

The background of the slide features a dynamic image of The Flash, the superhero, in his iconic red and yellow suit, running at high speed. The image is slightly blurred to convey motion, with a dark, atmospheric background. The text is overlaid on this image.

# **HAPS, LAPS & Non-Terrestrial Networks**

**Bharat B Bhatia (BB)**

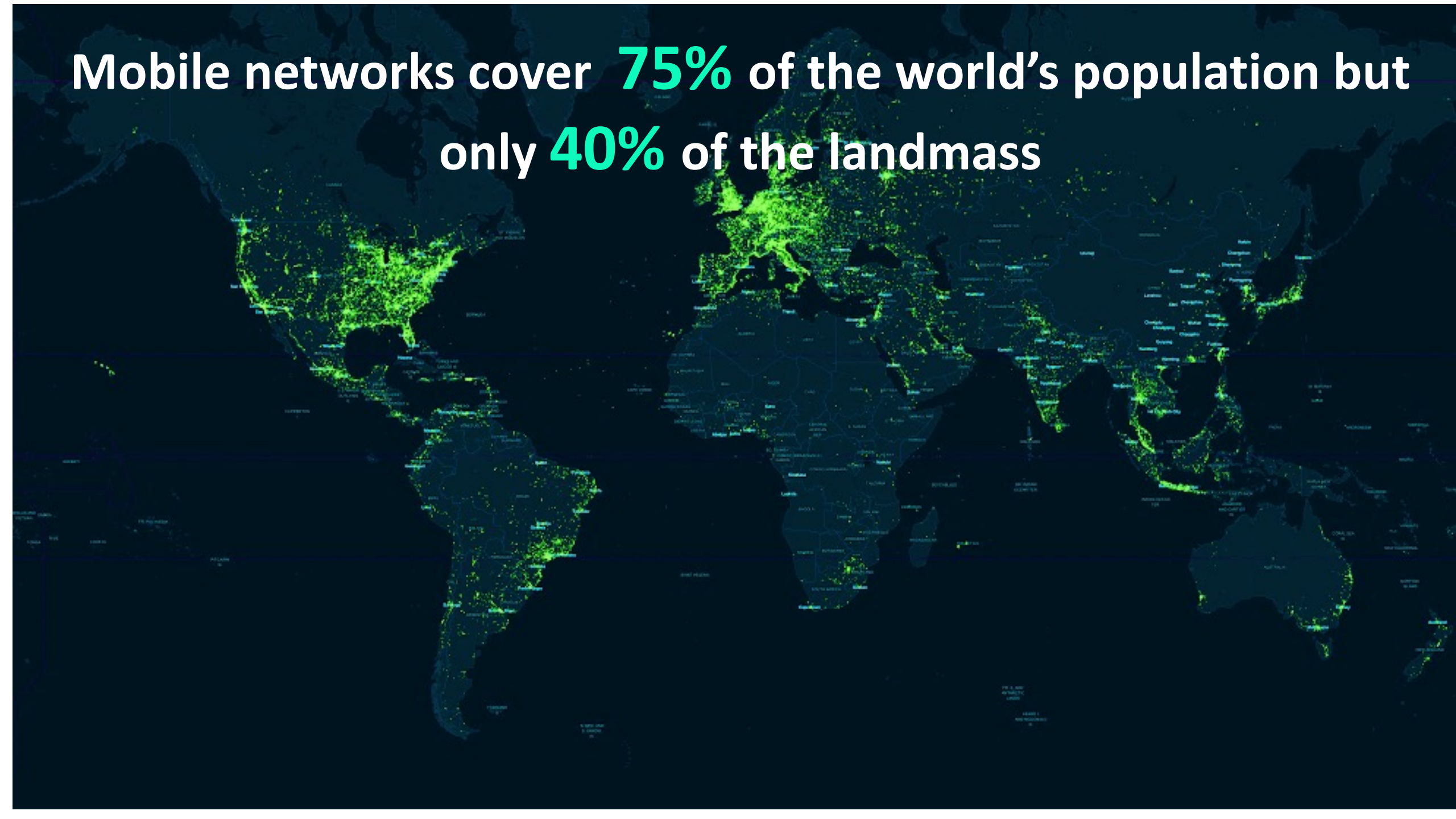
**President, ITU-APT Foundation of India**

