

Satellite Services and Spectrum for 5G

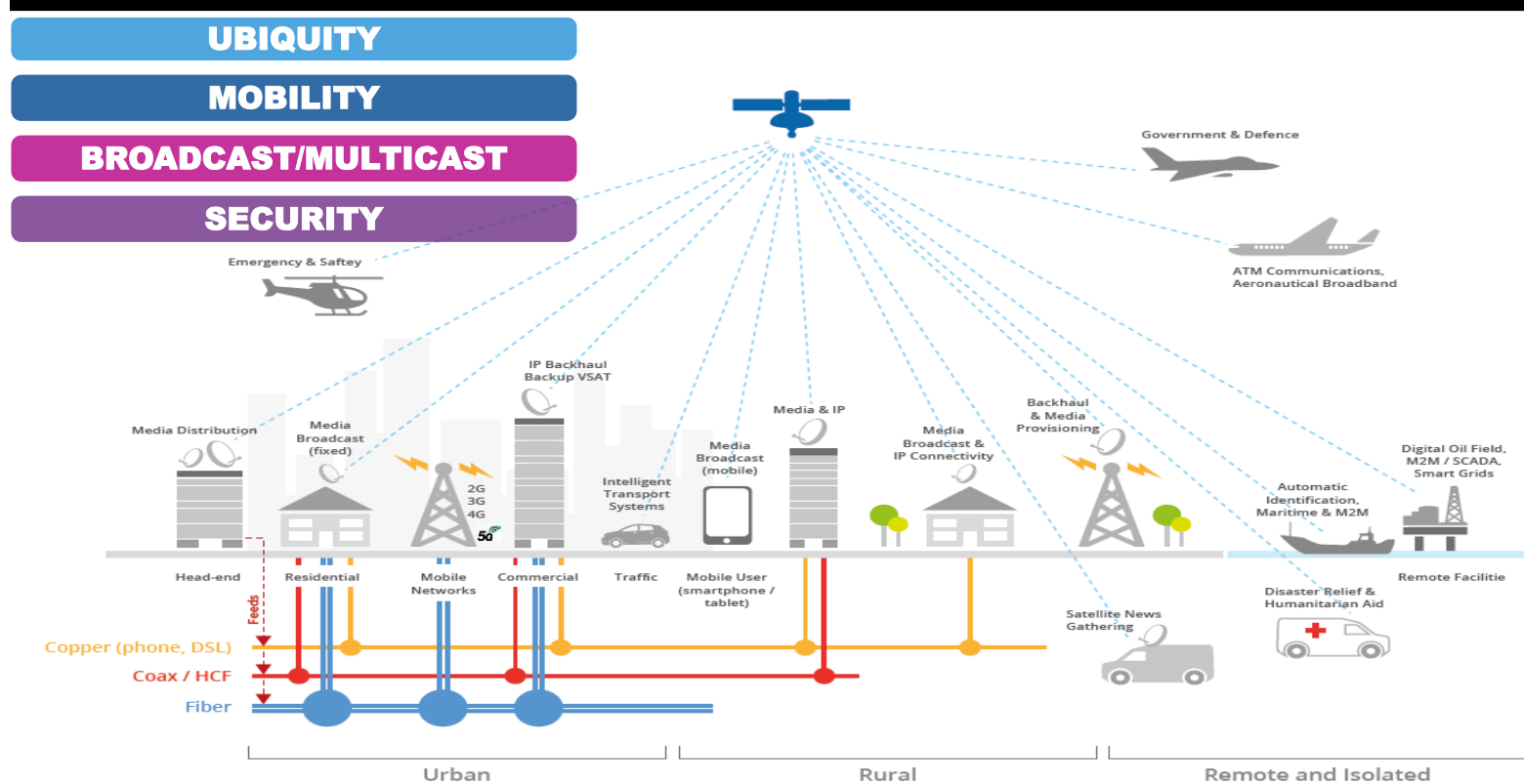
PRESENTED BY
Tare BRISIBE

PRESENTED AT
ITU-APT Foundation of India
4th National Workshop on WRC-19 Preparations
Spectrum for 5G and Other WRC-19 Agenda Items
12th June 2019

