SATELLITE SYSTEMS AND 5G ECOSYSTEM

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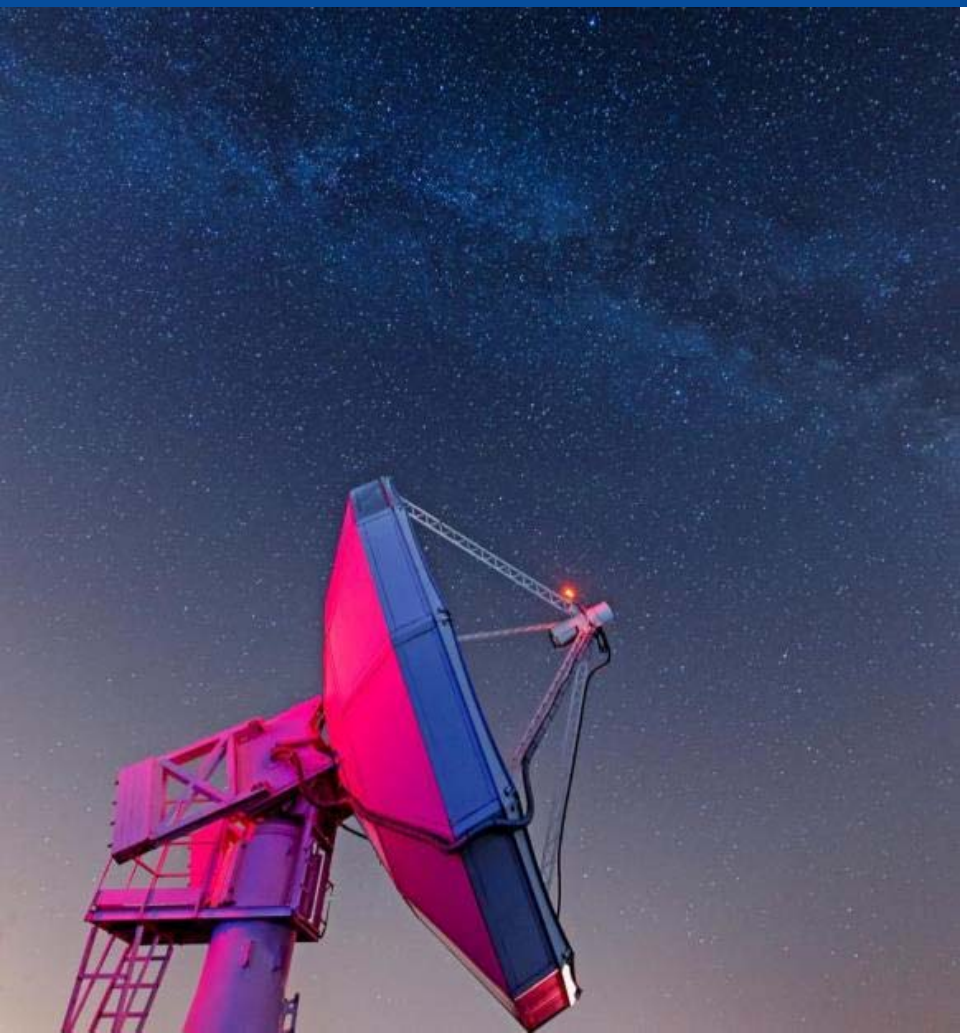
AGENDA

- **Eutelsat: a key player in the space business**
- Role of satellite in the 5G world
- Satellite Technologic Evolution to the 5G ecosystem
- Spectrum in the context of WRC-19
- Final thoughts

