



The Scotland  
**5G** Centre

# Leading our nation's digital future

Paul Coffey, Chief Executive

Share your feedback via Twitter [#S5GConnect](#)

# **5G will be transformative for Scotland**

**Job growth**

**Economic gains**

**Rural and urban development**

**Safer, more connected, more productive**

# 5G will be transformative for Scotland



**£17bn**

by 2035



**3,000**

new businesses



**160,000**

jobs

**Introducing**

# **The Scotland 5G Centre**



**Our mission:**

**To accelerate the  
deployment & adoption  
of 5G in Scotland**

**Our mission:**

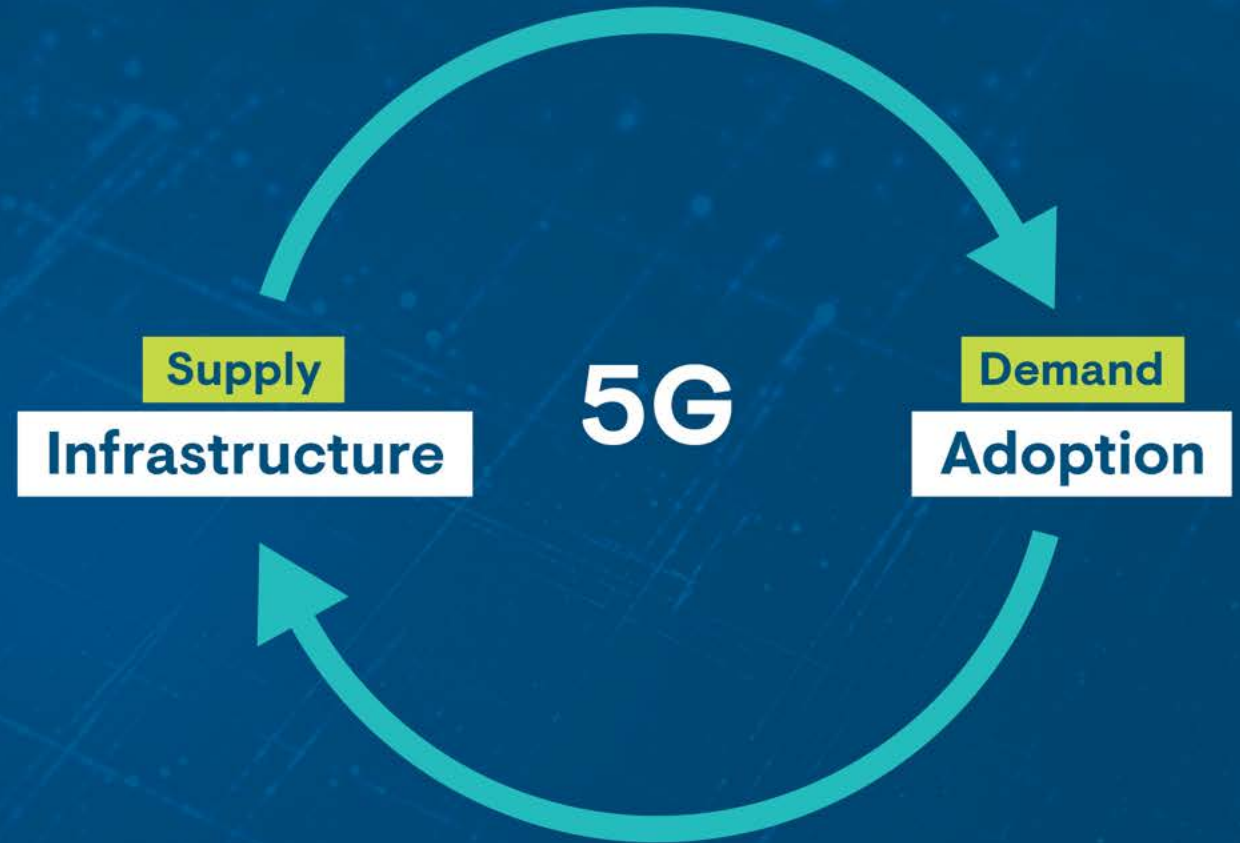
**To help businesses all  
over Scotland recover  
and rebuild following  
COVID-19**

**Our mission:**

**Raise awareness of 5G  
and the benefits to businesses,  
people and communities**

**And be their catalyst for collaboration**

# Building the 5G eco-system





Success is:

**A thriving 5G  
eco-system**



# **S5GConnect Programme**

## **Objectives**

Objective 1

**Transforming  
5G demand**

Objective 2

**Accelerating  
regional  
networks**

Objective 3

**Shaping a  
technological  
eco-system**

Objective 4

**Generating  
awareness and  
engagement**

**Transforming connectivity**

**Transforming regions**

## Satellite Comms, Transforming the Sector - Scotland

### Strength of the Sector

1. Employees 26,000 with a current GVA of £2.5 billion
2. Projected as £4 billion (2030)
3. Nearly a fifth of all UK space jobs are based in Scotland
4. More than 130 space organisations in Scotland – including the headquarters of 83 UK space industry firms – combined income of £140 million
5. Glasgow manufactures more satellites than any other city in Europe

## Flagship Projects & Key Players

Strong industry cluster

Supported by a strong supply chain with extensive experience

## Strong R&D and Skills Base

Graduate and Postgraduate - Engineering  
and Technology, Physical Sciences  
and Mathematical Sciences

## To Summarise

- Strong industry sector
- Mature ecosystem and supply chain
- Developing interdependence of technologies - 5G and satellites
- Natural collaborative opportunities
- Supportive policy environment - e.g. S5GC and Scottish Space Leadership Council
- Integrated economic development and research networks





# The Scotland **5G** Centre

Share your feedback via Twitter [#S5GConnect](#)

# Space and 5G Event – Opportunity in Scotland

09:30 – 09:40 **WELCOME**

Paul Coffey, CEO Scotland 5G Centre

09:40 – 10:10 **THE PROJECT OPPORTUNITY - INTRODUCTION AND INFORMATION SESSION**

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

10:10 – 10:40 **WORKED EXAMPLES OF ADVANCED 5G LOGISTICS**

Rail

- 5G Transport and Logistics: Robert Gardner, Senior Innovation Engineer, Network Rail
- Introduction to Smart Ports: Elaine Scott, North East Satellite Applications CoE
- 5G and Urban Mobility: Adrian Talbot, Head of CoE for Mobility -Ferrovial

10:40 – 11:00 **OPEN DISCUSSION**

Moderator: Paul Coffey

- Kenneth Gordon - Scotland Ambassador ESA Business Applications
- Open Discussion on potential projects in Scotland
- Agreement on formative consortia and collaborative actions



