

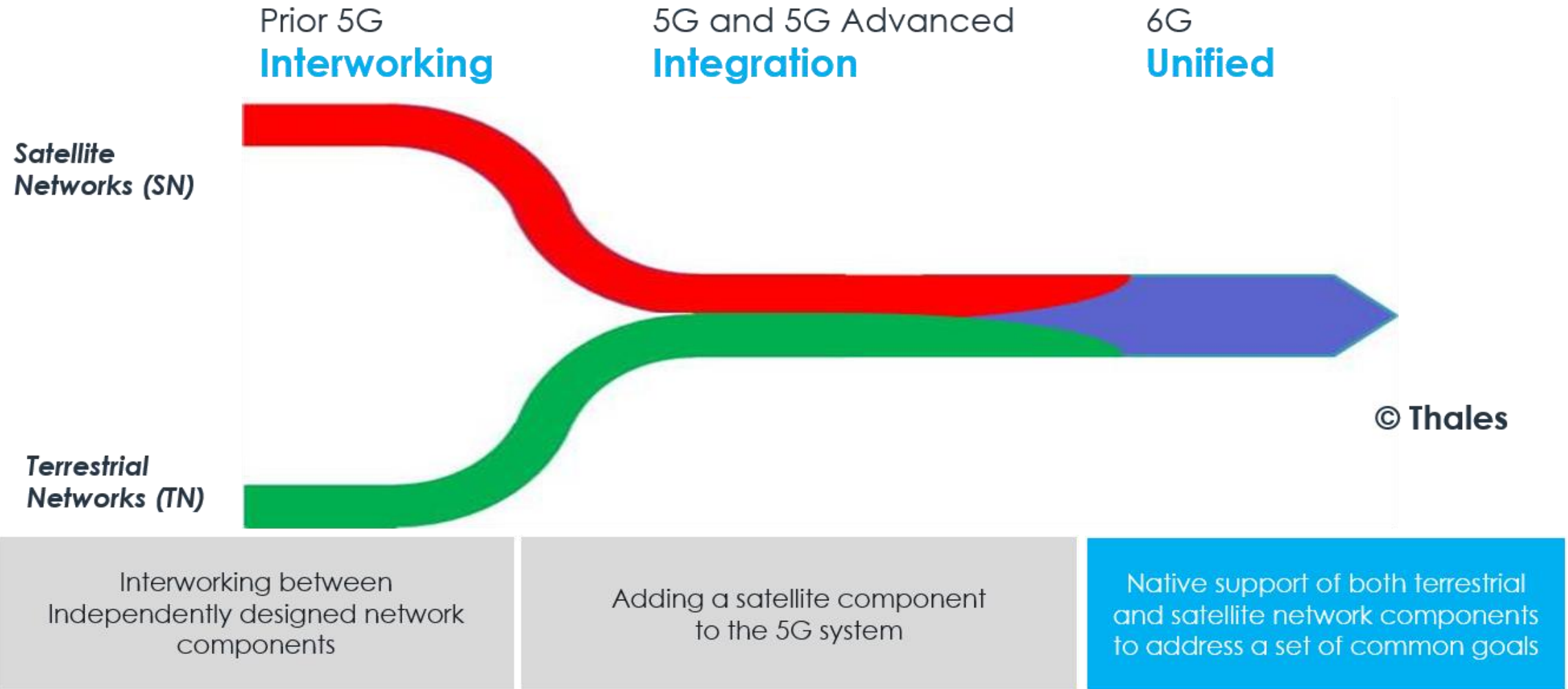
From Integrated to Unified 3D Networks

The 5G Journey... and the 6G Destination (sessions 11 - 12)
Hyperconverged Hybrid Networks: Space . Stratosphere . Terrestrial

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Satellite Integration in 3GPP Eco-System: Vision



Classical Targets / KPIs...



Are NTN helpful?

- Data Rates
- Capacity
- Latency
- Coverage
- Connection Density
- Network Energy Efficiency
- ...



