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EMEA SATELLITE OPERATORS ASSOCIATION

Spectrum Management & the Future of 5G

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An Important Time for Satellite in 5G

WRC 2019	**Basis for future growth across different bands: L, C, Ku, Ka, Q/V**
3GPP Decisions	**Service capabilities & architecture of satellite systems based on 3GPP** **Rel. 17 includes work on 5G NR & NB-IoT/eMTC both to support satellite**
Trials & Demos	**Satellite technologies validated for key 5G use cases**

Satellite can already provide 5G backhaul services for IOT, multicast, on the move & other applications

ESOA Vision for the 5G World

Why is 5G different from previous Gs?

A **paradigm shift in connectivity pooling** strengths of different technologies

The European Commission View

5G is a "**Network of Networks**"

⇒ **Satellite is essential to 5G**

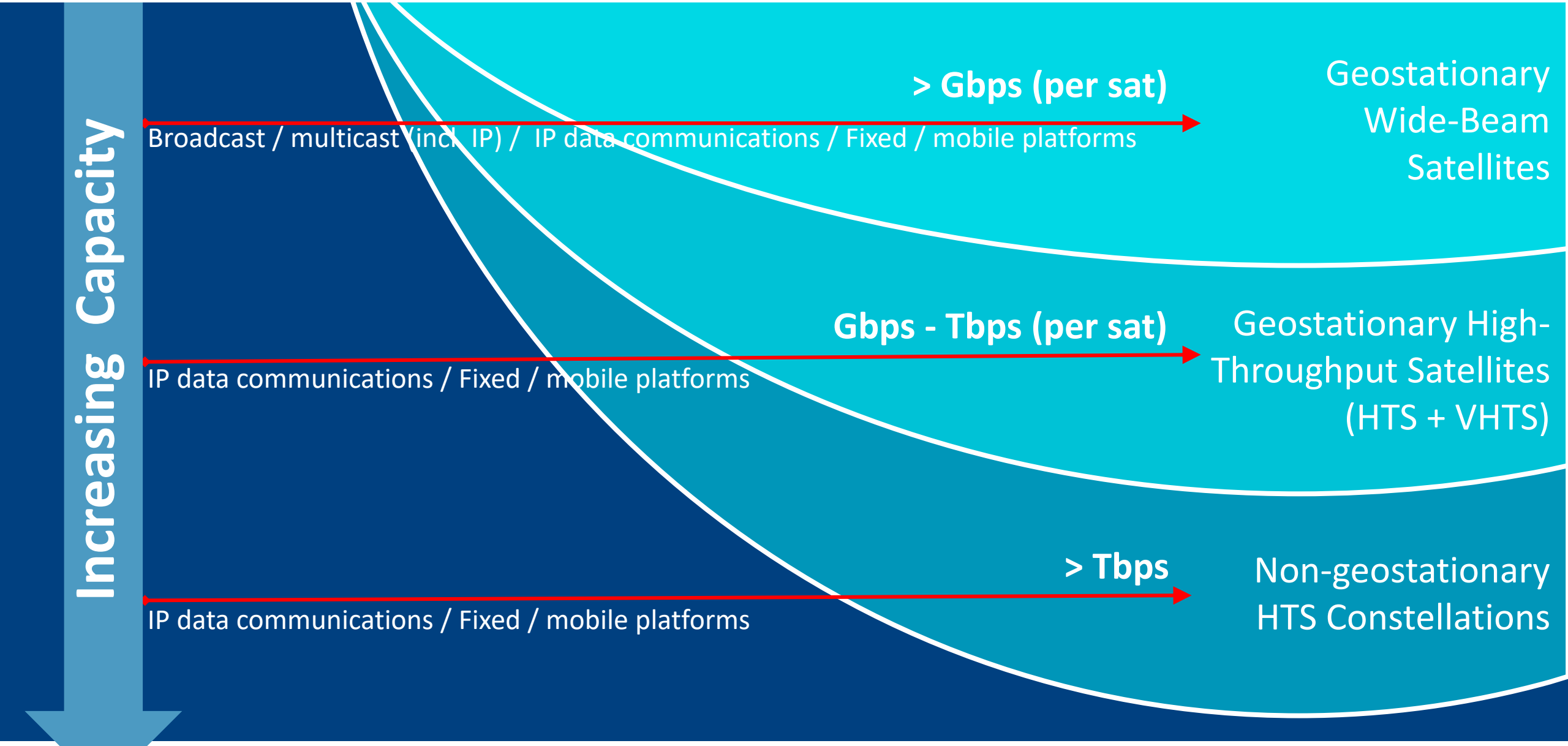
Preventing a **5G-divide**

Enabling **5G use cases for key verticals**

CEPT, ITU, NGMN have **validated** the role of satellite:

- **CEPT** - ECC Report 280
- **ITU** WP4B Report M.2460 "Key elements for integration of satellite systems into Next Generation Access Technologies"
- **NGMN** Position Paper on Non-Terrestrial Networks

Evolution in Satellite Systems



A broad range of satellite capabilities to support 5G deployment needs

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Satellite Technology Validation

