SPACE & 5G CONVERGENCE: TRANSPORT & LOGISTICS WEBINAR
NICK APPLEYARD

ESA

Head of ESA Space Solutions
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
MIKE RUDD

UK Space Agency

Head of Telecommunications Strategy
DIT

Chief Scientific Advisor
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
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
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Satellite based network resilience - VSAT location

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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...
Satellite & 5G Communications in Rail

Space and 5G: Transport & Logistics

Webinar

9th July 2020

robert.gardner2@networkrail.co.uk
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:
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.*
Satellite Connectivity Application Domains

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

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

IoT, GNSS & Sensor Communications
- 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.

- Passenger | Retail | Maint | Ops
- Moving Trains and Fixed Infrastructure (Buildings)
- Moving Trains and Fixed Infrastructure (Trackside)
Converging Networks in the Space-Terrestrial 5G ‘ecosystem’

Space and High Altitude

- IoT LEO (e.g. Orbcomm)
- Future? 5G/4G/3G 3GPP HAPS or LEO
- Narrowband LEO (e.g. Iridium)
- Broadband LEO (e.g. OneWeb II, Starlink, Telesat)

Terrestrial Wireless

Possible aggregation of multiple bearers to provide suitable services to applications

5G/4G/3G 3GPP

Non-3GPP

Aggregation of multiple bearers to provide suitable services to applications (see FRMCS)
Space and 5G: Transport & Logistics
Potential Use Cases and Business Opportunities

Dr. Jaime Reed
Director, SatCom and Space Data Platforms, New Projects

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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

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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 postal sectors

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

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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

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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
11:00 – 11:30

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

→ Q&A