

HTS Roundtable

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CGI



Agenda

1. Introduction to CGI
2. SODOR Project and suitability of different satellite types for rail
3. North York Moors hybrid rail trial with Eutelsat OneWeb
4. Next Steps

CGI at a glance

Founded in 1976 (predecessors since 1969)

>50 years of excellence

>US\$9 billion revenue

91,500 consultants

400 locations in 40 countries

5,500 clients benefiting from end-to-end services



SODOR ('Satellites for Digitalisation of Railways')

- European Space Agency project led by CGI which aims to demonstrate the use of new constellations of communication satellites alongside terrestrial to provide seamless connectivity for passengers and train crew
- Major focus on passenger Wifi alongside other use cases:

Use Case	Throughput 'Bit Rate'
Passenger broadband	High (50Mbps -> 400Mbps)
Train-to-Shore Telephony	Low
IOT sensor data reporting (e.g. RoughRide)	Low
Real-time journey updates for passengers	Low
Ticketing	Low
Point of sales and real-time stock taking	Low



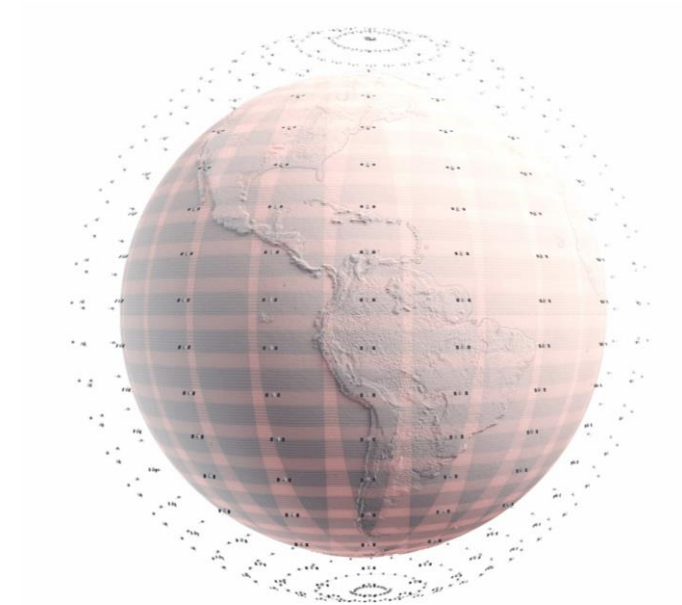
Satellite Suitability

- Ka band GEO satellites initially considered (especially new generation VHTS)
 - But ruled out because of elevation angles in northern latitudes
- Iridium trialled for low bit rate applications – but serious issues with line of sight



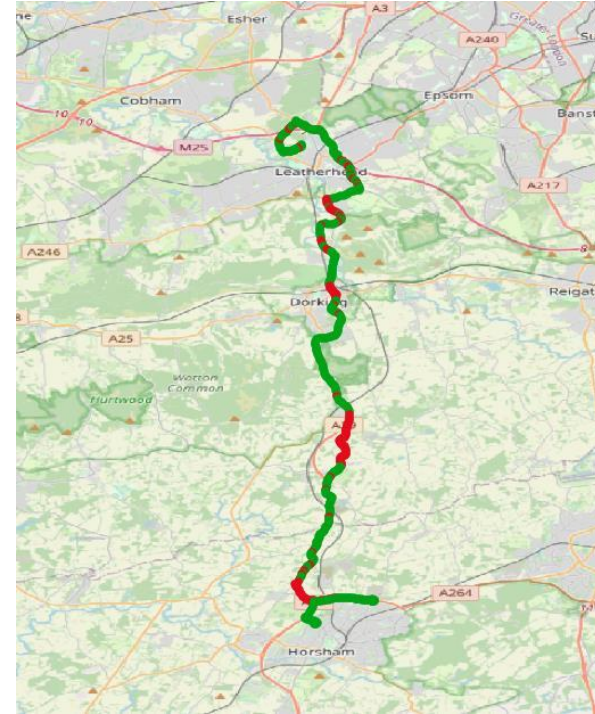
Starlink v OneWeb

	Starlink LEO	OneWeb LEO
Testing type	Road test	Road & rail tests
Constellation size	~4000 active	600 active
Available?	Yes	Mobile service available very soon
Coverage in challenging terrain	Good	Good
Throughput per terminal	Very good currently – but no commitment	Good
Terminal price	Very low	Low
Airtime list price	Low - currently	Medium
Co-operation level with CGI in trials	Poor	Very good