**Vice Chairman - World Wireless Research Forum**

**Chairman, ITU SWG IMT Specific Applications**

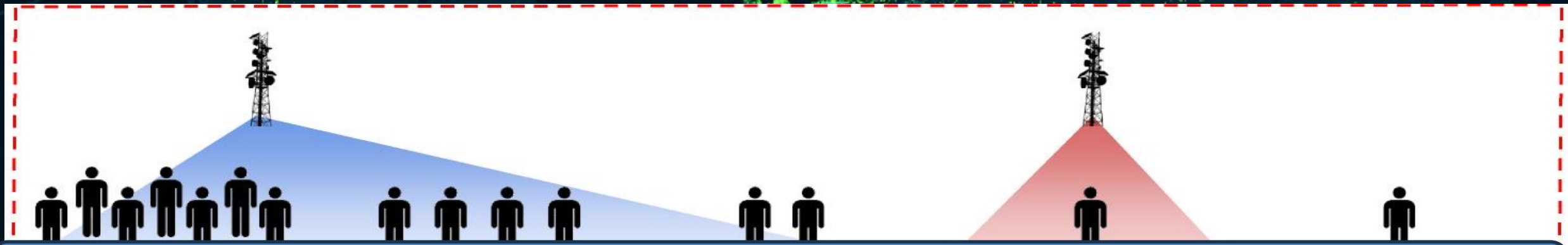
**Chairman, APT Task Group on RLAN**

Mobile networks cover **75%** of the world's population but  
only **40%** of the landmass