Department for  
Digital, Culture,  
Media & Sport



**Mohammad Lari**

Head of Cross-Government &  
International Coordination

**5G** TESTBEDS  
& TRIALS  
**PROGRAMME**



**Build**

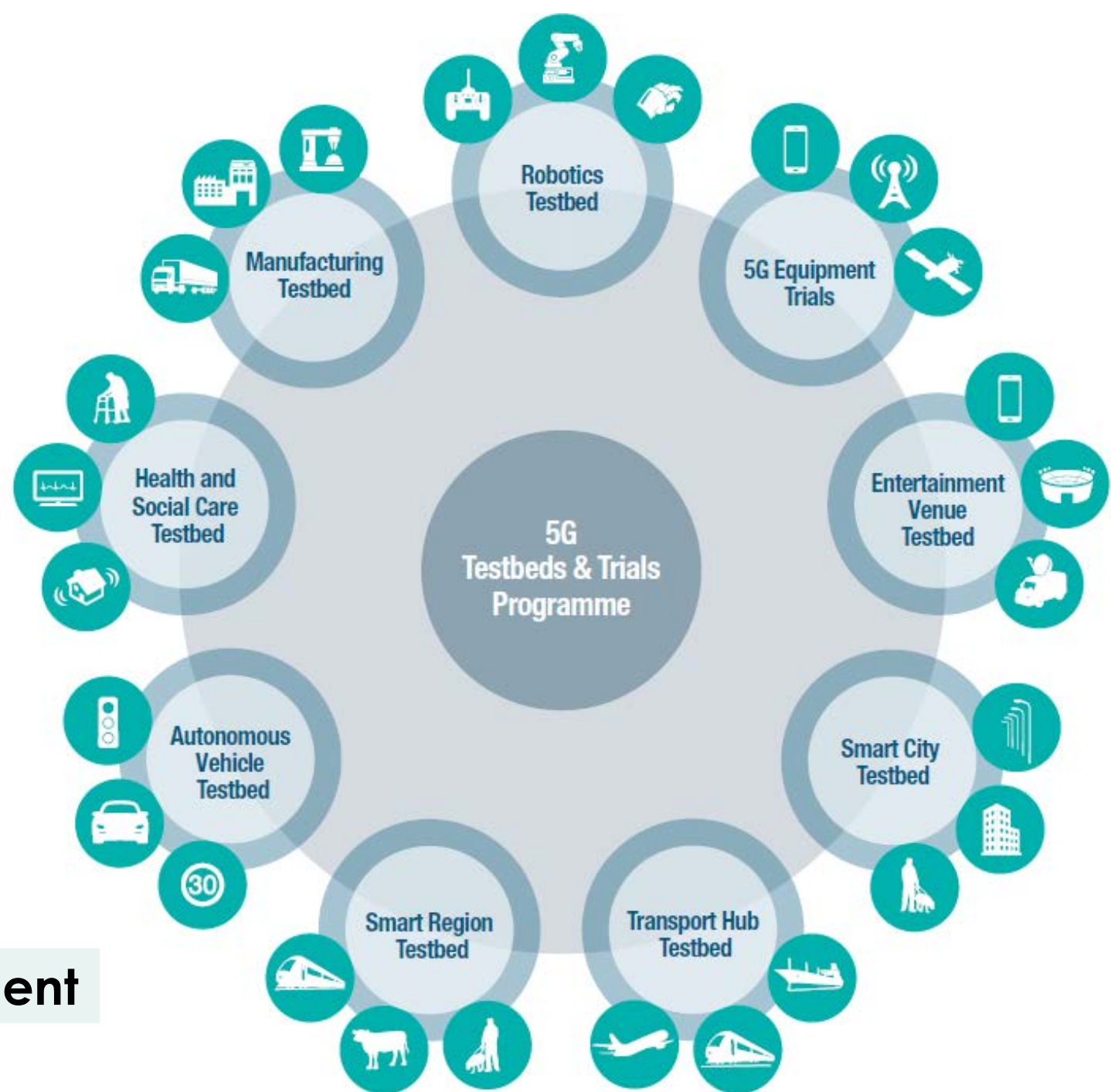
**Business cases**

**Foster**

**5G Ecosystem**

**Lead**

**Research & Development**



# UK 5G Innovation Network

**3500+**  
Users

**1500+**  
Organizations

UK5G is a 'network of networks' to facilitate, encourage and coordinate 5G activities across the UK.



(Electronic copies available [UK5G.org](http://UK5G.org))





Department for  
Digital, Culture,  
Media & Sport

# Thank you

**Mohammad Lari**

Head of Cross-Government & International Coordination

[mohammad.lari@dcms.gov.uk](mailto:mohammad.lari@dcms.gov.uk)



<https://uk5g.org/>

# 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

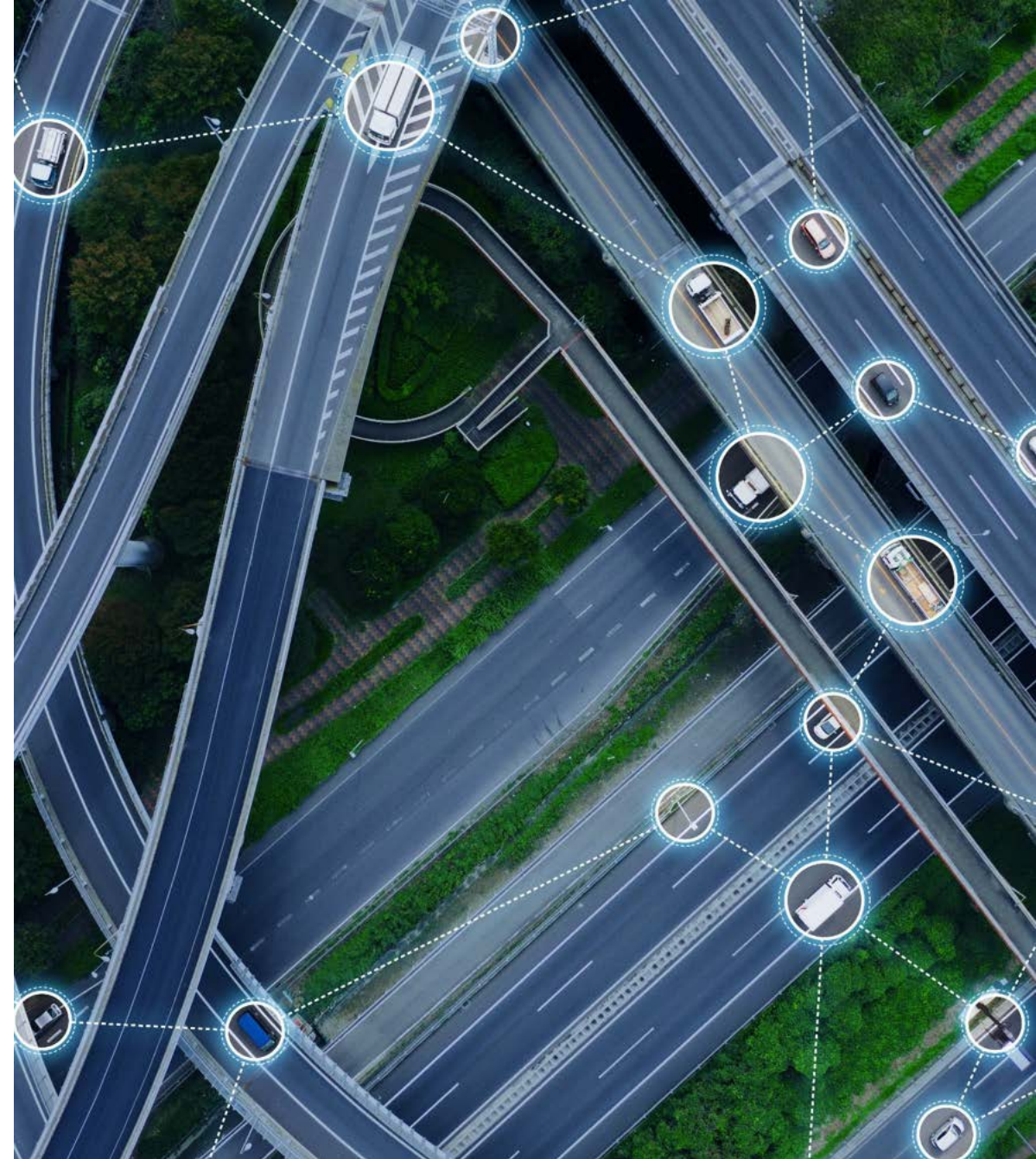




## How to apply

- 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 09<sup>th</sup>
- Closing date: December 15<sup>th</sup>
- The UK Delegation has allocated 5.0 MEUR funding to this call

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



# Satellite & 5G Communications in Rail



Space and 5G: Transport & Logistics (ESA/DCMS)

Webinar hosted by the Scotland 5G Centre

28<sup>th</sup> September 2020

✉ [robert.gardner2@networkrail.co.uk](mailto:robert.gardner2@networkrail.co.uk)

Network Rail Telecom

Picture credit: AAC Clyde Space Epic 6u Cubesat



# Satellite & 5G Communications in Rail

Satellite communications within an **integrated and converged 5G networking ecosystem** are potentially capable of transforming **data communications connectivity that supports transport logistics (especially, perhaps, in rural and remote areas)** 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 5G-enabled Digital Logistics Ecosystem

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

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

How to enable **monitoring** and **tracking** of passengers and freight, end-to-end, and ethically so ?

How to provide **relevant information** for passengers & freight handling systems (human or automated) ?

