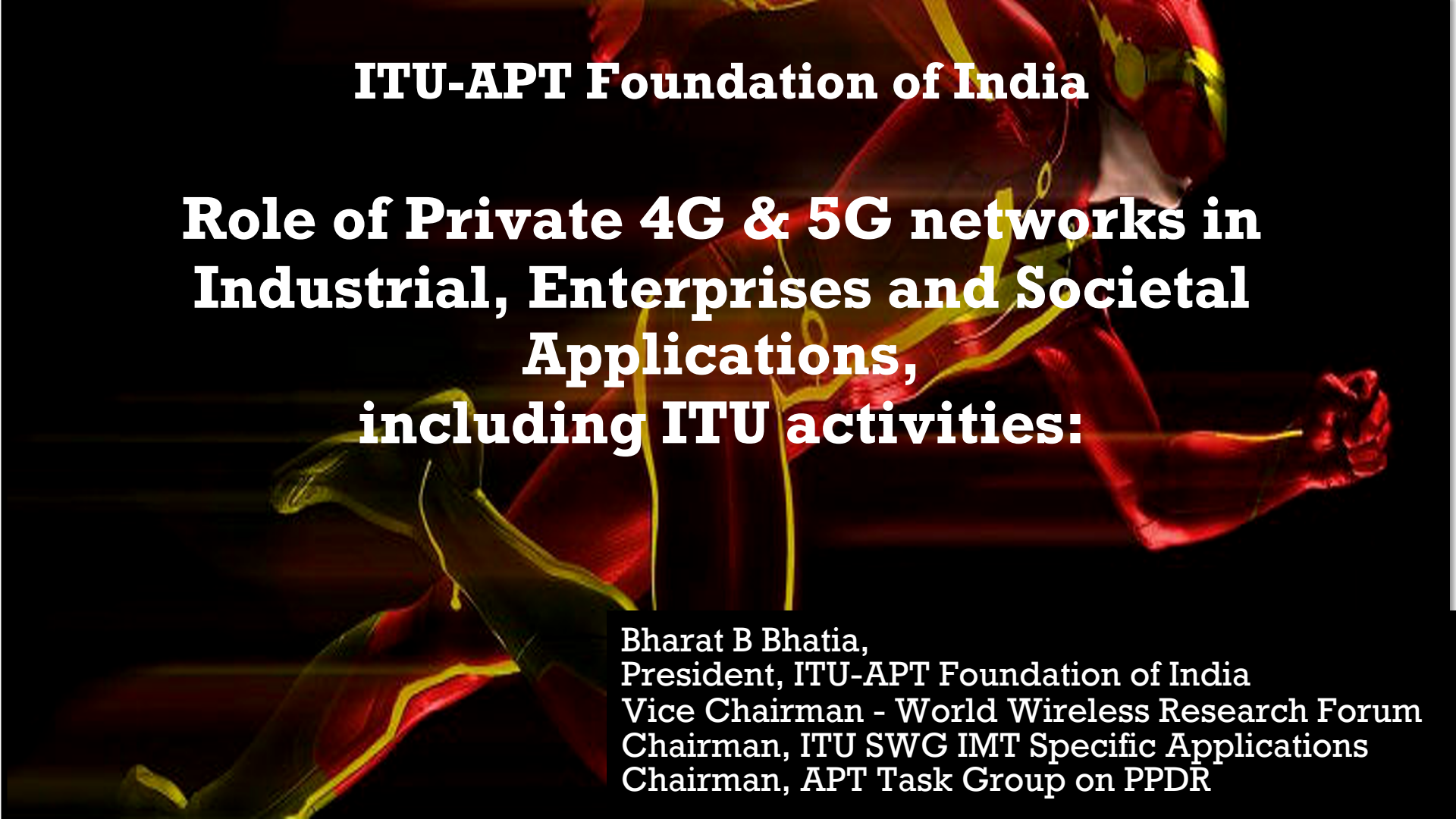


ITU-APT Foundation of India

Role of Private 4G & 5G networks in Industrial, Enterprises and Societal Applications, including ITU activities:

Bharat B Bhatia,
President, ITU-APT Foundation of India
Vice Chairman - World Wireless Research Forum
Chairman, ITU SWG IMT Specific Applications
Chairman, APT Task Group on PPDR