# Terrestrial Networks alone can't provide Ubiquitous Coverage around the Globe on Ground, Air and Sea

Either Economically unviable or Technologically not possible



Good Terrestrial Coverage

Bad Terrestrial Coverage

No terrestrial Coverage



Dense Urban

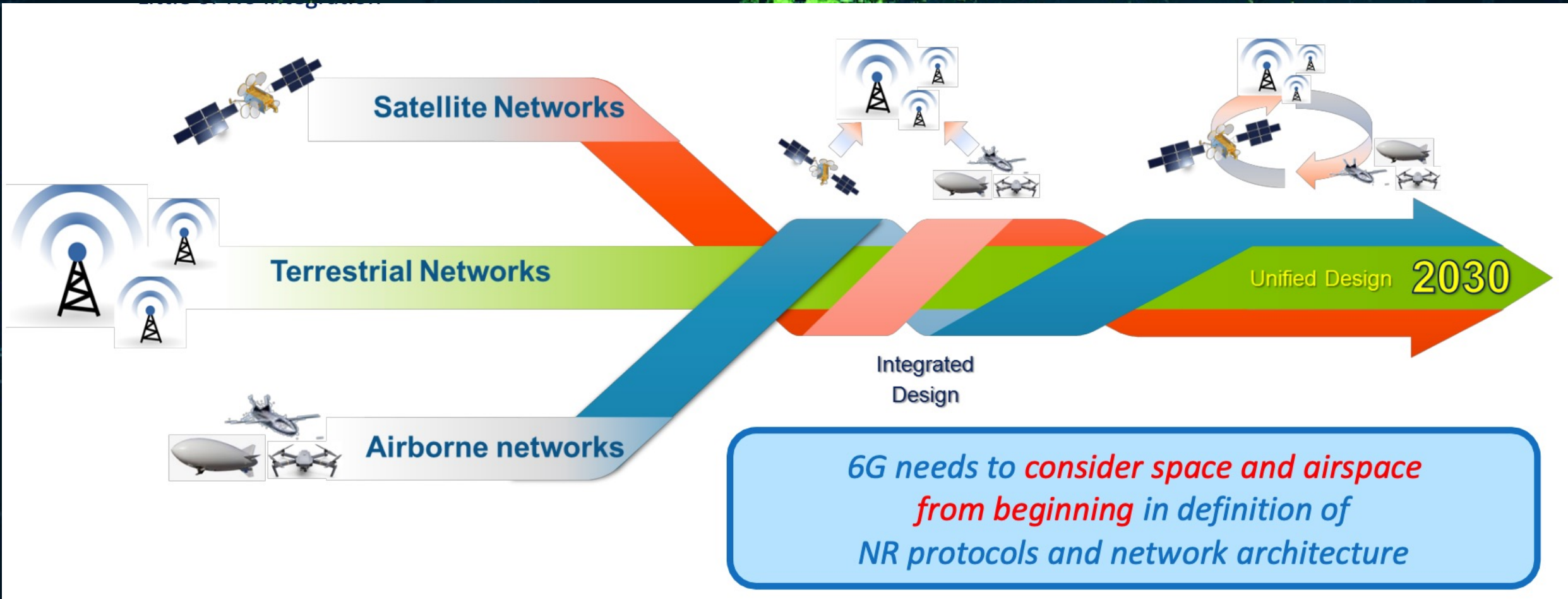
Urban

Rural

Super Rural

Maritime / Sky

# Ubiquitous Connectivity can be achieved by integrating Terrestrial, Airborne and Satellite networks



***NTN can support direct connectivity to existing devices  
No need for a new device eco-system***

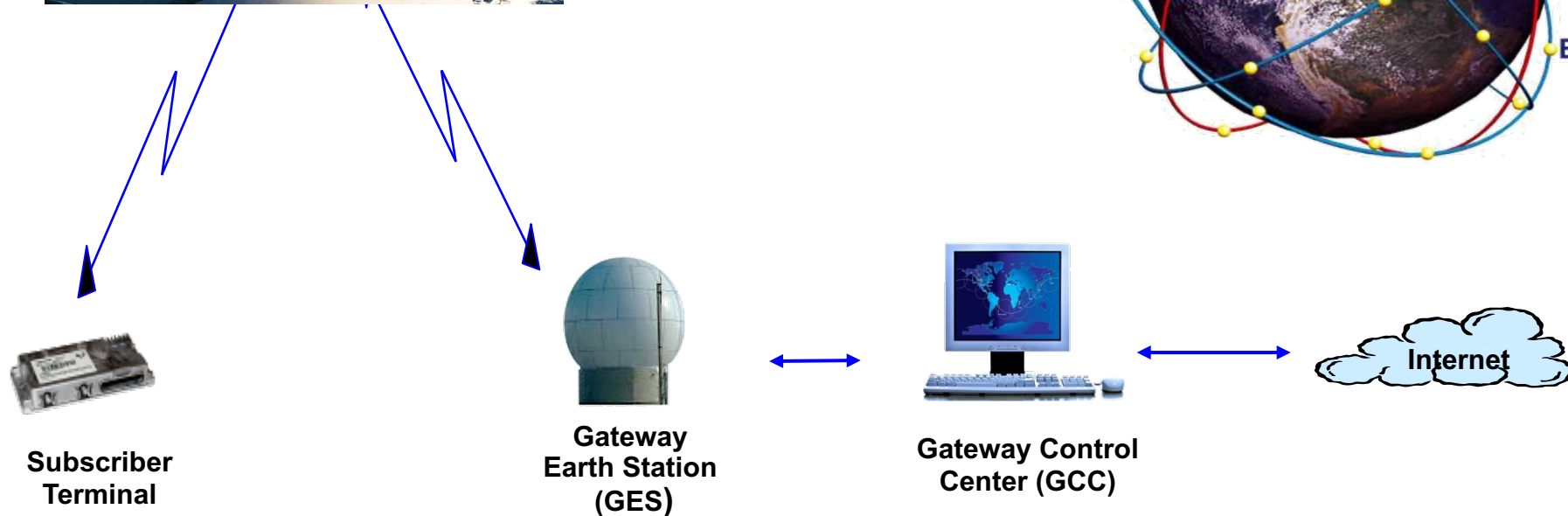
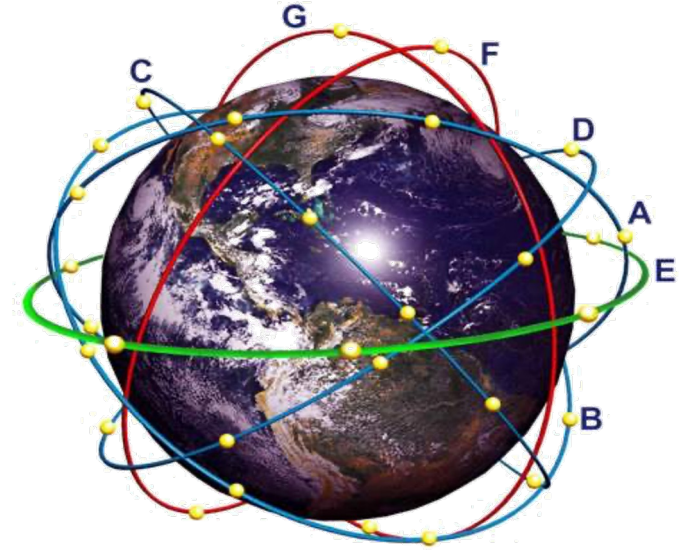
**HAPS**