Satellites in a Global Communications Infrastructure

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

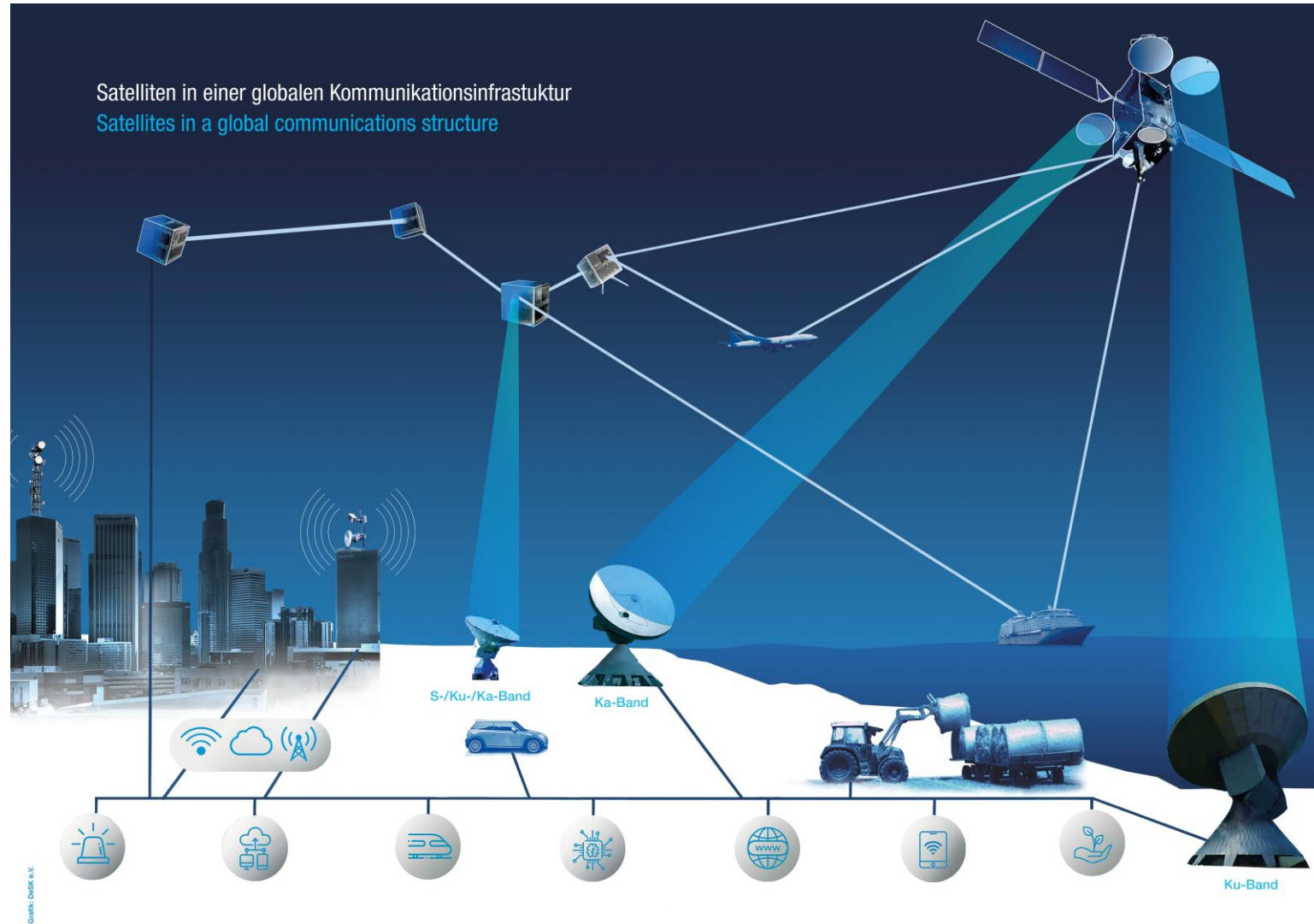
→ **Multi-tier Architecture with GEO and LEO as complement of terrestrial network**

→ Both direct access and backhauling

→ Delay sensitive services via the LEOs

→ **Satellites as Intelligent Networks Nodes**

→ From Regenerative to Intelligent Payloads



New Design Drivers



- Sustainability
- Technological Sovereignty
- Resilience / Reliability
- Trustworthiness
- Security and Privacy
- Pervasive Intelligence
- (Deployment) Flexibility
- (Service) Versatility
- ...