About ITU-APT (IAFI)

ITU-APT Foundation of India
ITU's Association in India

- ITU-APT Foundation of India (IAFI) is a non-profit, non-political registered society based in India
- We are a nonpartisan Foundation and we do not identify with any Industry sector or group. We support all telecom sectors – mobile broadcasting, satellite,
- We are working for the last 18 years with the prime objective of encouraging involvement of professionals, corporate, public/private sector industries, R&D organizations, academic institutions, and such other agencies in the activities of ITU and APT
- We are recognized by the ITU as an international/regional Telecommunications organization.
- We are a sector Member of the ITU Radio Sector (ITU-R), ITU Development sector (ITU-D) and ITU Telecommunication Standardization Sector (ITU-T)

Our members include many stalwarts of the telecom Industry and corporates from R&D organizations, telecom operators, manufacturers and technology providers

ITU-APT CORPORATE MEMBERS

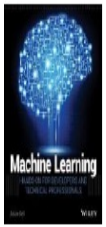
facebook · inmarsat · MOTOROLA SOLUTIONS · Viasat · सी-डॉट C-DOT · OneWeb · TELESAT · Qualcomm · रेलटेल RAILTEL · HUGHES An EchoStar Company · STL 25 YEARS OF OPTICAL FIBRE · syRotech Let's Fiber

Digital technologies are driving new innovations in vertical markets…..

