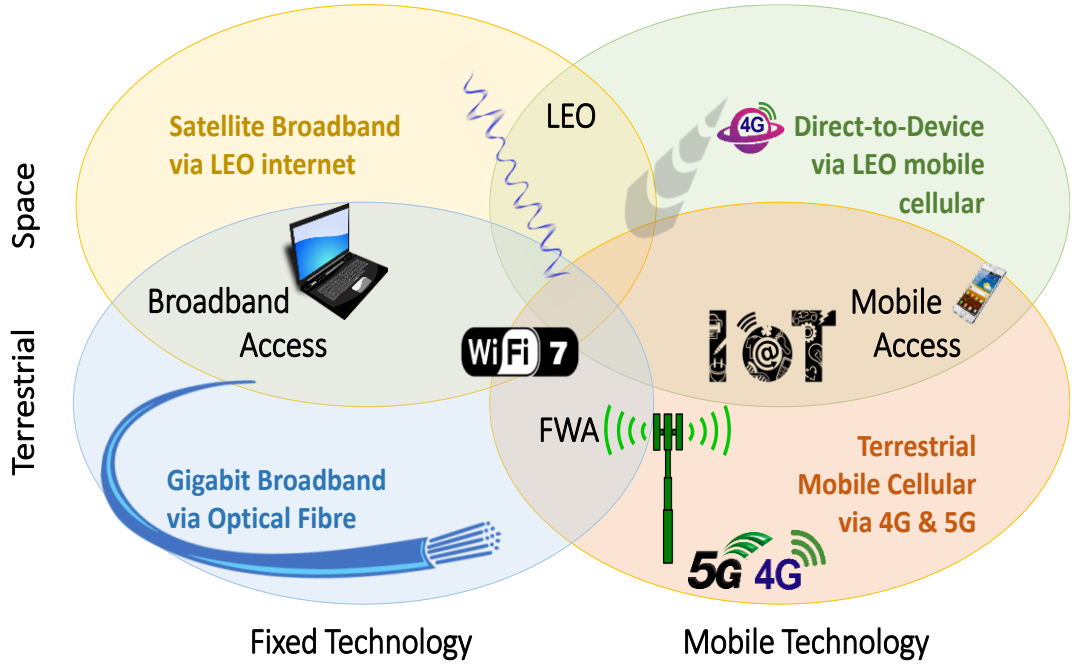
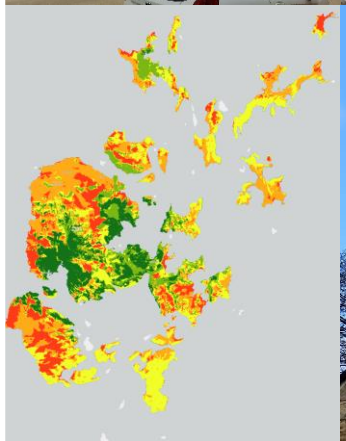
SCOTTISH FUTURES TRUST



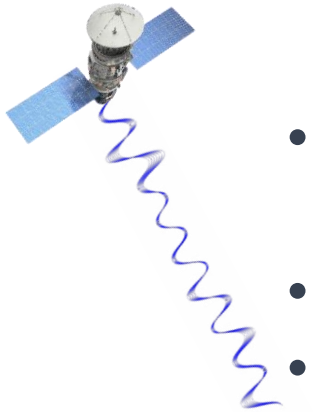
Ultrafast Wi-Fi on Far North Line Trains in Scotland



What does SFT Do?

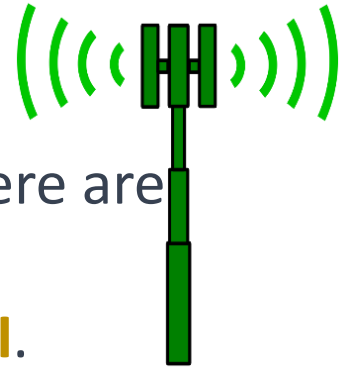
- Established in 2008 as an arms' length company owned by the Scottish Government.
- SFT, with its infrastructure specialisms, works with the public and private sectors to maximise the benefits resulting from infrastructure projects, one of which is Digital Infrastructure.
- SFT has a range of technical, legal and financial specialists all under one roof, who bring extensive commercial expertise in infrastructure financing, procurement and delivery into the public sector.

