



→ SPACE & 5G CONVERGENCE:
TRANSPORT & LOGISTICS
WEBINAR



Department for
Digital, Culture,
Media & Sport

→ NICK APPLEYARD

ESA

Head of ESA Space Solutions



ESA UNCLASSIFIED



→ PANEL 1

Setting the scene

- 10:00 - 10:05 – Magali Vaissiere, ESA TIA Director
- 10:10 – 10:15 – Mike Rudd, UK Space Agency Head of Telecommunications Strategy
- 10:15 – 10:20 – Mike Short, DIT Chief Scientific Advisor



→ MAGALI VAISSIERE

ESA

TIA Director



ESA UNCLASSIFIED



European Space Agency

→ MIKE RUDD

UK Space Agency

Head of Telecommunications Strategy



ESA UNCLASSIFIED



→ MIKE SHORT

DIT

Chief Scientific Advisor



ESA UNCLASSIFIED



→ PANEL 2

Potential use cases and business opportunities

- 10:25 - 10:30 – Andy Sutton from BT
- 10:30 – 10:35 – Robert Gardner from Network Rail
- 10:35 – 10:40 – Jaime Reed from CGI



→ ANDY SUTTON

BT



ESA UNCLASSIFIED



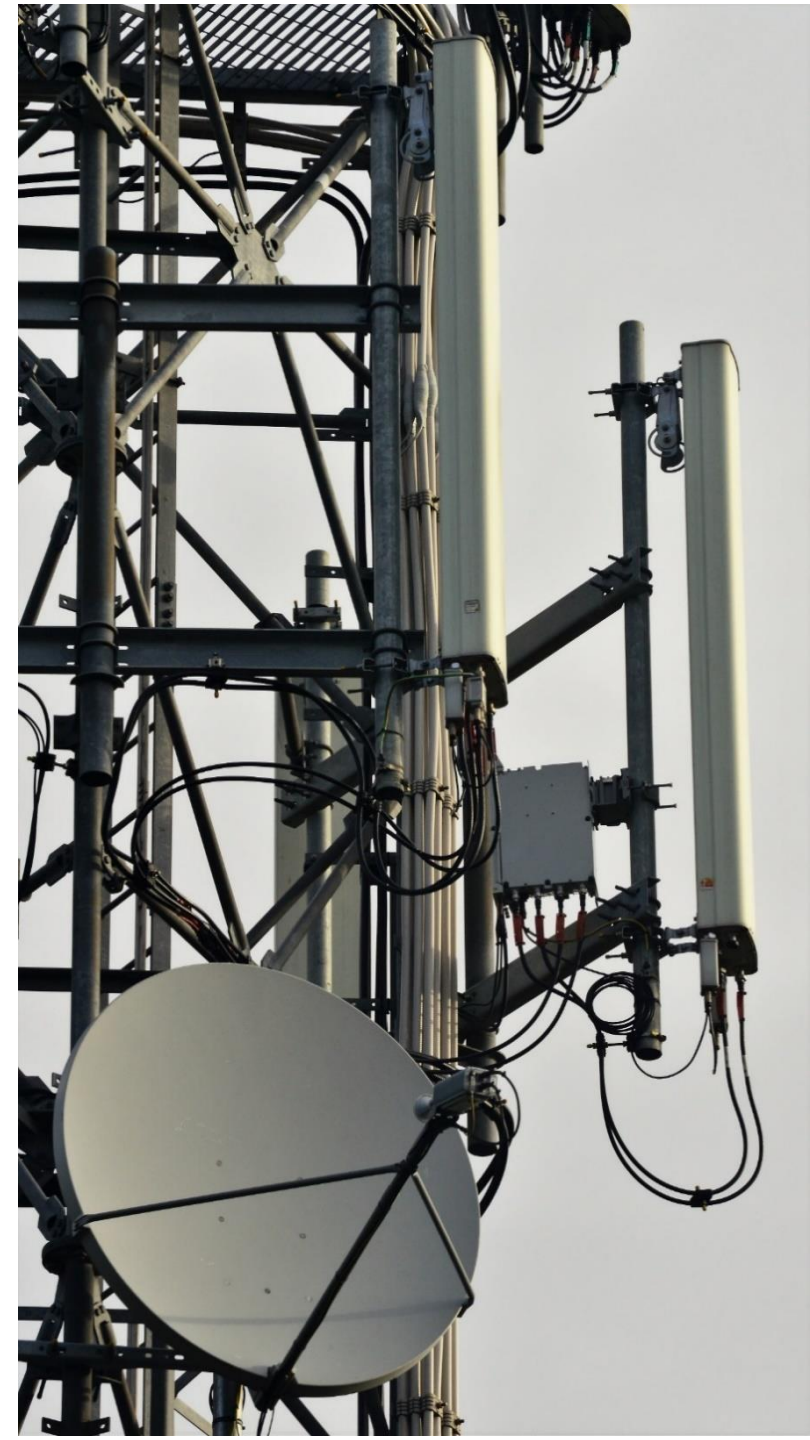


Satellite based mobile backhaul

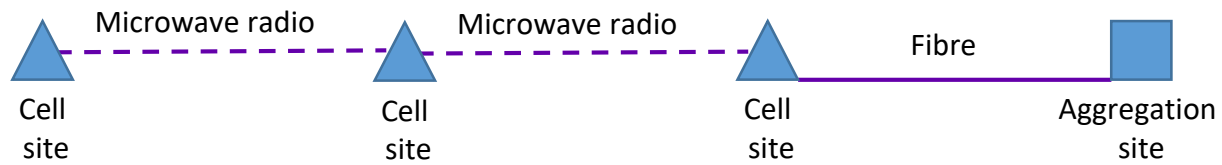
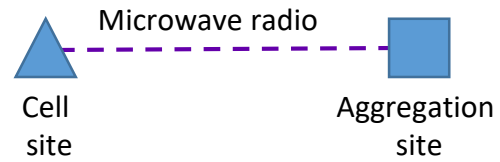
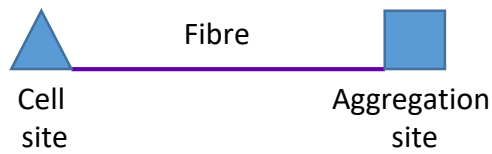
Professor Andy Sutton
Principal Network Architect
BT Technology
9th July 2020

Contents

- Review of use cases for satellite based mobile backhaul
- Deployment scenarios
- Summary



Mobile network topology



Many variations of network topology are possible to meet different deployment scenarios



Satellite based network resilience

- example

- A fibre aggregation site support three cell sites, the first connected on point to point fibre, the second sub-tended from the first by point to point microwave radio, the third sub-tended from the second by point to point microwave radio