Virtual / Augmented reality

Software-defined machines

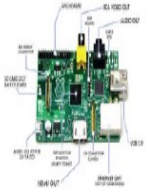
AI and Machine learning



Time-sensitive networking

Big data

Inexpensive computing



Cloud computing

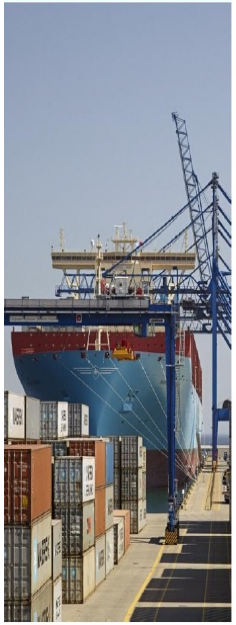
Cybersecurity

Connectivity

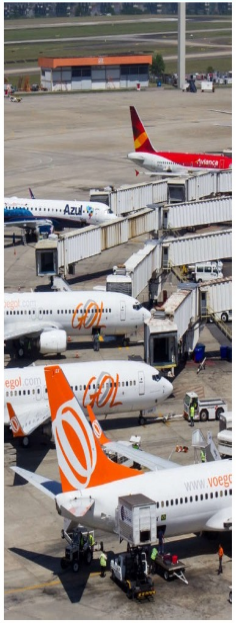
Blockchain

….. and many vertical markets are already benefitting from these innovations

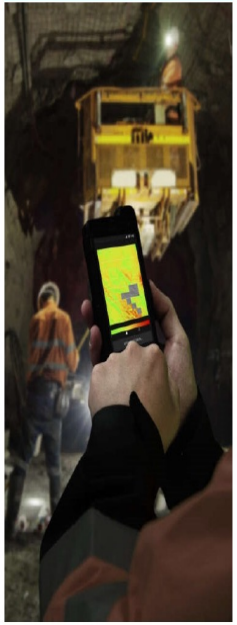
Ports



Airports



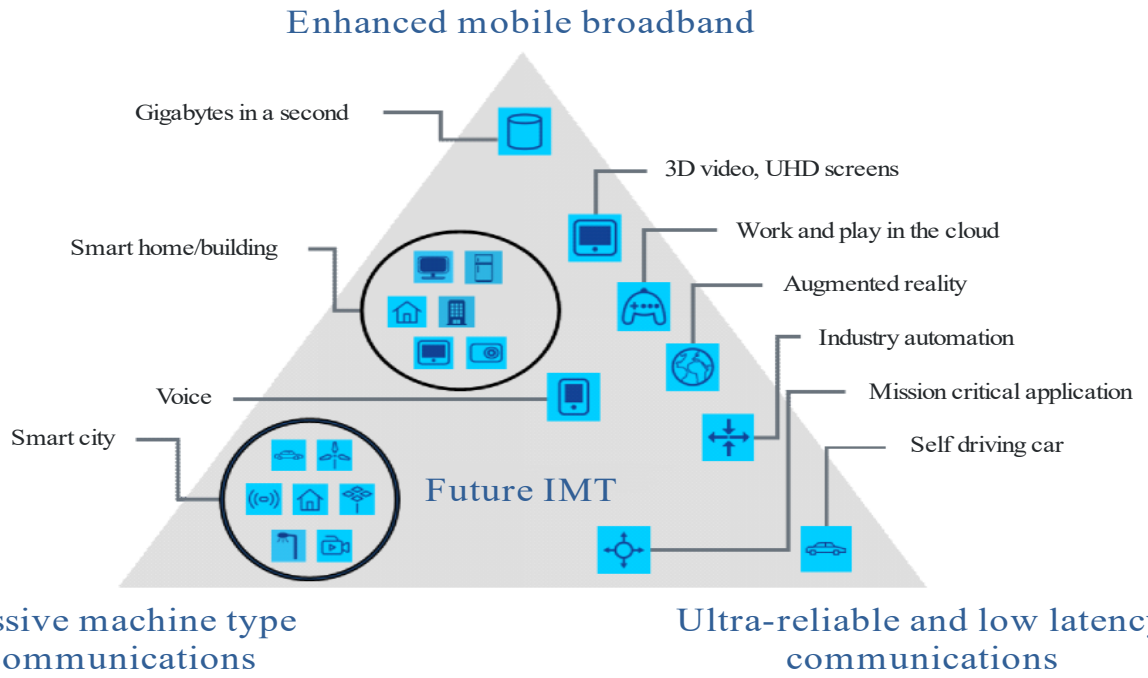
Mines



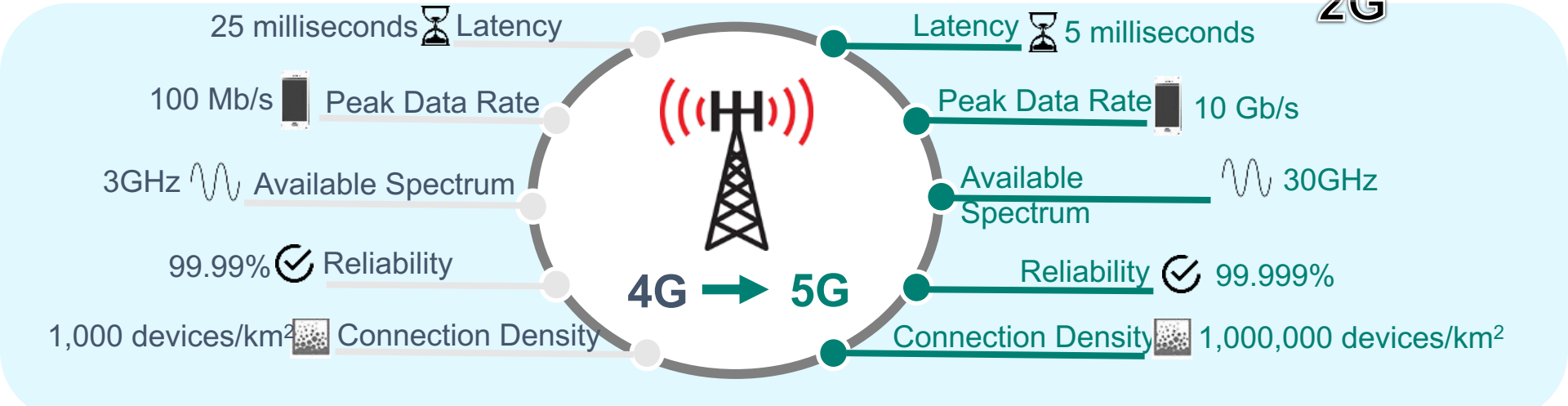
Factories

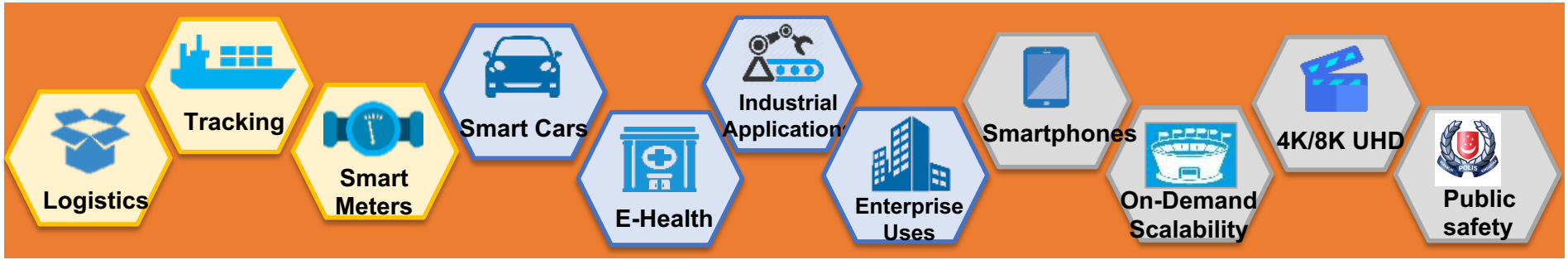
4G/5G is a game changer for the vertical markets

