Uni5G Private Networks:
A Simplified Path to Deployment Webinar

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5G Private Networks for Maritime Use

Opportunities for Digital Port Automation

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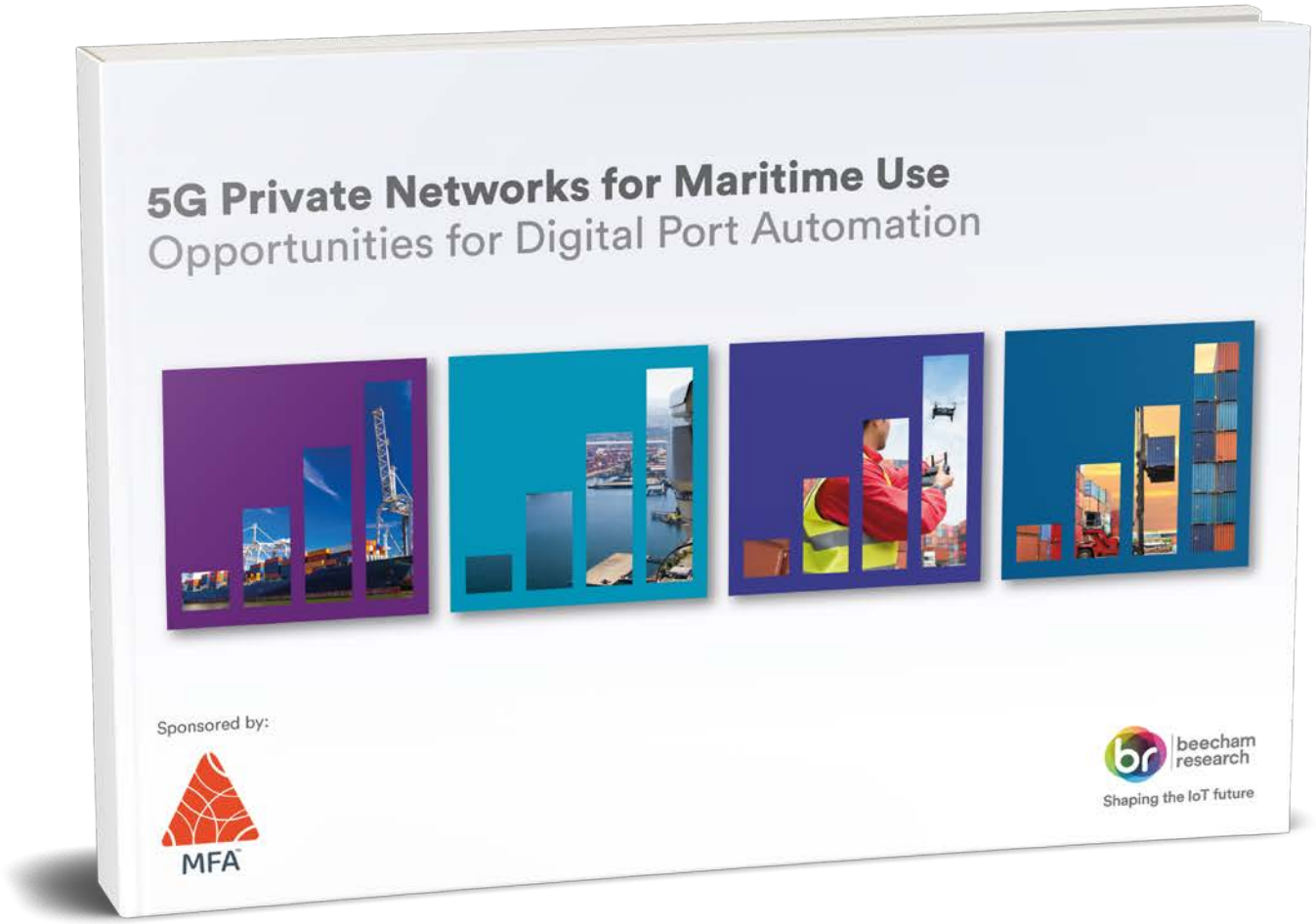
Shaping the IoT future

See also related report:



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Study on use of 5G NR-U in Ports

- Recent study conducted by Beecham Research on behalf of MFA confirms that 5G Private Networks (5G PNs) operating in unlicensed spectrum offers significant opportunities for Port Automation in Maritime sector
- Enabling technology is 5G NR (New Radio). 5G NR-U part of same 3GPP R16 finalised in July 2020
- Enables advanced features of 5G NR to operate in unlicensed bands – in particular mobility and QoS
- Combines high performance and security benefits of 5G with simplicity and low cost associated with Wi-Fi
- In controlled environments like Ports, port authority can set aside one channel for NR-U use so that it is quite separate from other traffic
- Study interviewed operations managers responsible for port activities in different locations worldwide
- Which 3GPP features do they need for which applications?