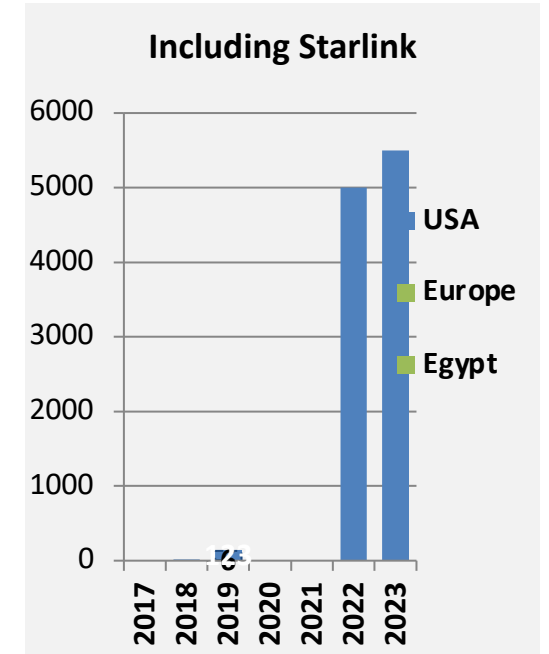
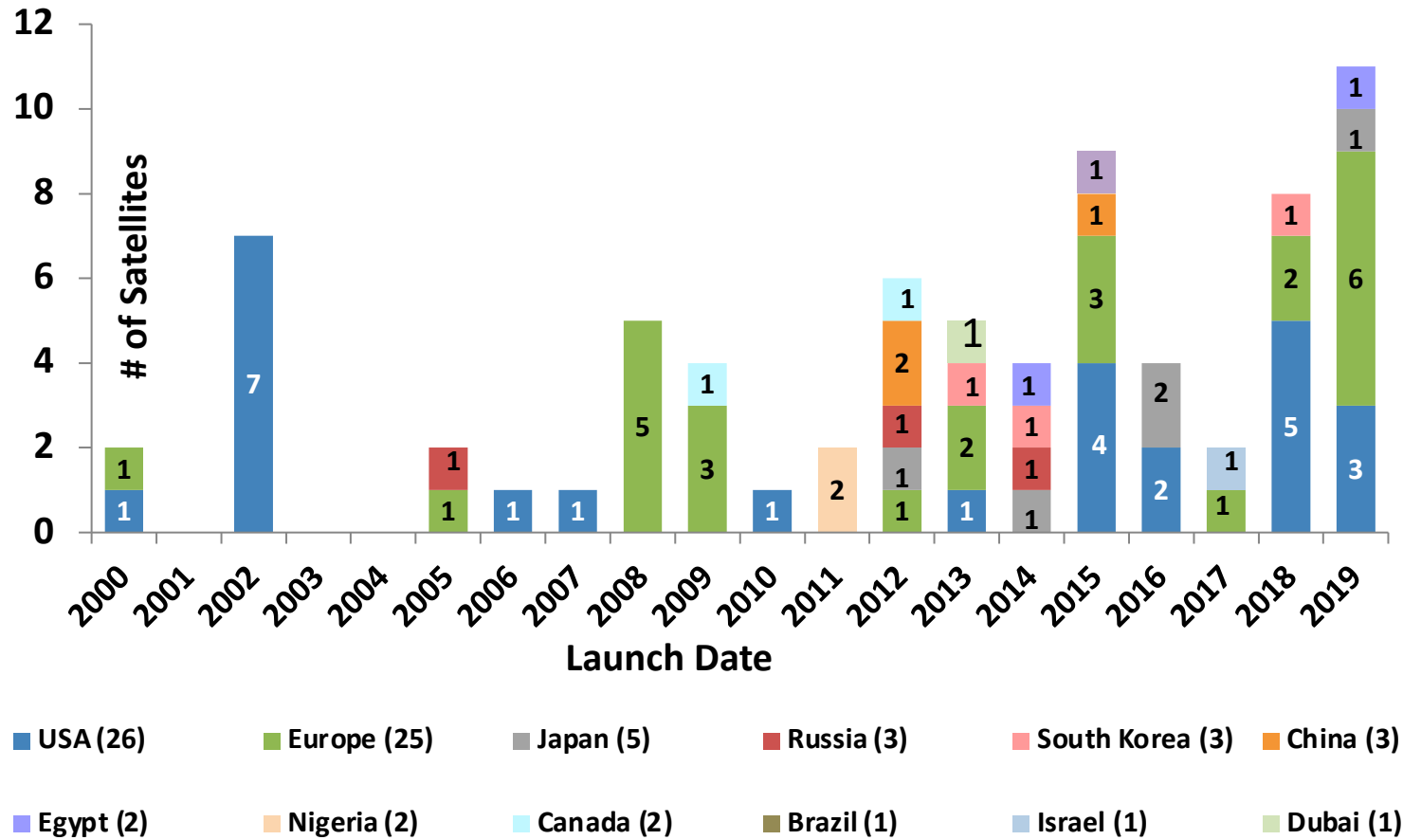
**Satellite**