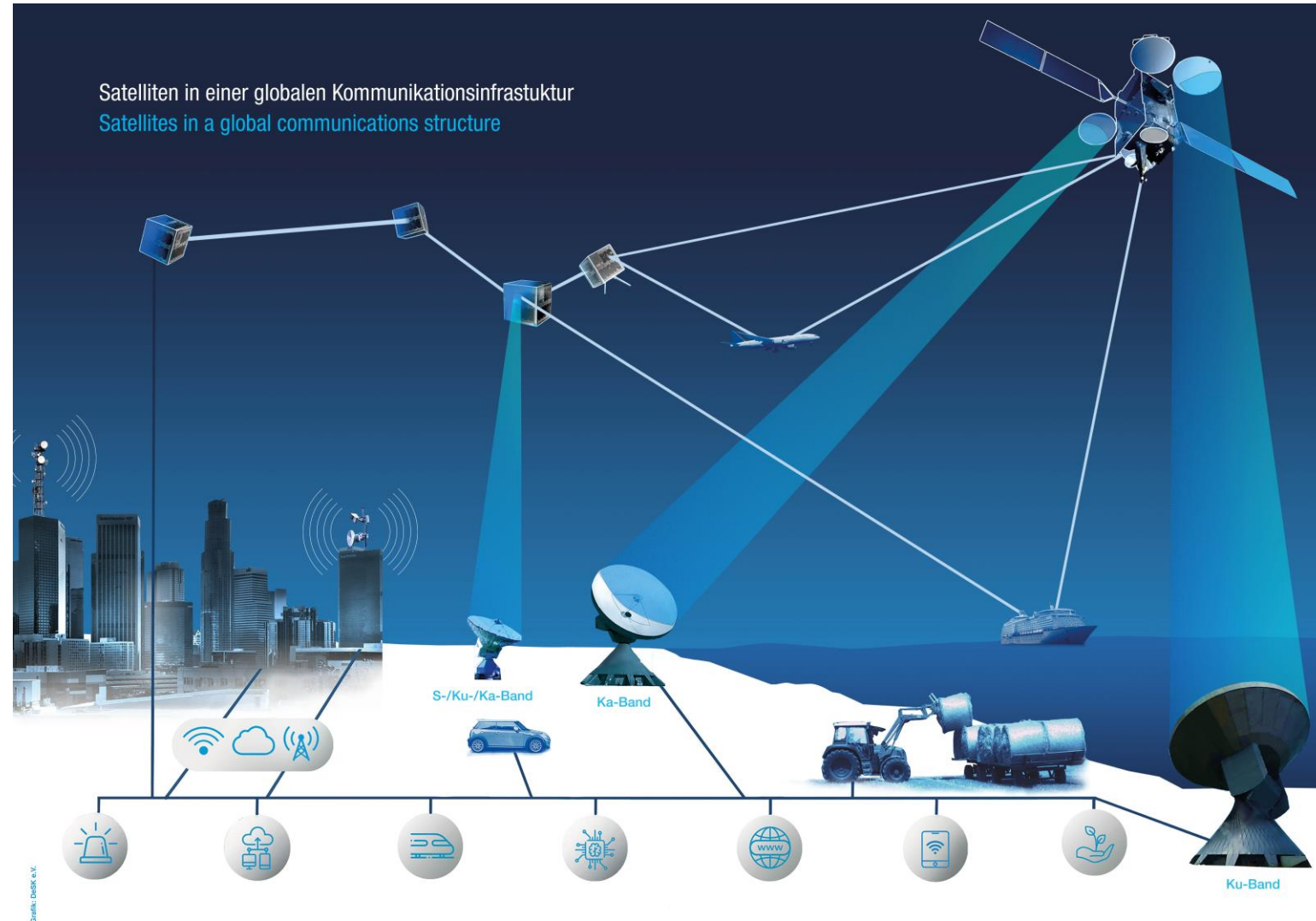
- Somehow related to Energy Efficient but....

The capability to keep providing reliable services even in presence of:

- Natural disasters
- Man made disasters
- Disruption attempts

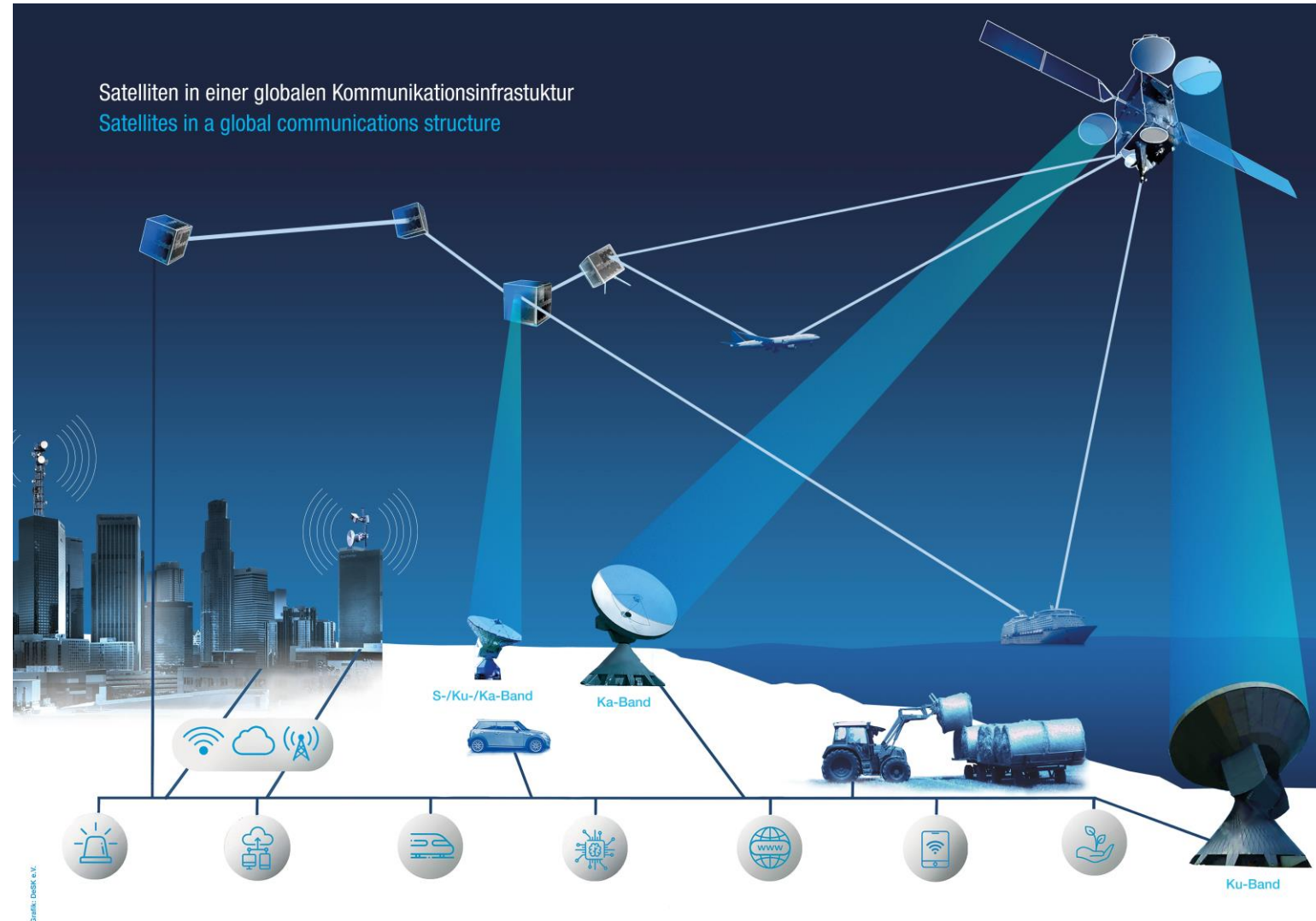
Resilient Satellites in a Global Communications Infrastructure

- Ground Segment
 - Exposed to the same vulnerabilities as terrestrial infrastructure
 - Bring network control and management functionalities in space
 - **Satellites as Intelligent, Reliable and Secure Networks Nodes**

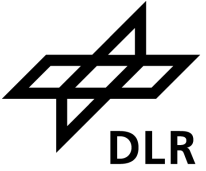


Resilient Satellites in a Global Communications Infrastructure

- Feeder Links
 - Optical Feeder Links are inherently secure
 - Spot diameter in the order of tens of meters
 - Nice „side effect“:
 - One Optical Ground Station can support throughput in the order of several Tbps
- User Links...
- TT&C Links...



Take-Home Message



- Sustainability
- Technological Sovereignty
- **Resilience / Reliability**
- Trustworthiness
- Security and Privacy
- Pervasive Intelligence
- (Deployment) Flexibility
- (Service) Versatility
- ...