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Digital Port Automation

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Ports are challenging environments

- Container shipping growing fast to keep up with consumer and industrial demands
- Rapidly increasing size and capacity of vessels, but limited port space
- Time in port of the essence – cargoes must be handled quickly, distributed efficiently
- Delays are expensive – demurrage and detention charges: up to 20x container value
- Also requires safe and secure environment
- Plus border checks becoming more stringent
- Need to minimise congestion in port area – inefficiencies + environment impact

Automation requirement never more pressing

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Need for connected data in real time

- Automation needs huge volumes of timely data to control, monitor all assets
- Wireless is only option
- Ports very large physical areas, wireless coverage required throughout
- Many moving assets, containers, people
- Must operate in all weathers
- Cellular is only realistic option
- Real time essential for remote control of large moving assets
- 5G PN under local control – fast admin
- 5G PN unlicensed $0 ARPU.

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Assessment of connectivity requirements for port applications

Application	Data Rate	Latency	Site Area Coverage	Density (of devices)	Power Efficiency (battery life)	Mission Critical Reliability	Need For Low Cost	Mobility	Indoor/ Outdoor
Crane Operation	High	Slow	Large	Medium	Low	High	Low	Low	Outdoor
Autonomous/Semiautonomous Vehicles (Cargo Moving)	High	Fast	Large	Medium	Low	High	Low	High	Both
Environmental Sensing	Low	Slow	Large	Large	High	Low	High	Low	Both
Docking Ship Communications	High	Fast	Large	Medium	Low	High	Low	Medium	Outdoor
Video (Surveilance)	High	Slow	Large	Large	Low	Low	Medium	Low	Both
Drone (Inspection)	High	Fast	Large	Small	High	Low	Medium	High	Outdoor
Operational Equipment Monitoring	Low	Slow	Large	Large	Low	High	Low	Medium	Both
Remote Control: Static Machines e.g. Cranes	High	Fast	Large	Medium	Low	High	Low	Low	Outdoor
Remote Control: Loading Bays	High	Fast	Large	Medium	Low	High	Low	Low	Outdoor
Robotics (Material Handling w/in Warehouses)	High	Fast	Large	Large	Low	High	Low	High	Indoor

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Technical definitions of connectivity requirements

Sector Requirements	Low/Small/Slow/Sparse	Medium	High/Fast/Large/Dense
Data Rate	<10Mbps (avg mmTC dev UL 200b/DL 20b/day)	10-250Mbps	250-500Mbps
Latency	>50mS	10-50mS	>10mS
Site Area Coverage (F1) Distance Between Sites	<20m	20-250m	250-500m
Site Area Coverage (F2) Cell Coverage (Indoor)	150m2	500m2	1600m2
Density of Devices	<100dev/Km2	100-1000dev/Km2	>1000dev/Km2
Power Efficiency (FR1 Range)	3 days	1 month	10 years
Power Efficiency (mm-Wave)	3 days	3 months	15 years
Mission Critical Reliability	$<1\text{-}10^{3}$	$1\text{-}10^{3} – 1\text{-}10^{5}$	$>1\text{-}50^{5}$
Mobility	0-3Km/h	3-50Km/h	>50Km/h

