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BUILDING EQUITABLE, SHARED WIRELESS INFRASTRUCTURE

Optimizing Shared Access Licenses

Paul Senior, Founder & Chairman, Dense Air Networks

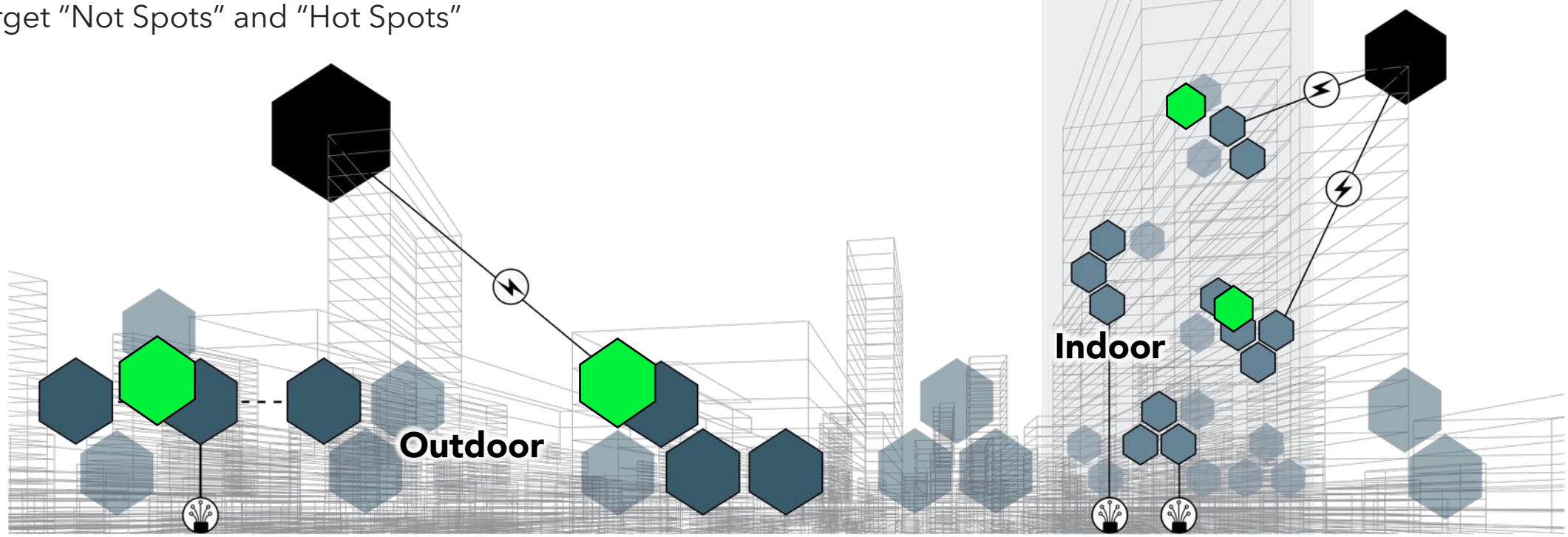
Dense Air: Shared Network Infrastructure Provider

Extending MNO 4G and 5G coverage using small cells, augmenting operator macro coverage and capacity, to underserved areas, and delivering Hybrid Private Networks.

Delivering a fully managed RAN-as-a-Service using an Open RAN based cloud native architecture.

Focused on Public-Private Partnerships to host private or shared mobile network infrastructure networks as using a "Co-Fi" business model.

We identify deployment opportunities using Big Data Analytics which enables us to target "Not Spots" and "Hot Spots"