- This topology is common however it introduces a number of technical design challenges; capacity management and network availability...



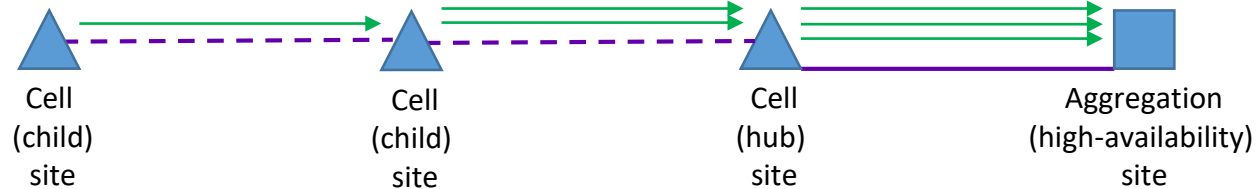
- Where should we place VSAT capability to minimise probability of network service affecting outage in the event of a transmission failure?

Note: Electrical power resilience is also considered and addressed however this is excluded from this example



Satellite based network resilience - traffic flows

- A fibre aggregation site support three cell sites, the first connected on point to point fibre, the second sub-tended from the first by point to point microwave radio, the third sub-tended from the second by point to point microwave radio
- This topology is common however it introduces a number of technical design challenges; capacity management and network availability...



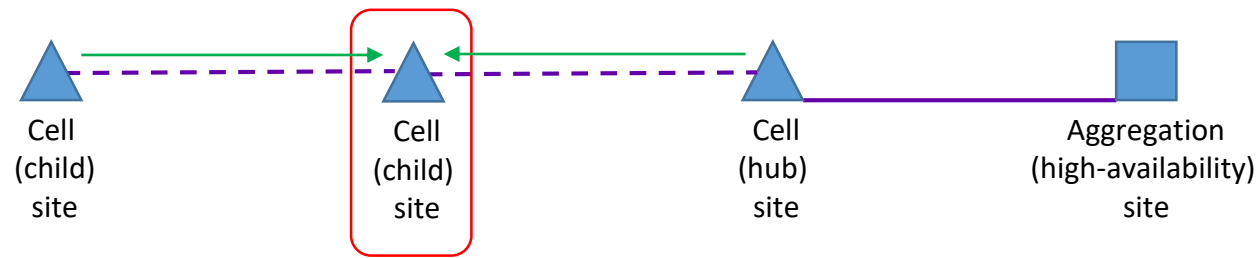
- Where should we place VSAT capability to minimise probability of network service affecting outage in the event of a transmission failure?

Note: Electrical power resilience is also considered and addressed however this is excluded from this example



Satellite based network resilience - VSAT location

- A fibre aggregation site support three cell sites, the first connected on point to point fibre, the second sub-tended from the first by point to point microwave radio, the third sub-tended from the second by point to point microwave radio
- This topology is common however it introduces a number of technical design challenges; capacity management and network availability...