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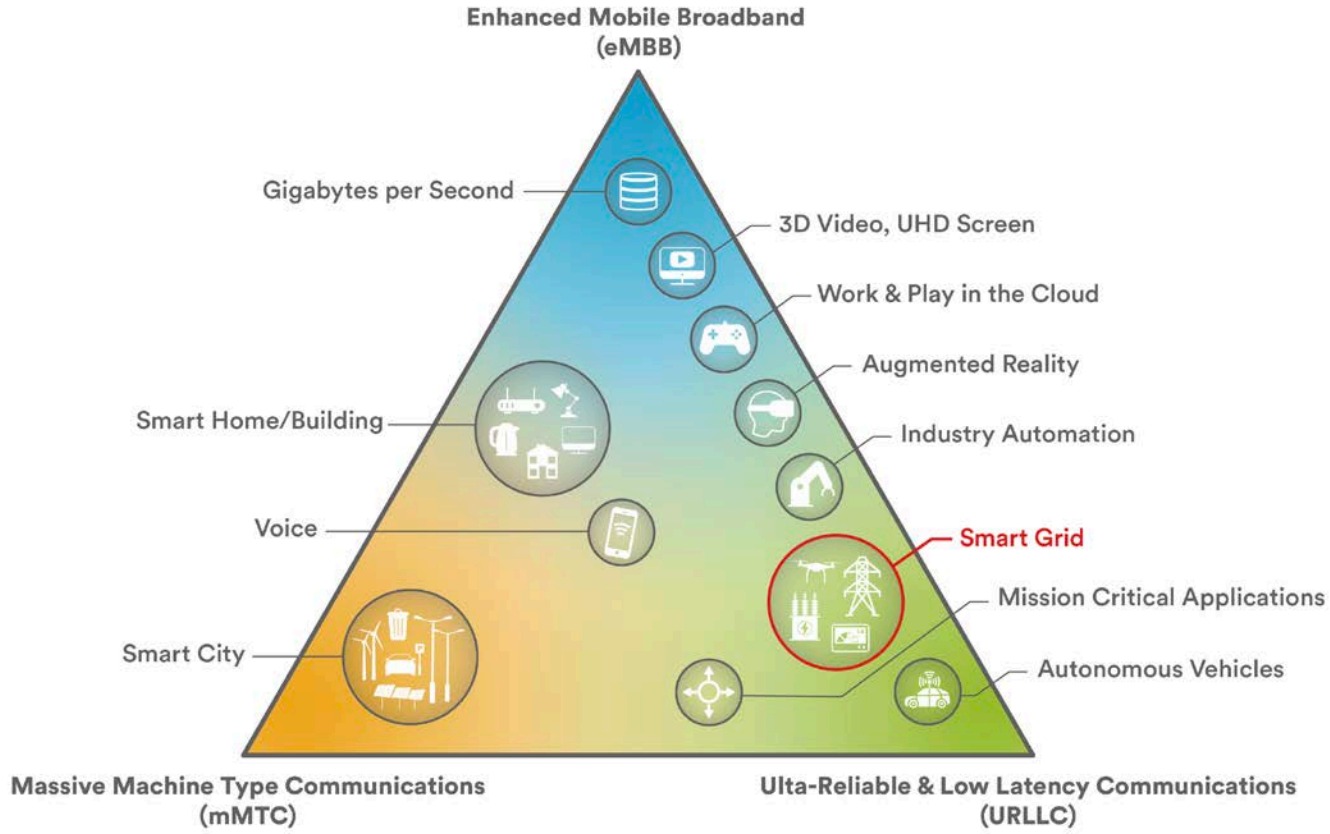
eMBB, uRLLC and mMTC services

- Study found connectivity reqts for connected port assets fit well with the generic services of 5G
- Means 5G NR-U can provide for a significant proportion if not all port automation connectivity needs
- Network slicing use means 5G PN aligns with specific performance needs
- Robust security fits port requirement