# *Low Earth Orbit Satellites provide a great opportunity to support direct connectivity to existing devices*



# LEO Satellites: Operator Country/Region



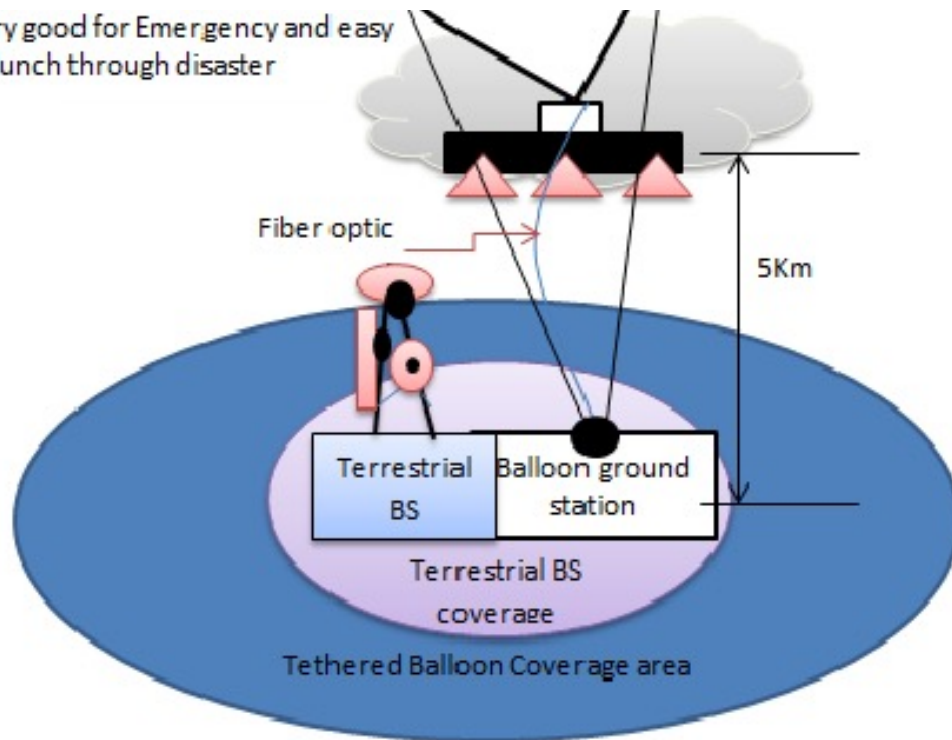
• More Starlinks (6000) launched since 2019 than total LEO satellites for the last 20 years (74), OneWeb (600) will be ramping up also, Excluding Starlink, the US and Europe have launched similar numbers of EP LEO Satellites