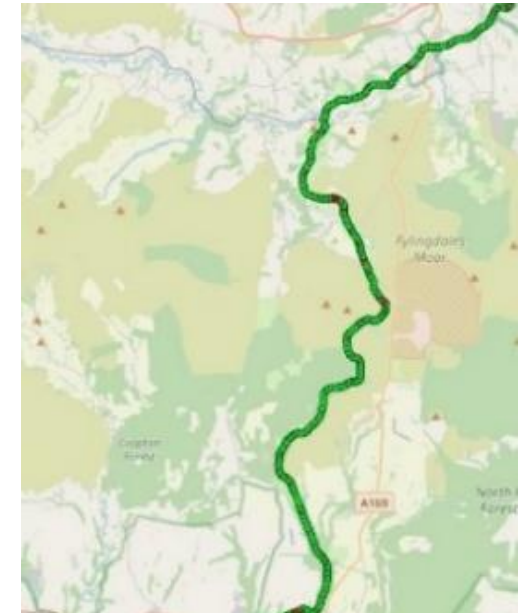
SatView

- CGI utility to predict satellite communication coverage to any location from any satellite constellation by calculating line of sight data from orbital information and terrain data
- By using LIDAR data SatView can calculate where trackside obstacles will cause coverage issues and advise on which satellite constellations will work best on which routes
- SatView can also be deployed alongside CGI Onboard Controller software to dynamically switch between multiple satellite services where they are available