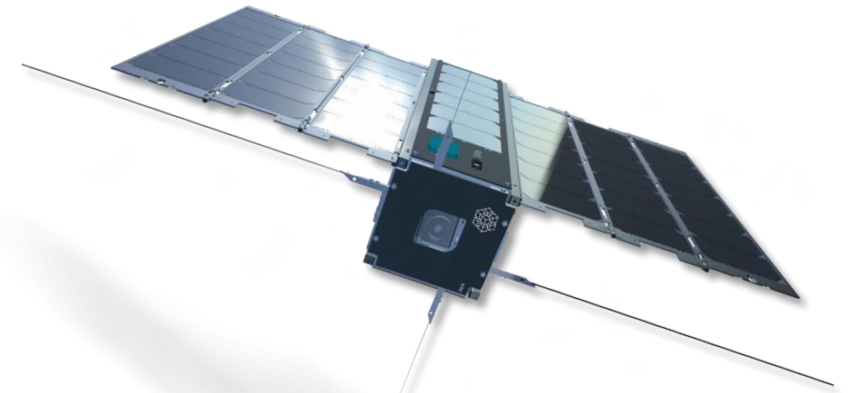
How can transport logistics systems be connected reliably and efficiently to enable greater **automation**?

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](https://www.researchgate.net/publication/320925444_Principles_of_Logistics_Applied_to_Railway_Passenger_Transport)

# Railway Satellite Applications

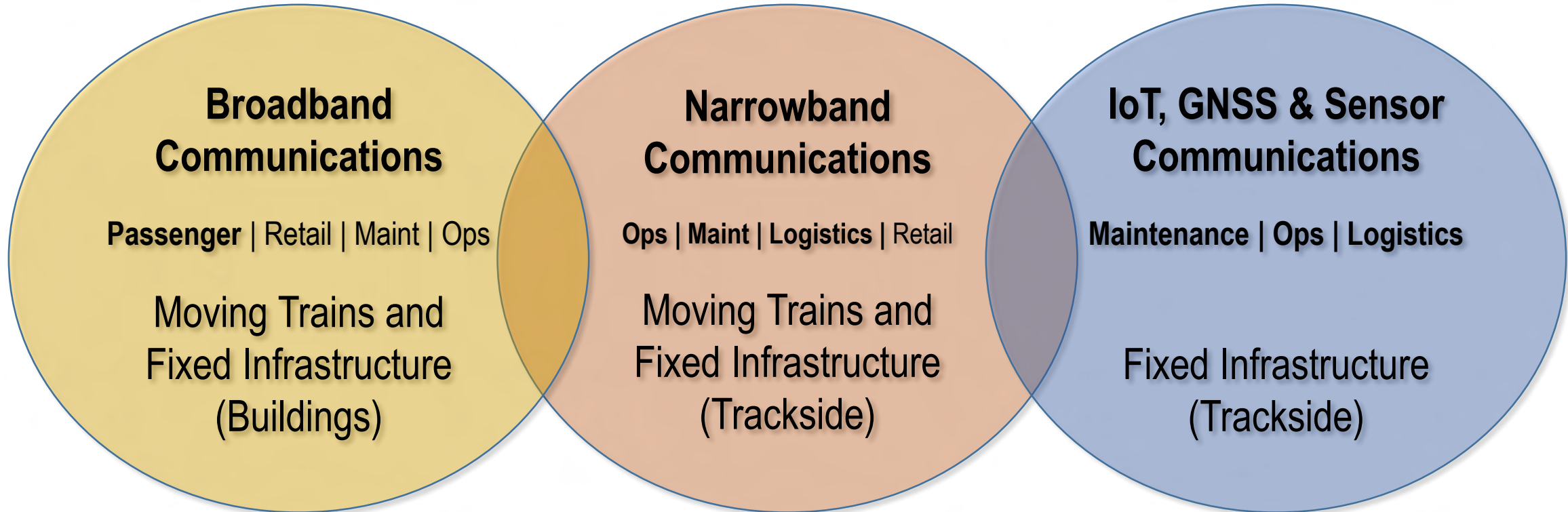
Some railway telecoms use cases include:

- 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:

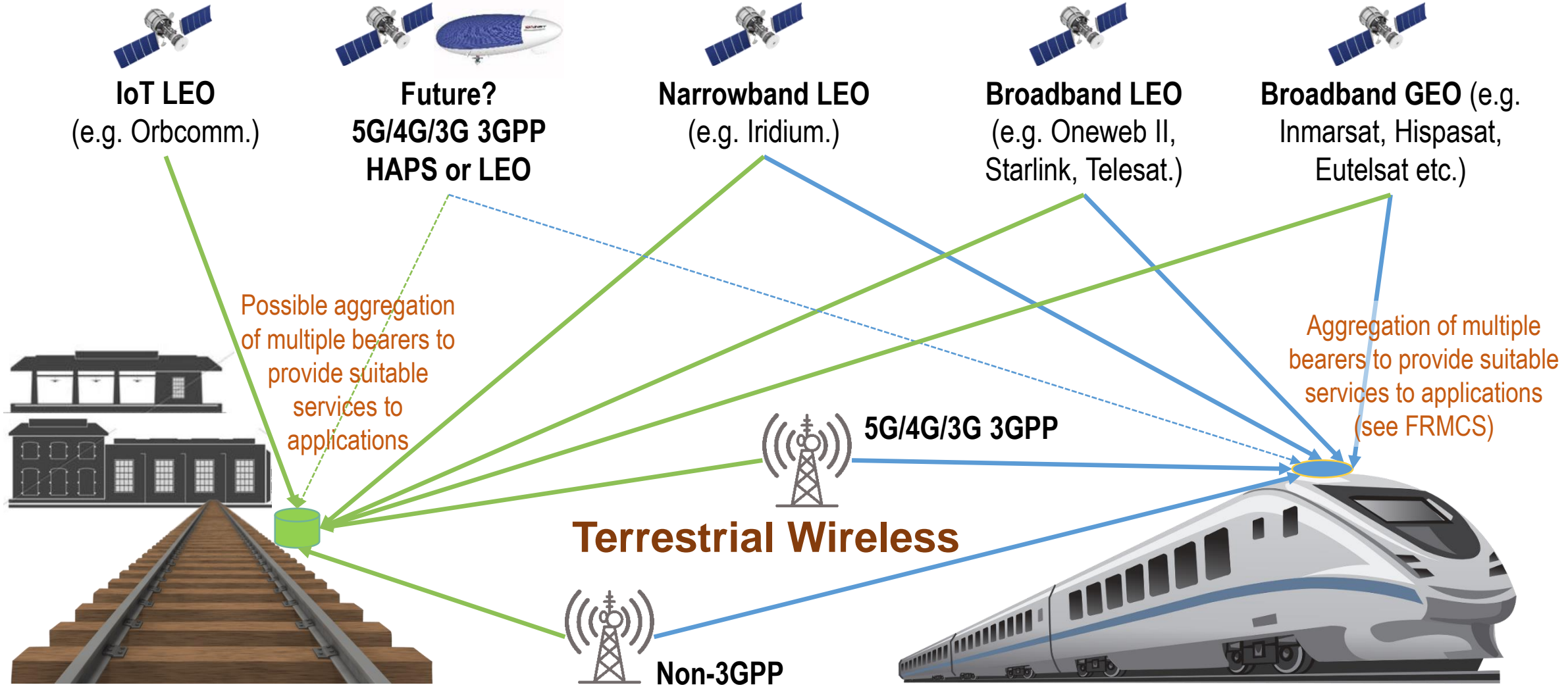
- Modest throughput ~1Mbps
- Multi-bearer integration or interoperability (satcom & terr)
- Ultra system reliability ~100%
- Ultra-high mobility coverage [satellite union. Terrestrial].

