

# IMT Connectivity by Stratospheric Base Stations

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# HIBS can extend mobile connectivity

HIBS = High Altitude Platform Stations as Base Stations to provide International Mobile Telecommunications (IMT)

**HIBS will be located in the stratosphere – much closer to earth than traditional satellite systems**

Cosmic Space

36,000 km



GEO Satellite

Exosphere

Exobase

Thermosphere

Karman line

Mesosphere

Stratosphere

Ozon layer

Troposphere

1,200 km

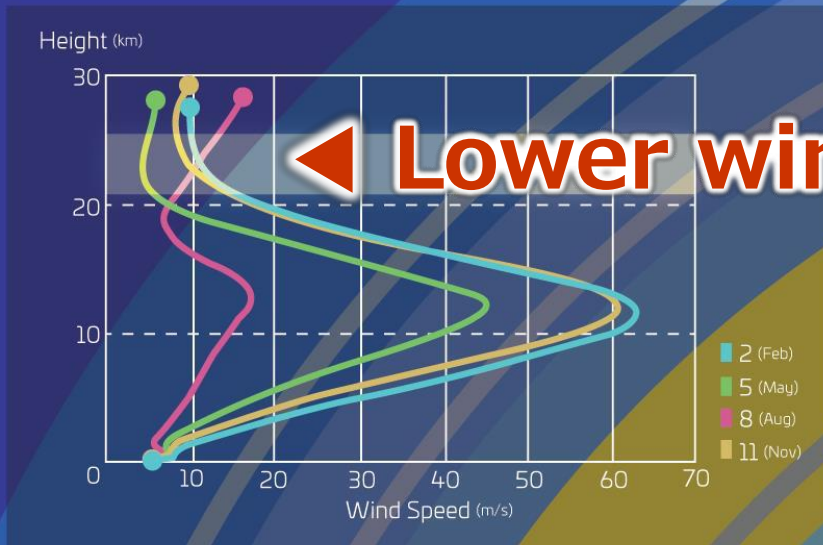


LEO Satellite

20 km



HIBS



**High altitude IMT base stations → HIBS**

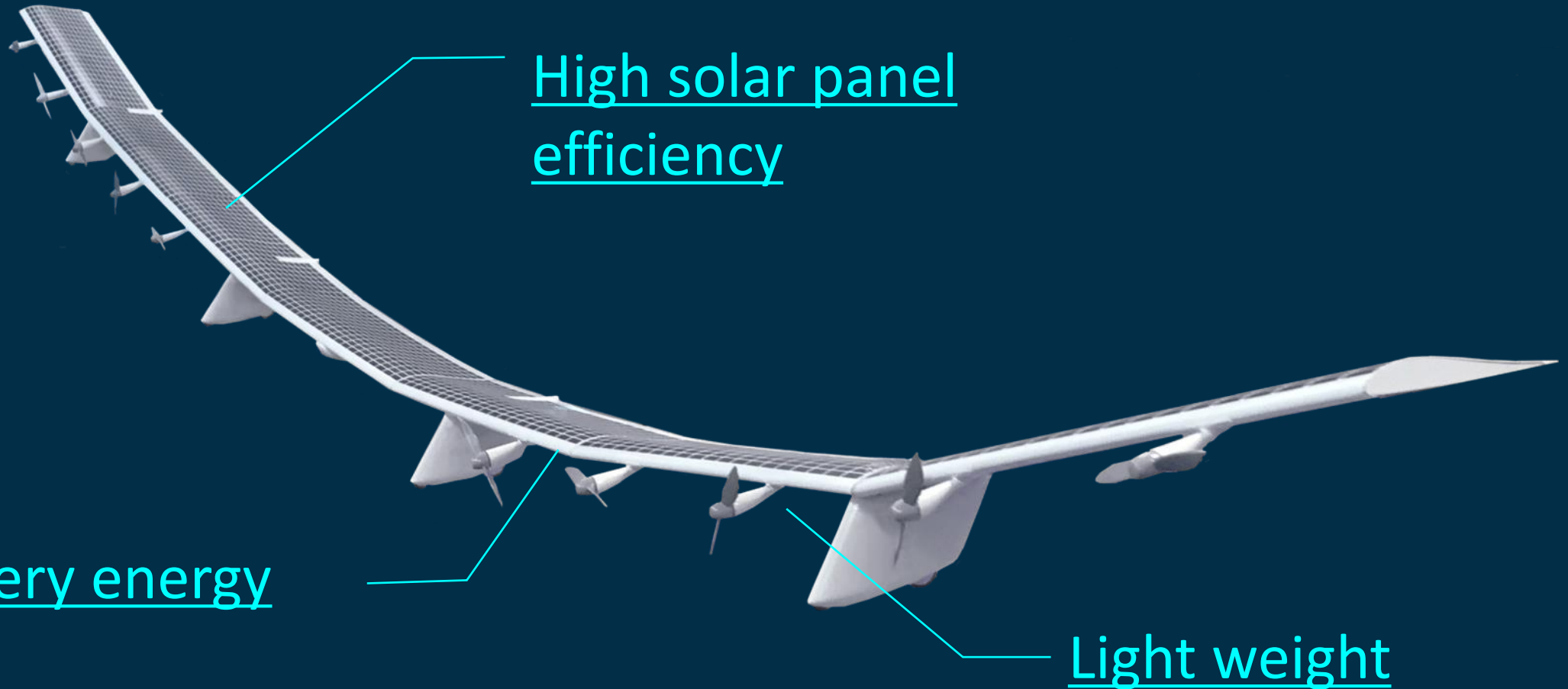
# Why the world needs HIBS

- The widespread deployment of HIBS would provide a highly-effective and efficient way to meet the growing demand for mobile broadband in underserved areas.
- **HIBS offers:**
  - A very large footprint that can complement the coverage provided by mobile network operators
  - Much lower latency than higher-orbit satellite systems, including the latest “non-GSO” (non-geostationary satellite orbit) solutions
  - Minimal ground infrastructure and maintenance requirements
  - Support for existing IMT-compatible mobile devices.

# HAPSMobile and the Sunlider

- HAPSMobile Inc., a joint venture between SoftBank Corp. and AeroVironment Inc., is looking to establish a network of HIBS that will enable mobile operators to provide broader coverage.
- HAPSMobile has developed the Sunlider, an unmanned aircraft that can fly at altitudes of approximately 20 km.
- With a view to providing HIBS globally, HAPSMobile has conducted a number of test flights – one of which was in the Stratosphere (Sep 2020)
- HAPSMobile is targeting 2023 for service launch.
- Along with leading telcos and aerospace companies, HAPSMobile is part of the HAPS Alliance, which is advocating the use of high altitude platform stations (HAPS) to extend connectivity.

# Key technologies for HIBS



= flight duration of six months

# Features of HIBS

## STRONG SIGNAL & LOW LATENCY

Direct access with existing services



1,000m

## 3D AREA

Stable connection for drone/airplane

50m

## SUPER WIDE AREA

Cell diameter: 200km

\*Signal Strength : vs GEO x 1M Stronger, vs LEO x 10K Stronger

\*\*Latency : 0.3ms (one-way)



