

Satellite Communication: Key Technology for Space Applications and its Role in Horizon 2020

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- **Quick Overview of NetWorld2020 European Technology Platform (→ separate presentation)**
- **SatCom in a Nutshell**
- **SatCom Market**
- **Threats & Risks vs. Opportunities**
- **Innovation Challenges**
- **Concluding Remarks**

SatCom in a Nutshell (1/3)

- Space component of communication systems are located in the outer space following different types of orbit among which
 - Geostationary (GEO)
 - Medium Earth Orbiting (MEO)
 - High Elliptical Orbit (HEO)
 - Low Earth Orbiting (LEO).
- SatComs operates in Frequency bands allocated to Broadcasting, Fixed or Mobile Satellite services in
 - low frequency bands (below 3 GHz) such as VHF, UHF, L and S band)
 - higher frequency bands (above 3 GHz) such as C, X, Ku, Ka, Q and V bands.

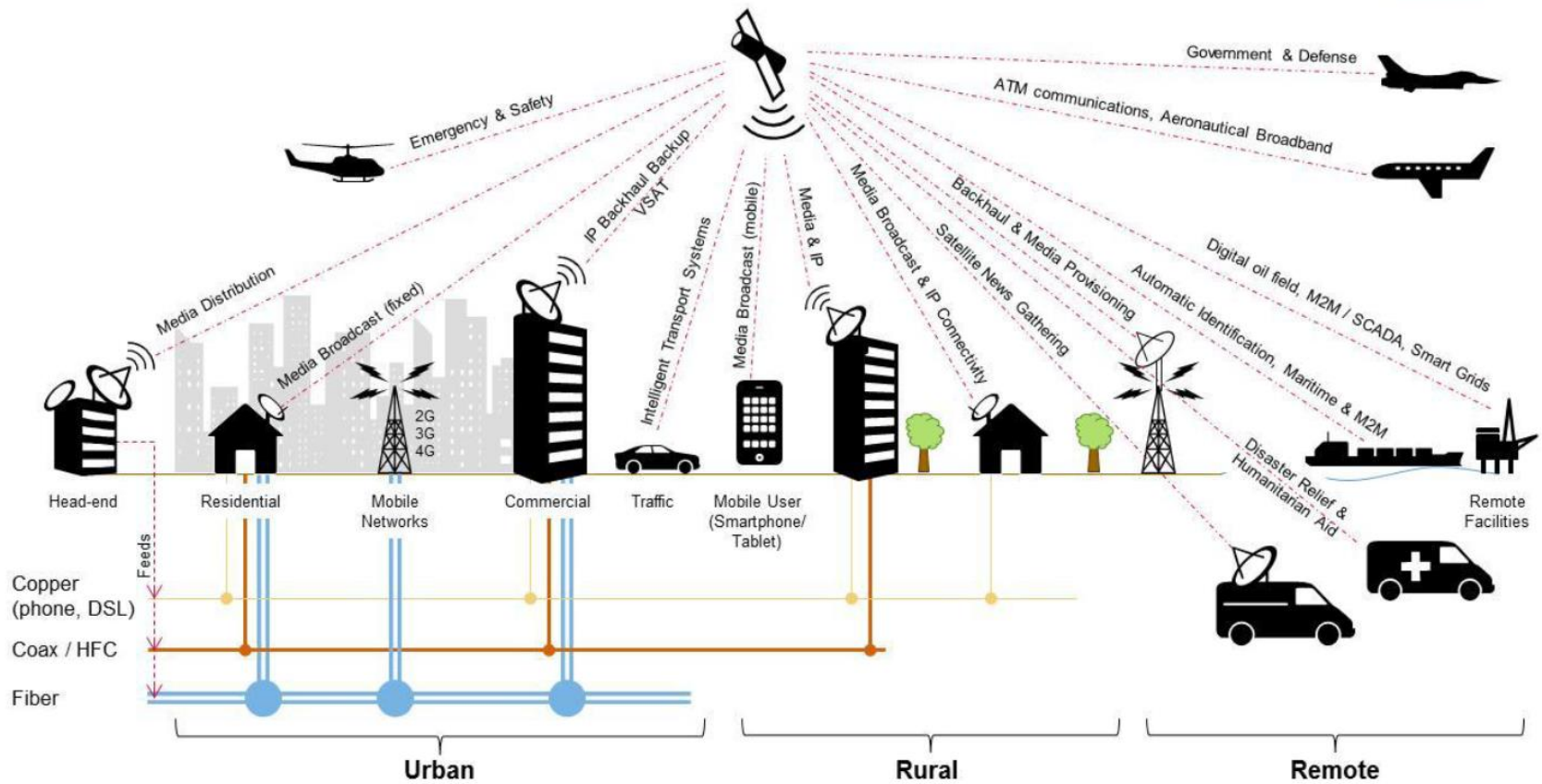
SatCom in a Nutshell (2/3)