## 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



# Some of our associates:



If you have a proposition that you think would be of interest on the railways, please get in touch:

[robert.gardner2@networkrail.co.uk](mailto:robert.gardner2@networkrail.co.uk)



**North East SMART Ports**  
**[Elaine.scott@durham.gov.uk](mailto:Elaine.scott@durham.gov.uk)**

Space and 5G Convergence: Transport and logistics webinar  
28 September 2020



# Why SMART Ports?

## **Primary reasons and drivers:**

- Various satellite applications across multiple value chains – a great demonstrator platform!
- Changing role of ports, partly driven by environmental and political factors

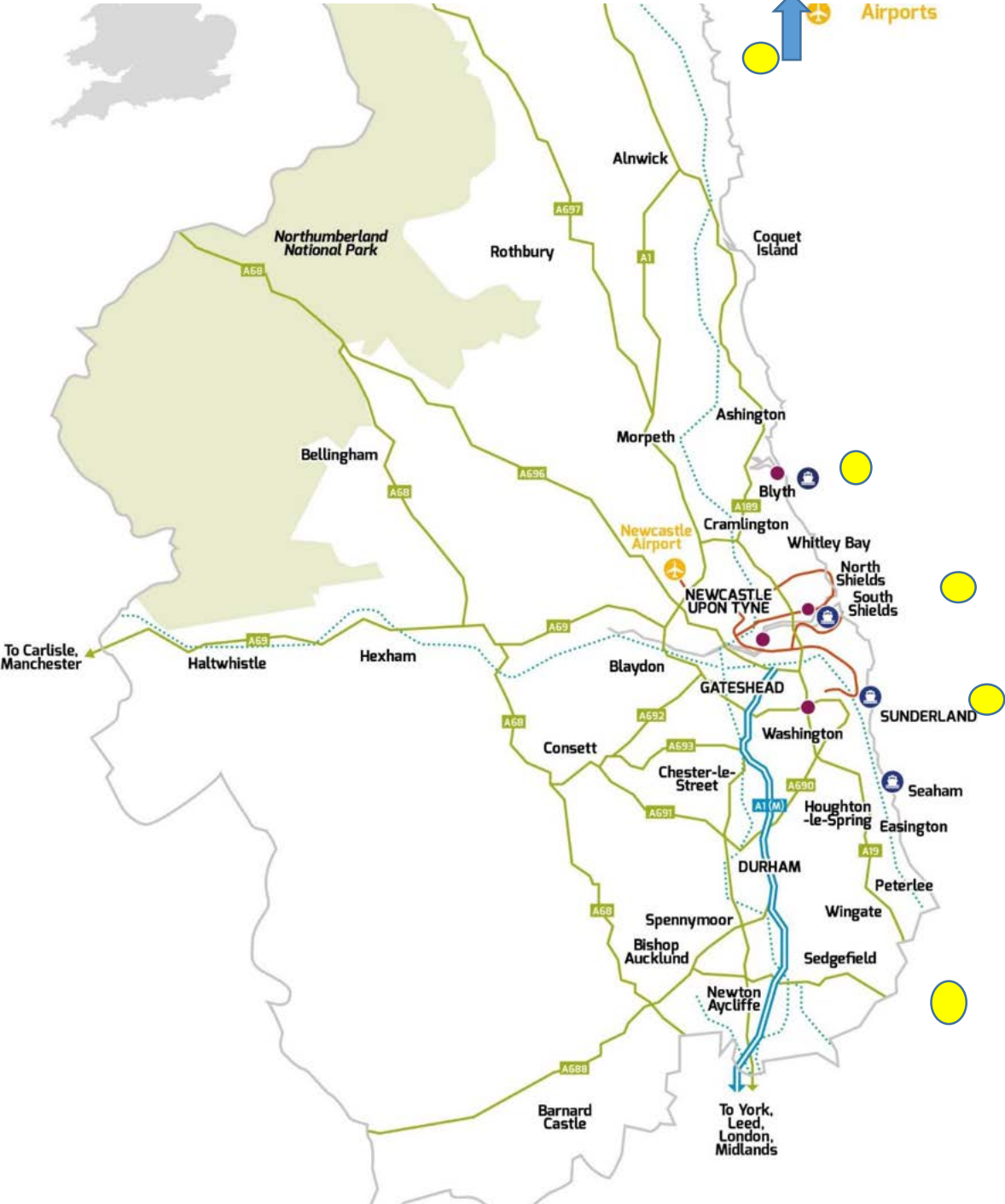
...and then, Maritime 2050 : Navigating the Future strategy

# SMART Ports

Shifting focus from administration, infrastructure and capacity to... improving connectivity between the port and the hinterland through various means of intermodal transport.

In other words, port authorities today are no longer concerned only by moving goods from sea to land, but they all act as facilitators in international logistic chains.

This is the essence of a '**Smart Port**' through optimising port processes and infrastructure, creating platforms to integrate more closely with stakeholders in the supply chain, and develop strategic relationships with businesses and citizens in their hinterland.



# North East ports

- Berwick
- Blyth
- Tyne
- Sunderland
- Tees

# Uses of 5G in ports:

- Video surveillance including AI recognition
- Remote control of equipment
- Remote connection
- Remote monitoring
- Providing a cheaper network compared to ducting/fibre
- Environmental monitoring within the port and external to the port

# Key considerations:

- Lack of fibre infrastructure
- Private vs public networks
- Legacy systems and compatibility
- Culture and engagement including data sharing agreements
- Be clear about the goals – danger of too much data
- Digitisation of vessels
- Common industry standards – shipping is fragmented

Thank you for listening.

[Contact: Elaine.scott@durham.gov.uk](mailto:Elaine.scott@durham.gov.uk)

07786 026916

We are on LinkedIn and Twitter (@satelliteapps)

# Digital Infra & 5G/SatComms Opportunities

Adrian Talbot | Head of Centre of Excellence for Mobility | **ferrovial**

September 2020

## Ferrovial improves the future

through the development and operation of sustainable infrastructure and mobility solution. We are committed to the highest level of operating excellence and innovation **and we create value for society and our stakeholders and employees.**

**E6.1 Bn  
revenues  
(2019)**

### HIGHWAYS



### CONSTRUCTION



### AIRPORTS



### OTHER



- Mobility
- Power Infrastructure
- Water
- [Services]