# Usage scenarios



Coverage  
Enhancement



Safety and  
Security



IoT / Drones



Remote  
Working /  
Learning

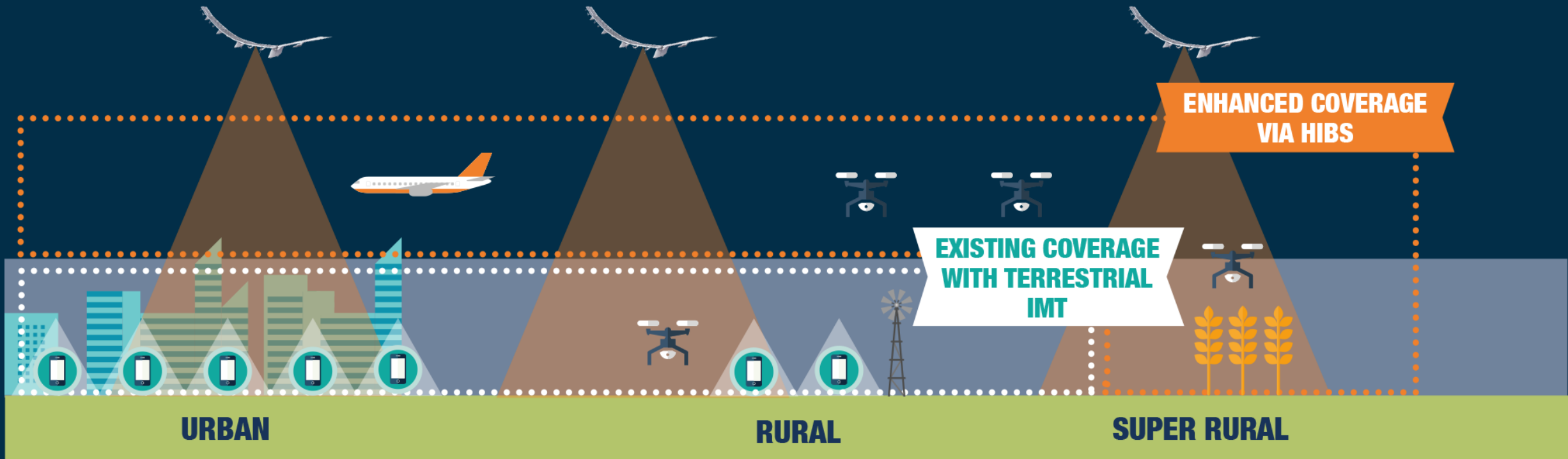


Disaster  
Response

**Mobile Connectivity Anytime, Anywhere**

# Extending MNOs' coverage with HIBS

**HIBS CAN DELIVER:**  
**STRONG SIGNAL AND LOW LATENCY**  
**DIRECT ACCESS TO EXISTING SERVICES**  
**WIDE AREA COVERAGE (MORE THAN 31,000 SQUARE KM PER HIBS)**



# New deployment scenarios for MNOs

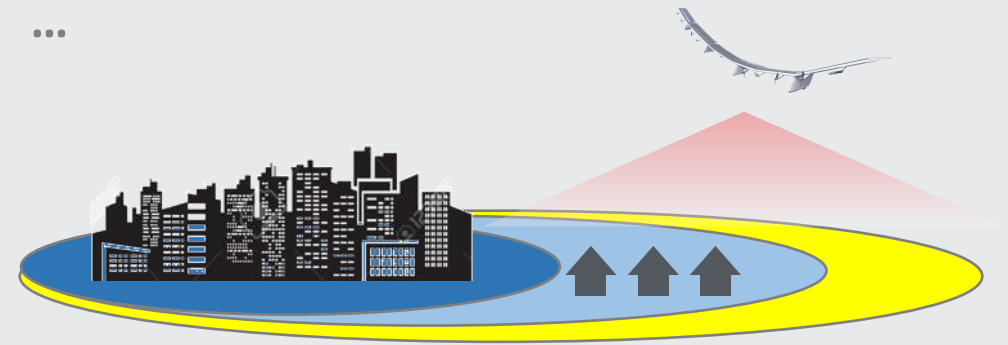
## MNOs Today

- Wider Macrocell (tower base station)
- Urban Macrocell (rooftop base station)
- Urban Microcell (hotspot base station)
- Urban Picocell (indoor base station)
- ...