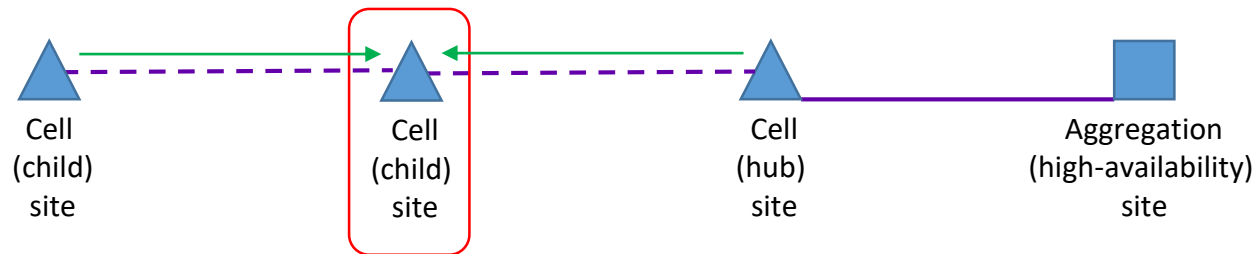
- Where should we place VSAT capability to minimise probability of network service affecting outage in the event of a transmission failure?

Note: Electrical power resilience is also considered and addressed however this is excluded from this example



Satellite based network resilience

- VSAT terminal installed on site terminating the first microwave radio link. Hub site installation wouldn't maximise resilience uplift - need to consider frequency sync, phase sync too if TDD
- Overlapping coverage generally provides external street-level coverage if a single cell site is lost

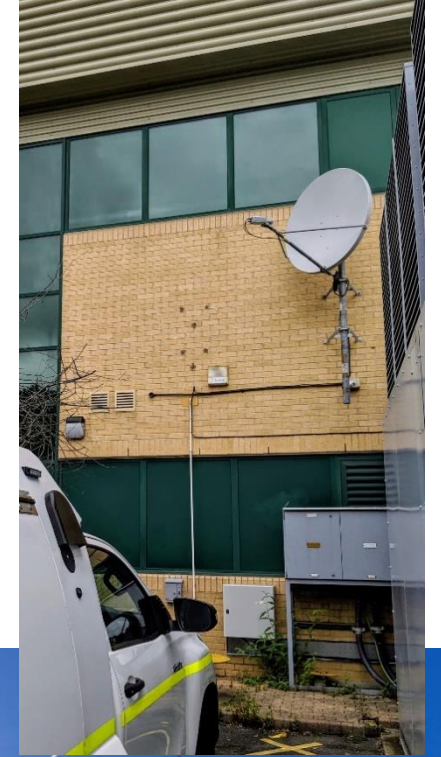


- Geostationary satellite capacity is extremely expensive, therefore resilient capacity is constrained and managed accordingly by prioritisation and QoS mechanisms



Use cases

- Network availability uplift
- Extreme rural coverage - no terrestrial solution available
- Rapid deployment - while awaiting terrestrial delivery
- Disaster recovery
- Tactical coverage
- Special events
- ...



Summary

- BT has a rich history in satellite communications
- The application of satellite communications to mobile backhaul has been relatively niche until recently
- Recent deployments have increased global volumes however the economics restrict the scale of the opportunity - will HTS and/or LEO change this?
- Terrestrial and satellite backhaul integration enables high-availability mobile networking while offering subscribers the low-cost, mass market, economies of scale in smartphones, tablets, broadband and IoT solutions
- BT has on-going dialogue with satellite eco-system players and is investigating new and exciting opportunities...





→ ROBERT GARDNER

Network Rail



ESA UNCLASSIFIED



European Space Agency

Satellite & 5G Communications in Rail



Space and 5G: Transport & Logistics

Webinar

9th July 2020

✉ robert.gardner2@networkrail.co.uk

Network Rail Telecom

Picture credit: AAC Clyde Space Epic 6u Cubesat



Satellite & 5G Communications in Rail

Satellite communications, particularly recent developments in low- and medium-earth orbit systems, in an integrated 5G networking context could soon deliver a step-change for **data communications connectivity and logistics in transport** owing to:

- Global coverage
- 5G integration and interoperability
- Diverse data service capabilities
- High reliability
- Lowering costs for initial entry and data
- Competitive service-provider market

Developing the Digital Logistics Ecosystem

The “Physical Internet” of passengers & freight transport, enabled by 5G “Internet of Things” & Automation:

How to facilitate the **efficient transportation** of passengers and freight, origin to destination, similar to datagrams in the Internet, according to the relevant constraints (link cost, time, etc.)?

How will passengers and freight be monitored or **tracked**, end-to-end, and ethically so ?

How can passengers & freight handling systems (human or automated) be **informed** ?