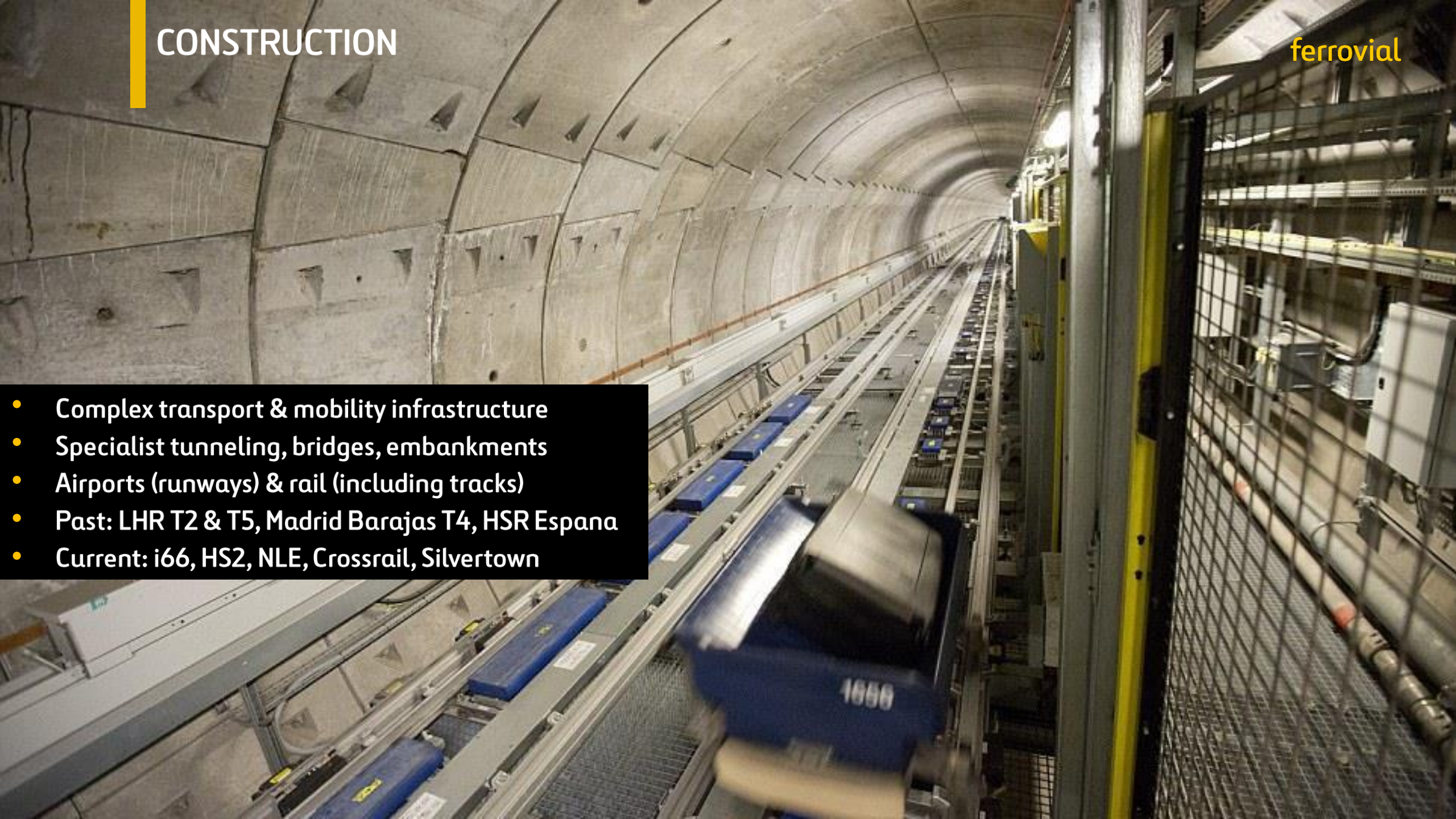


- Leader in Dynamic Pricing & Managed Lanes
- Multiple concessions: LBJ | NTE | i66 | i77 & 407ETR
- 18 toll-road concessions (barriers & free flow)
- Spain | Portugal | Ireland | UK | Slovakia | Colombia
- 1474 km of highway under management

# CONSTRUCTION

ferrovial

- Complex transport & mobility infrastructure
- Specialist tunneling, bridges, embankments
- Airports (runways) & rail (including tracks)
- Past: LHR T2 & T5, Madrid Barajas T4, HSR Espana
- Current: i66, HS2, NLE, Crossrail, Silvertown





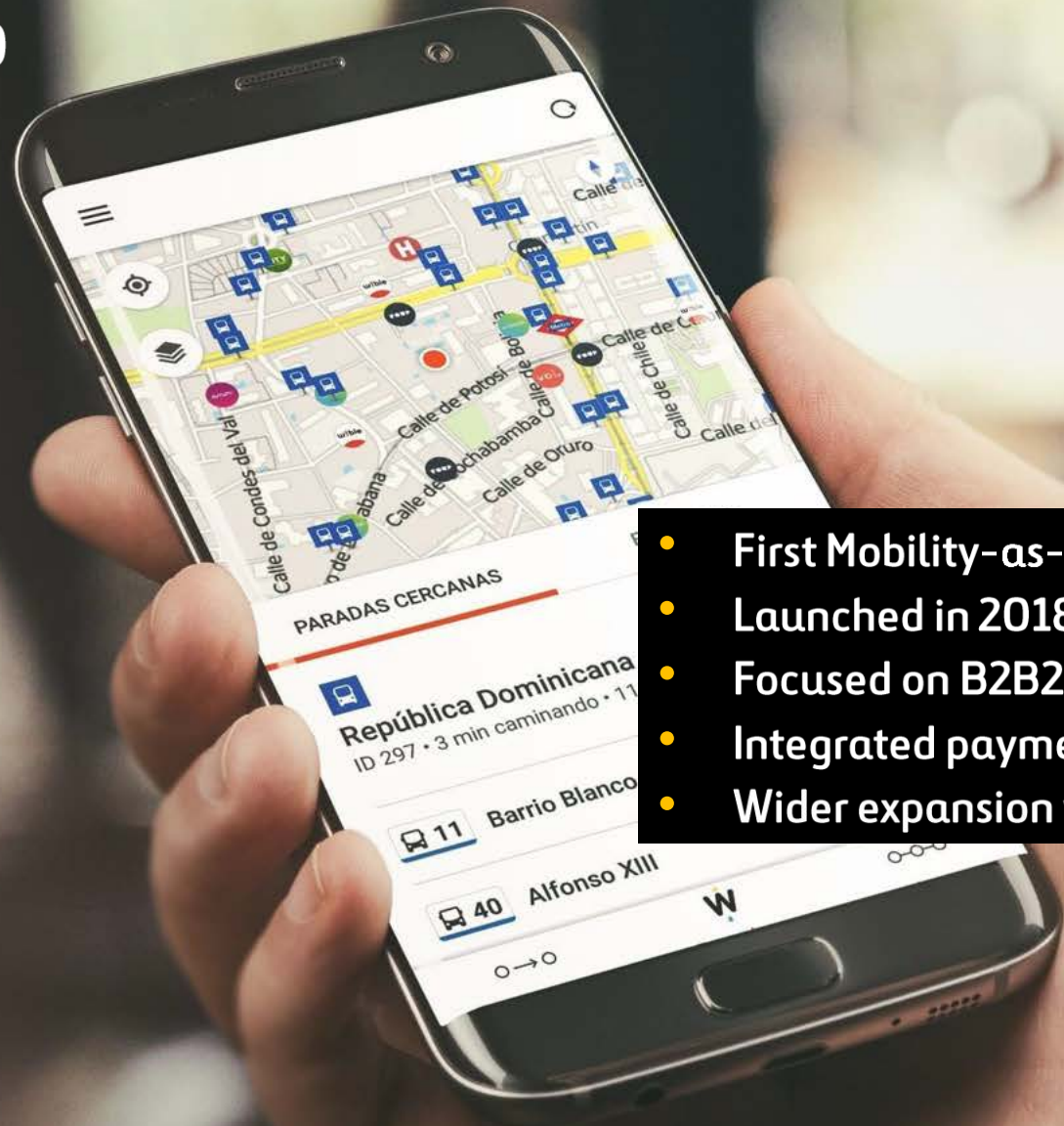
- Largest shareholder in LHR (25%)
- HAL is owner/operator of Heathrow Express
- 75% owner of ULTRA GLOBAL (AV PODs)
- 10 yrs fully commercial AV POD service at T5
- 50% owner of ABZ, GLA & SOU airports
- ABZ world's busiest helicopter operation

## MOBILITY: ZITY

ferrovial

- ZITY Madrid – Free Floating Car Sharing
- Joint-Venture Ferrovial+Renault (since 2017)
- Fleet of 750 fully electric Zoes
- City+metro area thanks to 400km range
- 300k+ registered users
- ZITY Paris launching in 2020 (650 vehicles)





- First Mobility-as-a-Service Platform in Madrid
- Launched in 2018; Partnership with Moovit
- Focused on B2B2C ride-sharing & DRT services
- Integrated payments
- Wider expansion within Spain & Portugal in 2020

# The Mobility Landscape & Transversality

<b>Users</b>	<b>User Behavior</b> Driver/Pilot Dynamics, Rider Dynamics, Citizen Dynamics										
<b>Mobility Services</b>	Mobility as a Service	Ride Sharing/Hailing	P2P/Fleet Vehicle Sharing	Demand Responsive Transit	Micro-Mobility Provision	Smart Parking	Data Services	In-transit services	Pre/Post Journey Services	First/ Last Mile	Goods Logistics
<b>Network Management</b>	<b>Single-Mode Network Management</b> Managed Lanes, Light Rail, Air Traffic Control			<b>Multi-Modal Network Management</b> Transport inter-connect, Resilience, Hubs			<b>"Smart City" / Geo-fenced Operator</b> Airports, Campuses, LEZ & CZ				
<b>Fleet Management</b>	<b>Fleet Management</b> Procurement, Finance & Insurance, Maintenance, Disposal/Repurpose					<b>Fleet Operations</b> Real-time logistics, Vehicle Tracking & Allocation, Dynamic routing/pricing, mixed fleet					
<b>Vehicles</b>	<b>Type</b> Ground, Air, Sea, Space, Sub-surface	<b>Control</b> Autonomous, Assisted, Manual	<b>Power</b> Manual, Electric, Gas, Petrol / Diesel, Hydrogen	<b>Connection</b> Connected, proprietary/ interoperable	<b>Capacity/Use</b> Single/multi personal/ shared	<b>Ownership</b> Private, Leased, Subscription	<b>Cargo</b> People, Goods, Mixed				
<b>Technologies</b>	Big Data IoT Blockchain Advanced Analytics AI 5G Spatial Analytics AR/VR Simulation/Modelling Image Processing Edge/Cloud Computing Robotics/Autonomy Biometrics Monitoring Batteries Advanced Materials GPS										
<b>Infrastructure</b>	<b>Physical Infrastructure</b> Highways, Streets, Parking, Rail, Airports, Vertiports, Spaceports, Transfer hubs, Power Infrastructure, Safety & Security			<b>Devices</b> EC Chargers, Mobiles, OBUs, LiDAR, Sensors, TAGs, Data Concentrators, Cameras, PLCs etc.			<b>Digital Infrastructure</b> Connectivity, ITS, V2X, Solutions, Data, Digital Twin, Standards, Cybersecurity				
<b>Role</b>	Owner	Enabler	Advisor	Design	Build/Develop	Operate	Maintain				
<b>Context/Scope</b>	Urban	Inter-urban	Rural	Regional	National	International	Inter-planetary				