Satellites / NTN can play a pivotal role in enabling a truly resilient global communications infrastructure

BUT

Key technological developments are needed to make it happen

German 6G Programme (Sponsored by BMBF)



Four Research Hubs

- 21 Universities + 15 Research Institutes
- 160 Research Groups

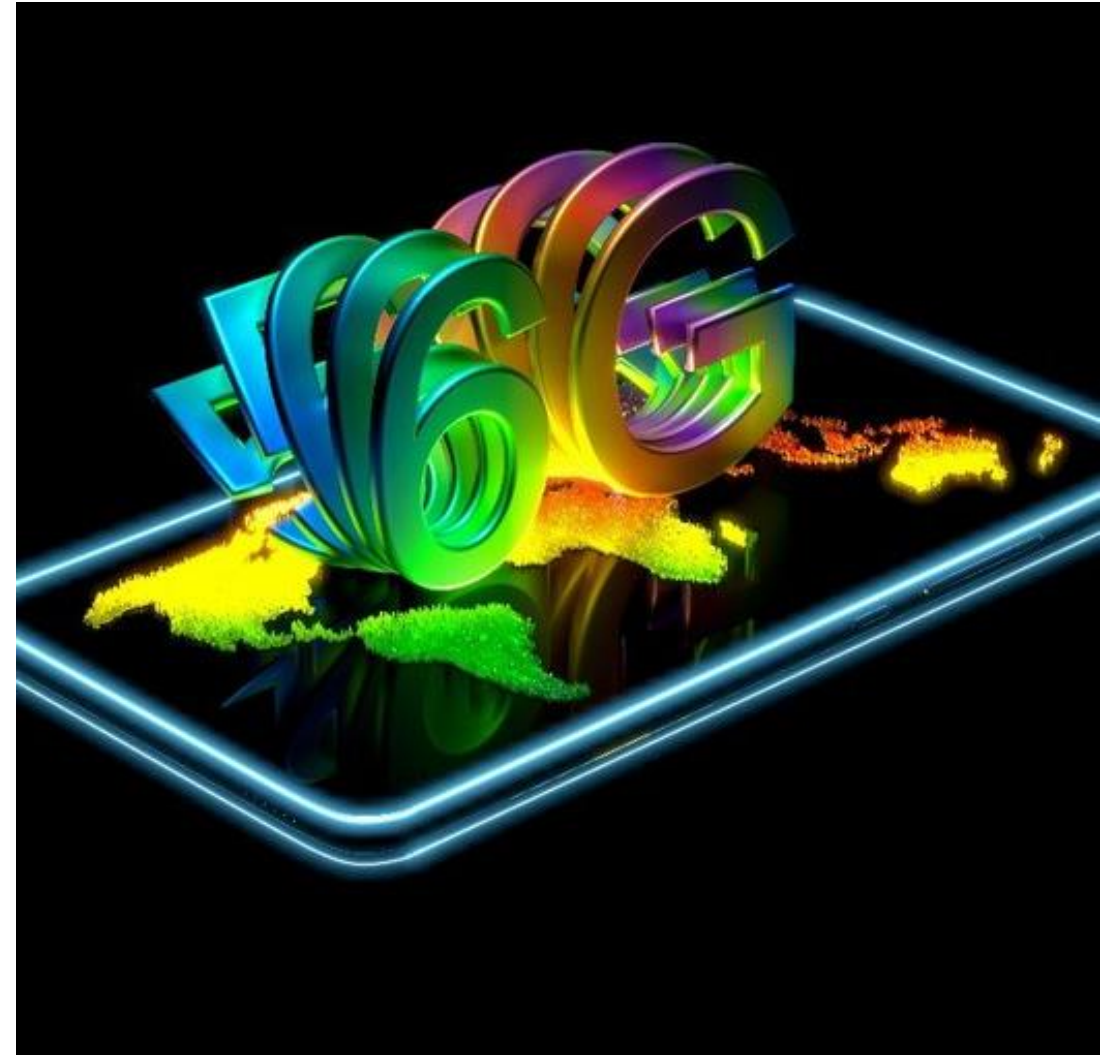
Industry Led Projects

- 6G-Anna (Nokia) – Flagship
- 6G-Takeoff (DT) – **NTN-Project**
- ...



6G Platform

- Umbrella organisation for the whole program
- International collaborations, liasons



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Thanks for your attention!

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