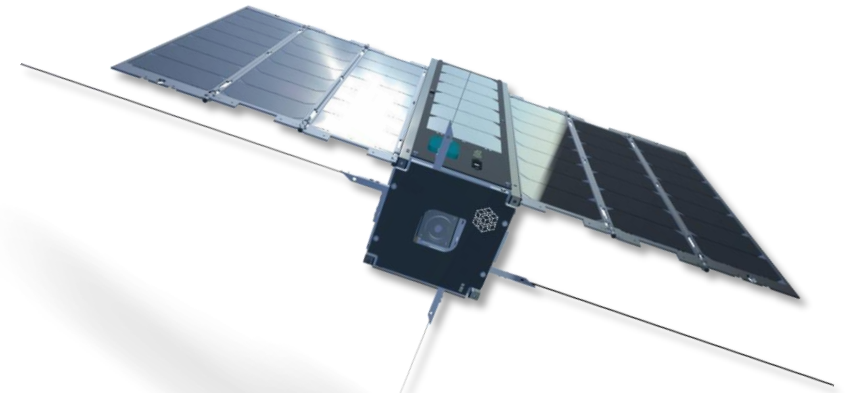
How can **automated** transport logistics systems be connected reliably and efficiently?

References: <https://www.globalrailwayreview.com/article/68448/rail-freight-digital-logistics/>
https://www.researchgate.net/publication/320925444_Principles_of_Logistics_Applied_to_Railway_Passenger_Transport

Railway Satellite Applications

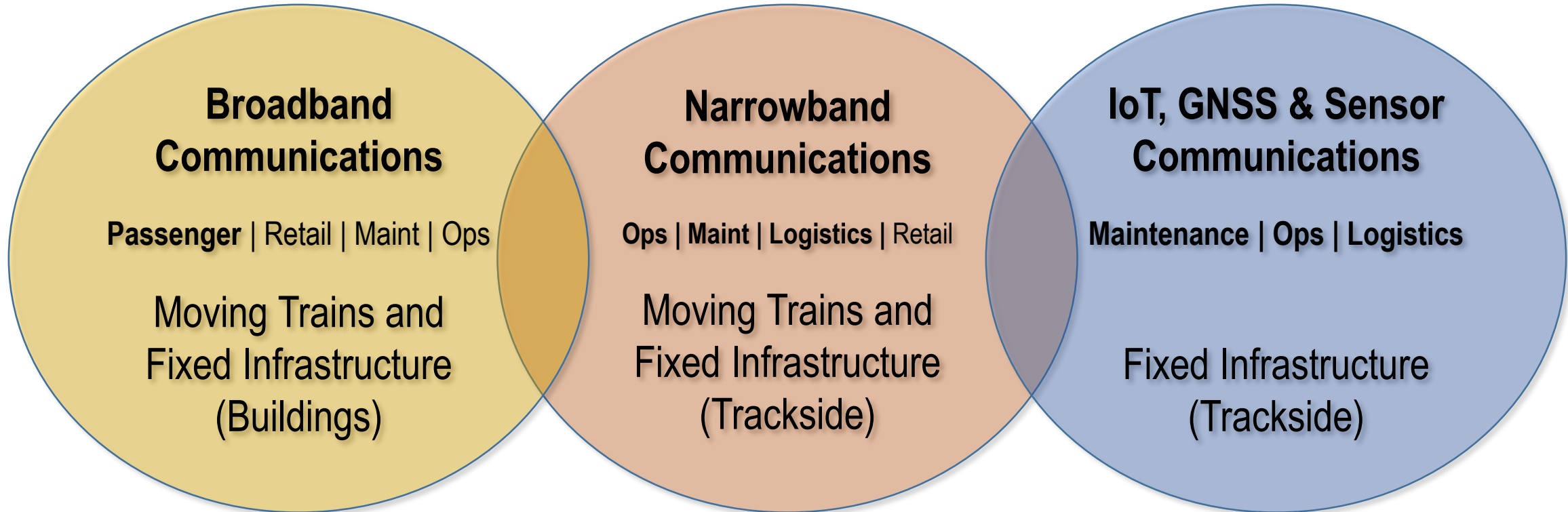
Some railway telecoms use cases include:

- Rail Vehicle:
 - Passenger Broadband Connectivity
 - ***Customer Information, Communications and Surveillance Systems***
 - ***Retail Point of Sales Systems***
 - ***Rolling Stock Condition Monitoring and Diagnostics***
 - ***Location Services and Tracking (for safety and logistics)***
 - Operational Voice Communications Systems (e.g. GSM-R successor)
 - Operational Train Control Systems.
- Trackside:
 - Level Crossing Safety
 - ***Remote Condition Monitoring of Assets (Intelligent Infrastructure)***
 - ***Workforce Communications and Safety***
 - Emergency and Secure Telecommunications Services
 - Operational Telecoms Connectivity
 - ***Station, Depot and other Facilities Connectivity.***



Picture credit:
AAC Clyde Space
Epic 3u Cubesat

Satellite Connectivity Application Domains



Characterized by:

- High throughput
- Multi-bearer integration or interoperability (satcom & terr)
- Modest system reliability
- Good mobility coverage [satellite union. terrestrial].