Mobility



Airports & Power Infra



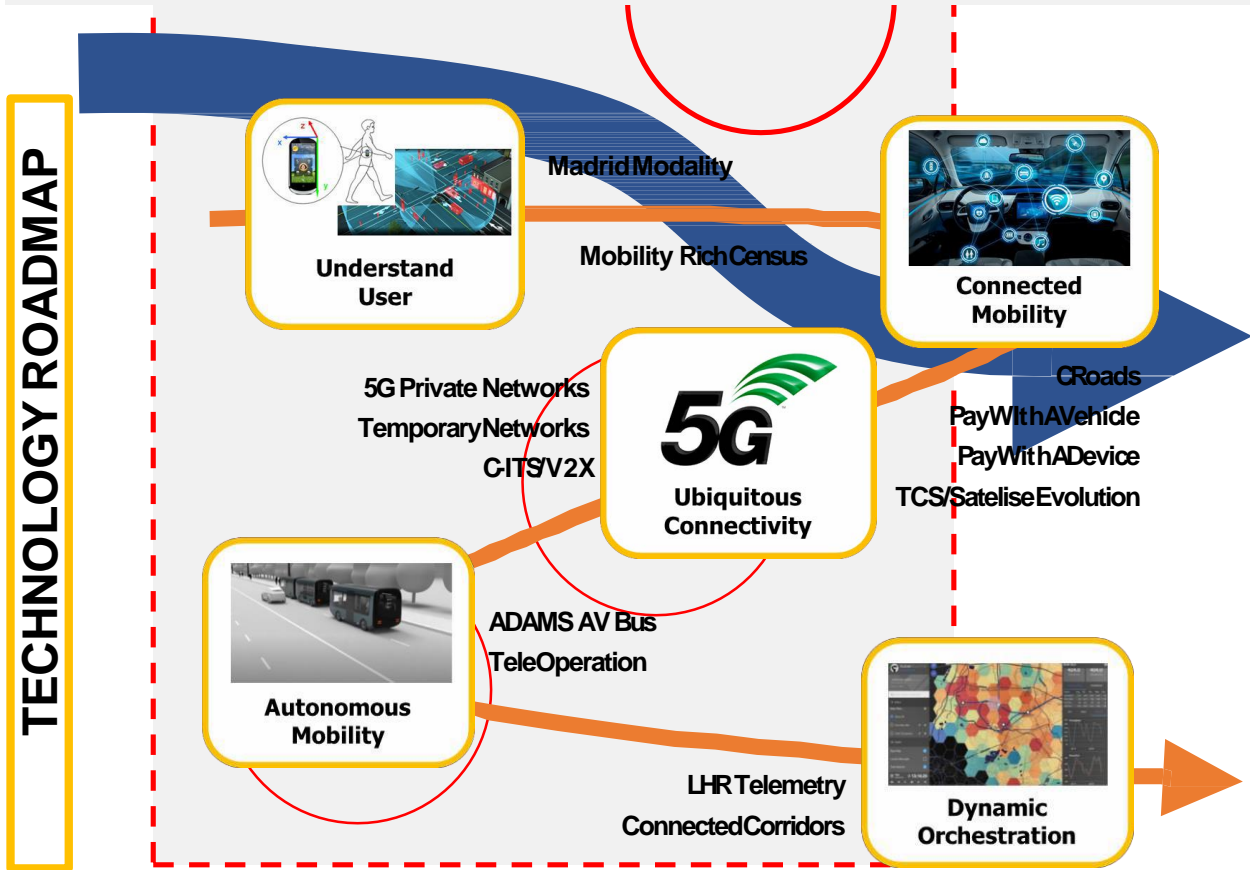
Highways



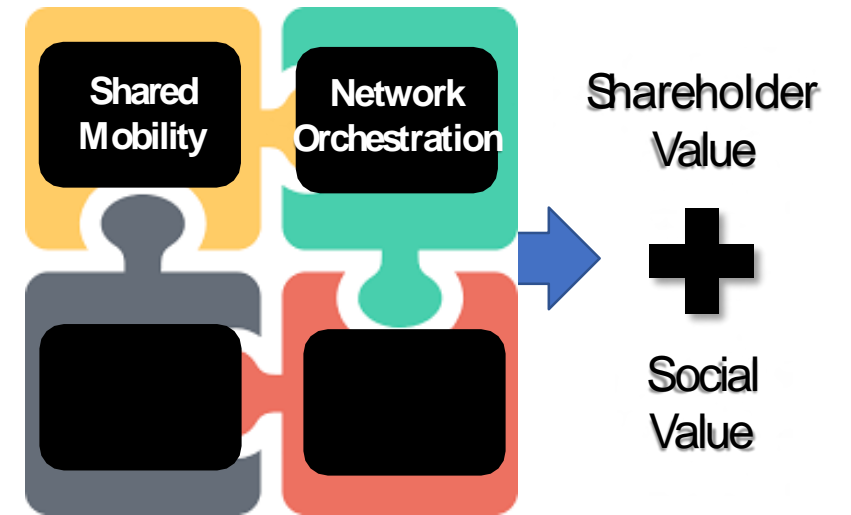
Construction

# What are Digital Network Options at Silvertown

Future-proofed infrastructure that enables user interaction, dynamic capacity management & new mobility/OTT services to unlock financial and social value



Enhances capacity & value of existing assets  
 Insulates against “value chain squeeze”  
 Unlocks new customer segments and social value  
 Extends reach beyond existing assets  
 Enables exponential growth (NFX)



# sustainability (+20%), energy &

# operational efficiency (+30%)

# Increase capacity (x4), oversight

# & resilience of

## Highways

- Tolling & Dynamic Pricing
- Stopped-vehicle detection & HOV
- V2X for safety & payments