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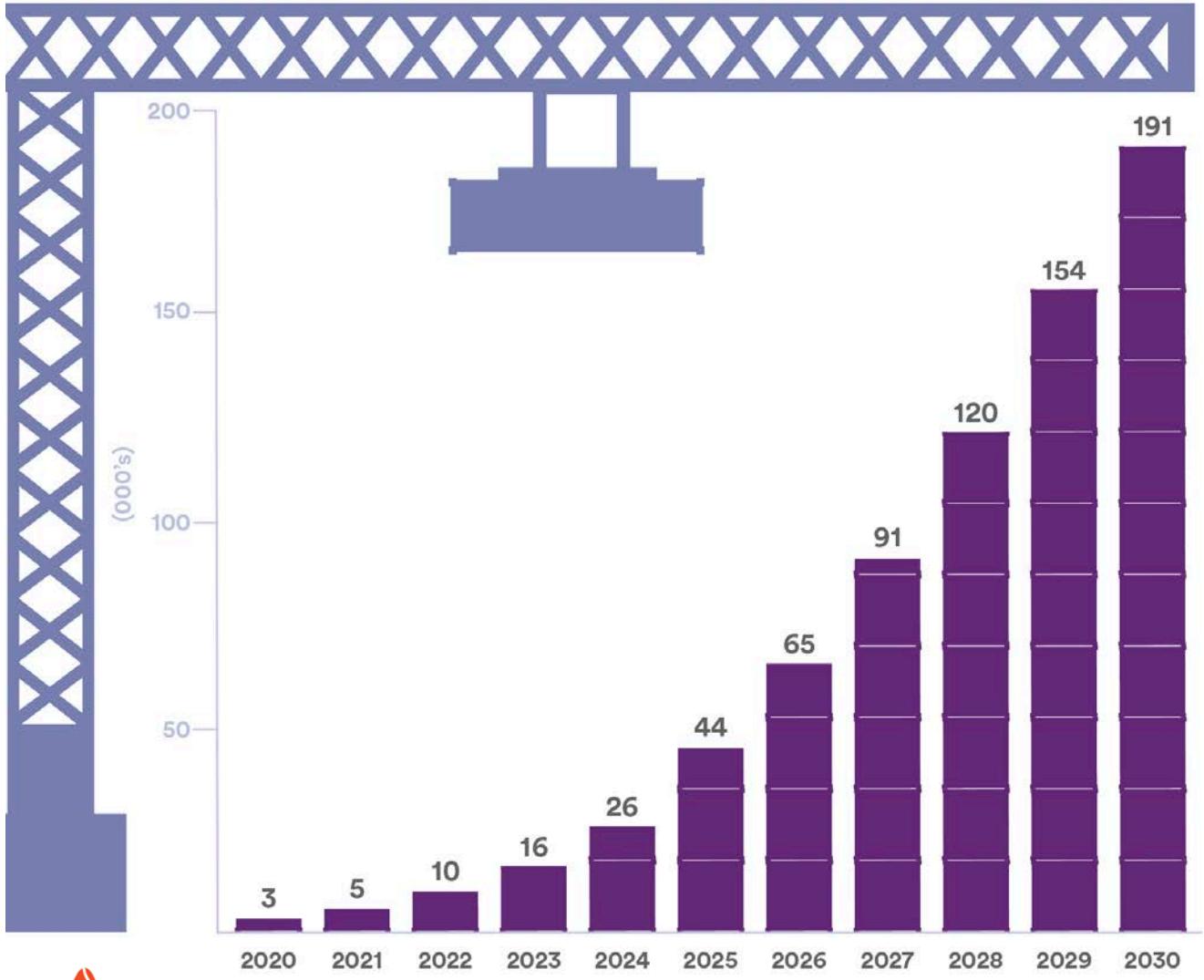
Projected use of 5G for major port assets



- Millions of containers shipped in and out in a year
- Thousands of trucks delivering and removing loads daily
- Train operations daily
- Hundreds of staff on-site with comm reqts for voice and data
- Tens of thousands of sensors across site
- Site covering tens of square kilometres
- **Low hundreds of major port assets:**
  - *Ship-to-shore cranes*
  - *Automated guided vehicles*
  - *Automated rubber-tired gantries*
  - *Drones delivering ship-shore docs*
  - *Etc.*

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Quick Summary

- Need for Automation in Ports has never been more pressing: need for connectivity
- Ports are very large physical areas – ‘Wireless’ is only option
- Wi-Fi is not feasible. Cellular is only realistic option
- Study conducted to establish which 3GPP features required for Port applications
- Interviewed operations managers in different port situations in different countries
- Matched their requirements with 3GPP features to specify a subset relevant to Ports
- Towards simple, effective solutions for Industrial users
- Shows that 5G PNs operating in unlicensed spectrum offers significant opportunities for Port Automation in Maritime sector
- Contact: info@beechamresearch.com or via LinkedIn
- Next: How MFA is addressing this area