The Need for Digital Connectivity in Every-day Life (incl. Public Transport)



The Growing Importance of Digital Connectivity

- The Scottish Government's Digital Strategy theme: **"No One Left Behind"** aims for an inclusive digital nation with equal opportunities for all.
- Digital connectivity is now regarded as **essential national infrastructure** like safe water, electricity, education, healthcare, and transport infrastructure.
- There is increasing reliance on **connectivity in daily life** of which travel is part.
- Digital Connectivity is recognized for its contribution to **inclusive growth**.



The Digital Divide in Rural and Remote Areas

- Need to address **"digital divide"** in sparsely populated areas, where there are limited resources and a lack of infrastructure.
- Market doesn't provide necessary infrastructure due to **insufficient ROI**.
- Results in **regional disparities** in education, healthcare, jobs, civic engagement…

Why do ScotRail want connectivity anyway?

- Improved customer Wi-Fi service.
- Improved staff Wi-Fi service.
- Wi-Fi Calling.
- GPS tracking of trains in operation.
- Live passenger counting.
- Revenue systems.
- Hospitality Services.
- On Train IOT services – toilets, temperature, etc.
- Train Telemetry.
- Live CCTV access and download.
- Improved passenger information services.

History of Connectivity on ScotRail Trains

- 2012 – ScotRail install free customer Wi-Fi, based on 3G onto the 170 fleet serving the Glasgow & Edinburgh.
- 2013 – Fit out on other fleets begins. 4G begins to be a specification.
- 2014 – ScotRail begin rollout of free customer Wi-Fi to stations. 20 stations initially (now up to over 60).
- 2015 – Abellio ScotRail Franchise begins and franchise commitment is to fit Wi-Fi on all trains.
- 2015 – Abellio move management of the services and costs into information technology.
- 2016 – ScotRail IT engage with Project Swift Trackside infrastructure project.
- 2018 – 3 & 4G fit out of all fleets is completed.
- 2018 – ScotRail agree to procure a new private LTE data network on the E&G and Stirling, Dunblane & Alloa, but initiative is cancelled owing to high cost and concerns over use of LTE equipment on GSM-R masts.
- 2020 – Telecoms Innovation division at Network Rail introduces prospect of satellite connectivity.
- 2022 – ScotRail and Scottish Futures Trust (owned by Scottish Government) jointly take forward a satellite broadband initiative, assisted by Clarus Networks, a SpaceX/Starlink partner based in Scotland.

2015 – At the start of the franchise there was a great deal of pressure to improve the Wi-Fi service.

- Franchise obligations around micro cells.
- Lack of understanding of the reasons for the poor performance.
- Efforts mainly focused on providing an improved service to customers.

2016 – ScotRail became part of the Swift project, along with Cisco and various other suppliers.

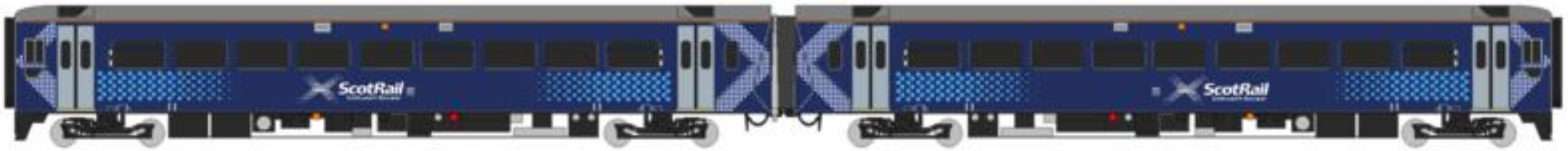
- Activated a 10 mile stretch of the Edinburgh to Glasgow route and two trains.
- The project was successful in proving that trackside connectivity would work.

The findings of this and a subsequent procurement were:

- The trackside Wi-Fi connectivity didn't achieve particularly high performance (although further investment and tuning may have improved it)
- It would be very high capital cost to install – needs fibre alongside trackside, masts, power, install hardware on trains (that gets more difficult on rural routes). This applies whether Wi-Fi or 4G/5G.
- It would be high cost to maintain the infrastructure.