# HIBS, HAPS, LAPS provide a cost-effective Solution for Specific Area Coverage

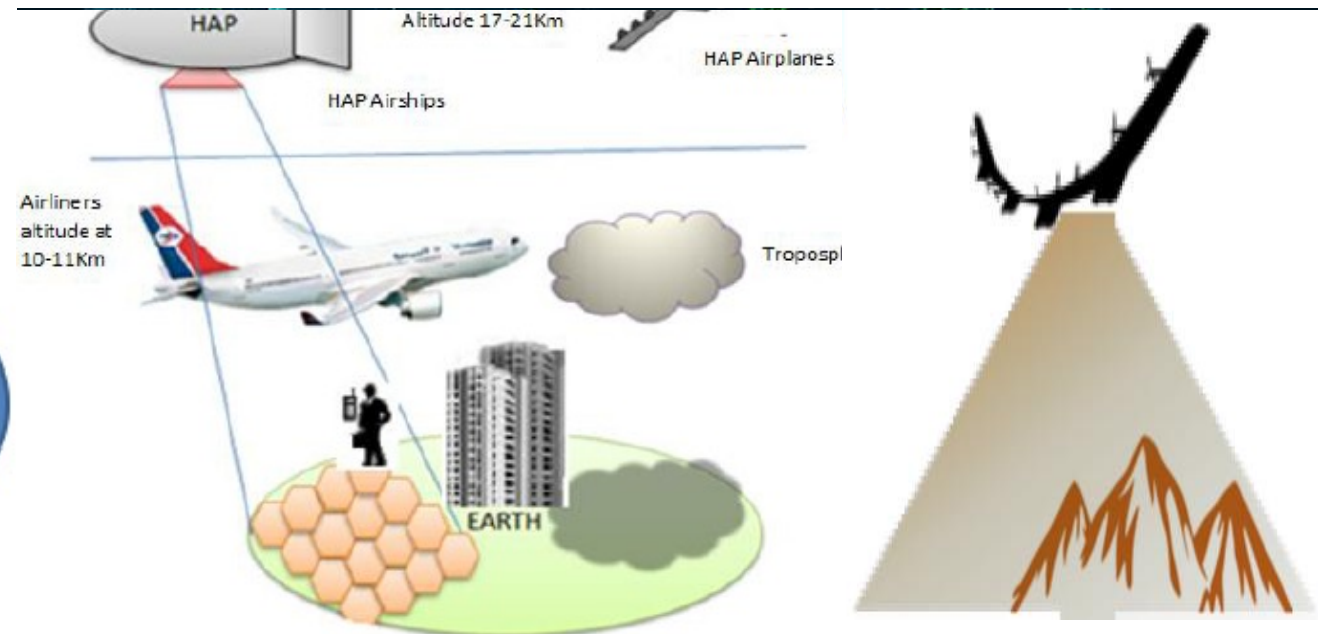
HAPS is defined under Article 1.66A of ITU Radio Regulations as A station on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth

## Tethered Base Stations

Very good for Emergency and easy to launch through disaster



HAPS and HIBS can provide good Coverage  
All communications via HIBS will go through local MNO's network and will be subject to all local rules





# Recent Examples of HAPS



U.S. Naval Institute  
High-Altitude Pseudo-Satellites Are ...



Airbus  
Zephyr | UAS | Military Aircraft ...



Via Satellite  
Commercialize HAPS, Led by Samer H...



Unmanned airspace  
Thales Alenia Space receives go-ah...



The Indian Express  
Meet HAPS: India's very own UAV that ...



Avionics International  
Commercialize HAPS Connectivity ...



Airbus  
Zephyr | UAS | Military Aircraft ...



Amprius Technologies  
High-Altitude Pseudo Satellites (HAPS ...



Unmanned airspace  
HAPSMobile expects regulatory appro...



Airbus  
Airbus to deliver connectivity services ...



Data Center Dynamics  
PHASA-35 HAPS platform ...



European Space Agency  
ESA - HAPS – missions to the edge of ...



FlightGlobal  
Airbus readies high-flying Zephyr for ...