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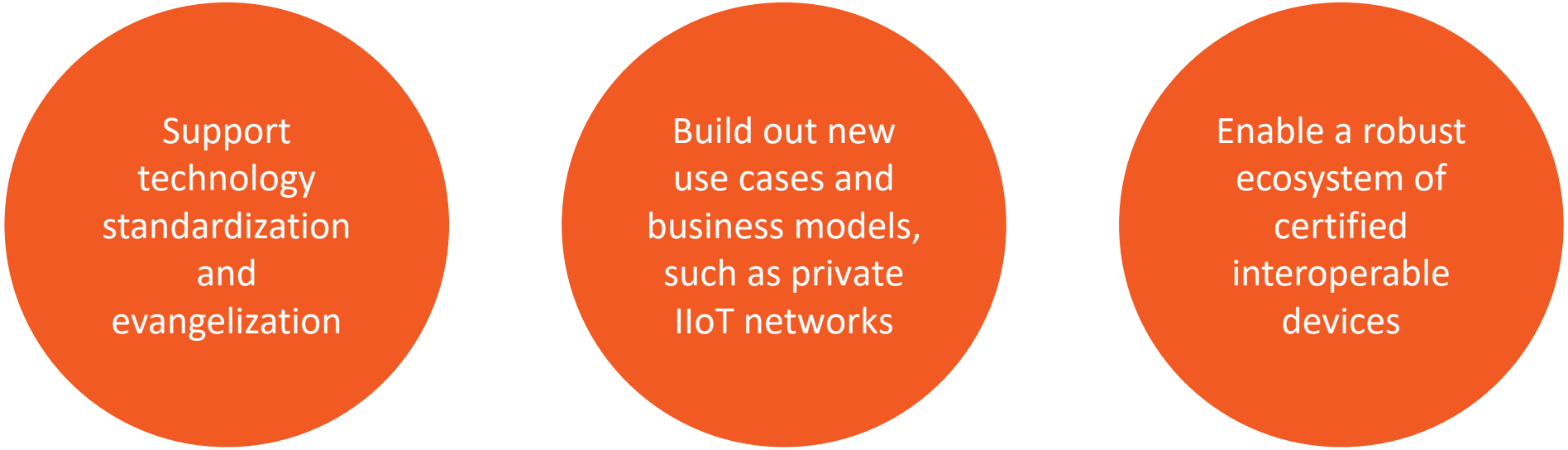
Uni5G Private Networks: A Simplified Path to Deployment

Asimakis Kokkos, MFA (MulteFire® Alliance)
Technical Specification Group Chair

The role of MFA

- MFA (MulteFire Alliance) is an international organization that is championing the global industry adoption of private cellular networks using MFA-defined MulteFire specifications for LTE and Uni5G technology blueprints for 5G.

- With Uni5G or MulteFire, enterprises can deploy their own optimized, reliable and secure private network in unlicensed, shared or locally licensed spectrum.



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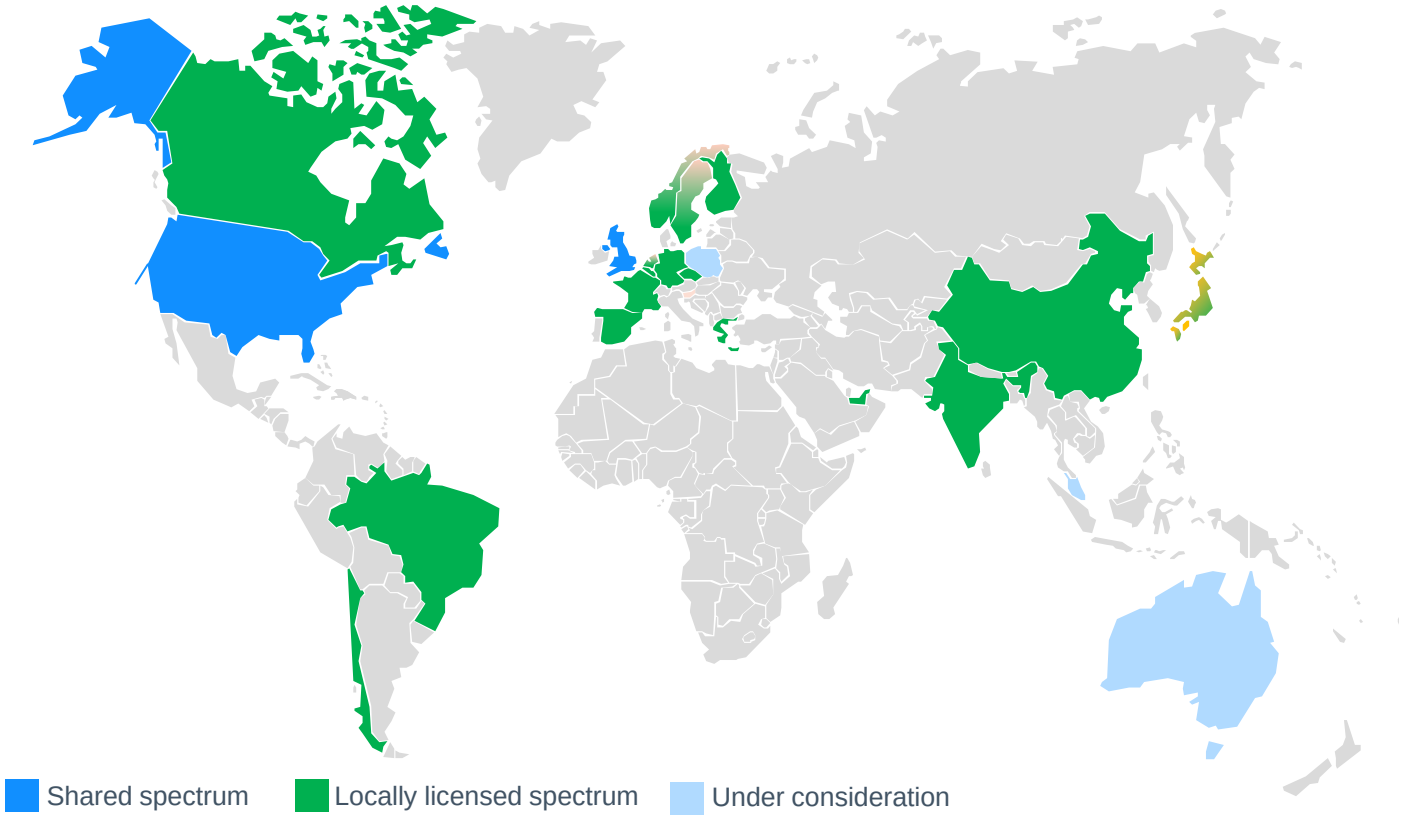
The unlicensed spectrum opportunity

