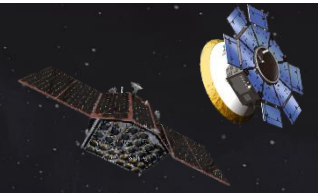
MULTILAYER SATCOM CONSTELLATIONS

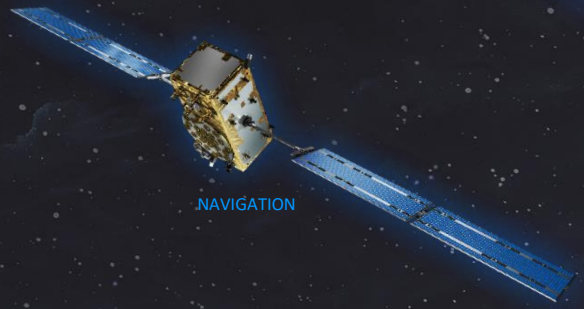
CHALLENGES FOR THE SATELLITE INDUSTRY

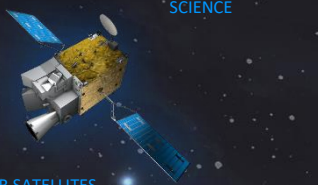
FABIO CURRELI, HEAD OF FUTURE PROGRAMMS TELEKOM DIRECTORATE, OHB SYSTEM AG
STEPHAN ROEMER, BD MANAGER SATCOM/NAVIGATION, OHB SE

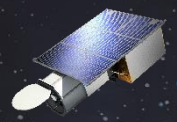
OHB Group: The Biggest Family Owned European Space Company

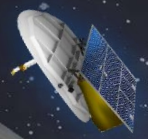
- 3,400 employees, of which 2,400 in Germany (1,200 in Bremen)
- Total yearly performance: 1.8 billion euros (FC)
- Family-run (Primary in Europe)
- One of the three leading European space systems companies (LSI)

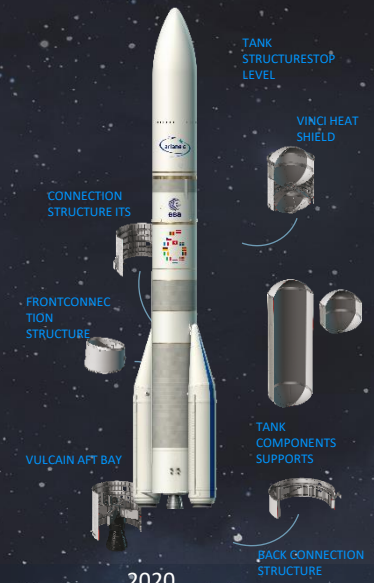












1958 — Founded as "Otto Hydraulik Bremen"

1981 — Takeover by Christa Fuchs

1985 — Entry into space travel

2001 — SAR-Lupe: Breakthrough as a system house, IPO,15 M€ turnover

2010 — Galileo: Breakthrough in Europe

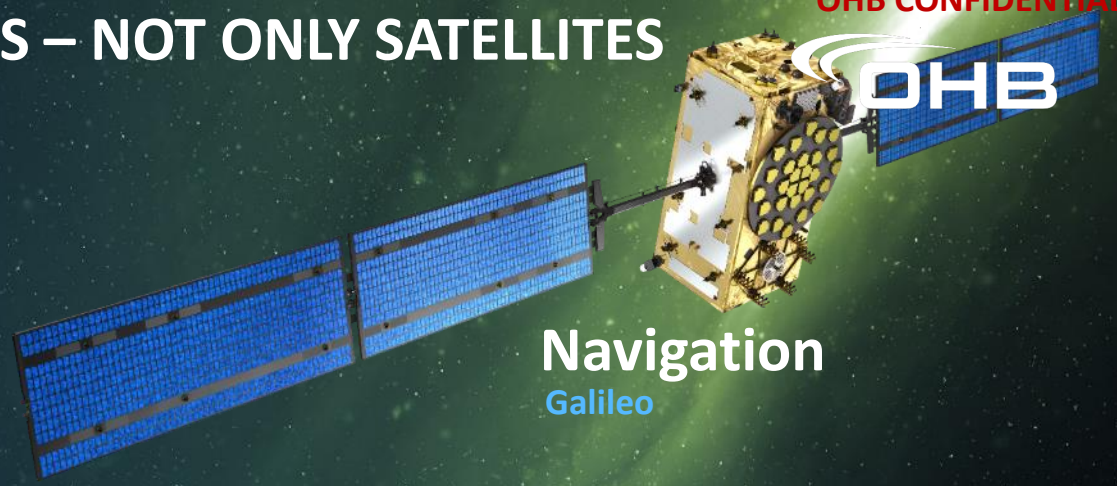
2018 — Development of own microlauncher, € 1 billion turnover