Particularly 5G is no longer only about consumer services. 5G is more to do with Industrial and Mission critical users.



5G is a paradigm shift from consumer to Industry

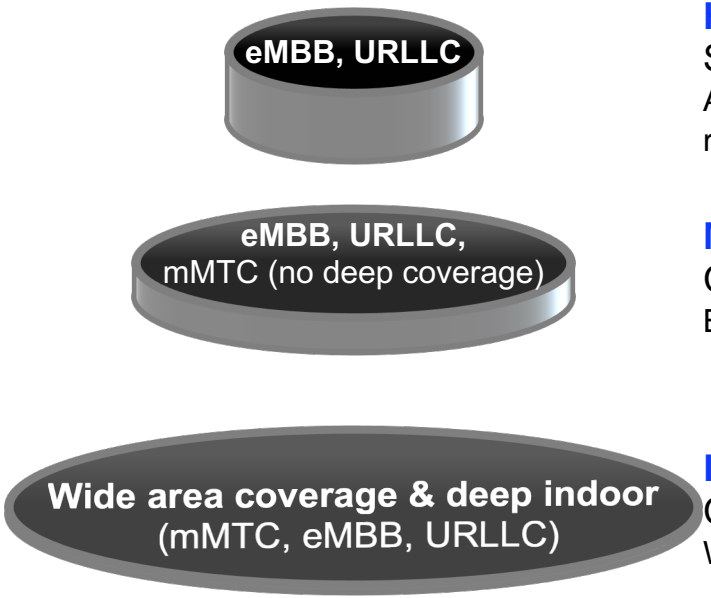




5G multi layer spectrum approach

Particularly useful for vertical markets

Various 5G use Cases and Business Models will require access to appropriate spectrum in all the three spectrum layers



High Band Frequencies
Super data layer
Addressing specific use cases requiring extremely high data rates

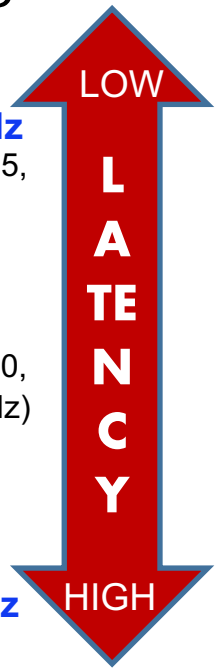
Above 6 GHz
(e.g. 24.25-29.5, 37-43.5 GHz)

Mid Band Frequencies
Coverage & capacity layer
Best compromise with capacity & coverage