Via Satellite  
BAE Systems' HAPS Vehicle Completes ...



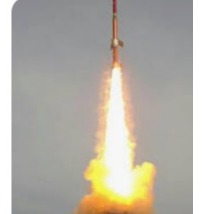
Linnk Group  
Japan's Flying 5G Base Stations Set to ...



Airbus  
Zephyr | UAS | Military Aircraft ...



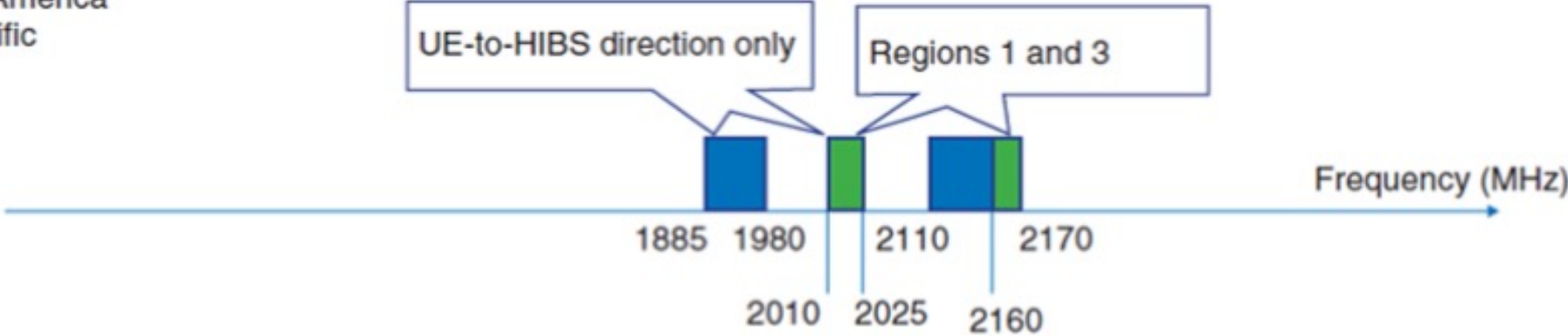
Data Center Dynamics  
HAPs company Avealto launches trademark ...



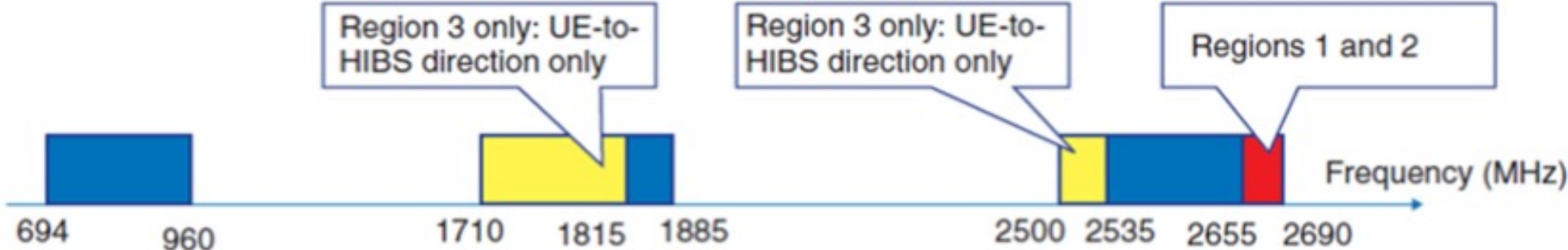
Airbus  
Airbus to deliver conn

# HIBS will use the terrestrial IMT spectrum

Region 1: Europe, Russia, Arab countries, Africa  
Region 2: North/South America  
Region 3: Asia and Pacific



(a) Frequencies currently used for HIBS



(b) Frequency candidates in WRC-23 Agenda Item 1.4

UE: user equipment

# Non-Terrestrial Satellite Networks will need a relook at the current Licensing Regimes

- Designation of relevant frequencies for use by LEO systems on a domestic basis consistent with ITU Radio Regulations
- Spectrum availability, especially in IMT as well as in the satellite Ku and Ka-bands
- No discrimination between different types of satellites in the authorization processes
- Affordable spectrum fees keeping into account the Larger shared bandwidth used by satellite systems operating in higher frequency bands



THANK  
YOU

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