EUTELSAT: A DIGITAL ENTREPRENEUR



Pioneer in Space

More than **40** years of experience

37 Satellites with global coverage

Solid investment programme

6 satellites to launch

7,000 TV channels

1,550 HD Channels

1 billion TV viewers

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- Conclusions

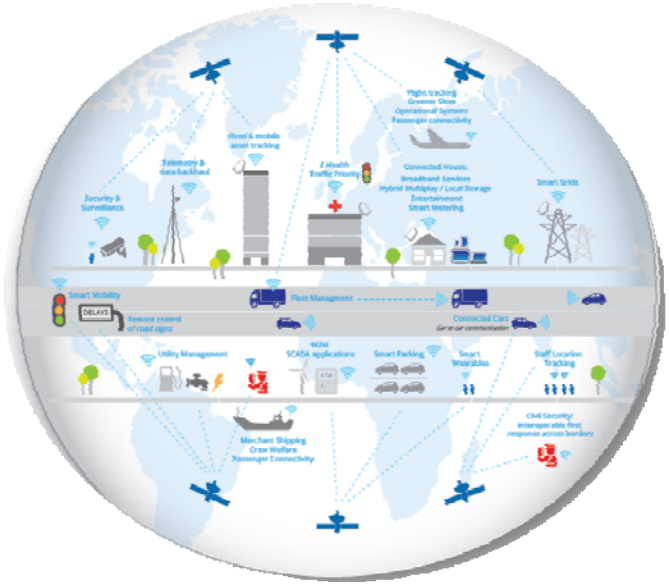
5G REQUIRES THE STRENGTHS OF DIFFERENT TECHNOLOGIES

5G Not a simple evolution of mobile broadband networks; is a real integration of different communication systems

Each technology has its own characteristics & eco-system:

Satellites:

- **Inherently global networks**, new satellites being launched
- Provides services that **other technologies cannot replace**
- **Efficient** use & re-use of spectrum.
- **Economies of scale** generated for equipment worldwide
- **Cost-effective** in rural and remote areas & in urban / suburban areas.



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Source ESOA

FOUR SATELLITE ASPECTS IN THE 5G ECOSYSTEM

Trunking and Head-End Feed

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

Backhauling and Tower Feed

Satellites provide a high speed connectivity complement (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)

These four aspects leverage the advantages of satellites – high bandwidth and ubiquitous coverage – to enable and extend terrestrial 5G networks

These aspects are very important, because many of these and other satellite enabled services already are key ingredients in both:

- Existing terrestrial networks (2G, 3G, 4G)
- Others: Disaster relief and Emergency response, Connectivity for remotely deployed battery activated M2M/IoT sensors, IoT devices on containers (e.g., for tracking and tracing)

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Source: Kumar Singarajah/Avanti, ESA/DRL "Spaces Moves" Conference 18-19, 2017/Berlin

SATELLITE SOLUTIONS FOR 5G TECHNOLOGY

Interoperability will be important

- ➔ 'Agree on technology, compete on services'
- ➔ Integrate satellite communication capabilities and requirements into standard
  - → Guarantee seamless compatibility of satellite technologies with the deployment of 5G networks
  - → Develop protocols integrating natively satellite capabilities, without delaying or degrading other 5G key issues / use cases
- ➔ Solutions need to be long-term and sustainable

Quick deployment & Cost-efficiency will be key

- ➔ 'Softwarisation'
  - → Integrate networking, computing and storage resources into one programmable and unified infrastructure

HOW TO INTEGRATE SATELLITE SOLUTIONS IN 5G?

Offer an appropriate policy framework to support investments in the different connectivity platforms (Fixed, Mobile & Satellite)

- **Be correctly reflected in the way to manage spectrum**
  - ➔ Efficiently use of existing allocation
  - ➔ Respond to the market demands in term of connectivity
  - ➔ Offer certainties and incentives for current and future investments

- **Leverage on satellite uniqueness and capabilities**
  - ➔ To deliver broadband Everywhere
    - → Offer ubiquitous coverage and connectivity
    - → Expand the benefit of broadband connectivity
    - → Reduce the digital divide
  - ➔ To develop solution on planes, faster trains and cars
  - ➔ To enable an ultrareliable network for mission critical applications

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AT THE HEART OF A DIGITAL ECOSYSTEM