Outline

- 1 Introduction
- 2 Satellites in the 5G Ecosystem
- 3 SES and 5G
- 4 Spectrum for 5G
- 5 Conclusions

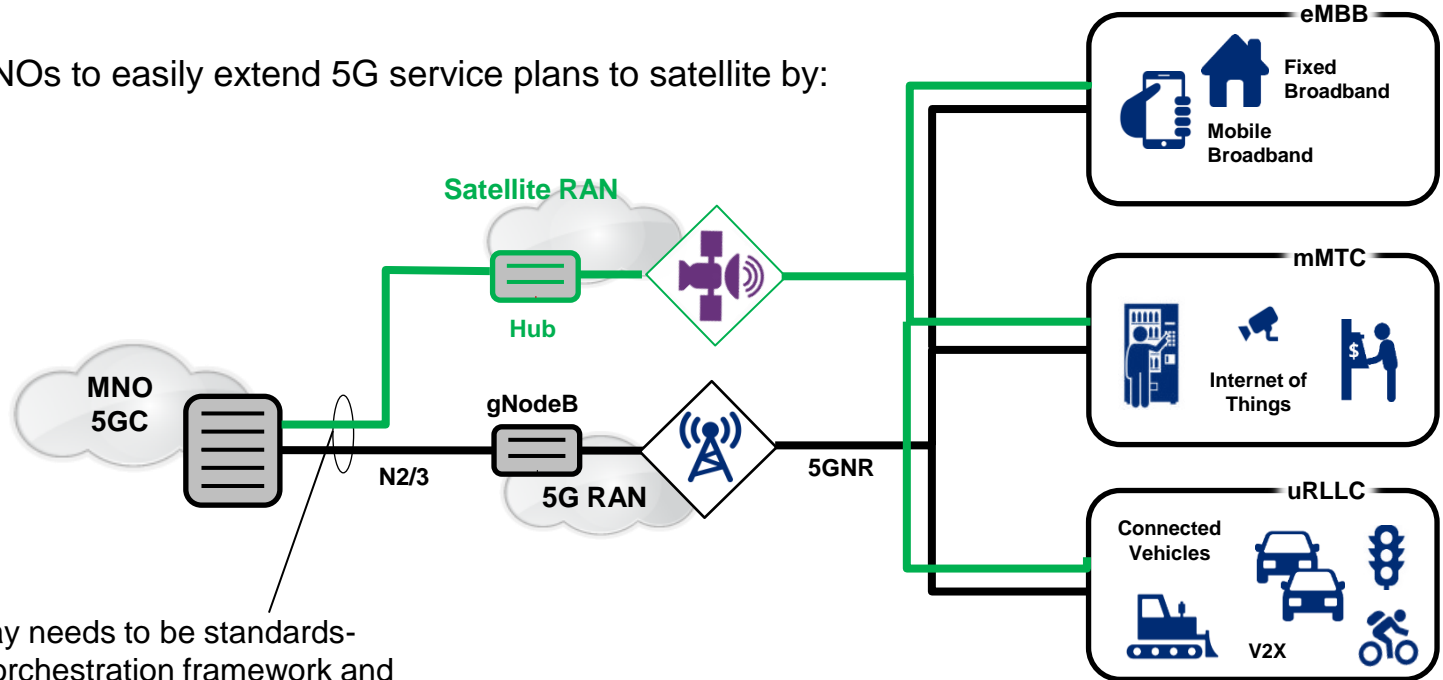
Key Satellite Features that Enhance the Networked Society



Source: ESOA

Satellites Support the Key Usage Scenarios for 5G

Enable MNOs to easily extend 5G service plans to satellite by:



Hub/ Gateway needs to be standards-based SDN/orchestration framework and 3GPP N2/3 interface

Enable hybrid 5G/satellite terminals

Four Satellite “Sweet Spots” in the 5G Ecosystem

TRUNKING & HEAD-END FEED

Satellites provide a very high speed direct connectivity option to remote / hard-to-reach locations