Why satellite is a major part of the answer

- The introduction and availability of low earth orbit data services has created a solution to ScotRail's problem.
- Resolves most of the problematic trackside infrastructure issues.
- We can fit the train, rather than both the train and trackside infrastructure.
- Cost effective as there are 2000 miles of track to operate.
- No other way cost-effective of delivering mobile connectivity to a moving train for the vast majority of the routes operated in Scotland.
- Represents the only realistic way of enabling connectivity to trains in Scotland.



ScotRail Trains:

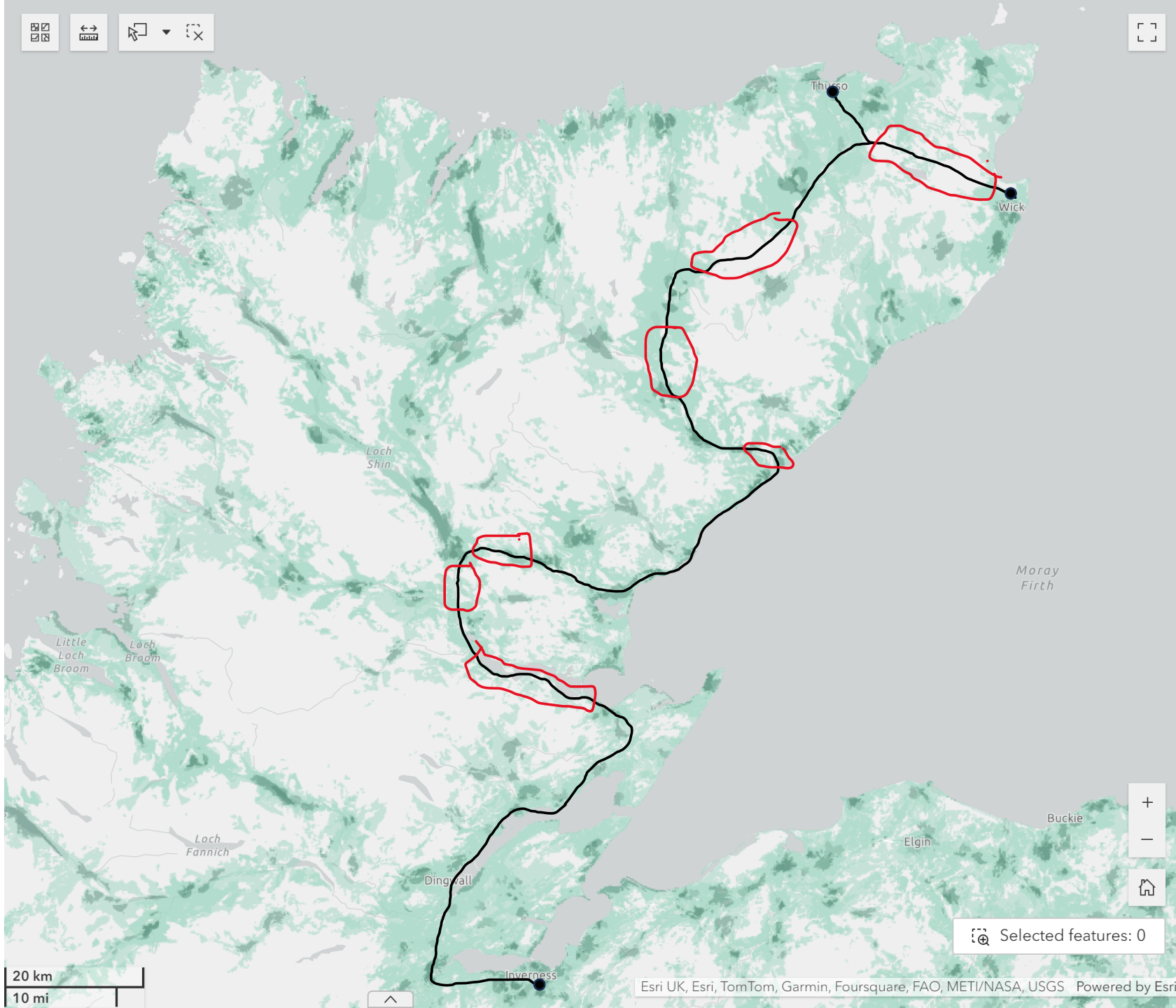
Far North Line
Onboard LEO Broadband

Far North Lines” from Inverness to Wick and Thurso, through Ross-shire, Caithness and Sutherland.

