

The HTS Roundtable

High and Very High Throughput Satellite Systems: Trends, Challenges and Enablers

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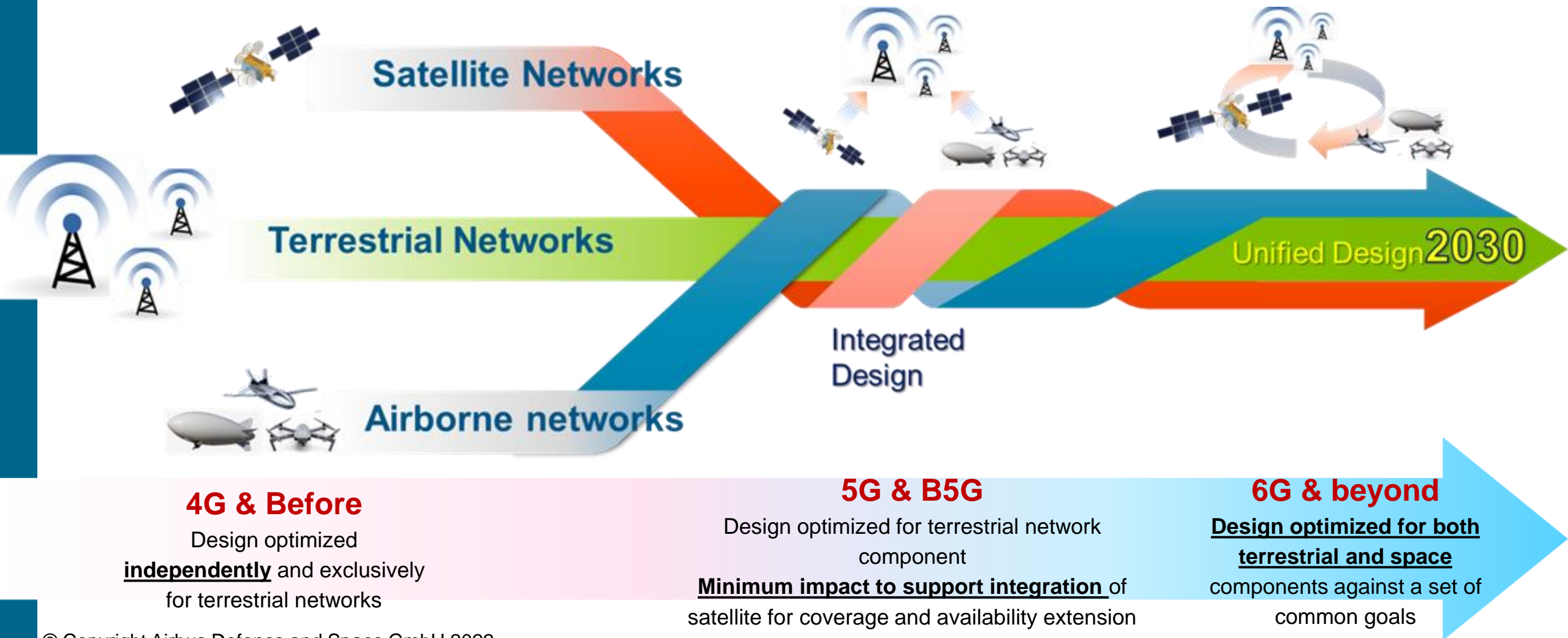
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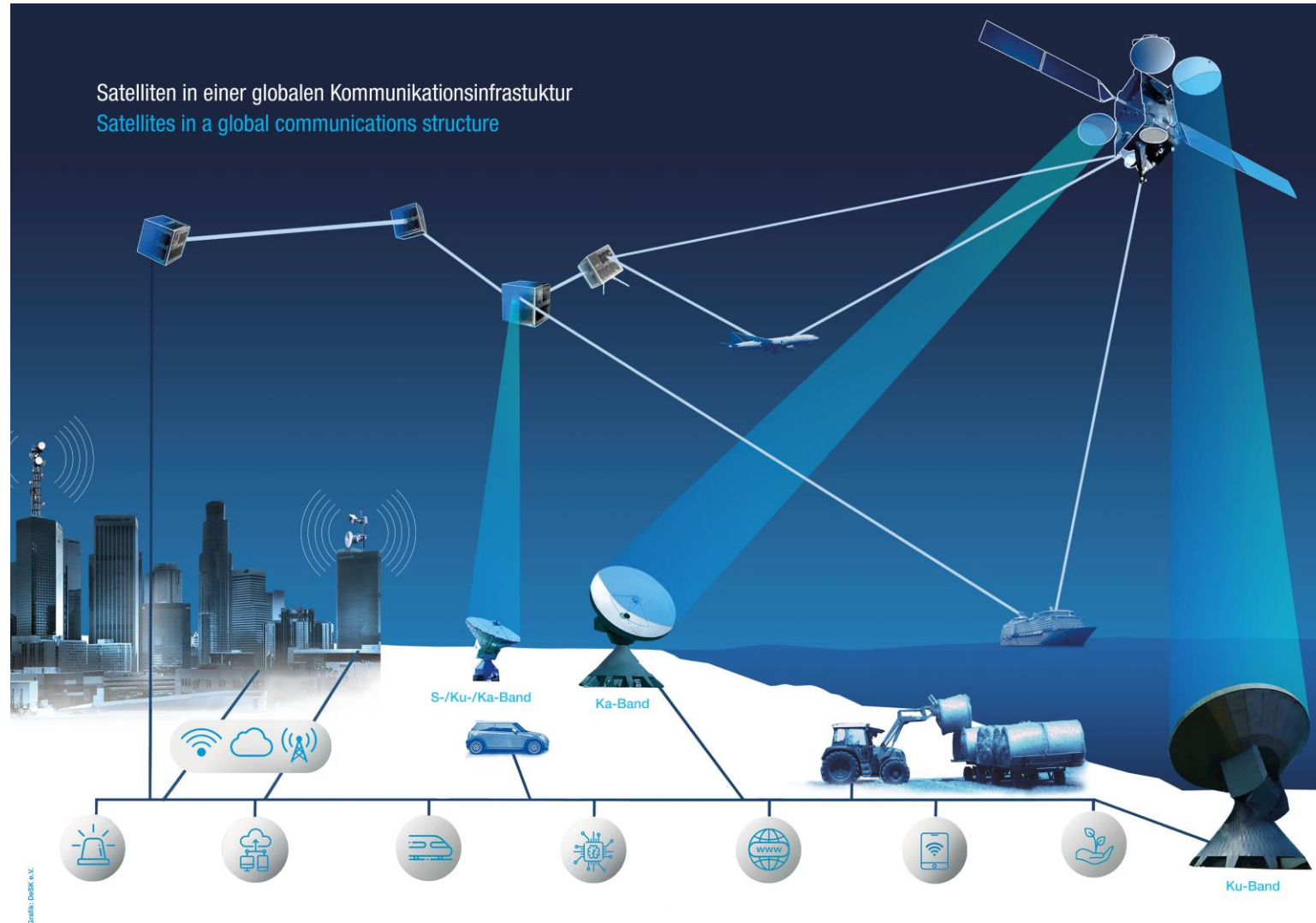