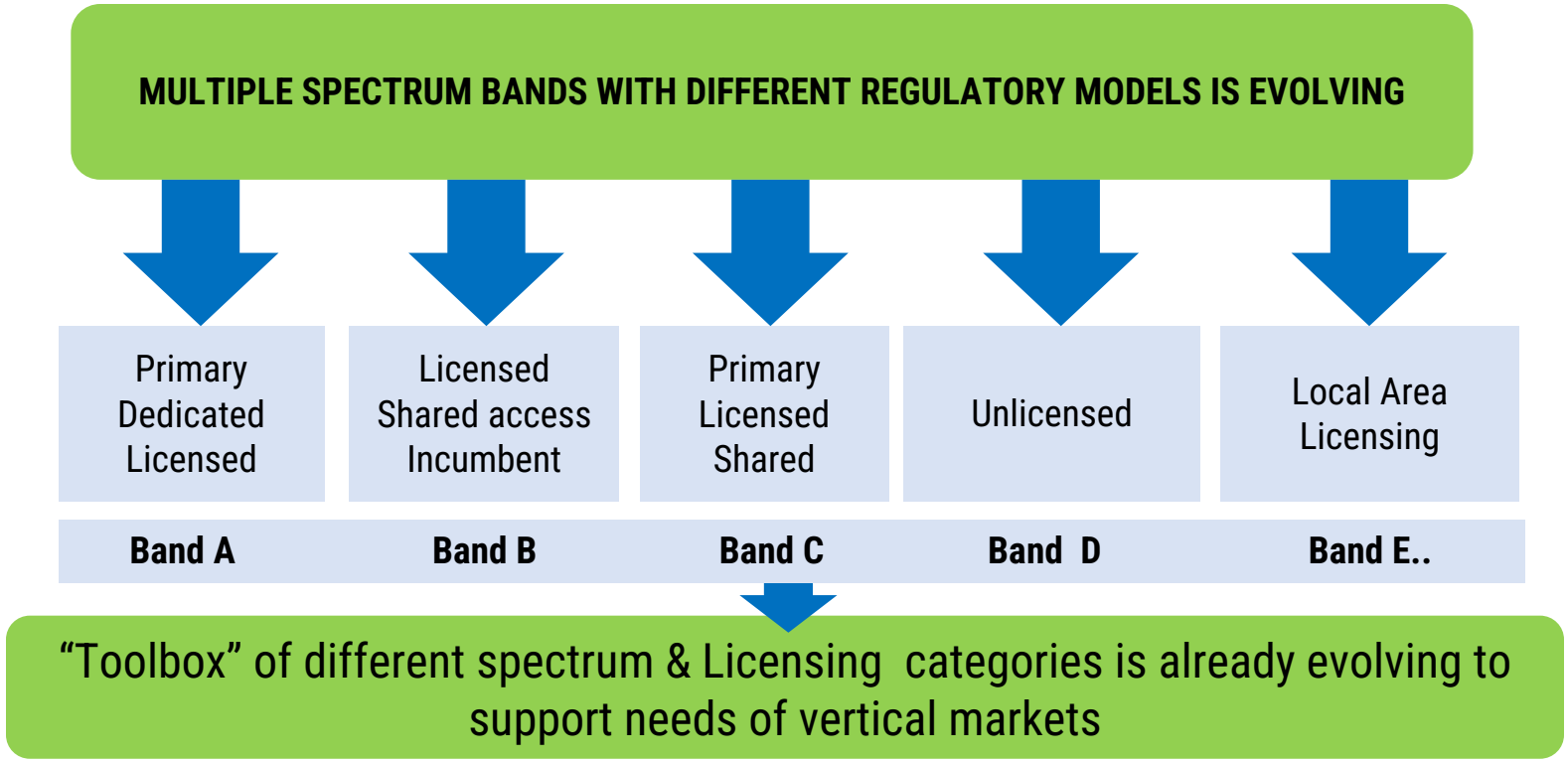
3 to 6 GHz
(e.g. 3300-4200, 4400-5000 MHz)

Low Band Frequencies
Coverage layer
Wide and deep indoor coverage

Below 3 GHz



New 4G/5G regulatory models are evolving



5G Focus is on new business models

… Release 15 First 5G NR Specs:

- Licensed bands
- LTE-Anchored(NSA), and Standalone
- Basic URLLC support
- Massive MIMO
- Flexible RAN architecture
- Fulfills ITU IMT2020 criteria

Release 16-17 onwards the fuller 5G vision:

- V2X support – autonomous driving
- Enhanced MIMO
- Support for Unlicensed bands
- Factory automation
- Support of higher frequency bands