Characterized by:

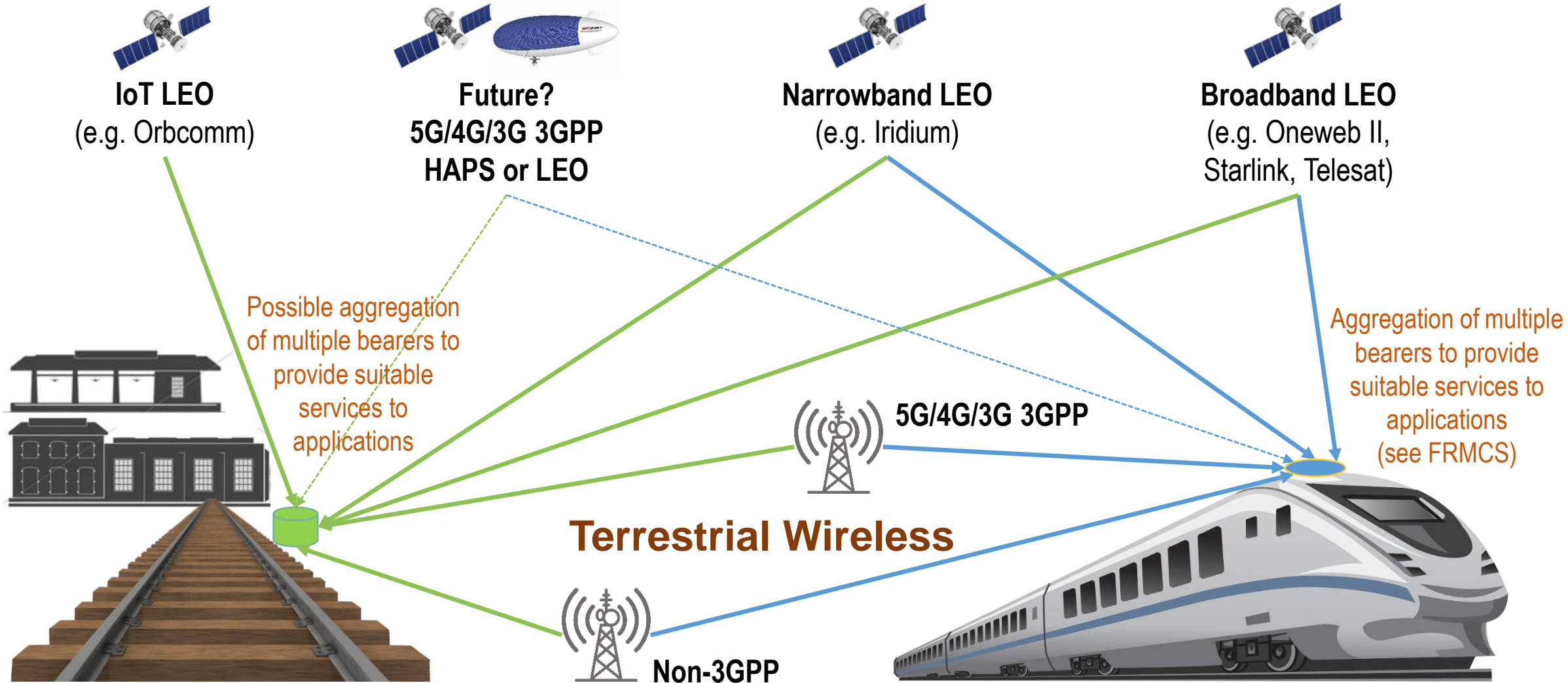
- Modest throughput ~1Mbps
- Multi-bearer integration or interoperability (satcom & terr)
- Ultra system reliability ~100%
- Ultra-high mobility coverage [satellite union. Terrestrial].

Characterized by:

- Low rate, bursty or intermittent
- Optionally interoperable and/or integrated with terrestrial wireless
- Good reliability
- Mobility coverage n/a
- Low power / ultra-long field life.

Converging Networks in the Space-Terrestrial 5G 'ecosystem'