- Different initiatives to broaden enterprise access to mobile network spectrum:
  - Spectrum sharing between public authorities & enterprises (e.g., CBRS)
  - Spectrum sharing between CSPs & enterprises (e.g., spectrum sharing in the UK)
  - Spectrum sharing on the 1.9 GHz band (e.g., Japan)
  - Locally licensing spectrum for Enterprises (e.g., 3.6 – 3.7 GHz in GER)
  - 5 GHz unlicensed spectrum available globally today



Source: ABI Research

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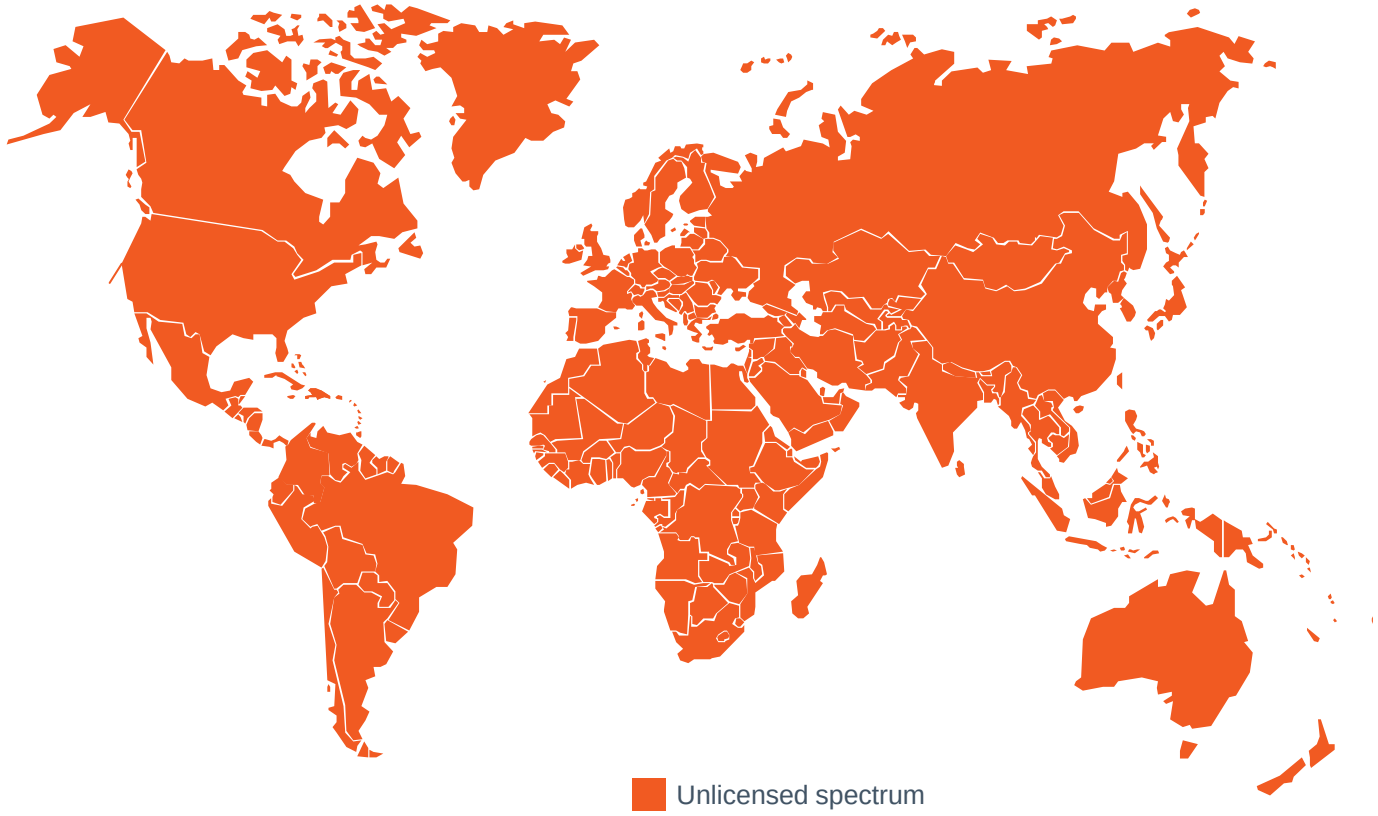