The Class 158 diesel fleet is based at Inverness Depot.

Existing Mobile Network Operator Coverage

(2024)



Starlink Communications Constellation

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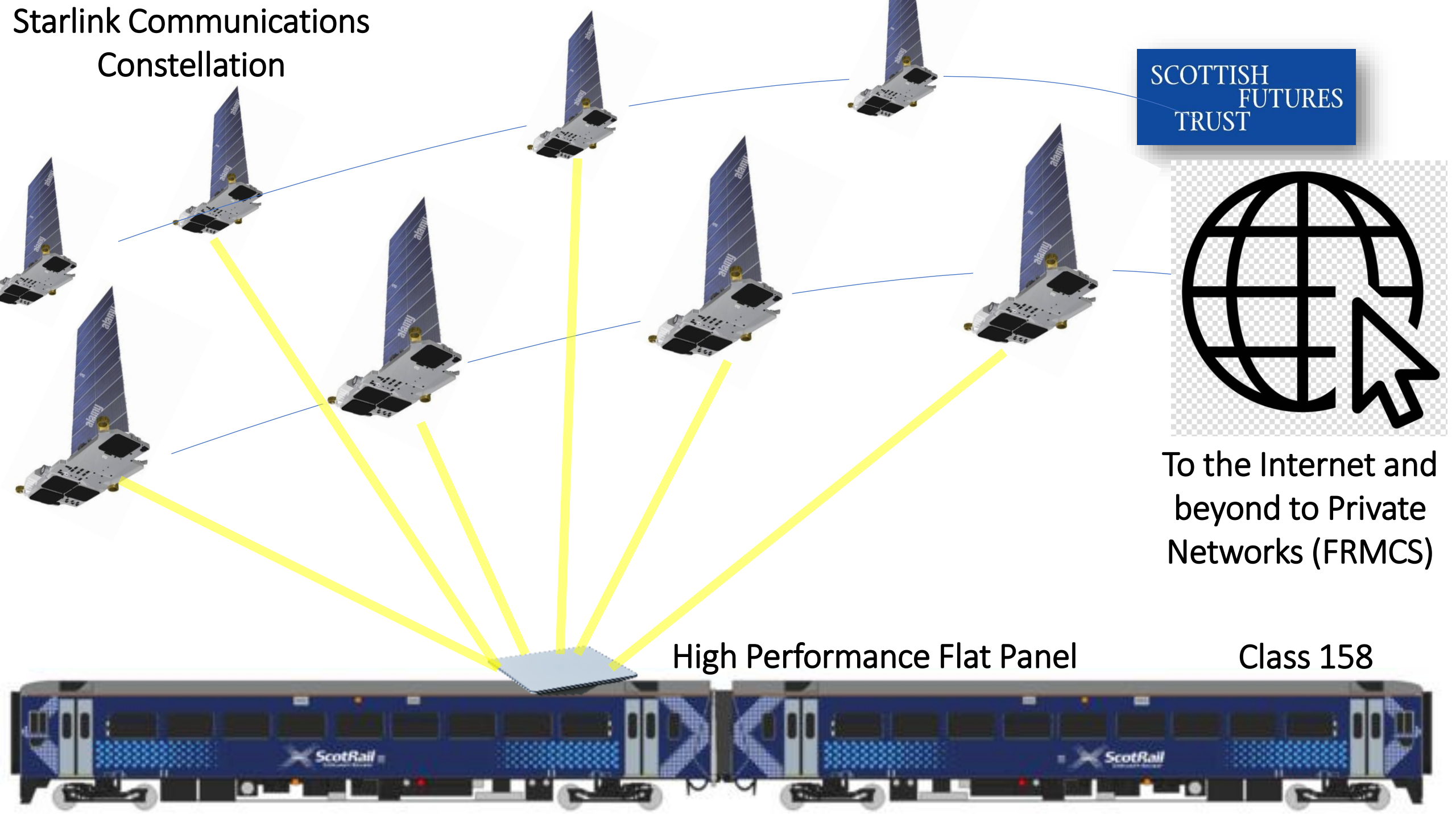


To the Internet and beyond to Private Networks (FRMCS)

High Performance Flat Panel

Class 158

Desired Outcomes

- Delivery of Wi-Fi on Six Trains: Install Wi-Fi on six Class 158 2-car train units at Inverness depot, with the ability to collect data for assessment.