Space and High Altitude





Space and 5G: Transport & Logistics

Potential Use Cases and Business Opportunities

Dr. Jaime Reed

Director, SatCom and Space Data Platforms,
New Projects

jaimereed@cgi.com

[linkedin.com/in/jaime-reed/](https://www.linkedin.com/in/jaime-reed/)

twitter.com/JaimeReedSpace

CGI at a glance

Founded in 1976
44 years of excellence

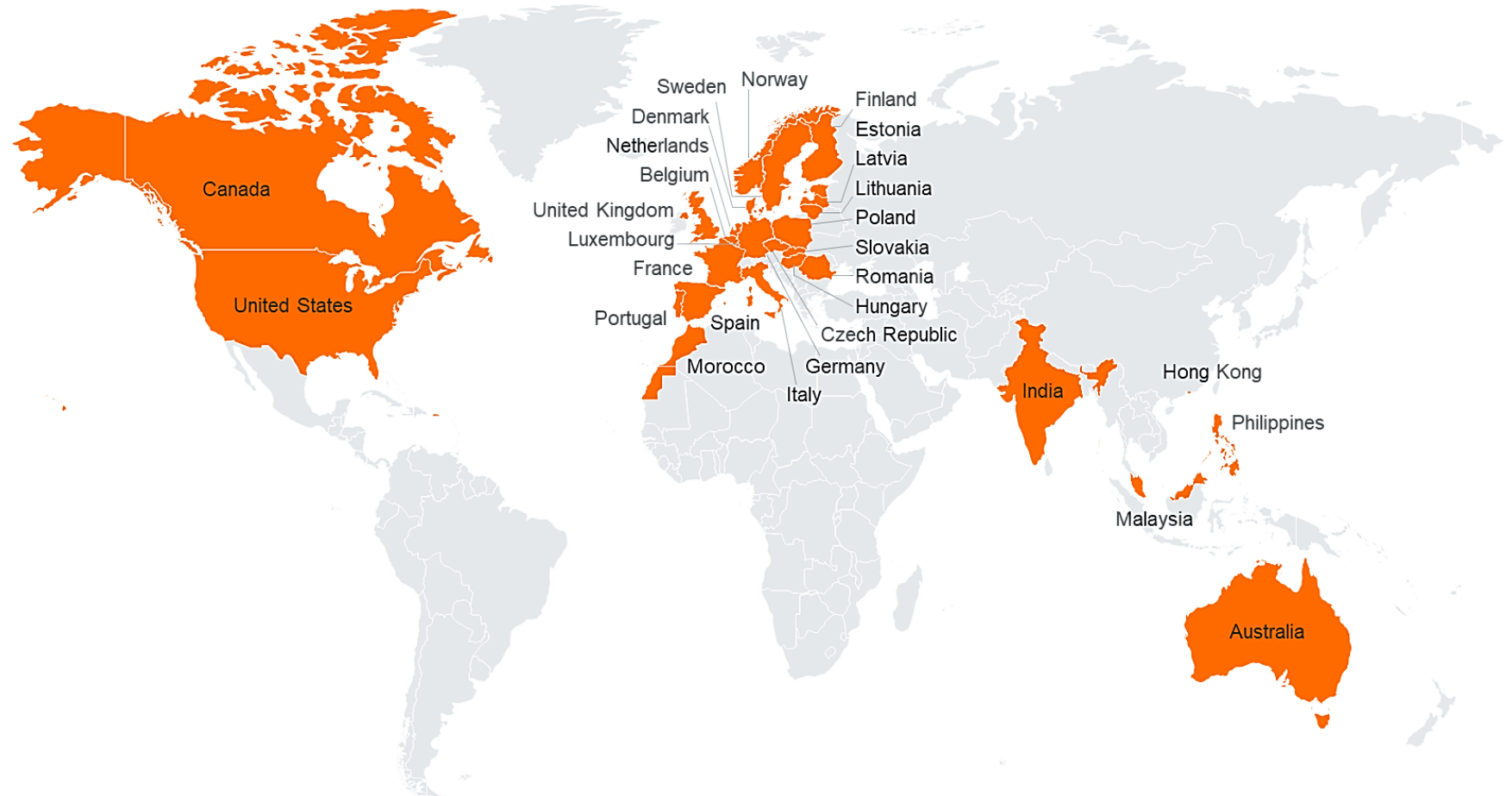
CA\$12.1 billion revenue

78,000 consultants

400 locations in **40** countries

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

170+ IP-based solutions serving **50,000** clients



Our market sectors relevant to today

Communications

- › Partnering with **5** of the world's **top CSPs**
- › **5,000+** communications consultants focus on the end-to-end needs of our clients

Transport and Logistics

- › **200+** clients globally
- › **4,000** consultants support clients in the aviation, maritime, rail, road, logistics and post sectors

Space

- › Working with **5** of the top SNOs
- › **700+** members supporting space customers
- › Supporting **800+** satellites and **50+** ground stations





Satellites and 5G in Logistics

- Supply chain visibility and freight tracking helps to solve many business and regulatory problems, but it must:
 - Provide an unbroken communications chain
 - Be ubiquitous & cross border
 - Be (very) cheap
 - Be unobtrusive / easy to implement
 - Provide rich data (not just position but status)
 - Be secure / tamper-proof (physically and digitally)
- Roles for satellites:
 - Coverage extension
 - Transport vehicles becoming data hubs
 - Security overlay
 - Authentication signals



