The need for reliable, ubiquitous connectivity

Insufficient coverage for mobile connectivity

- White spots in terrestrial networks
- Insufficient capacity in rural areas
- Offshore areas
- Airspace

Temporarily / locally insufficient capacity

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

Consortium

AIRBUS, CREONIC, DLR Deutsches Zentrum für Luft- und Raumfahrt, DSI Aerospace Technology, EANT, Fraunhofer FOKUS, ip, IMST, John Deere, NXP, TARIS, Rohde&Schwarz, RPTU Rheinland-Pfälzische Technische Universität Kaiserslautern Landau, Smart Mobile Labs, T, ZF, Telefónica, University of Bremen, ZFT Zentrum für Telematik

Associated Partners

Bayerisches Rotes Kreuz, BMW, Continental, MAN

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Holistic 3D Communication Networks for 6G

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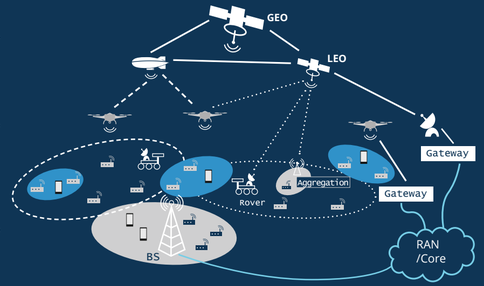
3D Networks

Processing platforms for network functions on different heights

SPACE SEGMENT
- Multi-orbit: LEO, MEO, GEO satellites

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

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



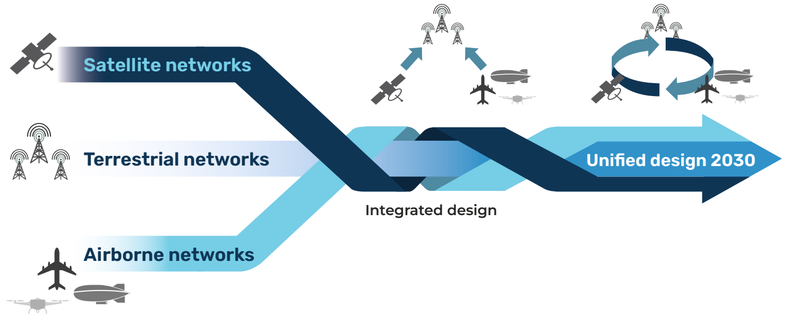
Different properties with respect to:

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 provide service links, adapt information flow, processing and re-routing

Unified 3D Networks



4G & Before
Design independently and exclusively optimized 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 a unified network of terrestrial, airborne and spaceborne components

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 / microelectronics

Novel Network Architecture:
- 3D: Ground, LAPS, HAPS, LEO, GEO
- Dynamically varying network structure

Key Technologies:
- Dynamic connectivity management and allocation of network functions
- Highly automatic operation, based on Information Flow Processing and AI/ML
- Relevance Information Preserving Flow Processing

Key Components:
- Reconfigurable HW platforms and communication modules of LEOs