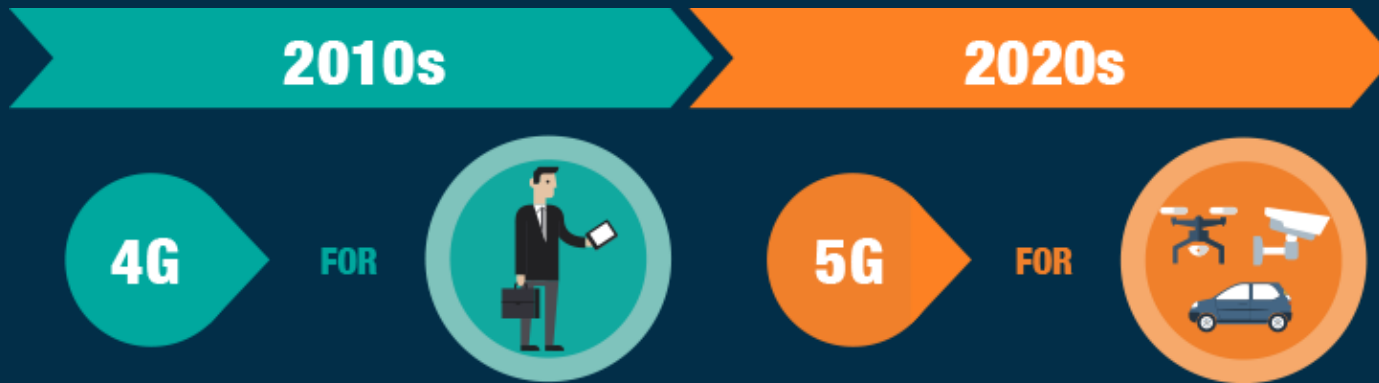


## MNOs in Future

- **Super Macrocell (HIBS)**
- Wider Macrocell (tower base station)
- Urban Macrocell (rooftop base station)
- Urban Microcell (hotspot base station)
- Urban Picocell (indoor base station)
- ...