Where are we heading to (or aiming at...)



Satellites in a Global Communications Infrastructure

- The Game Changer is not about orbits (LEO vs. MEO vs. GEO)
- Rather: achieving **Flexibility and Reconfigurability in space...**



Flexibility and Reconfigurability in Space



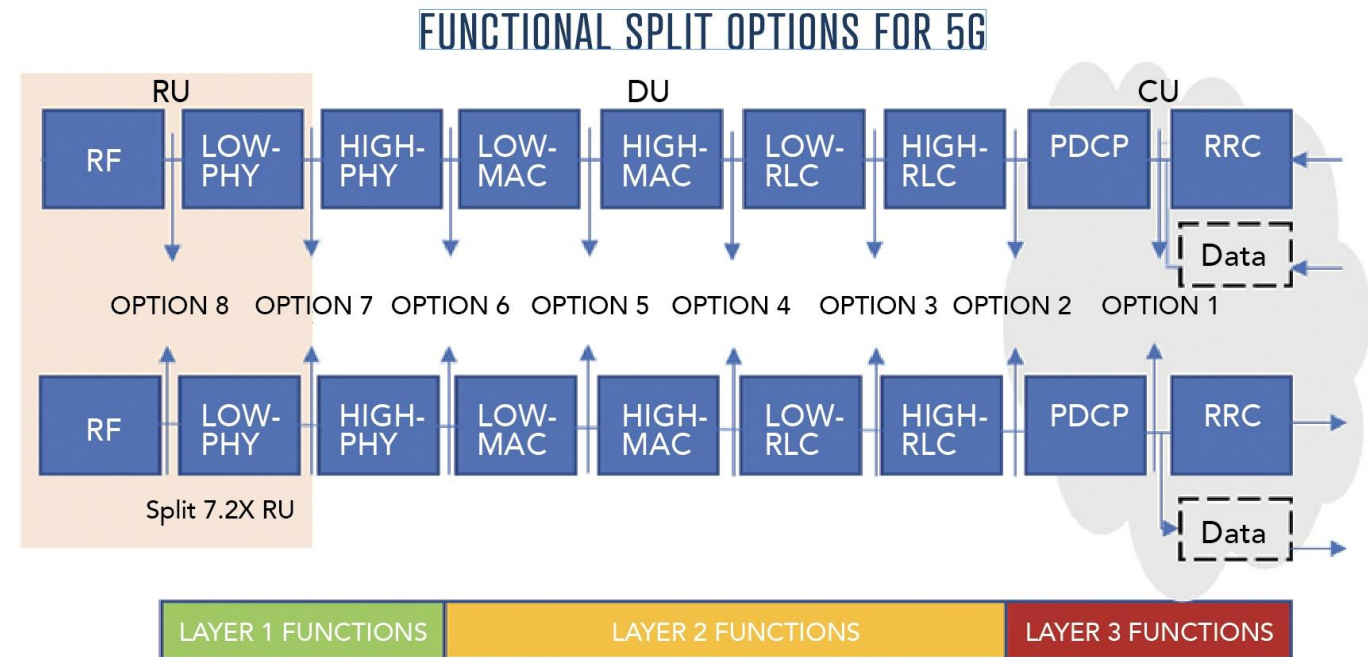
1. Dynamically reallocate bandwidth, power and coverage → most modern satellites can do
 2. Fully regenerative and reprogrammable payloads (aka „Software Defined Satellites“) implementing also (virtualised) network functions
 3. Satellites also able to process / generate **information**, not only signals/bits
 - Mobile Edge Computing in space
 - Semantic communications
- So far so good BUT:
 - Mass and power budget in space are always very tight...
 - Different use cases requires different payload capabilities and configurations

Example: Bringing 5G Functional Split to Space



- gNB functionalities can be distributed/split between space and ground...

RU+DU	CU	Remarks
All satellites	Ground	Interface DU/CU not designed for wireless link with long delay
All satellites		Payload complexity
All satellites	Some satellites	It affects routing...