Satellites and 5G in Transport

- Transport industries are typically heavy on capital investment with a wide range of legacy technologies
- They are usually highly regulated with many barriers to technology adoption
 - Note: desire to reduce fixed infrastructure
- 5G will enhance:
 - Digital asset management to reduce costs
 - Data mining and real-time analytics to improve reliability & respond to crises
 - Enhance the customer experience
- Roles for satellites:
 - Continuous connectivity for mobility but must be **very** robust & take into account many standards (automotive, rail, aviation etc.)
 - LPWAN for fixed assets

→ PANEL 3

Launch of call for proposals

- 10:45 - 10:50 – Antonio Franchi from ESA
- 10:50 – 10:55 – Rita Rinaldo from ESA



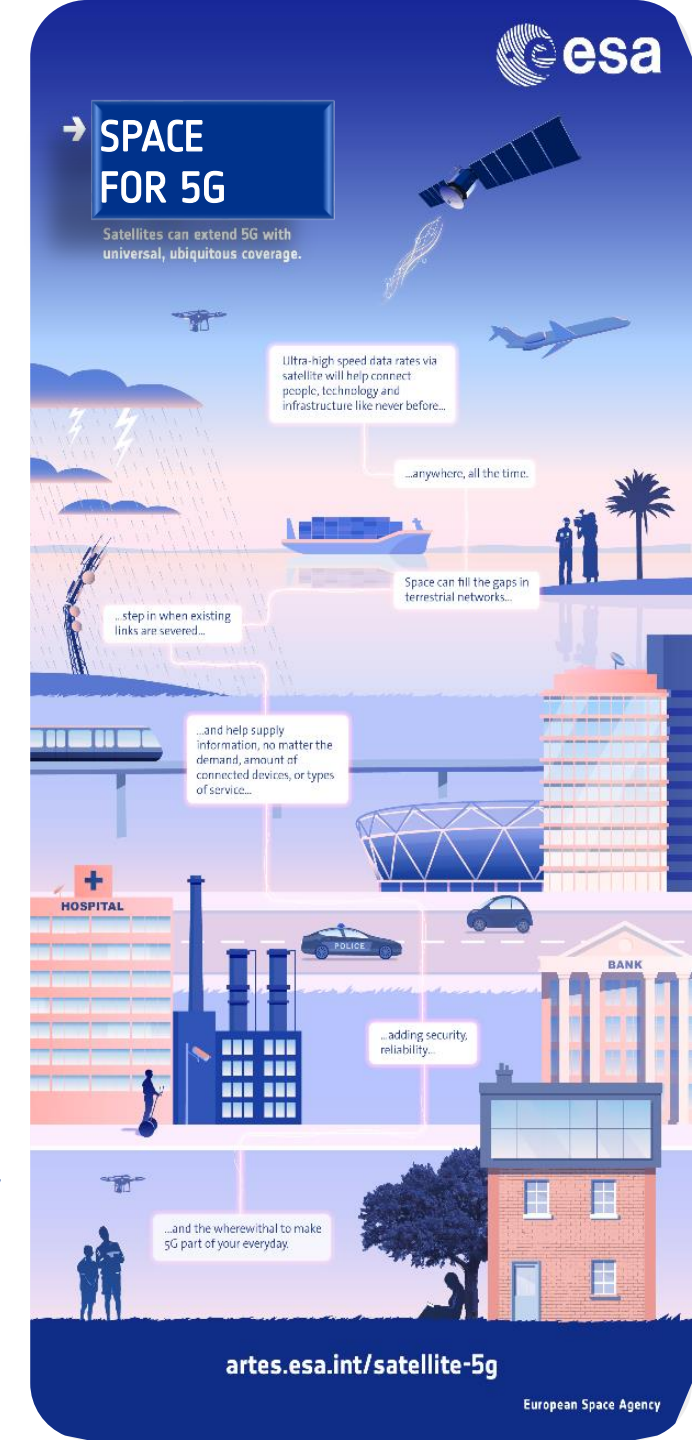


Space for 5G Strategic Programme Line

SPACE AND 5G CONVERGENCE: TRANSPORT & LOGISTICS

Antonio Franchi - ESA

5G network convergence is key to support the Transport & Logistics sector in its Digital Transformation



Call for Proposals “Space and 5G convergence: Transport and Logistics”

- **What:** **Demonstration projects** focussing on the development and pilot of **sustainable downstream services** addressing UK Government's priorities in the **Logistics sector**.
- **How:** The services shall rely on **converged 5G terrestrial and satellite communication networks** and shall demonstrate **innovation** and **sustainable business models**
- **Why:** to deliver innovative and sustainable services for a longer term **efficient, competitive and low carbon** logistics sector