## Construction

- AR/VR for iterative design
- Temp. private networks
- Simulation

## Airports

- Vehicle Telemetry
- Stand Automation
- AR Tele maintenance

## Power Infra

- Automated inspectors
- Drone platform
- Microgrids

## Mobility

- User modal choice data
- **W O N D O** MaaS platform
- Teleoperated



Stop-vehicle detection, HOV & vehicle supervision



Airport stand automation & quick turnaround



Digital construction & simulation



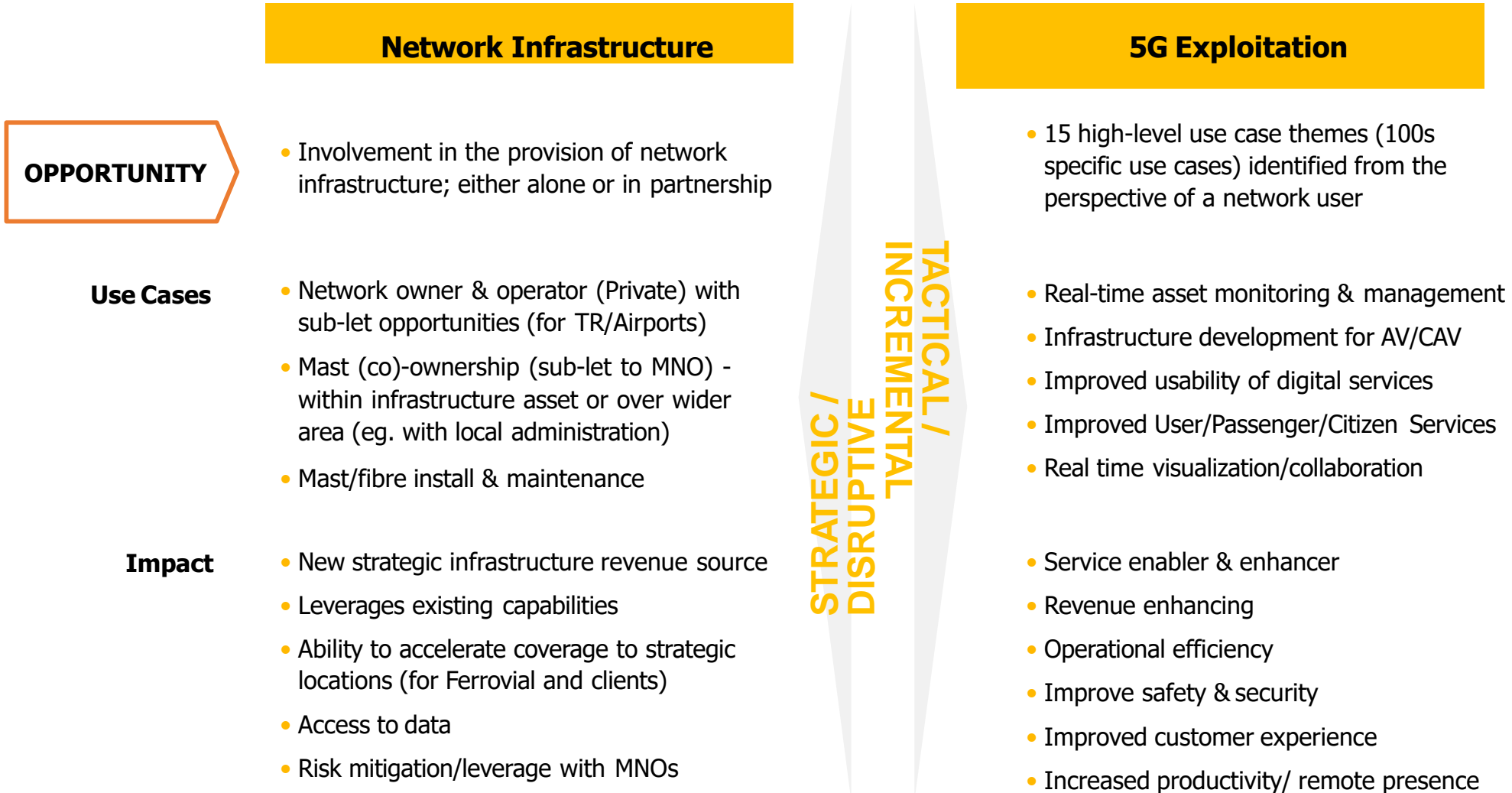
Linear asset management inspection using drones