Picture taken from: <https://www.5gtechnologyworld.com/>

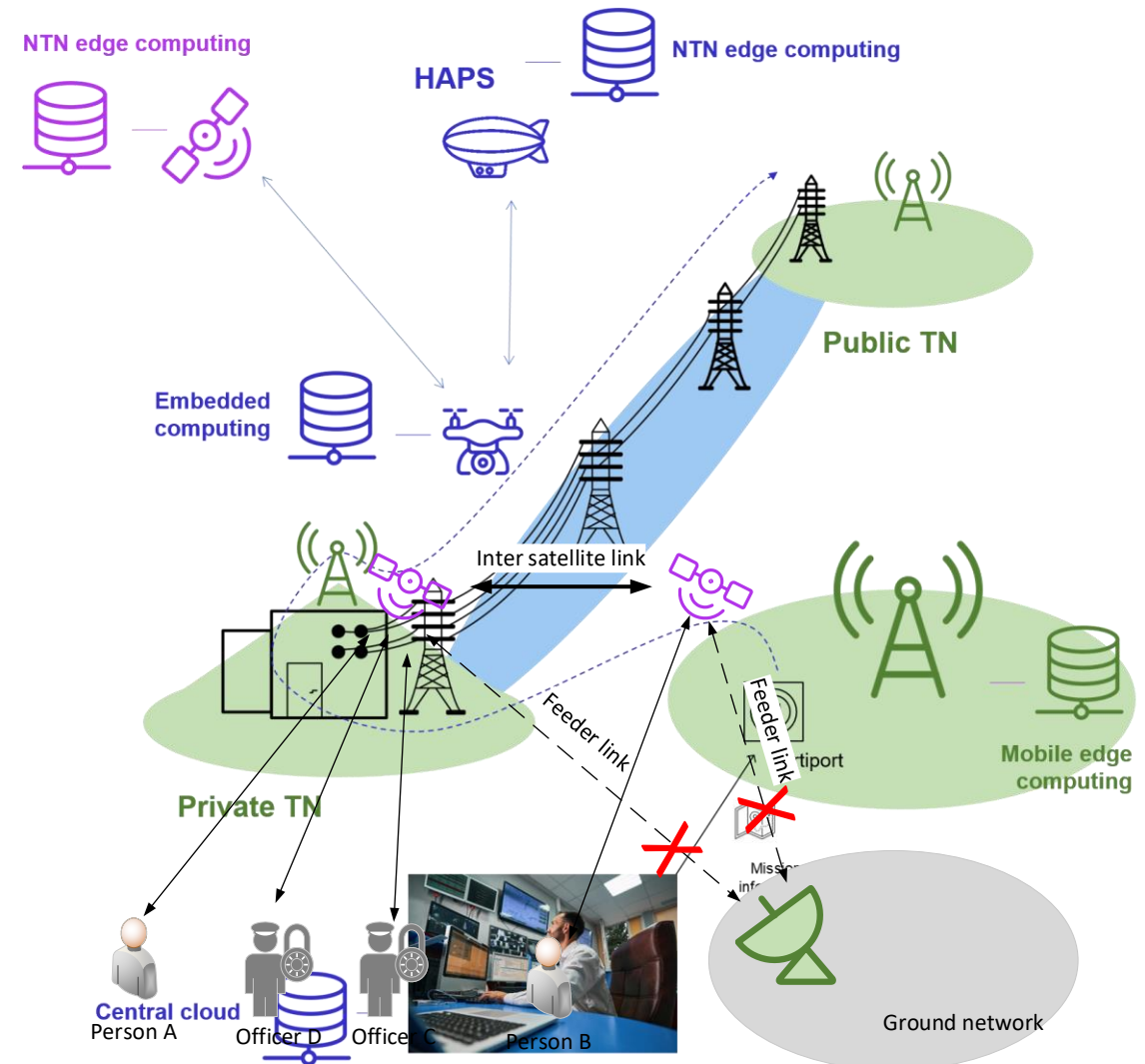
Use-Cases from 6G-NTN Project: Bringing 5G/6G Functional Split to Space

Autonomous Power Line Inspection using Drones

- Simpler Split could work
 - RU in Space
 - DU+CU+Core on Ground
- Need everything in space including also some core network functionalities in case edge computing shall be used...

