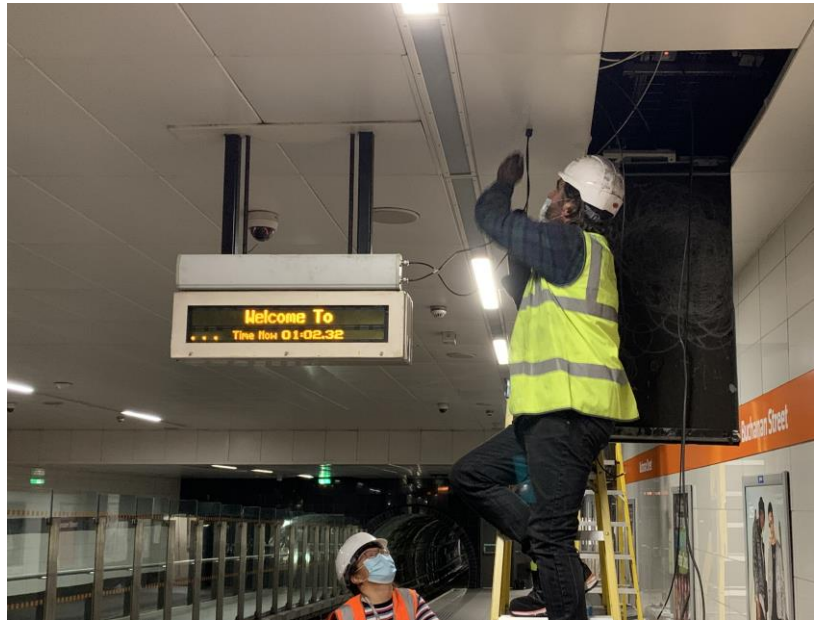
Buchanan St. Platform

AW2S n77 Black-hawk Remote Radio Head (RRH)

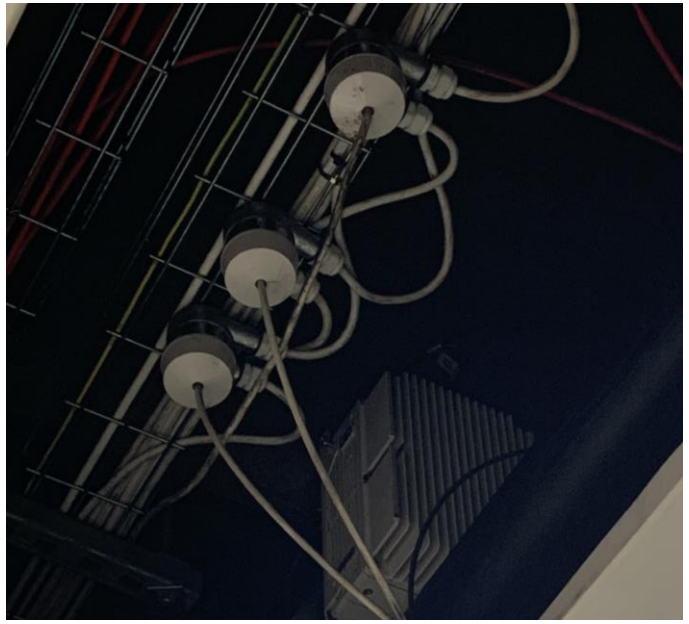
RF Cables

Alpha Wireless AW3014 2x2 n77 Panel Antenna

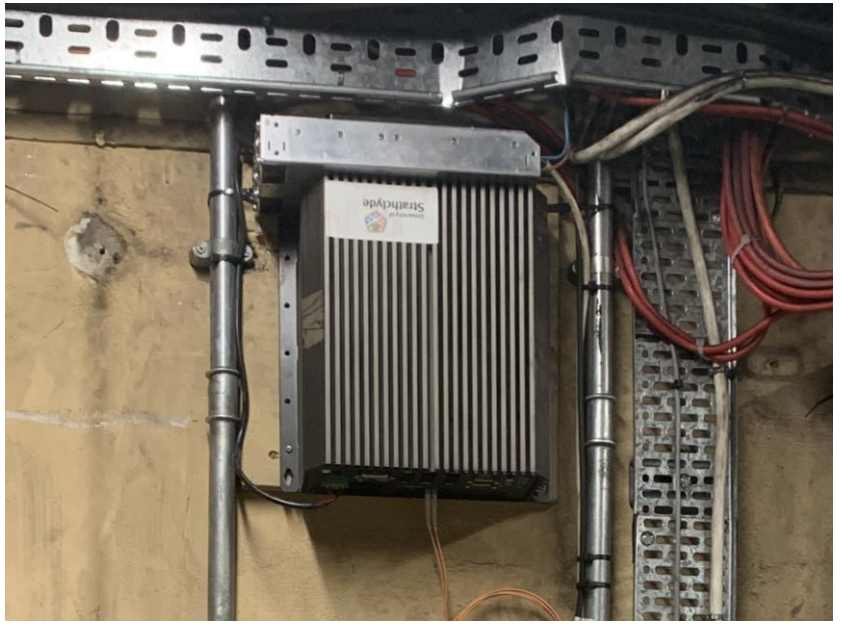
Network Deployment



Base station antenna placed above information sign



Blackhawk RRH mounted above ceiling panel



BBU mounted on wall inside equipment room at end of platform

Network Deployment

On-board network equipment placed in Peli Case

5G SA UE & Antenna inside unoccupied driver's cabin at rear of train

5G RailNext Trial

- Due to Covid, non-public trial was conducted with members of project team and colleagues
- A successful video call was made to project manager in London and trialists were able to interact with AR advertising application through headsets and handsets

Conclusions

- 5G RailNext involved design and deployment of one of the worlds first 5G SA mobile networks in a public environment
- Enabled by Software Defined Radio (SDR) and Shared Spectrum technologies from Tier 2 vendors
- The project successfully demonstrated 5G enabled internet connectivity and AR applications for triallists travelling on a train travelling between Buchanan St. and St. Enoch’s stations on the Glasgow subway
- The project demonstrated that 5G enabled technologies can improve passenger experience and open up new avenues for companies and brands to engage with potential customers in a more interactive and meaningful manner

StrathSDR

Thanks for listening!

Engage with us:

https://sdr.eee.strath.ac.uk

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github.com/strath-sdr

The Scotland 5G Centre

University of Strathclyde Glasgow