2020 — GOSA: Foundation of the consortium

OHB PROVIDES ALL KIND OF END-TO-END SOLUTIONS – NOT ONLY SATELLITES

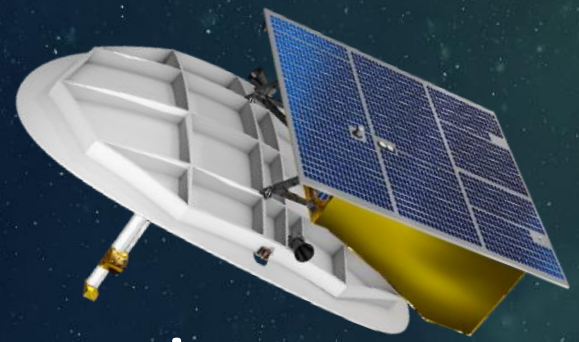
Exploration & Science

PLATO / ExoMars / Hera / Comet-Interceptor



Navigation

Galileo



Reconnaissance

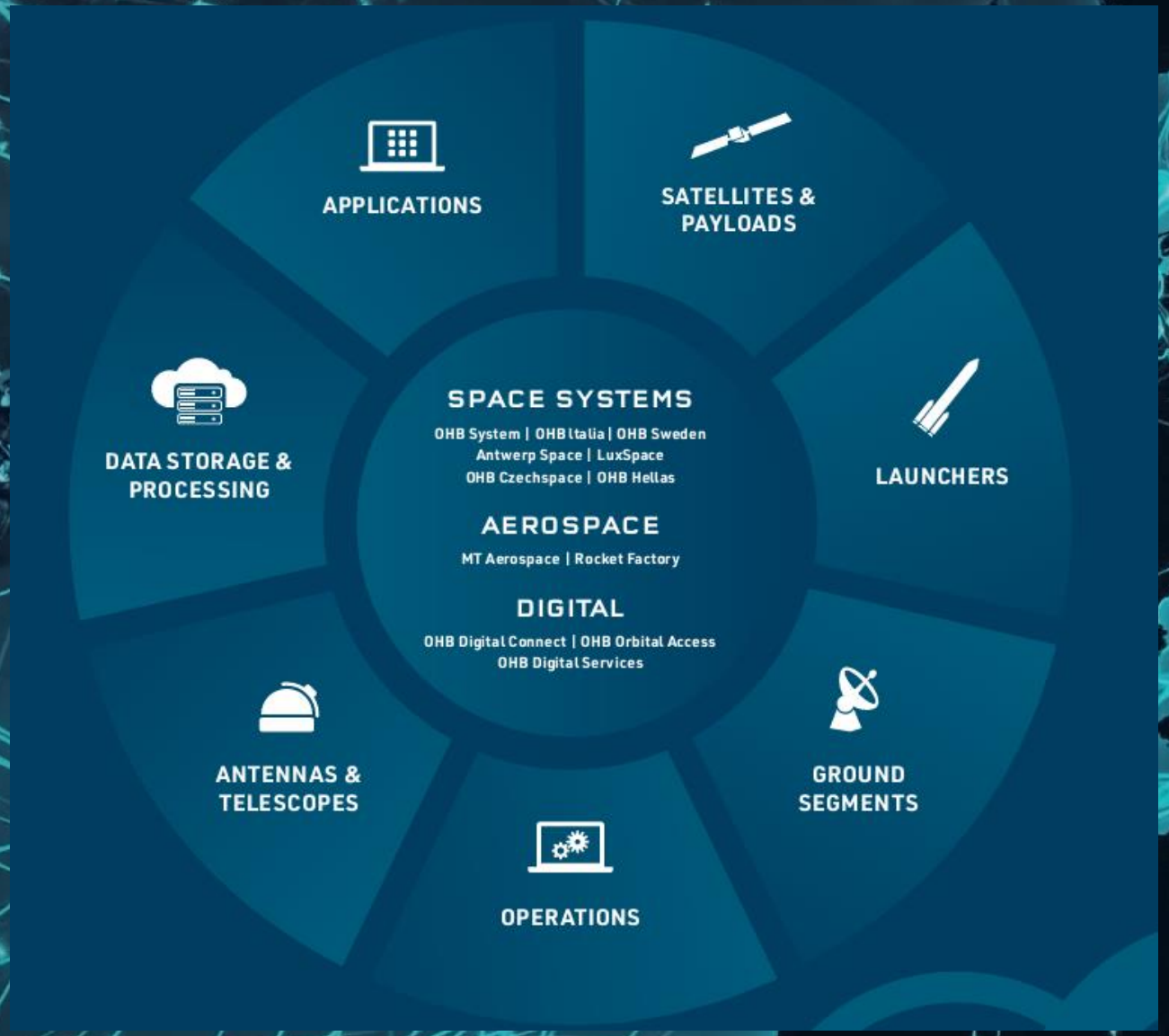
Earth Observation

MTG / EnMAP / PRISMA / FLEX Floris / FORUM / Copernicus (Sentinel-4, CO2M, CHIME, CIMR) / MetOp-SG MWI / EPS-Sterna / EIS / ConstellR

Telecommunication

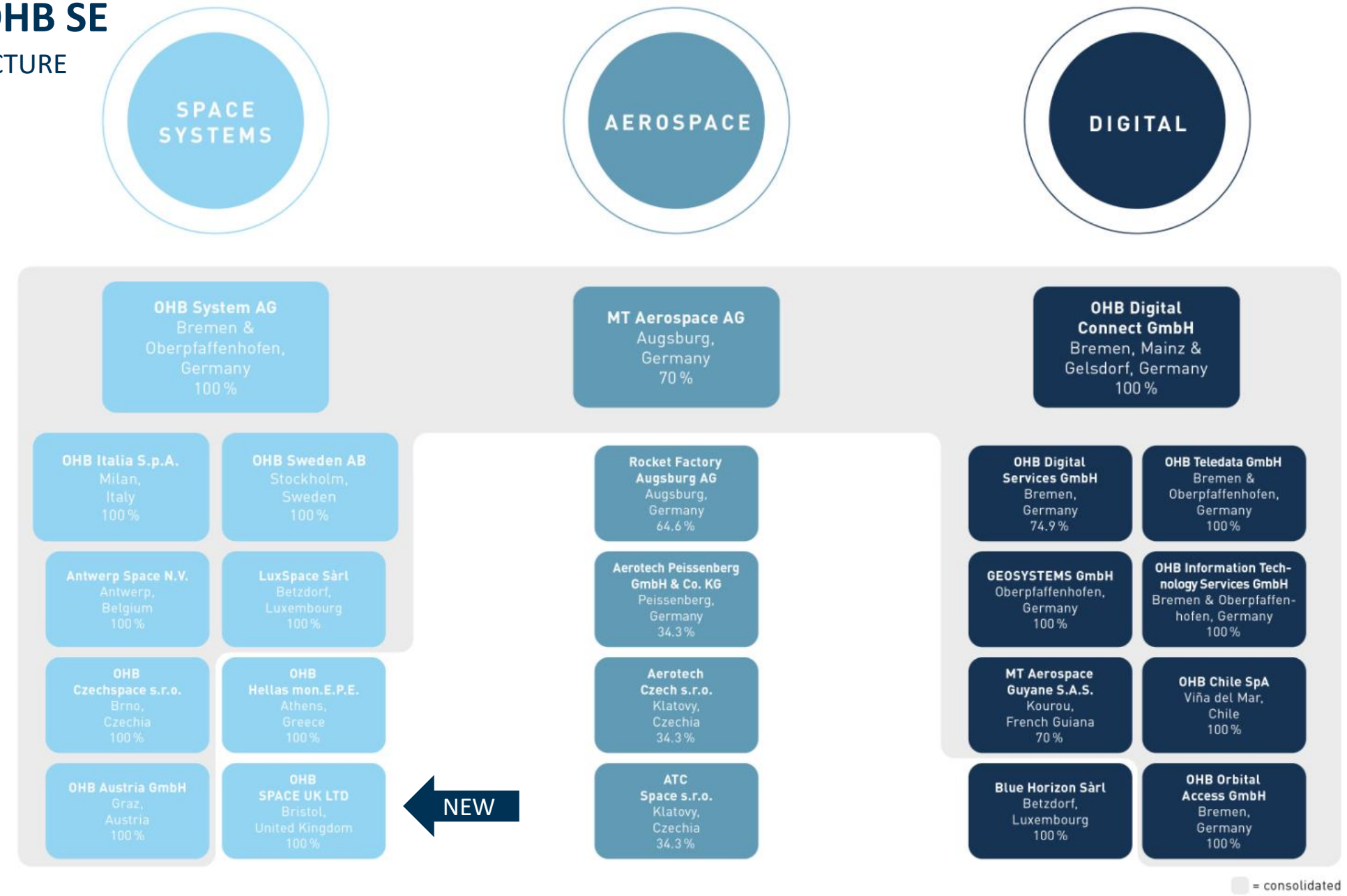
H36W-1 / ERDS-C / Heinrich Herz / Electra