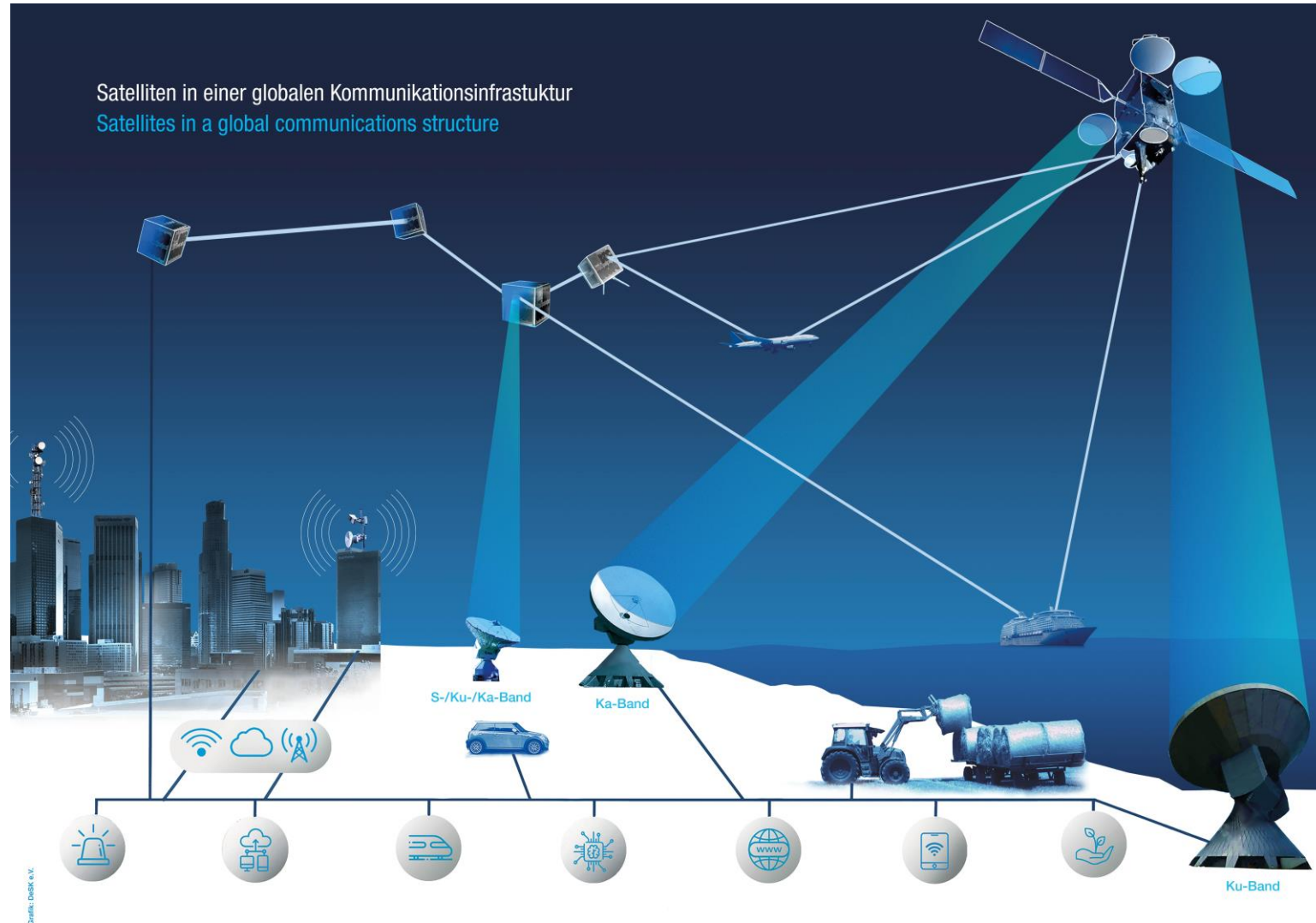
Direct communication between UEs over Satellites

- Need all RU+DU+CU as well as some core network functionalities (UPF) in space...