SatView predicted Iridium coverage on a drive testing route in Surrey

SatView predicted OneWeb coverage for NYMR

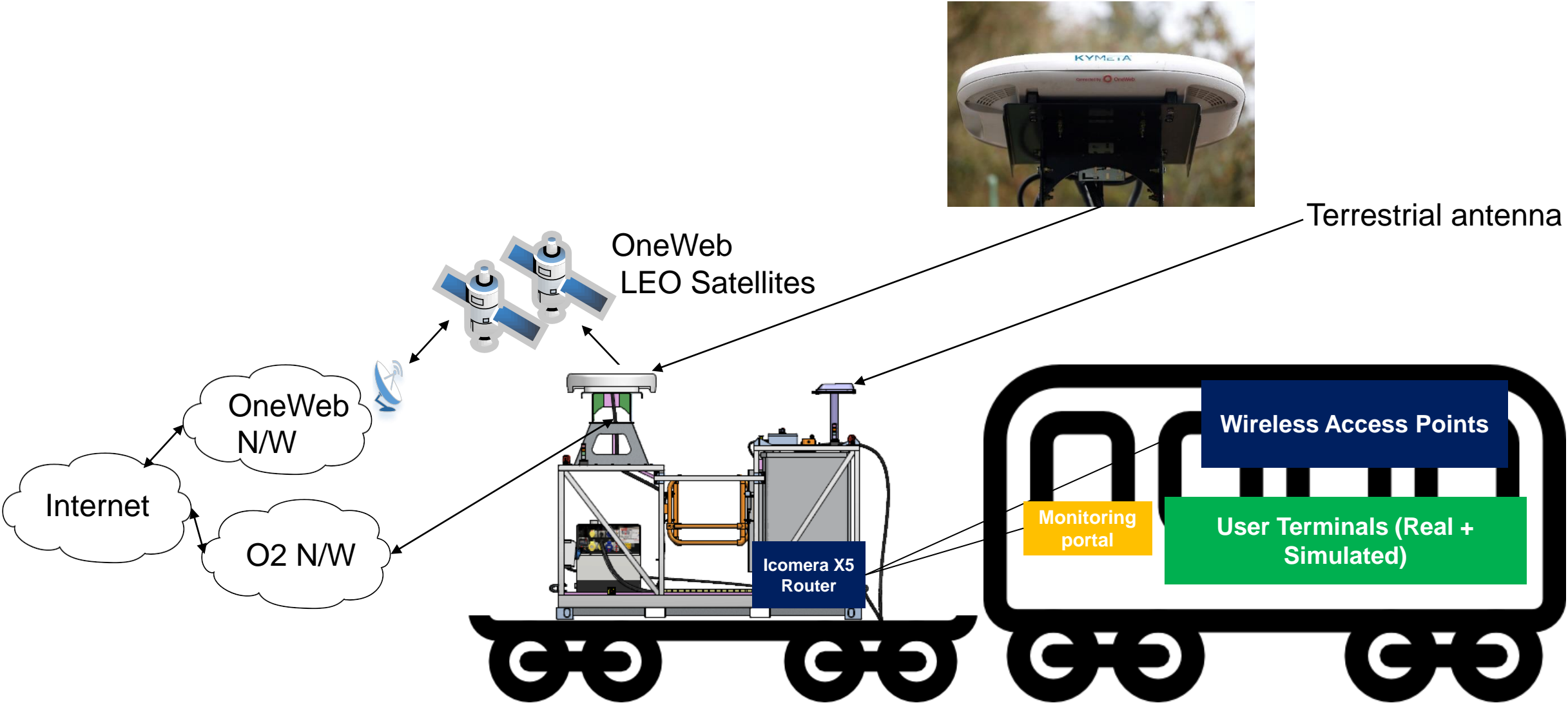


North York Moors Railway – location for SODOR trial with OneWeb

- Location chosen because of challenging terrain for terrestrial and satellite coverage:



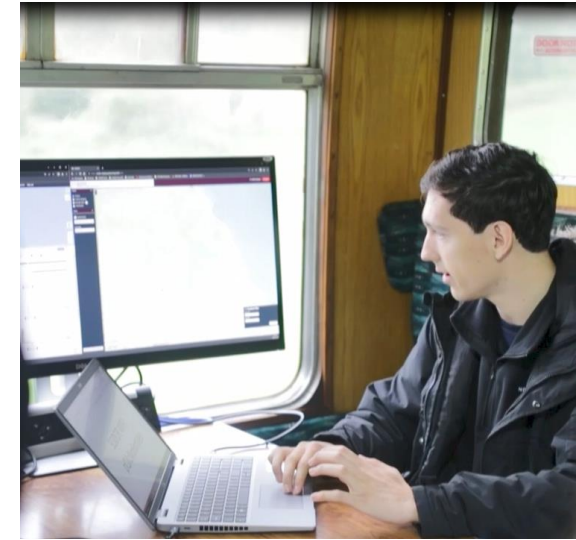
North York Moors Trial Architecture



<Play Video>

The Results

- In test runs, the satellite network achieved ~99% coverage. This compares to system based on terrestrial network coverage averaging around 55%.
- The Satellite network provided very good performance sufficient to provide good connectivity for >100 simulated active users
- Achieved 78 Mbps downlink, 15 Mbps uplink (max available on test package).
- Latency: Round trip time of 170ms, similar to terrestrial routing solutions in practice (expect to be able to reduce this to ~100ms in future trials)
- All this was achieved in poor weather conditions with frequent rain (sometimes very heavy) and cloud cover!



Feedback from the demonstration

- “Really impressed by the performance of the overall solution”
- “The connectivity seemed reasonably consistent, available at around 5-10mbps per user on a mobile phone while speed testing”
- “5* performance”
- “Wi-Fi was very impressive, especially for streaming video, was particularly impressed at usage in the travel”



Summary and Next Steps

- LEO satellite communications are an excellent complement to terrestrial (and GEO further south) to provide seamless services for passengers and staff
 - Much cheaper to install than trackside fibre in remote areas
- In advanced talks with two UK operators to undertake rail trials and interest from many others in the UK and around the world
- Engaging with Kymeta and other terminal providers with aim to provide specific rail terminal with smaller footprint soon

Insights you can act on

At CGI, we are insights-led and outcome-based to help clients accelerate returns on their investments.

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