- SatCom systems can address a wide range of services **broadcast, broadband** and **narrowband** services to **fixed, portable** and **mobile** terminals over **global** or **regional** coverage.
- Some SatCom systems provide service coverage all over the earth including the north and south poles.
- They are well recognised to
 - provide a resilient and ubiquitous service
 - be particularly cost effective for “one to many” (broadcast) and “many to one” (data collection) services
- All these features makes SatCom the ideal complement to other telecommunication technologies to meet the “everything, everywhere, all the time” Internet paradigm.

SatCom in a Nutshell (3/3)

Future European Communication Ecosystem

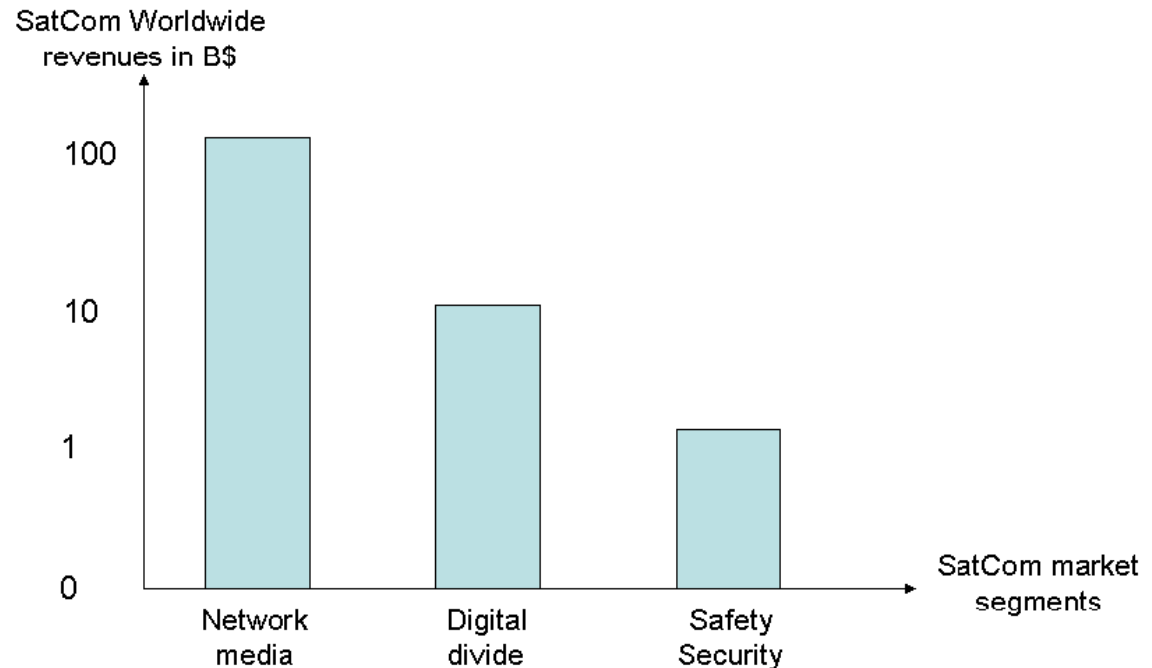
Booz&Co



SatCom Market (1/2)