Source: ABI Research

Introducing MulteFire and Uni5G

- **MulteFire®** is a **4G/LTE-based technology** that **operates standalone in unlicensed or shared spectrum**, enabling industry verticals to deploy their own private wireless network with Wi-Fi-like deployment simplicity and LTE-like performance.
- **Uni5G™** is a **technology blueprint** that leverages 3GPP 5G standards to define **profiling and classification requirements**, enabling industry verticals to efficiently deploy their own optimized, reliable and **secure 5G private network** in unlicensed spectrum.

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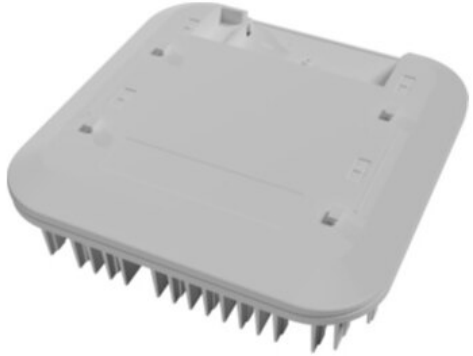
Global PLMN ID for 5G private networks

The International Telecommunications Union (ITU) has awarded MFA a global PLMN ID. MFA is planning to make this PLMN-ID available to industry verticals

With access to a unique global PLMN ID number, industry verticals can deploy their own 5G private network in locally licensed spectrum today

First certified products for MulteFire/4G private networks

- MulteFire 1.0 Certified Products are now available
- MFA Certification Program has certified:
  - Nokia's small cell and customer premise equipment (CPE) as the first MulteFire 1.0 compliant devices
  - Nokia's MulteFire solution, which is available for deployment with Nokia Digital Automation Cloud, is the first MulteFire 1.0 Certified solution
- MulteFire certified devices can enable Industry 4.0 use cases in unlicensed spectrum today



Nokia MulteFire pico access point

Nokia Industrial MulteFire router 700

Summary

- 5G private networks will be an important enabler for enterprises
- MFA is simplifying the path to 5G private networks today for industry verticals
  - Delivering Uni5G Technology Blueprints, based on existing 3GPP 5G specifications, that will enable enterprises to deploy their own 5G private networks in unlicensed, shared and locally licensed spectrum
    - The first Uni5G Technology Blueprint will be available in Q4 2021
  - Providing industry verticals access to a unique global PLMN ID that enterprises can use to deploy their own 5G private network in locally licensed spectrum today and in unlicensed spectrum when 5G NR-U devices become available
  - Developing best practices and deployment guides, including industry resources on understanding all available spectrum options for 5G private networks
  - First certified MulteFire devices are available to deploy for MulteFire/LTE-based private networks today
- Follow us on Twitter @MFA_Technology for updates

Q&A

Please share your questions in the Q&A chatbox