Satellite manufacturers

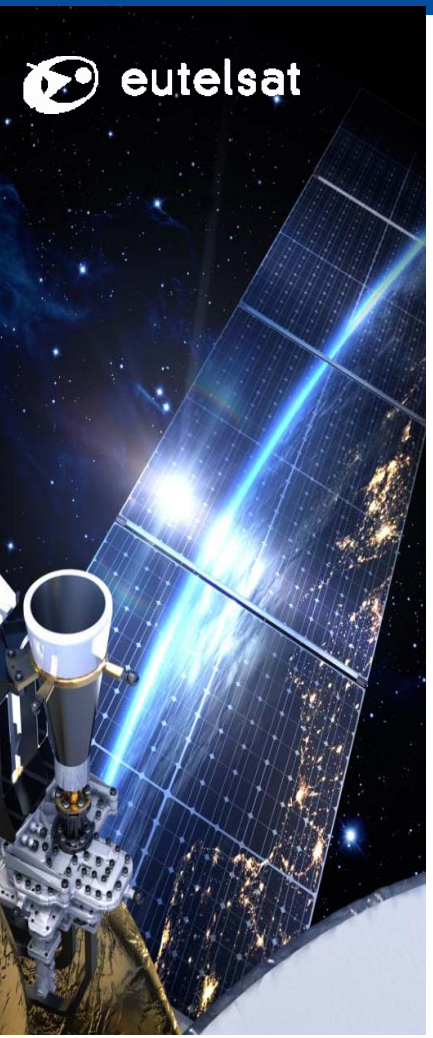
Launch agencies

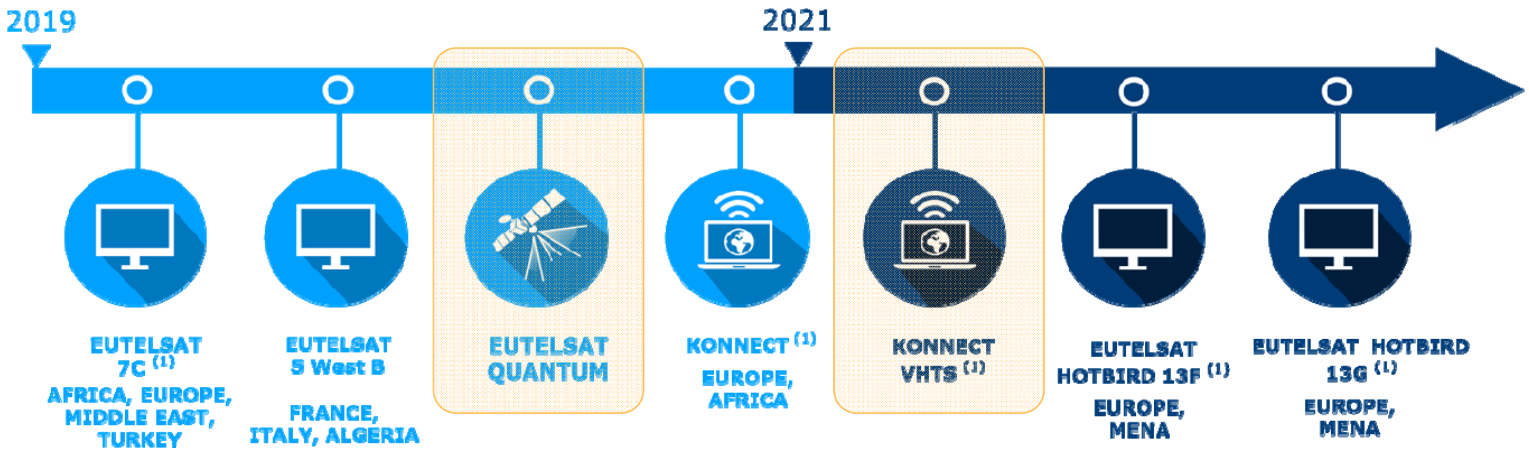
Satellite operators

Broadcasters, telcos, ISPs, government agencies

End-users: consumers, companies

EUTELSAT SATELLITE ADVANCES





Spearheading a new generation of SOFTWARE-DRIVEN satellites, with EUTELSAT QUANTUM

Accelerating the transition to ALL-ELECTRIC SATELLITES

Pioneering VHTS technology to deliver high-speed broadband with KONNECT VHTS

"More efficient satellites to serve 5G"

(1) Electric propulsion satellites : enter service between 4 and 6 months after launch.

SMART IOT SERVICE STANDARD – USE CASES


Smart Energy/Utilities


Remote ATM & POS


Access Control & Security


Remote Infrastructure


O&G SCADA


Industrial Sites

MONITORING & CONTROL

TYPICAL USE CASES

- Connect beyond IoT terrestrial networks
- Deliver highly reliable IoT connectivity

INDUSTRIES

- Retail, Banking
- Energy, Utilities
- Oil & Gas, Mining
- Agriculture

IoT BACKHAUL

TYPICAL USE CASES

- Connect LPWA IoT base stations to the core network
- Offload IoT traffic from LTE link to free up spectrum
- Deliver IoT connectivity outside licensed territory

INDUSTRIES

- Telecom

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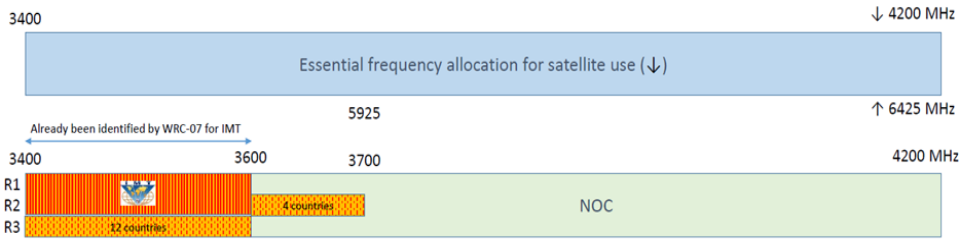
SPECTRUM IN THE CONTEXT OF ITU WRC-19