BACKHAULING & TOWER FEED

Satellites provide a high speed connectivity (incl. multicast content) to wireless towers, access points and the cloud

COMMS ON THE MOVE

Satellites provide a direct and/or complementary connection for users on the move (e.g. on planes, trains, automobiles and ships)

HYBRID MULTIPLAY

Satellites deliver content complementing terrestrial broadband (as well as direct broadband connectivity in some cases)

Satellite's ubiquitous availability helps accelerate global 5G deployment on the ground, at sea and in the air

SES & 5G



70+

satellites (incl. 20 MEO)
covering

99%

of the globe and world
population



Unique

GEO-MEO

constellation complemented
by a ground segment,
together forming a flexible
network architecture that is
globally scalable



Driver of

INNOVATION

in building a cloud-scale,
automated, “virtual fibre”
network of the future

**SES IS WELL-POSITIONED TO ADD VALUE TO THE 5G OPPORTUNITY BY
COLLABORATING CLOSELY WITH KEY PUBLIC AND INDUSTRIAL STAKEHOLDERS**



SES[▲]

TAKING A LEADERSHIP ROLE IN THE 5G ECOSYSTEM



SAT
5G
Satellite and Terrestrial
Network for 5G



eltic-Plus
Smart Connected World



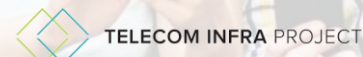
5G PPP
The 5G Infrastructure Public Private Partnership



5G IA
INFRASTRUCTURE ASSOCIATION



alcan
systems
Communication is the key



3GPP
A GLOBAL INITIATIVE



SES'S 5G INTEGRATION STRATEGY

SES[▲]

**Recognition that 5G represents
a satellite services opportunity**

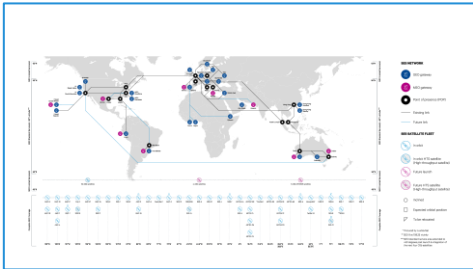


**Enable satellite
integration
within 5G**

**Commercialise
satellite
products and
services for 5G**

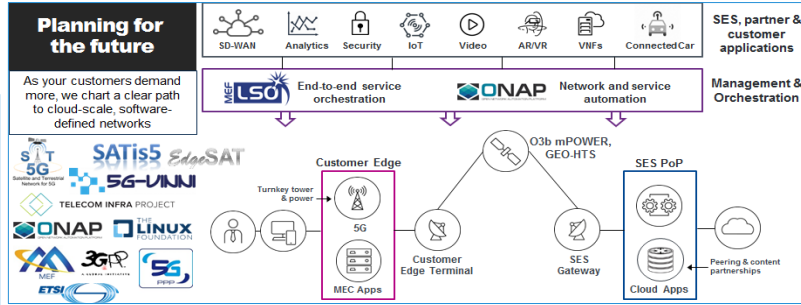
**Develop and
Demonstrate
satellite
integration
within 5G**

Building the Satellite Infrastructure to Support 5G Roll-out



Coverage

2019



+Capabilities

2020

O3b mPOWER



CAPACITY	FLEXIBILITY	COVERAGE	PRODUCTIVITY
Multi-terabit Scalable to 10x of Tbps globally	Shape, moderate, route, shift & switch 4,000+ beams per satellite	~400M Square kilometres covered	100% productive Beams go to customers, not empty territory

+Capacity

2021

2022+

Massive investments in satellite and ground infrastructure to support new capabilities and requirements

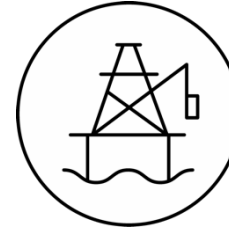
Increasing Spectrum Use Intensity

KEY OBJECTIVES

- Reusing spectrum allocated to FSS
- Broadening the addressable market
- Enabling new satellite applications
- Facilitating further spectrum efficiency