- Close to half a billion households worldwide receive more than 37.500 TV programmes from GEO satellites.
 - 40% are in emerging countries.
 - In Europe: 85M households (vs. 66M receiving cable TV)

- **CAGR:**
 - 5%-10%
 - > 20%
 - < 5%



- Out of the a total of 1200 satellites in orbit more than 50% are communications satellites
 - 67% of the value of all satellites launched in 2012
- 87% of Ariane launches in the last three years were SatCom, only 9% being governmental
- European SatCom Industry:
 - 4 global satellite operator
 - cumulated CAPEX of the in the period 2000-2012 has been \$25 billion
 - 3 manufacturers
 - 57% of the total orders for GEO satellites in 2014
 - 44% over the last 3 years (2012 – sept 2014)
 - 50% of the Space industry turnover
 - ~35 000 skilled employees throughout Europe
- Overall, the satcom sector
 - supports directly 2/3 of the space jobs in Europe
 - Indirect employment in the satcom applications and services sectors, may be estimated to be an order of magnitude larger

Threats & Risks

- The non-European manufacturing industry receives a very significant public support leading to competitive advantages and/or benefit from captive markets favoured by their governments (especially in China),
- Non-EU players apply aggressive commercial approaches which put even more pressure on the satellite prices
 - e.g. significant governmental contribution (NASA) to reduce the launch price (Falcon-9)
- The European governmental market remains too small to generate a level of activities sufficient to develop novel technologies re-usable on the commercial scene, while public sales represent more than 50% of the US manufacturers business.

Opportunities

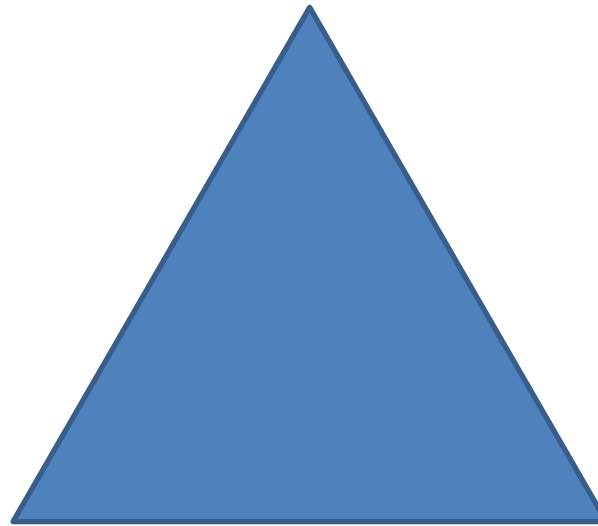
- Broadcast remains the core market for communication satellites
 - its future is however not secured...
- The next growth axis of the SatCom market has taken shape with the launch of **(very) high throughput satellites and payloads** worldwide enabling efficient high speed internet-by-satellite
 - European industry technical offer competes with the most advanced American one
 - **The adoption of laser communication technologies for the next generation VHT satellites could represent a European asset!!!**

Mapping of EU Policies vs. long term needs (market beyond 2020) vs. Low TRL space and ground technologies

	Long term needs	H2020 Space relevant R&D themes
<p>The Digital society:</p> <p>DAE 2020 objectives</p> <p>The 5G ecosystem</p>	<p>Up to 100 Mbps consumer offers to all European citizen</p> <p>Connectivity everywhere, all the time, always on, more and faster.</p>	<ul style="list-style-type: none"> • Building blocks (space and ground) of the next generation of High throughput Satellite Systems. • Technologies/building blocks (space and ground) for Non GSO systems to allow more throughput with lower latency everywhere for consumers. • Simulation tools
<p>The Common Defence and Security Policy</p>	<p>Governmental communication solutions for 2020/2025 and beyond, based on the outcome of the current EDA and DGENTR GovSatCom activities</p>	<p>typically work on highly flexible payload can be expected</p>