SATis5

METAMORPHOSIS

EdgeSAT

ESA ALIX project

- ⇒ Live over-the-air demos using satellite backhaul for video chat/ streaming/ internet browsing for 5G test beds
- ⇒ 4K-8K video backhaul to edge supported by network slicing
- ⇒ Direct access via satellite based on narrowband IoT
- ⇒ Multi-connectivity between cellular & satellite (direct/indirect access)
- ⇒ Full integration of 5G RAN with CPE
- ⇒ Contributions on Systems Aspects (SA) and Radio Access Networks (RAN) to 3GPP standards body

Operators are exploring opportunities to work with MNOs to assist them in adopting satellite as part of their solution set

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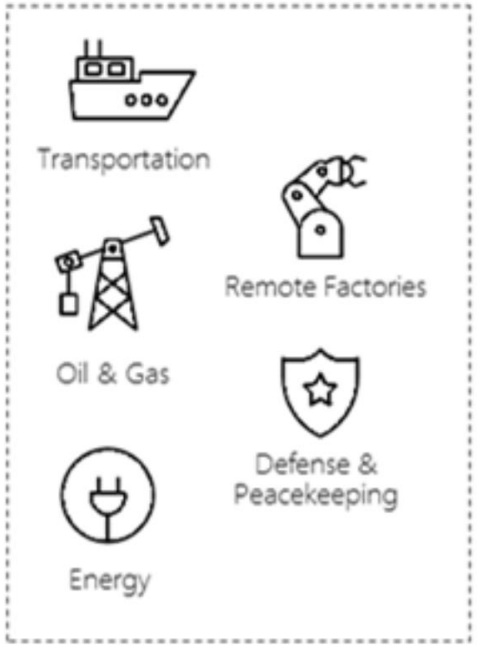
A Few Examples

From **Cloud** to **Connected Vehicles**

inmarsat
The mobile satellite company

INTELSAT
Envision. Connect. Transform.

SES
beyond frontiers



https://azure.microsoft.com/en-us/blog/satellite-connectivity-expands-reach-of-azure-expressroute-across-the-globe/

https://www.inmarsat.com/press-release/inmarsat-and-microsoft-azure-iot-join-forces-to-deliver-cloud-services-via-satellite/

https://www.satellitetoday.com/mobility/2018/10/25/ibm-cloud-solves-last-mile-challenges-with-satellite

IBM Cloud

hispasat

Hispasat & O2 collaborate to design
connectivity solution using LTE/5G/satellite for connected & autonomous industrial vehicles

O2

https://www.satellitetoday.com/mobility/2019/06/24/european-satellite-telco-operators-collaborate-on-5g-vehicle-trials/

The Relevance of Video Traffic

- **The lead mass market application is eMBB:** social media/OTT/gaming => all involve huge transmission of data
- **Need to find more efficient ways to deliver content to the edge**

⇒ **Satellite overlay can be used to pre-position content for local storage,** reduce data transmission needs *and* the burden on the network:

  - **Gaming** - whenever a new game comes out, huge amount of data needs to be downloaded (more & more games, more sophisticated, CGI/UHD imagery)
  - **OTT/video content** - every request streamed individually: huge data processing / energy required

Opportunities to Enhance use of Existing Spectrum

WRC-19 outcomes show greater understanding of satellite role across multiple bands

- Despite near-term challenges due to COVID-19, long-term opportunities for mobility market remain very strong
- Satellite industry is engaging actively in enhancing existing satellite allocations to cater for new applications
- Some WRC-23 Agenda Items provide opportunities:
  - **1.15 GSO FSS earth stations on aircraft and vessels in 12.75-13.25 GHz - Res. 172 (WRC-19)**
  - **1.16 NGSO ESIMs in Ka-band - Res. 173 (WRC-19)**
  - **1.17 Satellite-to-satellite links in Ku and Ka-bands - Res. 773 (WRC-19)**
  - **1.18 New MSS allocations for narrow-band mobile satellite systems - Res. 248 (WRC-19)**
- Europe has already proven itself a leader in developing some of these items (ECC Decisions (15)04 & (19)04

Challenges

Ensure continued protection of satellite allocations

- WRC-19 decided on multiple WRC-23 Agenda Items to study potential use of:
  - 1.2 IMT in 3/6/7/10 GHz - Res. 245 (WRC-19)
  - 1.3 Mobile Service in 3600-3800 MHz in Region 1 - Res. 246 (WRC-19)
  - Topic 9.1 c) IMT in bands of the Fixed Service (FS) - Res. 175 (WRC-19)
- Introduction of IMT identification or a primary Mobile allocation in bands used by FSS for many years can impact continuity & further development
- Many countries rely heavily on satellite services:
  - Satellite services in these countries require a framework to protect them from mobile deployment in neighbouring & nearby countries, both in-band & out-of-band

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Conclusions

⇒ **MNOs are prioritizing rolling out 5G**

⇒ **Existing & future Satellite Systems are both highly relevant**

⇒ **5G networks should be forward compatible with satellite: embedding satellite into critical parts of terrestrial infrastructure**

- **Satellite integration into 5G enables :**
  - An increased subscriber base
  - Business cases for verticals requiring uninterrupted coverage
  - Network efficiencies & reduced costs
- **Spectrum management should match the role satellite will play :**
  - Content pre-positioning/ multicast/ broadcast/ backhaul of data
  - Comms on the move
  - Direct broadband connectivity to users, homes, businesses, schools, etc.
  - Into the future: direct connectivity to devices

Thank You

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