- Data Collection: Gather data that will enable assessment of:
  - Connectivity improvement compared to 4G multi-SIM systems.
  - User behaviour and usage.
  - Impact on passenger numbers and surveys.
  - Wider benefits aligned with government policy.

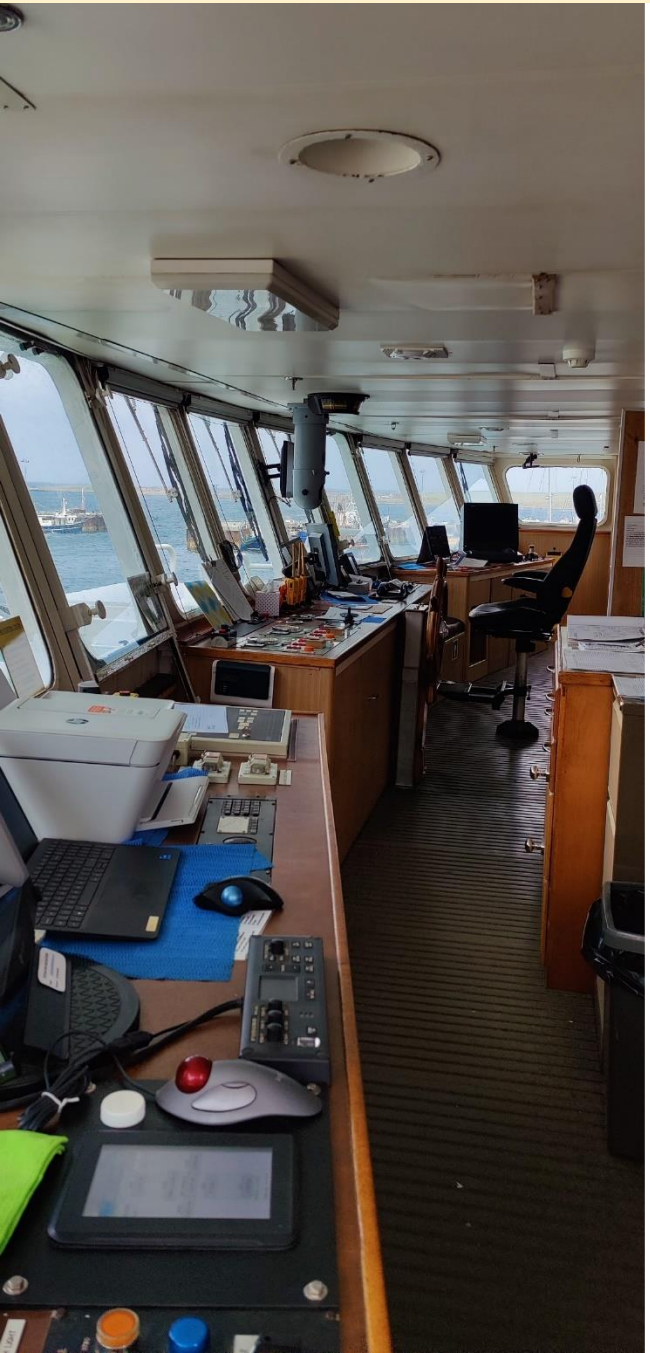
- Conduct Benefits Assessment: Evaluate the impact on public transport operators, passenger growth, passenger satisfaction, plus wider benefits such as inclusive growth, social inclusion & wellbeing, and helping to reduce depopulation issues.

Building on Recent, Related Developments

CGI have recently successfully demonstrated use of Oneweb satellite broadband on the North Yorkshire Moors Railway.

LNER are conducting a pilot of LEO satellite broadband on the “Flying Scotswoman”, which starts testing before Christmas between Leeds and London.

LEO BB for Transport Connectivity



Orkney Ferries

Onboard LEO Broadband

Thank You for Your Attention!

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ScotRail
SCOTLAND'S RAILWAY

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Project Partners

The Scottish Government
Riaghaltas na h-Alba

HIE
Highlands and Islands Enterprise
Iomairt na Gàidhealtachd 's nan Eilean