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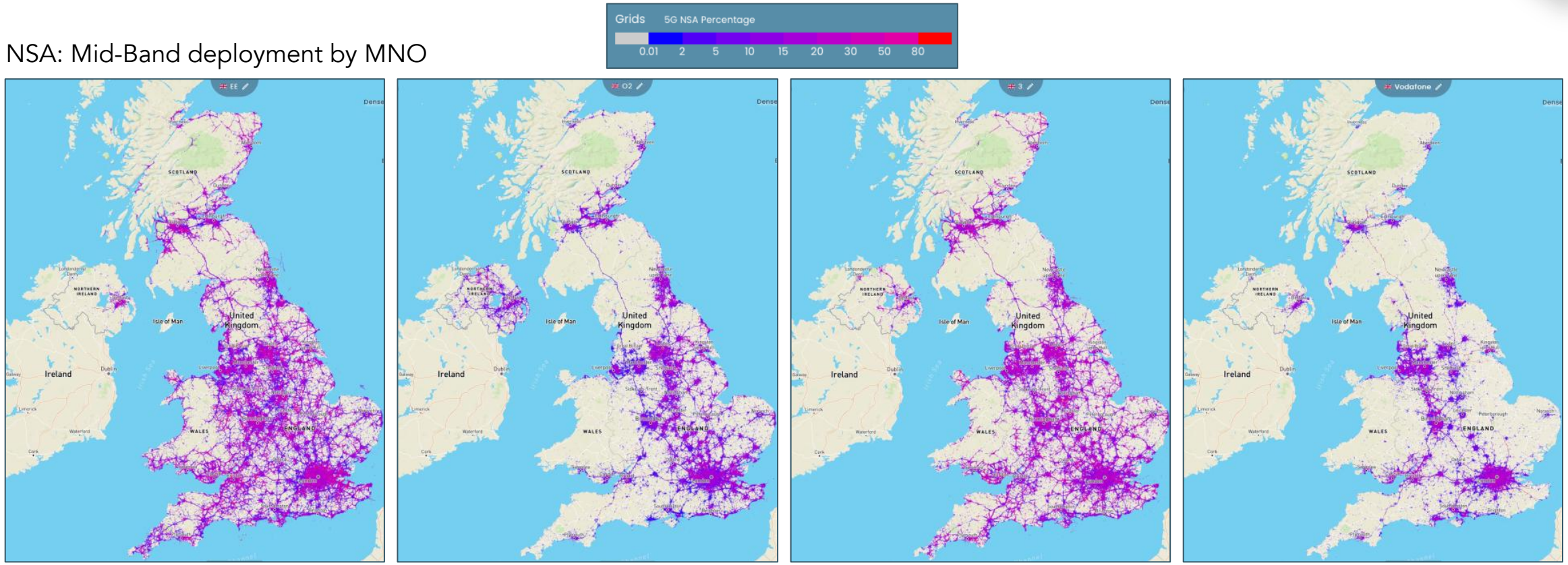
Why do we need Densification and Shared Mobile Networks?

NSA: Mid-Band deployment by MNO



Source: DenseWare Crowd-sourced Analysis

UK 5G National Picture: Rollouts are restricted to Urban Centers

5G Network Availability is still limited, and a large percentage of the UK's population sits outside this footprint creating a next-gen digital divide
700 MHz rollout / 3G spectrum re-farming will help but MNO Capex budgets are finite, and expansion of high-capacity mid-band 5G will be slow

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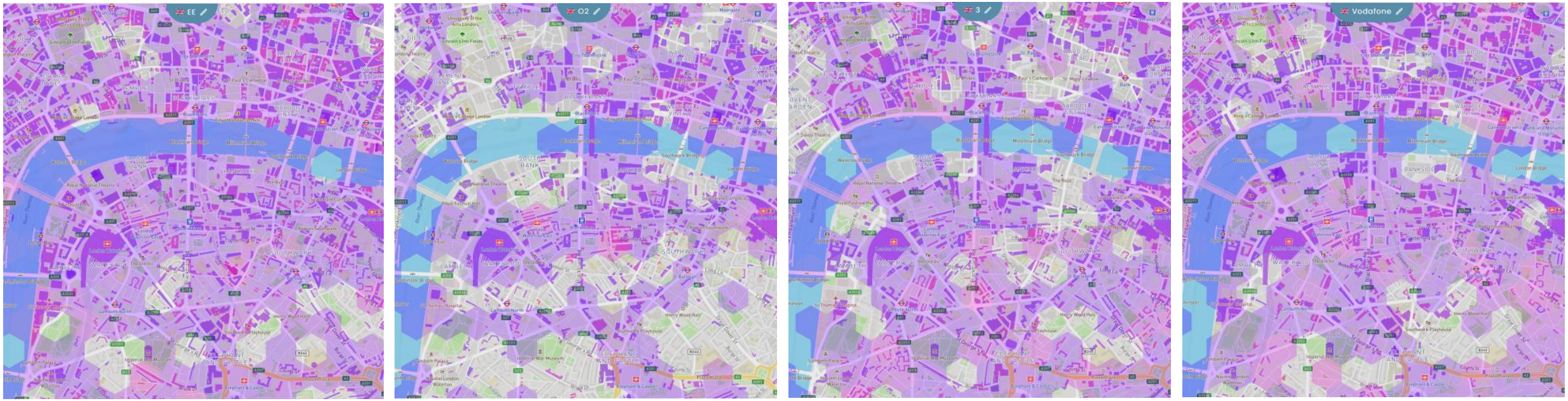

Source: DenseWare Crowd-sourced Analysis

Real-World (Indoor) Urban 5G Footprints have many "Not Spots"

Even in Central London there are a multitude of gaps in MNO "First-Wall" Indoor 5G NSA Macro Cell coverage.
Network Densification will be required <u>but</u> deployment economics for MNOs are poor.
High performance Pervasive 5G Standalone coverage (using mid-band spectrum) will be difficult to achieve if each MNO needs to build a separate in-fill small cell network.