END-TO-END SPACE SOLUTIONS



ABOUT OHB SE

GROUP STRUCTURE



03

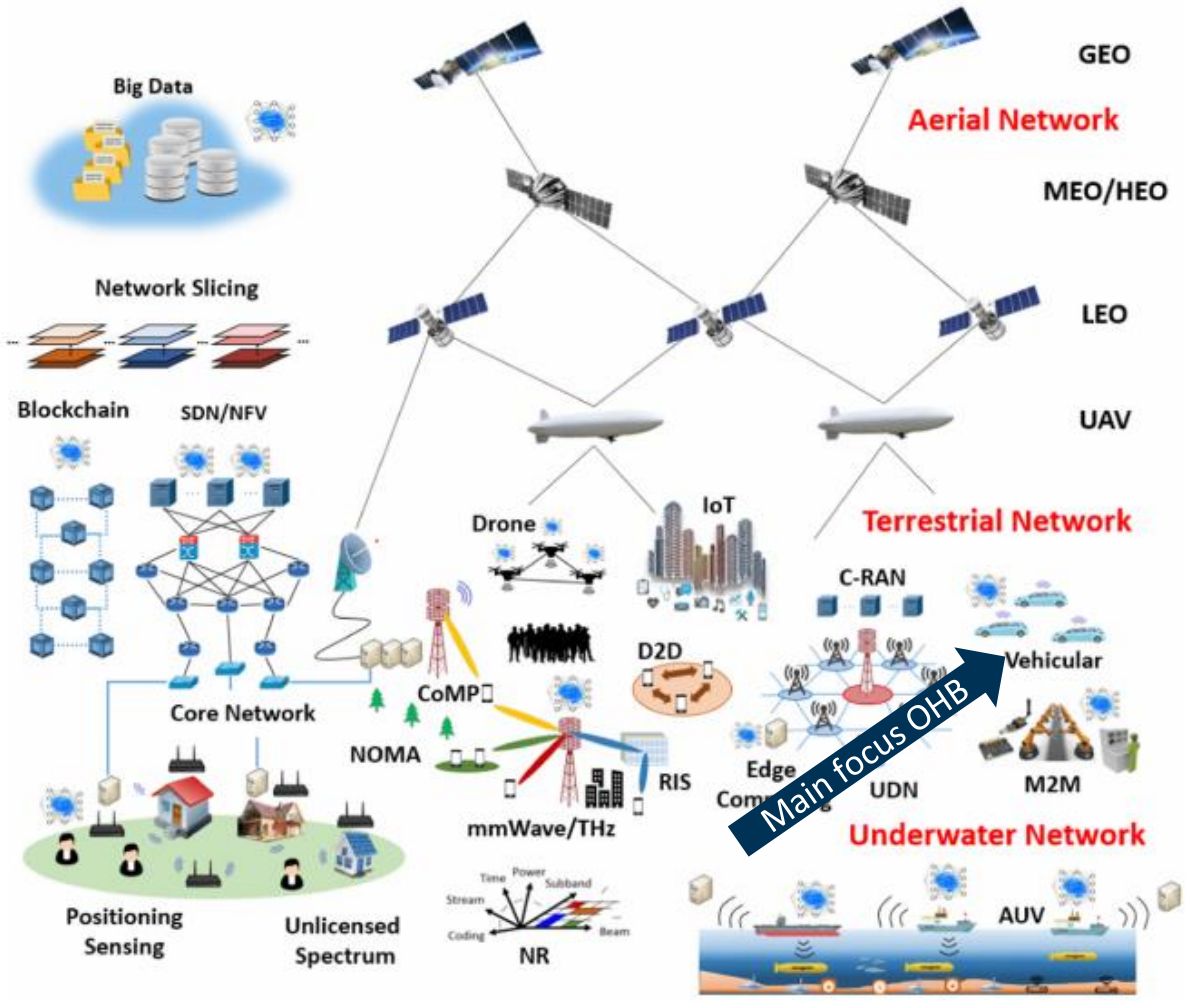
D2D MARKET

SATCOM IN CONTEXT OF TELECOMMUNICATION

FROM SEPERATE SATCOM TO INTEGRATED 3D-NETWORKS

- **till 4G:** independent Networks, optimized for terrestrial
- **5G:** Integration from Satellit and terrestrial Network
- **6G and Beyond:** Integrated 3D-Architecture

=> Including changing of operations as well as value chain

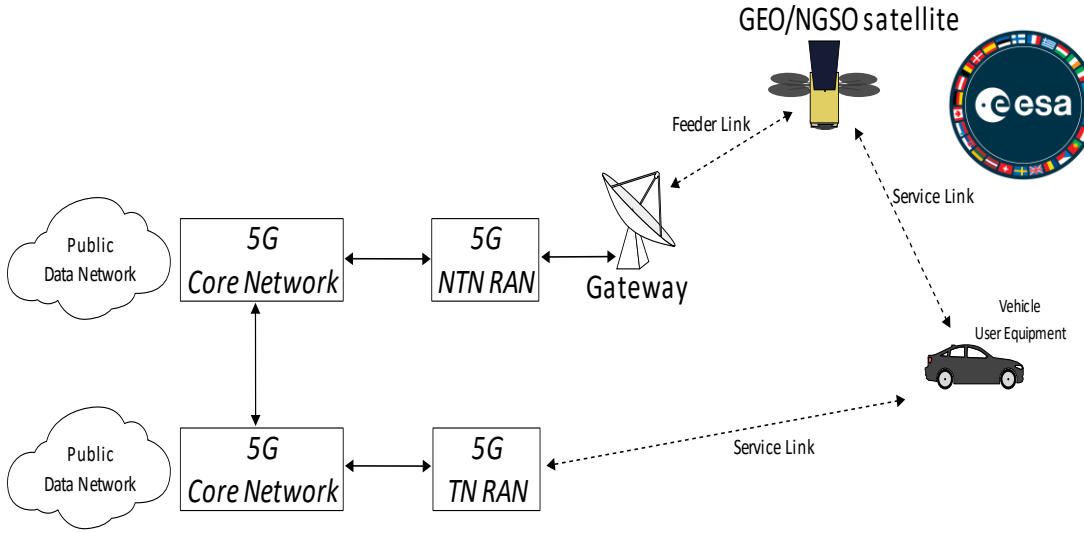


OHB IS ALREADY PREPARING ITSSELF TOGETHER WITH PARTNERS

SOME EXAMPLES

- **SEVECODE (V2X)** – (ESA ARTES)
  - To develop and build a **testbed** to demonstrate **End-to-End V2X applications** with an **integrated 5G TN-NTN network**
  - Partner BMW, Deutsche Telekom, Fraunhofer, Media Mobile

- **VLEO system simulator** for direct satellite-to-device 5G/6G communications (ESA ARTES)
  - To Establish a simulator able to derive and visualize the characteristics of the orbit parameters and flight dynamics of different mission scenarios – modeling the performances of the whole constellation



- **Nexasphere:**
  - Consortium of 19 European Partners led by Safran Passenger Innovations Germany GmbH
  - To conceptualize and develop advanced hardware prototypes and software algorithms for multi-connected 3D network. This network will integrate radio and wireless-optical technologies, and enable network orchestration through AI-driven programmability. o achieve effective coexistence of TN and NTN by means of advanced data-driven multi-path connectivity solutions.