Specific 4G/5G Technologies are evolving to meet vertical markets needs

5GNR

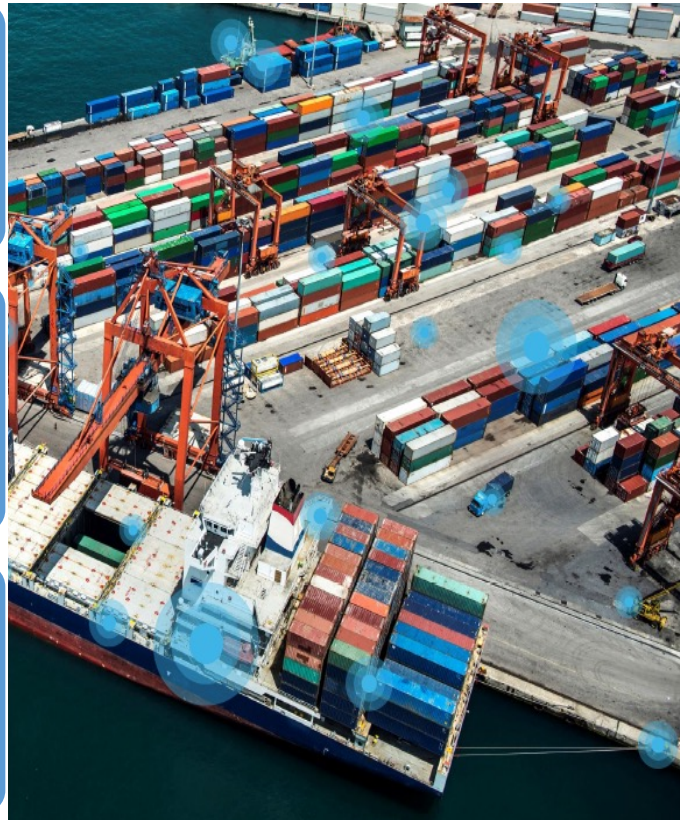
- 3GPP NR support for Private Networks
- Support for Unlicensed Bands
- Mission Critical Video/Voice/Data

CBRS

- Citizen Band radio Service
- 150 MHz Shared Spectrum in 3.5 GHz
- Spectrum Sharing with 3-tier priorities

MulteFire

- Standalone LTE based technology in unlicensed spectrum
- Listen Before Talk/Supports 5G globally



Many Countries are already implementing Rules for the vertical markets/Private Broadband/Local Area Licensing

Countries with Rules and Regulations for vertical markets/Private Broadband/Local Area Licensing	
United States	Hong Kong
Australia	Japan
Brazil	Mexico*
Canada*	Netherlands
Chile	Norway
Denmark	Poland*
Finland	Singapore*
France	Sweden*
Germany	United Kingdom
Saudi Arabia*	Tunisia