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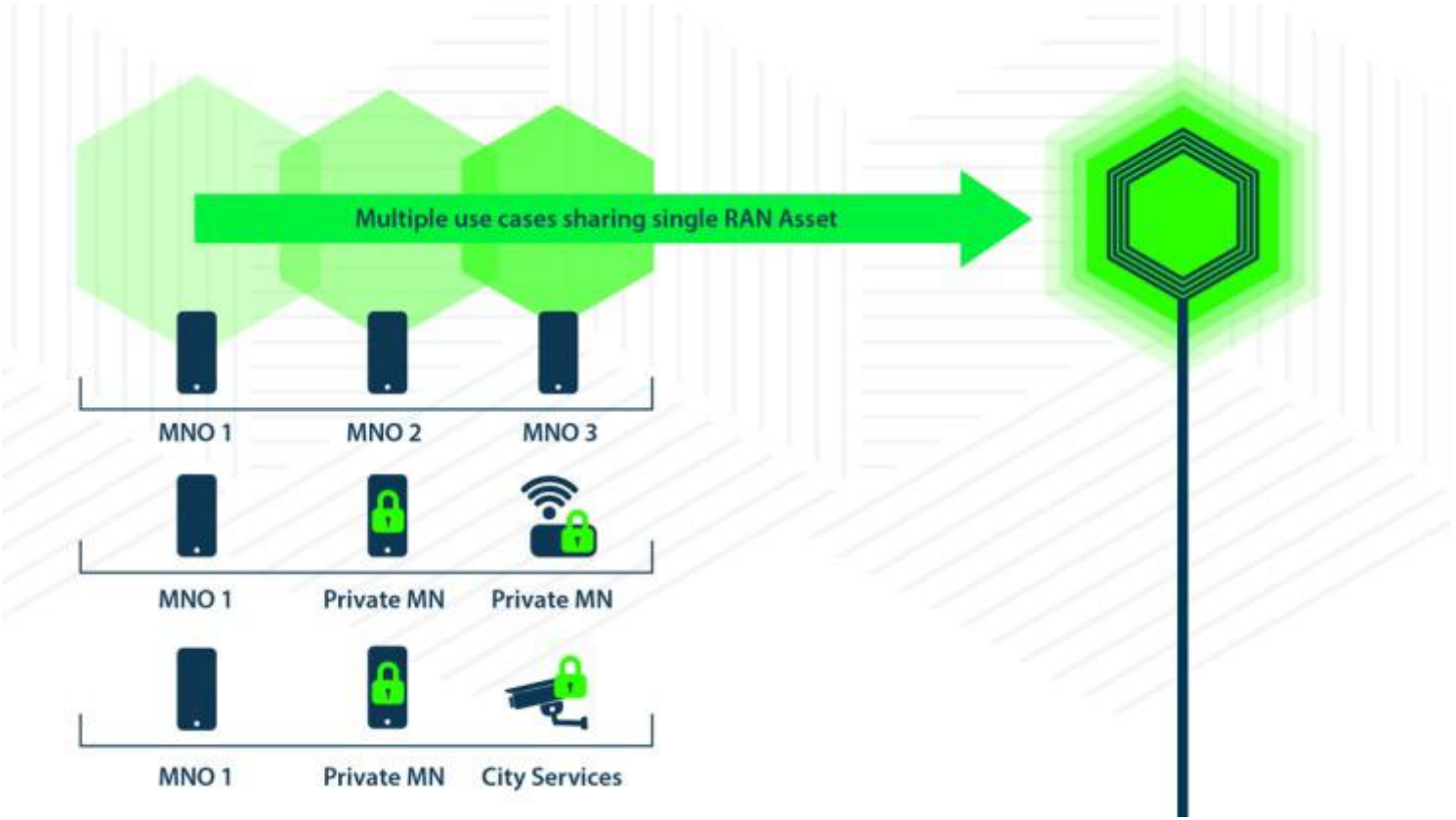
Why build Shared 5G Networks?

Un- and Under-served areas are prevalent across our cities, towns and rural communities. This is because today the economics for targeted infill and enhancement fail and practical deployment is hard to do.

Revenue-Per-User for 5G mobile services does not deliver significant additional RPU upside. Hard to justify the funding required for each individual operator to densify and build out pervasive 5G coverage, especially 5G Standalone.