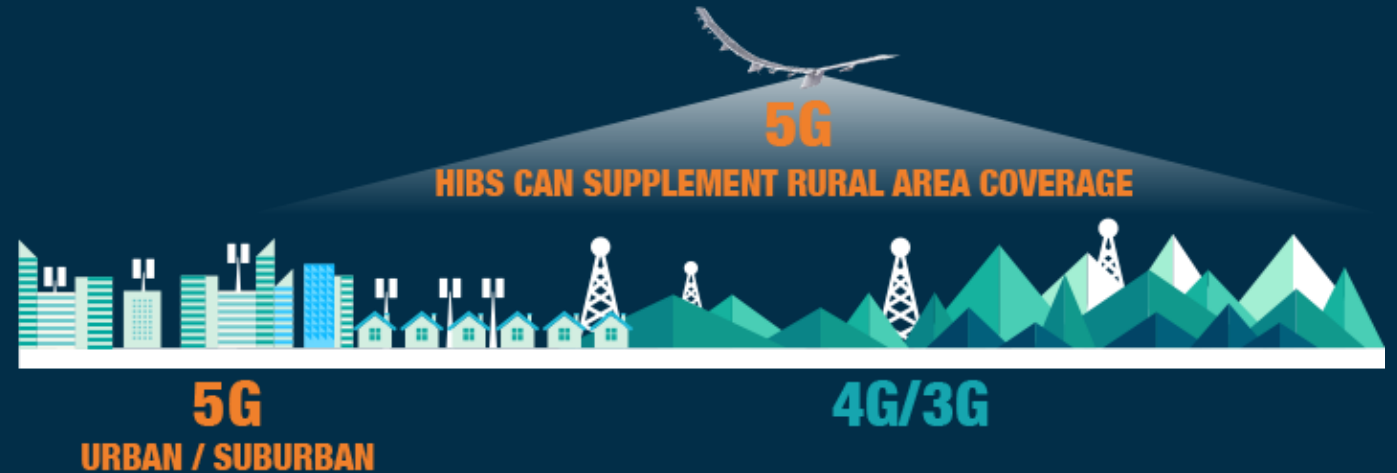


# HIBS and 5G



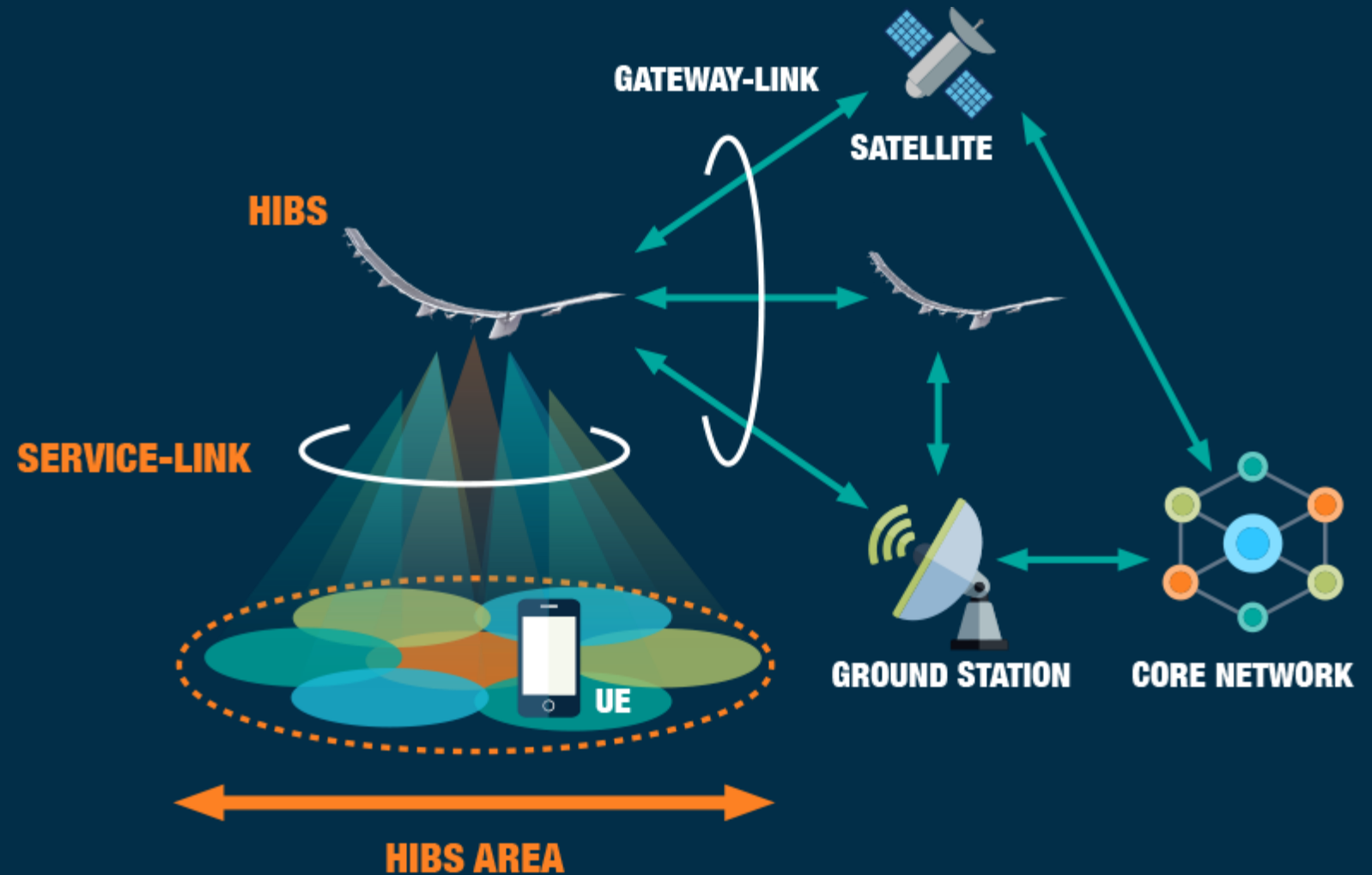
5G brings a paradigm shift

HIBS can accelerate migration to 5G



# Connecting HIBS to the wider world

- Each HIBS will connect to other networks and the Internet via a gateway link.
- In cases where it is difficult to deploy ground stations, inter-HIBS or HIBS-satellite links may be used for this purpose.
- The frequency bands (6 GHz to 47 GHz) identified for HAPS could be used for links to ground stations.