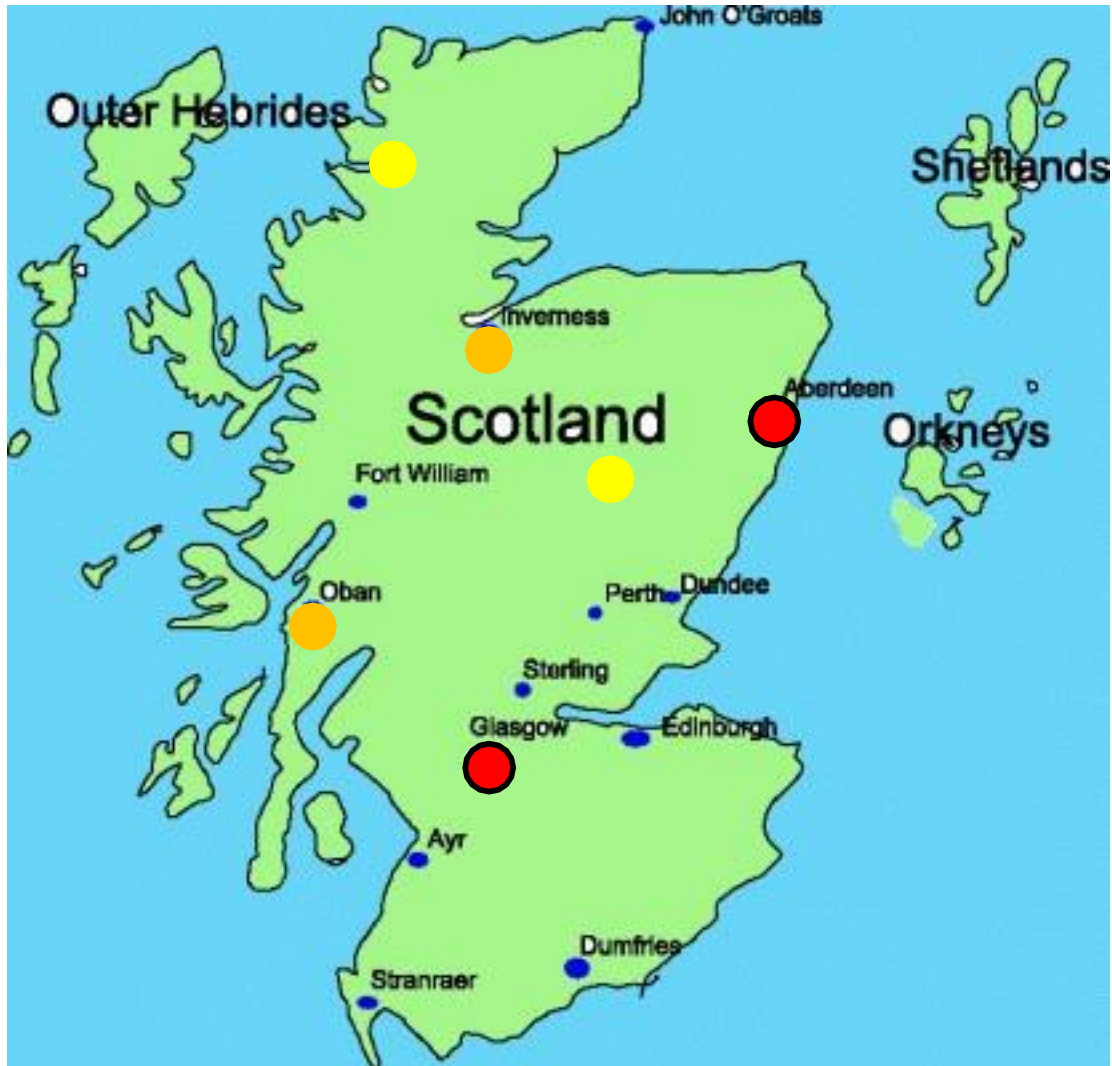
Mobility-as-a-Service Platforms



# 5G Opportunities



# 5G/SatComms Use-Case



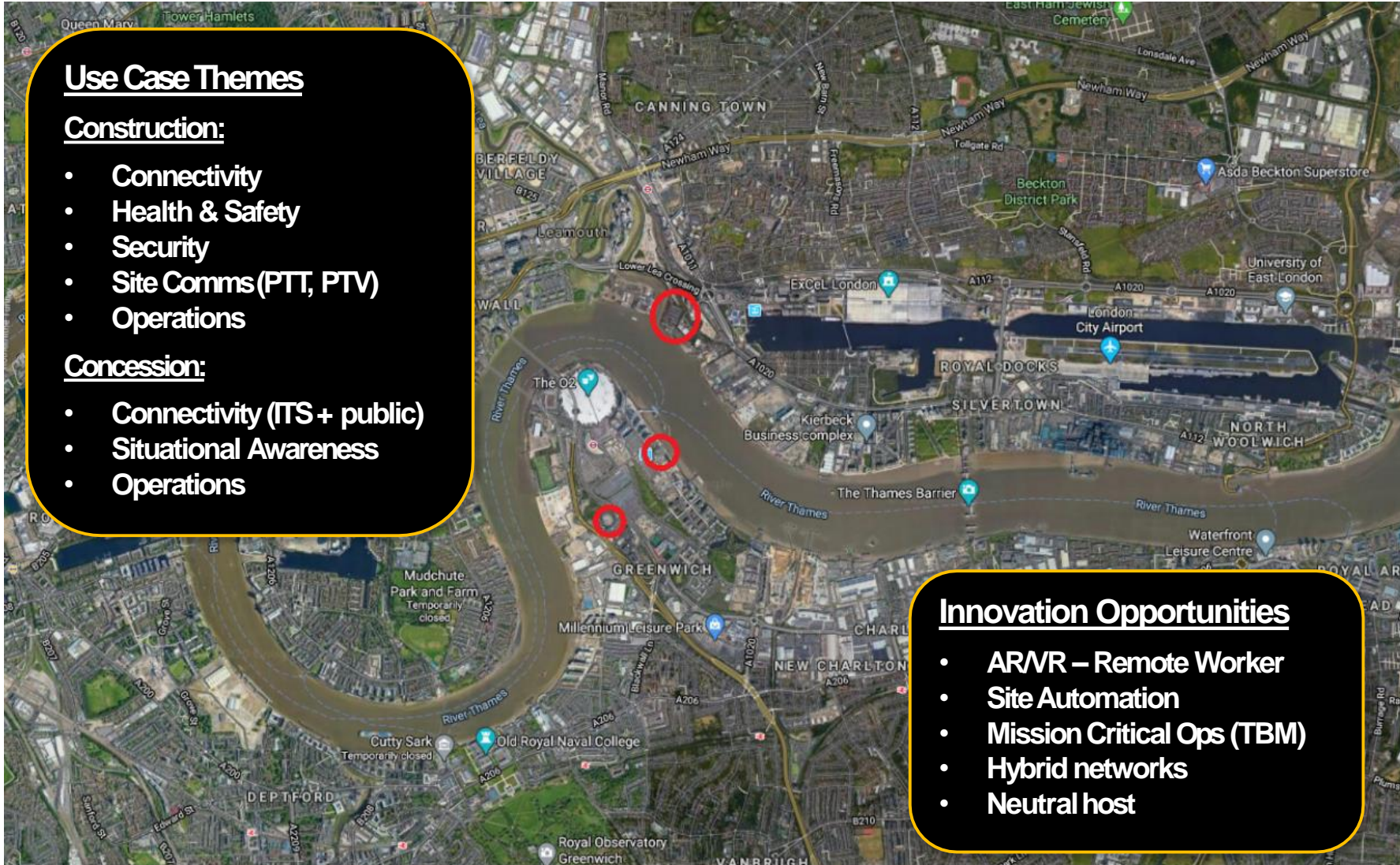
SUPPORTING  
OPPORTUNITY

## InnovateUK Future Flight

### Drone Logistics Network for Scotland

- Funded project kicking-off in Q42020
  - Drone logistics network for Scotland (& UK)
  - Focused on medical supplies (drugs & “wets” invc. Test)
  - Leveraging existing hubs (eg. AGS, Inverness etc) but also identifying locations for new fixed infra
  - **Currently no specific COMMS focus**
- 
- Opportunity for complementary project targeting:
    - **5G** (private networks at hubs + public where exists)
    - **SatComms** everywhere else (big opportunity for Scotland – drones will use direct flight-paths where possible which means MANY blackspots)

# 5G Project at Silvertown



## Use Case Themes

### Construction:

- Connectivity
- Health & Safety
- Security
- Site Comms (PTT, PTV)
- Operations

### Concession:

- Connectivity (ITS + public)
- Situational Awareness
- Operations

## Innovation Opportunities

- AR/VR – Remote Worker
- Site Automation
- Mission Critical Ops (TBM)
- Hybrid networks
- Neutral host

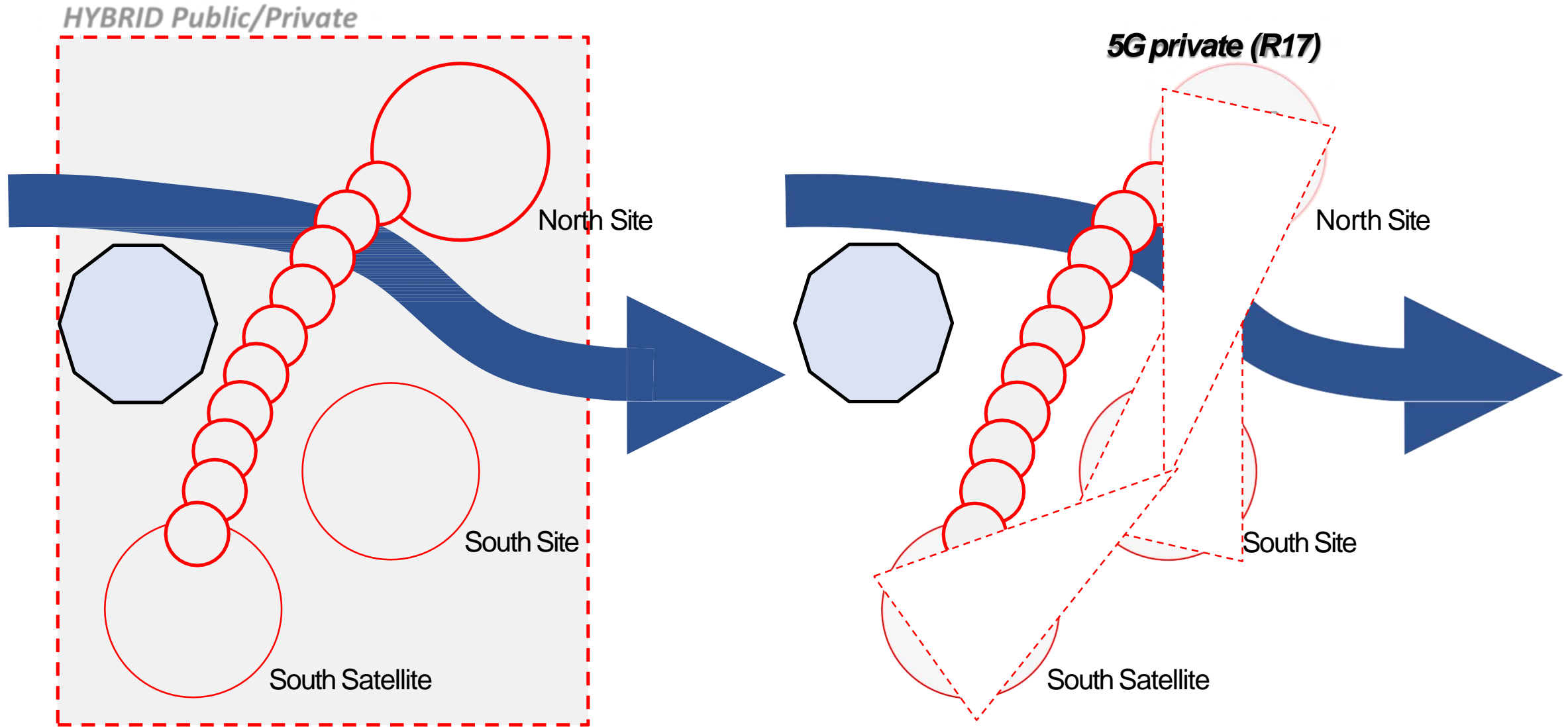
**Challenge:** use 5G to provide all site connectivity and remote site inter-connectivity

**Reality:** 5G and private licensing not yet ready to deliver site interconnectivity solutions

**Reality:** For Full Private Cellular, 4G LTE+ 5G NSA is the most comprehensive solution today

**Reality:** MNOs 5G capabilities target consumers, “telco-grade” and network consistency

# Future Private Network Options at Silvertown



**THANK YOU!**



# YOUR BUSINESS POWERED BY SPACE

28<sup>TH</sup> SEPTEMBER 2020

BUSINESS  
APPLICATIONS

BUSINESS  
INCUBATION

TECHNOLOGY  
TRANSFER

ESA UNCLASSIFIED



## RAP-SNI



**Name:** Ken Gordon

**Role:** Regional Ambassador Platform (RAP) Midland & North East England

**Background:** >12 years experience as an innovation funding specialist helping Scottish businesses understand and apply for funding including trade visits overseas promoting the Scottish Aerospace industry. Significant business support skills in proposal preparation, finding collaborative partners and proposal review to assist the space and non-space sectors. RAP-SNI will have good collaborative links to business support organisations including Scottish Enterprise (SE), Highlands and Islands Enterprise (HIE), and Northern Ireland's economic development agency, Invest NI.

**Location:** University of Strathclyde

**Contact:** [kenneth.gordon@strathclyde.ac.uk](mailto:kenneth.gordon@strathclyde.ac.uk)

# UK Ambassador Platform Network



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# → ESA Business Applications Ambassadors – Service Offer



# NEXT STEPS

Ask Questions  
Get in Touch  
Discuss and Develop Your Idea



## CONTACTS:

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