Sustainable Inclusion of SatCom R&D in H2020 Space Programme

ESA and National Space Agencies:
mid-to-high TRL technologies



DG-CONNECT / ICT Prog.
*End-to-end integration with
terrestrial networks*

DG-ENTER / Space Prog.
**Low TRL space and ground
technologies research**

SatCom Research Priorities (1/2)

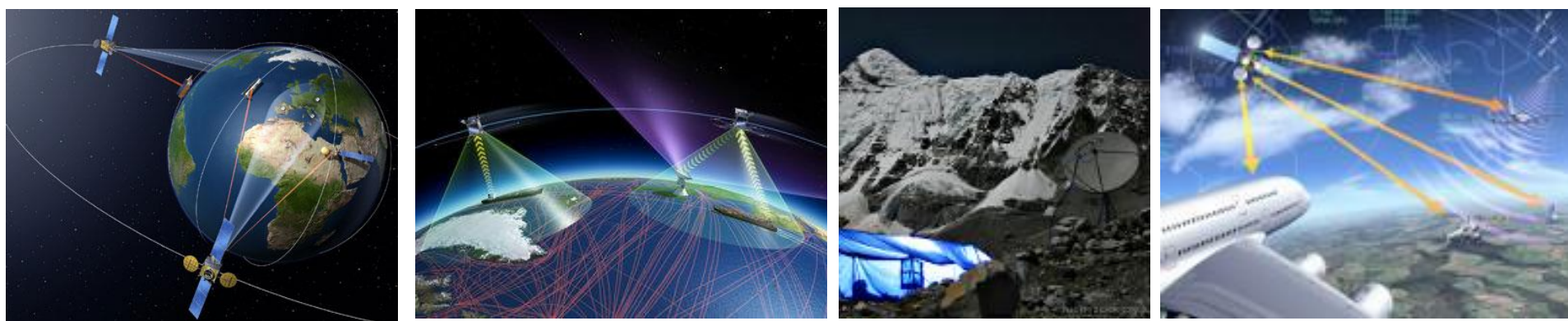
- Technologies for flexible/reconfigurable and spectrum-efficient SatCom systems
 - Optical communication technologies for feeder or service links
 - Laser communication terminals
 - Telecom chain: Laser Rx and Tx technologies.
 - Opto-mechanical chain: telescope, optical bench, pointing mechanisms, pointing loops and sensors
 - Site diversity technique to adapt to weather conditions, gateway network management, interface with ground networks.
 - Ground optical means to determine small satellites orbital position, attitude and deployment (from nano to microsat).

SatCom Research Priorities (2/2)

- Photonics technology (for high capacity reconfigurable payloads)
- Ka antennas reflectors beyond 5 m
- Active antennas building blocks (Tx/Rx active antenna technology building blocks at different frequencies up to Ka, Gan SSPA)
- Flexible repeater (equipment enabling flexible frequency plans, flexible channelization, evolution to new RF bands such as Q- and V-band, etc.)
- End to end system enablers in telecommunications: Technical enablers to increase the security, efficiency and performance of satellite-based communications – solutions for weather conditions adaptation.

Take-Home Message

- Today, public R&D effort is successful in supporting the SatCom sector for the current race within an harsh competition environment
- The sector is doing very well in 2014 😊
- However, this landscape is not static
- through research on low TRL technologies, H2020 Space could play a major role in the establishment of the fundamental assets for the competitiveness of the European industry for future markets beyond 2020
 - **The adoption of laser communication technologies for the next generation VHT satellites could represent a European asset!!!**



THANKS FOR YOUR ATTENTION!!!

- Contact: Sandro.Scalise@dlr.de
- References
 - ESA Article: [Satellite services and applications - a vital cornerstone of modern society \(2014\)](#)
 - Eurospace, TELECOMMUNICATIONS Reference document 2013 , [Space Telecommunications. A key sector for Europe: achievements and perspectives](#)