# The regulatory situation today

- Existing ITU Radio Regulations (RR 5.388A) allow for the use of HIBS in parts of the 2 GHz range identified for IMT (Resolution 221).
- Adopted by 45 countries, RR 5.388B identifies technical conditions to enable the use of HIBS while providing protection to terrestrial IMT and other mobile and fixed services.
- Agenda item 1.4 for WRC-23 will consider the use of the bands identified for IMT below 2.7 GHz by HIBS (without negatively impacting ground based IMT services).
- WRC-19 identified spectrum and related regulations for HAPS in the frequency range 22 GHz to 47 GHz to improve broadband connectivity to fixed terminals.

# Frequency bands available for HIBS and HAPS before WRC-19

## MOBILE SERVICE

(Service Link)

**2 GHz**

**170 MHz (REGIONS 1 AND 3) /  
145 MHz (REGION 2)**

**ONLY FREQUENCY BAND FOR  
HIBS SERVICE-LINK (RR5.388A)**

## HAPS FIXED SERVICE

(Feeder Link)

**6 GHz** by FN for some countries

**28 GHz** by FN for some countries

**31 GHz** by FN for some countries

**47 GHz** global

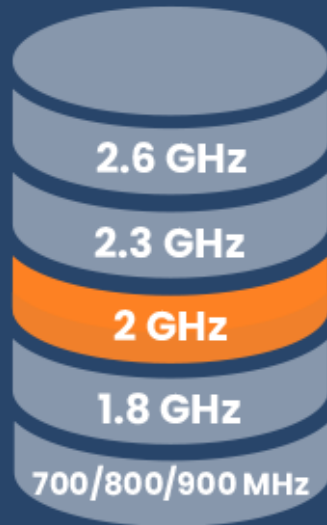
# WRC-19 paved the way for HIBS to use more IMT bands and identified additional bands for HAPS

<b>MOBILE SERVICE</b> (Service Link)	694 – 960 MHz		
	1710 – 1885 MHz		1710-1815 MHz to be used for uplink only in Region 3
	2500 – 2690 MHz		In Region 3, 2655-2690 MHz is excluded and 2500-2535 MHz is to be used for uplink only
<b>HAPS FIXED SERVICE</b> (Gateway)	28 GHz	} FNs modified	
	31 GHz		
	47 GHz		
	21 GHz	Region 2	21.4 – 22 GHz
	26 GHz	Region 2	24.25 – 27.5 GHz
	38 GHz	Global	38 – 39.5 GHz
			} New bands for HAPS



# Agenda item 1.4 can deliver more flexibility

## CURRENT REGULATION



**NO FLEXIBILITY**  
**ONLY 2 GHz CAN BE USED**  
(SEE RR 5.388A AND RR 5.388B)

MNOs' spectrum  
holdings  
(example)

## AGENDA ITEM 1.4 COULD OPEN UP MORE IMT BANDS



**FLEXIBILITY TO USE EXISTING  
IMT SPECTRUM HOLDINGS**  
(THE BANDS SHOWN IN ORANGE)

# Support for IMT band plans

The additional IMT bands that could be used by HIBS under agenda item 1.4 (specifically 1710-1885 MHz) together with existing HIBS bands (1885-1980 MHz and 2110-2160 / 2170 MHz) would allow HIBS to use two major band plans for 1.8 GHz and 2.1 GHz:

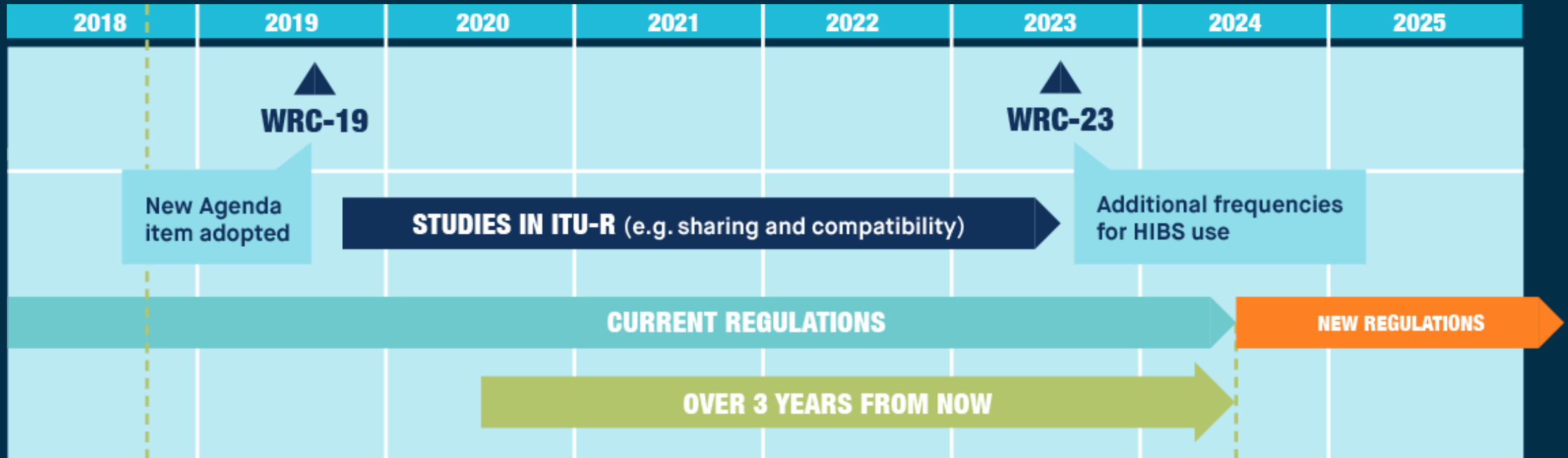
- 1710-1785 MHz / 1805-1880 MHz - the ITU Region 1 plan for the 1.8 GHz band
- 1710-1780 MHz / 2110-2180 MHz – the Region 2 AWS band plan

Agenda item 1.4 would also pave the way for HIBS to use the full band plans for 694-960 MHz and 2500-2690 MHz with some restrictions in Region 3.

# Preparing for agenda item 1.4

- ITU-R technical studies will address the compatibility of HIBS with other services in the IMT bands below 2.7 GHz.
- The technical studies and a review of the existing Radio Regulations for HIBS will inform the development of the regulatory options for the conference preparatory meeting (CPM) report.
- These options should:
  - Provide sufficient flexibility for use of the IMT bands by HIBS;
  - Ensure no negative impact on the use of the bands by terrestrial IMT networks;
  - Fully complement terrestrial IMT in the IMT bands below 2.7 GHz;
  - Ensure protection of other services with primary allocations.

# Schedule for new regulations



**Agenda item 1.4 allows for deployment of HIBS in the 2020s**

# Summary

With access to IMT spectrum below 2.7 GHz, HIBS will be able to:

- Extend coverage of terrestrial IMT base stations to improve mobile broadband connectivity for all IMT devices in unserved and underserved areas.
- Support a wide range of safety, security, consumer and business applications without negatively impacting existing services in the IMT bands.
- Help accelerate the deployment of 5G.

Next steps:

- Support the agenda item 1.4 for WRC-23 to allow HIBS to use the IMT spectrum below 2.7 GHz to complement terrestrial IMT services.
- Input to ITU-R studies to assess the compatibility of HIBS with terrestrial IMT and other services operating in the bands below 2.7 GHz.
- Support the revision of existing Radio Regulations for HIBS to include the bands considered under agenda item 1.4 for use by HIBS.