WRC-15

- ➔ Regulatory Framework for C-band was confirmed
- ➔ **rejected proposals to consider globally harmonized 5G spectrum in C-, Ku- or Ka-bands**
- ➔ **agreed to evaluate frequency bands above 24 GHz for 5G mobile services**



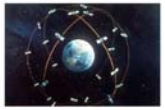
WRC-19

Exclusion of Ka-band from 5G, HAPS & NGSO

IMT-2020/5G

HAPS

NGSO



27.5 to 29.5 GHz not included

Bands for consideration by WRC-19:

IMT: 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, and 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz

HAPS: 38-39.5 GHz, and 21.4-22 GHz and 24.25-27.5 GHz (R2)

NGSO: 37.5-39.5 GHz↓, 39.5-42.5 GHz↓, 47.2-50.2 GHz↑ and 50.4-51.4 GHz↑

Q/V bands: to be used for next generation FSS networks!

INTERAMERICAN PROPOSALS TO IDENTIFY IMT SPECTRUM FOR WRC-19

Ítem 1.13 Status for WRC-19

Interamerican Proposals	
24.25-27.5 GHz	IMT
31.38-33.4 GHz	NOC
37-43.5 GHz	IMT
45.5-47 GHz	NOC
47.2-48.2 GHz	NOC
48.2-50.2 GHz	IMT
66-71 GHz	NOC
71-76 GHz	NOC
81-86 GHz	NOC

Ítem 10 WRC-19

Identify spectrum for IMT for WRC-23

CITEL Interamerican Proposal has identified the frequency range from 3 300 MHz to 15.35 GHz but in this frequency range, there are bands could be unacceptable for possible study and identification.

IMPORTANCE OF ITU WORLDWIDE PARTICIPATION

- **ITU WRCs drive consensus-based decisions that all nations can rely on:**
  - ➔ **WRC-15 decisions were made with the participation of up to 193 Member States**
- **Large & small nations; developed & emerging economies - are all placed on an equal footing in taking these decisions**
- **The best chances of achieving globally harmonized spectrum for 5G is by studying bands identified for 5G / IMT-2020 by WRC-15 (Resolution 238)**
  - ➔ Avoids spectrum fragmentation
  - ➔ Provides access to shared spectrum where appropriate / feasible; recognizes need for exclusive spectrum access for 2 or more widely deployed services
  - ➔ Paves the way for economies of scale and customer adoption

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Source: Kumar Singarajah/Avanti, ESA/DRL

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FINAL THOUGHTS

- 5G is a mix of diverse networks (Fixed, Mobile & Satellite), that are based on different technologies and media. **It's not just a new "G"**
- 5G will unlock far-reaching opportunities including satellite applications
- **Satellite connectivity in 5G is essential to reduce the digital divide**, offering unique, ubiquitous low-cost, high-speed connectivity outside large cities and in areas of limited (or not available) fixed or mobile coverage.
- **Appropriate policy framework must guarantee legal and regulatory certainty**, over the spectrum assigned to satellites, in order to guarantee investments in new satellites and constellations that ensure that connectivity is brought to all inhabitants, in an accessible and affordable way.
- Regulatory fees should also be considered and open skies policies that promote the development of industry and competition, not only have a tax collection purpose.

FINAL THOUGHTS

- Developments and innovations in the spatial and terrestrial segments are driving down the cost of satellite connectivity, contributing to the strength of satellite broadband as an option for widespread connectivity.
- Neither other frequency bands of C nor 28 GHz bands are on WRC15 ‘shopping list’ for IMT, as both bands are extensively used by satellite all around the world.
- 3.3-3.4 GHz and 26 GHz will be more than adequate to meet 5G demands for the foreseeable future - also re-farm 3G & 4G spectrum.
- **Working within the ITU framework ensures regulatory certainty required for future growth of all sectors**
- Satellite communications must be part of the 5G ecosystem for it to deliver on its promises

Eutelsat’s technology strategy, including High Throughput and Eutelsat Quantum-class satellites positions us to play a role in the 5G ecosystem