Project Proposal Requirements

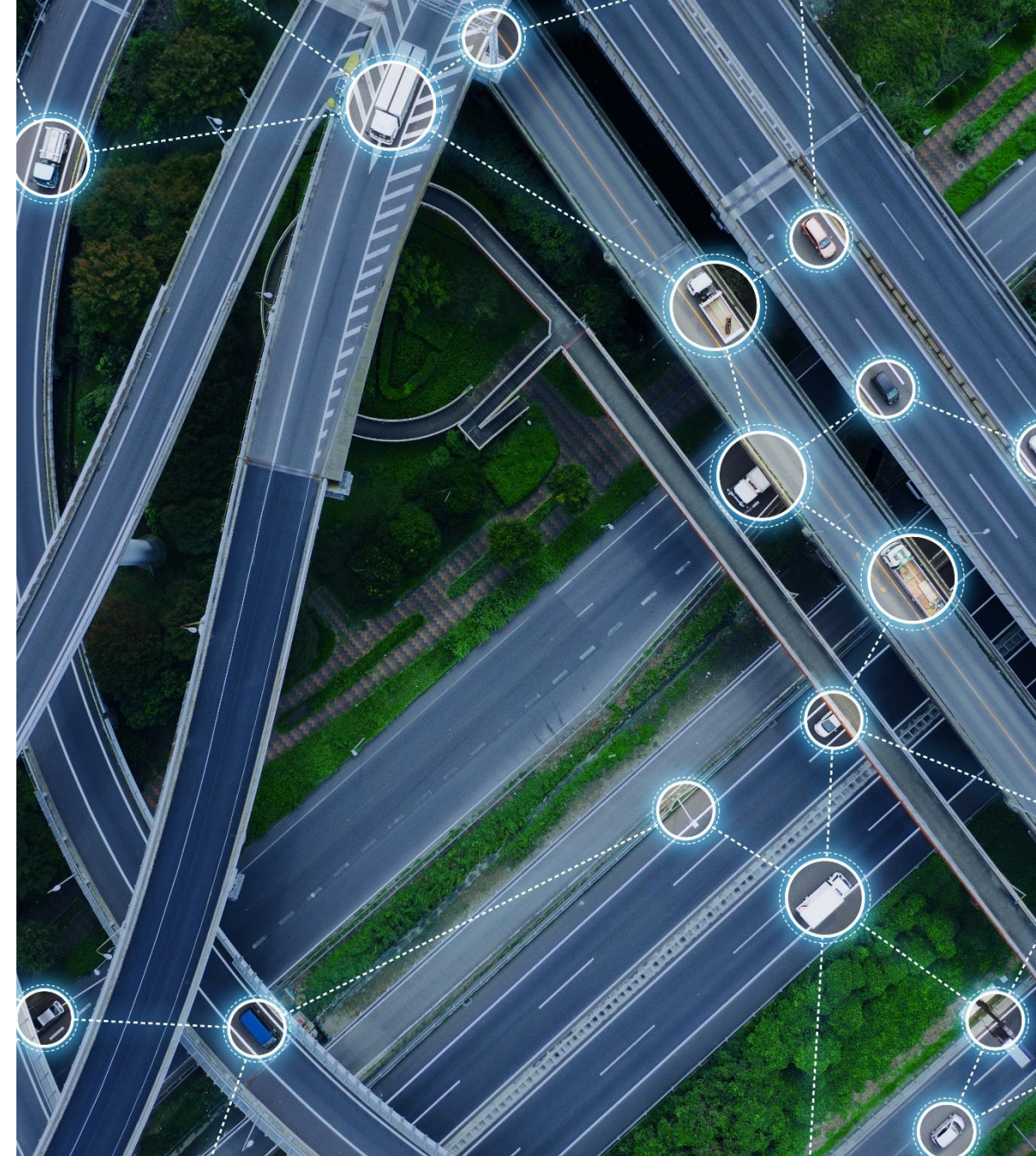
- Implement as a **minimum one pilot within the UK** territory addressing UK users
- Obtain the **commitment of relevant representatives of UK-based user communities** in the **Logistics sector** (including land, air and maritime) to participate in the project
- Include the **service provider with a leading role**
- Establish **agreements with 5G infrastructure providers** (satellite and terrestrial)
- Include all **technology and product ground developments as required** for the delivery of the proposed service



How to apply

- The call is part of the 5GSPL of ARTES 4.0 Programme
- Companies registered in the following Member States will be eligible to apply: Austria, Czech Republic, Denmark, Finland, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Norway, Portugal, Romania, Spain, Sweden, Switzerland, the United Kingdom and Canada.
- Companies are requested to obtain a Letter of Authorisation from all the respective national delegations
- ESA will fund up to 50% of the total project cost
- SMEs activities can be funded up to 80%, depending on the funding level authorised by the related National Delegation(s)
- Opening date: July 09th
- Closing date: December 15th

<https://business.esa.int/funding/intended-tender/space-and-5g-convergence-transport-logistics>





→ Q&A

11:00 – 11:30

- ESA – Rita Rinaldo
- UK Space Agency – Emily Gravestock
- DCMS – Mohammad Lari