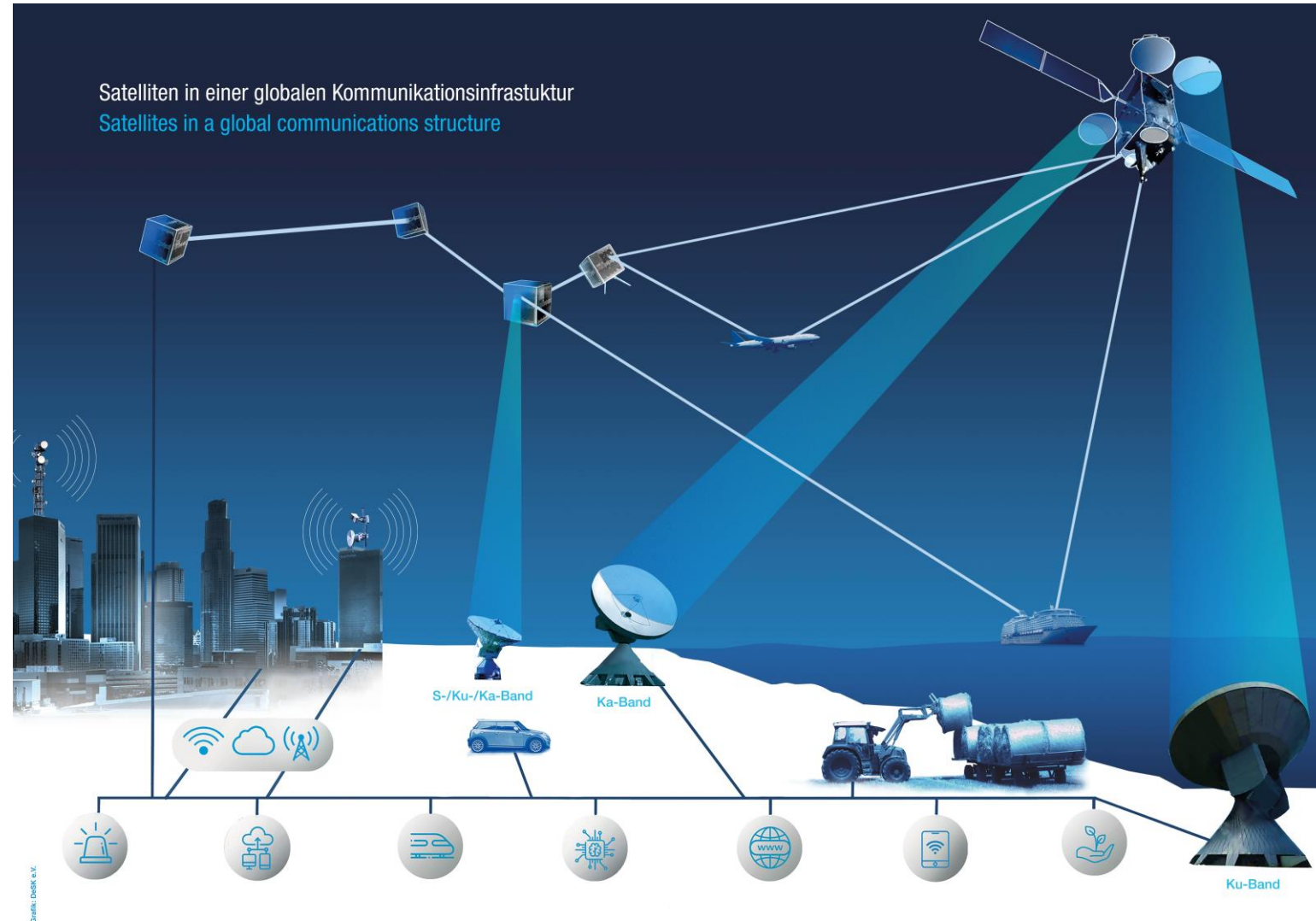
Satellites in a Global Communications Infrastructure

- The Game Changer is not about orbits (LEO vs. MEO vs. GEO)
- Rather: achieving **Flexibility and Reconfigurability in space...**
- **Satellites as Intelligent (Reliable and Secure) Networks Nodes**
- **Multi-Orbit Distributed and Flexible Architecture**
 - Routing
 - **Low SWaP-C Intersatellite Links**
 - ...



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- Rather: achieving **Flexibility and Reconfigurability in space...**
- **Satellites as Intelligent (Reliable and Secure) Networks Nodes**
- **Multi-Orbit Distributed and Flexible Architecture**
- **Towards „Autonomous Space Operations“**



What about the User Segment?



- Multi-orbit concept
→ User Terminals capable of handling it...
- Waveform: DVB vs. 5G NR
- One way or the other:
 - **True** interoperability across vendors is a must



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