Solution: Build Shared Networks - where RAN infrastructure can be utilised by multiple MNO's or mixed public/private use cases. This delivers deployment cost reductions, typically around 66-75%. It also dramatically reduces operation expense over lifetime of the network and has lower energy consumption / Net-Zero benefits



Question: How do we build <u>shared</u> low-cost infill 5G networks, both outdoors and indoors

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Neutral Hosts: MOCN vs. MORAN

In-fill Shared Networks come in two forms…

- Traditional MORAN
- Active MOCN in Shared (or Pooled) spectrum

Traditionally MORAN has been used (on behalf of MNOs) to do some sharing at Macro sites. This reduces cost to some degree.

- Can provide "Primary" 4G and 5G coverage using MNO spectrum but this drives detailed RF design processes
- Sharing is generally limited to passive elements
- Full Planning cycle required
- Large impact on Street-Scene

Active MOCN in Shared Access spectrum can deliver much greater savings which makes deployment in Un- and Under-served areas possible

- Overlay of existing MNO networks using Shared Access spectrum avoids per MNO detailed RF designs. Focus is in-fill
- Everything is shared
- Deployment can leverage rapid PDR / Open Access Agreements
- Limited impact on Street-Scene

	Trad. MORAN	Active MOCN
Form-Factor		
Spectrum	Separate MNO allocations	Shared Spectrum
Radios (RU)	Independent	Shared HW / Radios
DU Function	Independent	Multiple SW Instances same HW
CU Function	Independent	Cloud (Hyperscaler) or UK Datacentre HW
Transmission	Shared	Shared
Security	Shared	Shared
OAM	Independent	Customized per MNO
Pole (Tower)	New Monopole	Existing Street Assets
Antennas	Shared or Independent.	Shared
10 yr. TCO Reduction	**25%**	**66-75%**

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Solution: Shared Access Spectrum for Shared 5G Networks

Current Shared Access Licensing Scheme

Uses	1800 MHz shared spectrum	2300 MHz shared spectrum	3.8-4.2 GHz	Lower 26 GHz band
Private network (e.g. industry uses)	✓ (narrowband)	✓	✓	✓ (indoor)
Mobile coverage (rural)	✓	Certain locations	×	×
Mobile coverage (indoor)	✓	✓	×	✓
Fixed wireless broadband	×	×	✓	Prior Authorisations

Improvements

What Neutral Hosts (and some MNOs) want?

Uses	1800 MHz shared spectrum	2300 MHz Shared Spectrum (inc. 2.30-2.35 MHz)	3.8-4.2 GHz	Lower 26 GHz band
Private network (e.g. industry uses)	✓ (narrowband)	✓	✓	✓ (indoor)
Mobile Coverage (rural)	✓	With Spectrum automation	✓	×
Mobile coverage (indoor)	✓	With Spectrum automation	✓	✓
Mobile Coverage (HDD)	✓	With Spectrum automation	✓	✓
Fixed wireless broadband	×	With Spectrum automation	×	Prior Authorisations

<u>Existing</u> OFCOM Wireless "Innovation" through Local Licensing Scheme

- Introduced the concept of Shared Access Licenses suitable for 5G deployment in 3.8-4.2 GHz Band (aka US C-Band)
- Arbitrarily restricted the use cases to prevent deployment for improving Mobile Coverage (or Capacity)
- Encouraged deployment for Private Networks and FWA (in rural areas) with limited success
- Licensing scheme relied on "old" satellite sharing models, which proved cumbersome and difficult to use. Some licenses took years to grant…
- Changes to licenses can be fought with problems because of license renewal cycle

An <u>Updated</u> Shared Access / Local Licensing Scheme

- Allow <u>Neutral Hosts to build shared networks</u> @ 3.8-4.2 GHz for Mobile Rural, Indoor and HDD use cases. **This change would give Neutral Hosts the tools to build both Mobile operator in-fill coverage and capacity with dramatically lower cost.**
- We believe that license grants should be <u>restricted</u> to "Open Access" networks where there is an obligation to host other Operators and Service Providers. Typically, these networks will be constructed under the UK JOTS framework for Indoor and Outdoor Neutral Host. This prevents any competition distortion.
- The addition of the lower 2.3 GHz band for Shared Access licenses is a helpful and is the ideal band to pioneer an "automated" local license scheme to address issues with the current licensing process

OFCOM has a unique opportunity to update SAL scheme and support Neutral Hosts which would drive UK 5G densification / in-fill

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CONNECTIVITY / WHERE IT MATTERS

2023 SMALLCELLS WORLD SUMMIT