A mix of mid band spectrum & mmWave All are in core IMT bands

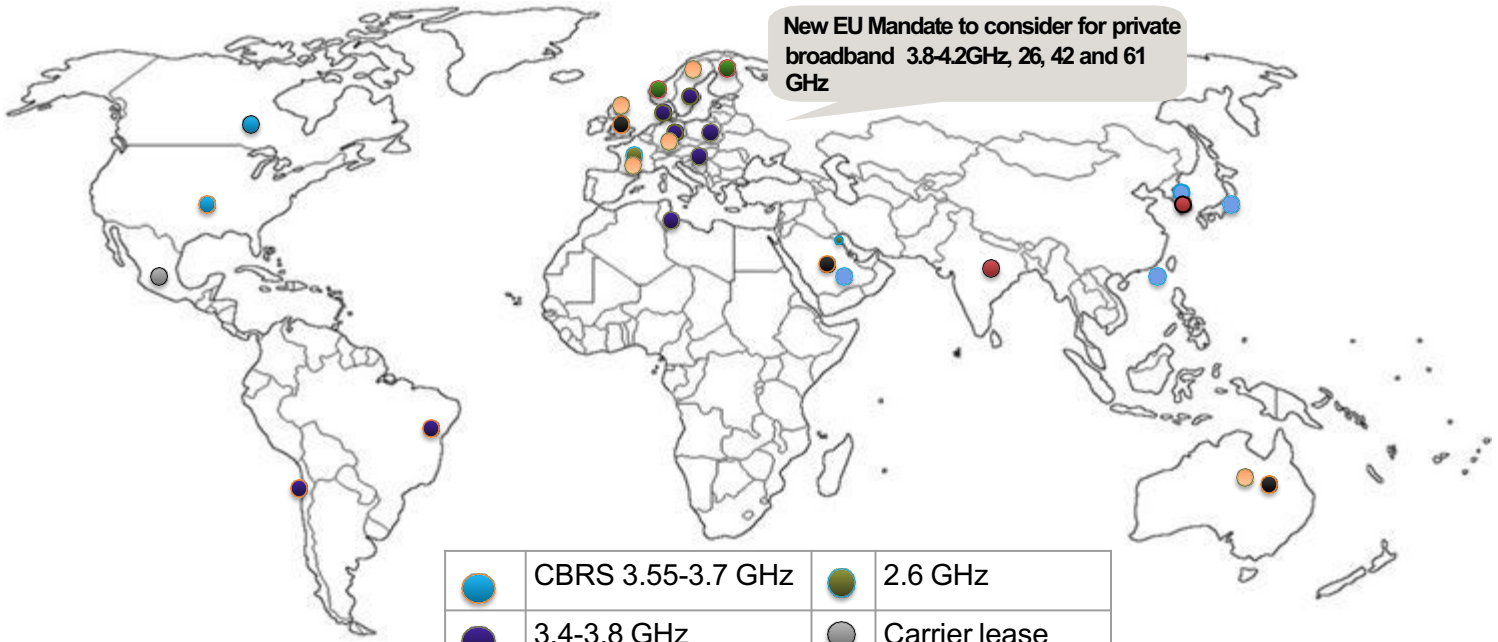
Some are supported by LTE/NR few are NR only

License based on:

- First Come First Assigned
- Use it or Lose it
- Shared & exclusive

License Fees: reduced to encourage investment

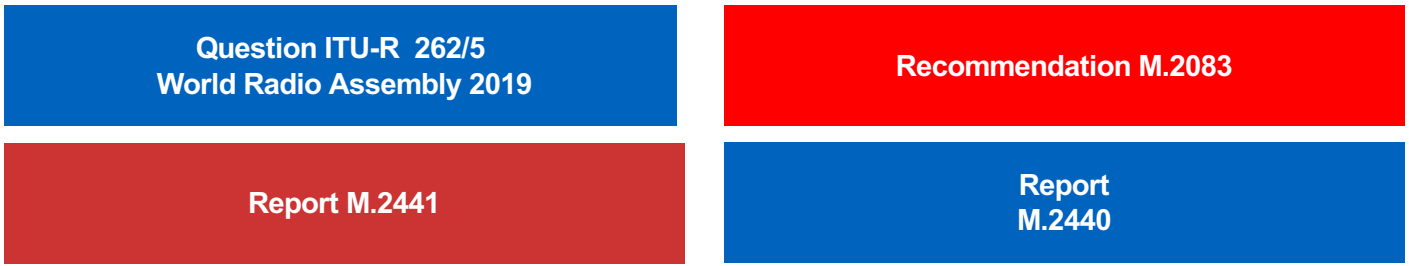
Many Countries are already allocating Spectrum for the vertical markets/Private Broadband/Local Area Licensing



	CBRS 3.55-3.7 GHz		2.6 GHz
	3.4-3.8 GHz		Carrier lease
	2.3 GHz		26 GHz
	3.8-4.2 GHz		In 4.4-4.9 GHz
	28 GHz mmWave		

ITU Activities towards 4G/5G in Vertical Industries

- Question ITU-R 262/5 prompts ITU to study the use of 4G & 5G technologies (referred to in ITU as International Mobile Telecommunication (IMT)) for specific applications in societal, industrial and enterprise usages
- Recommendation ITU-R M.2083 provides a framework and overall objectives of the future development of IMT for 2020 and beyond.
- Report ITU-R M.2440 covers the use of the IMT for Narrowband and Broadband Machine-Type Communications.
- Report ITU-R M.2441 – Emerging usage of the terrestrial component of IMT
- New Report ITU-R IMT.IND being developed –Inputs Requested



ITU-APT
Foundation of India
ITU's Association in India

Thank you !

Questions