The need for reliable, ubiquitous connectivity

Insufficient coverage for mobile connectivity:

- Coverage of (terrestrial) white spots
- Automotive: Autonomous driving
- Maritime: Cruise ships, offshore platforms
- Aerospace: Passenger aircraft

Temporarily / locally insufficient capacity:

- Agriculture
- Construction areas
- Cultural and sports events
- Disaster recovery

Consortium Structure

Applications / Vertical industries

John Deere · ZF · Continental · BMW · MAN · Bayerisches Rotes Kreuz

Security

NXP · TARIS

Network operators

Telefónica

Aerospace

AIRBUS · DSI Aerospace Technology

Micro electronics

CREONIC

Communications

Rohde&Schwarz · EANT · Smart Mobile Labs · IMST

Research and Academia

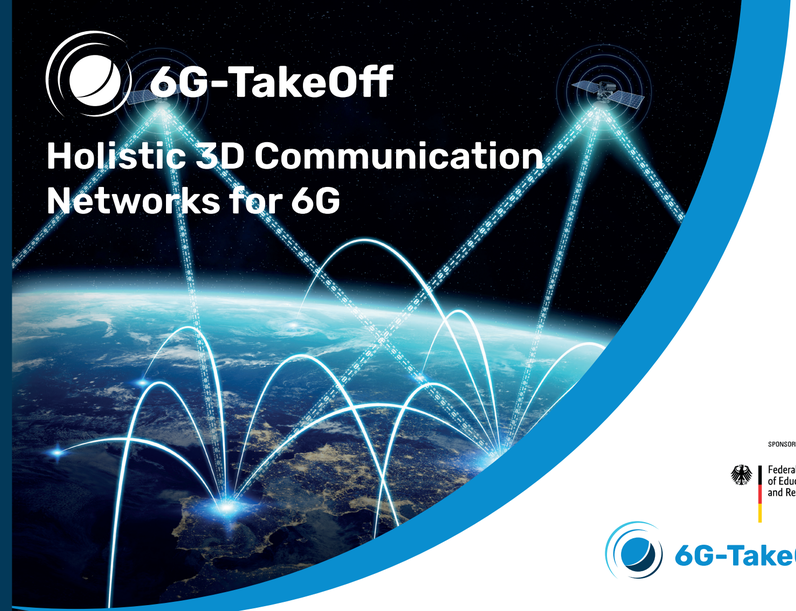
DLR Deutsches Zentrum für Luft- und Raumfahrt · ZFT Zentrum für Telematik · University of Bremen · RPTU Rheinland-Pfälzische Technische Universität Kaiserslautern Landau · Fraunhofer FOKUS

info@6g-takeoff.de

www.6g-takeoff.de

6G-TakeOff

Holistic 3D Communication Networks for 6G



SPONSORED BY THE

Federal Ministry of Education and Research

6G-TakeOff

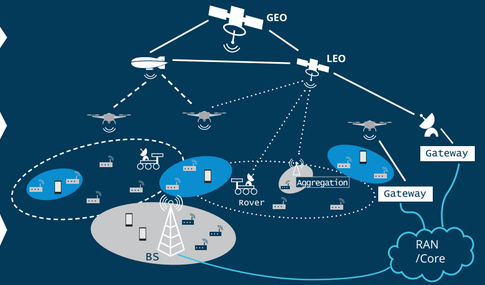
3D Networks

Unified processing platforms for network functions on different heights

SPACE SEGMENT
- Multi-orbit
- LEO satellites

AIR SEGMENT
- HAPS: Stratospheric airplanes, balloons
- LAPS: Drones

GROUND SEGMENT
- Terrestrial sites
- User equipment
- Customer premises equipment



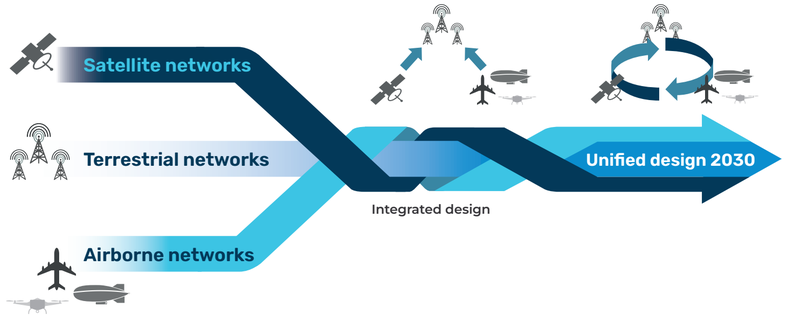
Different properties with respect to:

Performance
Coverage, capacity, data rate / link budget, latency, processing capabilities

Geography / economics
Global business model needed for LEOs; local business model sufficient for HAPS

Flexibility, mobility
dynamically deploy or recall nodes, dynamically adjust coverage areas

Unified 3D Networks



4G & Before
Design optimized independently and exclusively for terrestrial networks

5G & B5G
Design optimized for terrestrial network component Minimum impact to support integration of satellite for coverage and availability extension

6G & Beyond
Design optimized for both terrestrial and space components against a set of common goals

The infrastructures of 3D Networks will be moving

Key challenges:

- Nodes can join / leave network dynamically
- Security requirement: authentication of joining nodes
- Connectivity management for air interface and backhaul
- Dynamic reallocation of network functions
- Steerable high-gain antenna systems
- Reconfigurable hardware / micro electronics

Novel Network Architecture:
- 3D: Ground, LAPS, HAPS, LEO, GEO
- Organic behaviour

Key Technologies:
- Dynamic connectivity management and allocation of network functions
- AI-driven automatic operation

Key Components:
- Innovative antennas and processing platforms