Telcos



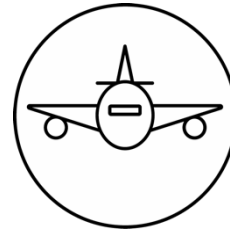
Energy



Maritime

KEY ENABLERS

- Permitting other service types in existing FSS bands
- Extending the use of mobile terminals
- Re-evaluating arbitrary restrictions
- Avoid unnecessary sharing with incompatible services



Aero



Government



Cloud

Spectrum for 5G

24.25-27.5 GHz

- The **24.25-27.5 GHz band** is among those being considered by the ITU for IMT-2020. It is a **promising band for 5G mobile services**, provided that protections are in place to protect co-primary Fixed Satellite Services (FSS) in certain portions of the band.
- The **24.65-25.25 GHz uplink band** was recently paired with a new BSS downlink allocation at 21.4-22.0 GHz at WRC-12 and satellites have only recently been deployed in the band. BSS spectrum can be used to complement future 5G networks by efficiently distributing common content to edge caches.
- The **27.0-27.5 GHz band** is allocated for FSS uplinks in ITU Regions 2 and 3. Modern HTS systems will require large amounts of spectrum to support growing bandwidth demands and recent HTS systems have turned to this band to meet their requirements
- On **sharing conditions**, 5G mobile services should be held to the technical parameters that were used in the ITU-level compatibility studies with FSS. In addition, the regulatory framework should **enable reasonable future deployment of satellite earth stations** in the band, even after the introduction of 5G, consistent with the co-primary status of the FSS.

Spectrum for 5G

27.5-29.5 GHz

- **The 27.5-29.5 GHz band is NOT among the bands being considered by the ITU for IMT-2020.** This band was excluded at WRC-15 in recognition of the extensive use of the band by satellites. Few countries support this band for 5G and most countries are focused on 24.25-27.5 GHz band
- **Dozens of satellites are in orbit today using this band** delivering hundreds of Gbps of throughput and many more will be launched soon
- **HTS systems** using this band provide direct **broadband access to millions, support 2G/3G/4G mobile networks** around the world today, and will support / extend **future 5G networks**
- **Ample other spectrum** is being considered for 5G (more than 33 GHz)
- Providing certainty to a future 5G mobile ecosystem **should not come at the expense of the existing and evolving satellite ecosystem**

Spectrum for 5G

37.0-43.5 GHz

- The 37.0-43.5 GHz band is among those being considered by the ITU for IMT-2020
- There are advanced plans by the satellite industry to deploy the next-generation of Very High Throughput Satellites (VHTS) using portions of this spectrum, including GEO and non-GEO systems
- With 6 GHz of spectrum in this band, there may be enough frequencies to accommodate both IMT-2020 and VHTS requirements. Provided that portions of the band designated for High Density FSS (“HDFSS”) should be preserved (i.e. not identified for IMT), while establishing reasonable sharing conditions in the non-HDFSS portions to ensure compatibility and continued ability of co-primary FSS earth stations to deploy into the future

Spectrum for 5G

3600-3700 MHz

- The 3600-3700 MHz band is not among the bands being considered by the ITU for IMT-2020
- In recognition of this usage, ITU Region 3 rejected proposals to introduce IMT in this band at WRC-15 given its extensive use throughout the region for satellite services such as broadcast and cable distribution, including in India
- There are other bands in the 1-6 GHz range that could be used for 5G not yet allocated, assigned or built out
- Certainty is required for preservation of the existing satellite ecosystem in the 3600-3700 MHz band which should be not be considered for release to 5G

Conclusions

- ▲ Satellites will play an important role in digital inclusion such as by extending 5G networks to hard-to-serve, under-served and un-served areas of the world
- ▲ Regulatory and technical decisions should enable, and not preclude, satellites from playing a role in the 5G ecosystem
- ▲ Spectrum decisions relating to terrestrial mobile 5G should not and need not be mutually exclusive of current and next-generation HTS and VHTS systems, especially when there is ample spectrum being considered for 5G that is not used or planned to be used by satellites