6GSNS Funded by the European Union

Nexasphere

- **AURORA Satellite On Board Software** for TELESAT Lightspeed Constellations
  - Partner MDA Space Ltd.
  - Full Platform and Payload On-Board Control Software, plus SW/HIL satellite simulators

MDA AURORA™

04

KEY NOTES

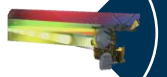
D2D Market requires substantial investment

And different stakeholders has very different sensitivity to the balance, e.g. automotive equipment fights for single euros price reductions

D2D Frequency regulatory aspects are fragmented between each EU country

Most of the scaling-stakeholders (e.g. automotive) decline FR2 use in the next decade,

-> A D2D constellation needs to offer FR1 –> this need will not be fulfilled not planned by IRIS²



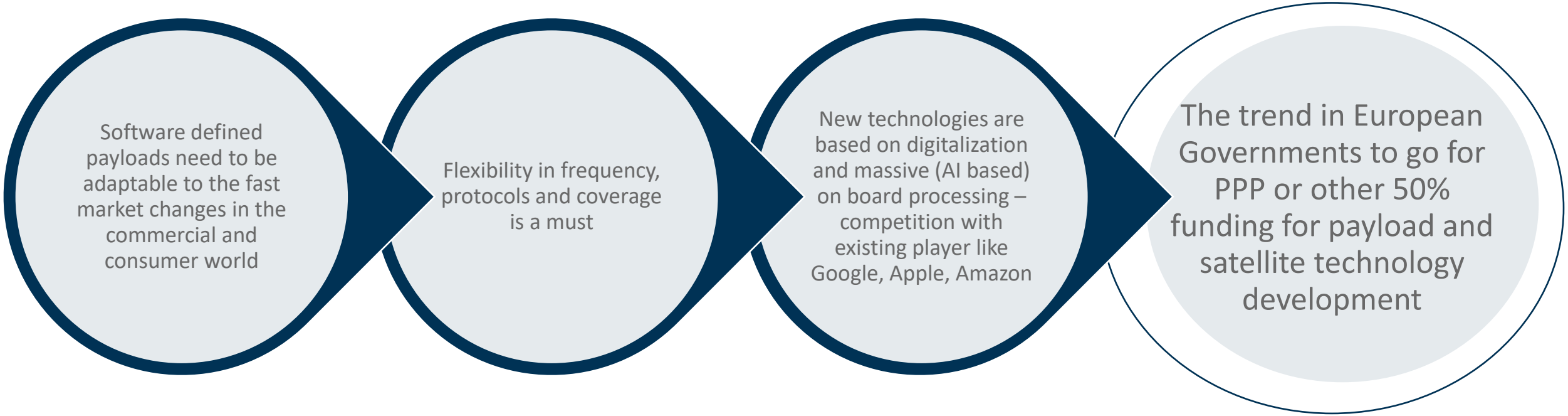
Frequency rights in FR1 are a major issue – not many European players holding spectrum rights

In Europe a “scattered” regulatory field because of 27 EU Member States plus others

Standardisation is still ongoing (e.g. via 3GPP and 5GAA) – meanwhile US and Chinese Players are pushing to the market with proprietary solutions (e.g. Starlink, Kuiper, Geely, Thousand Sails..)

- Can these Issues be solved by the market or do we need governmental action (e.g. by EC) ?
- Currently the dominance and political environment seems to result to need of governmental action.

Upstream companies struggle to develop key technology with own funds



Upstream companies struggle to develop key technology with own funds

- For Satellite industry (which is not an operator) it’s difficult to reach Return of Invest under such conditions!
- because this situation is combined with extreme price pressure for constellations (and in difference to TN/NTN Operators we have no major revenue/income via the communication services)
- How to solve this investment issue? Participation in the operational phase? Or additional income based on lifetime and performance of the satellites

Request of price competitiveness and established reliable supply chain –> it does not exist in EU (yet)!

„Mega“ Satellite Constellation requires:

- High investment costs -> high pressure for reduction of recurring cost by the constellation owners
- High volume production requires adequate facilities fast integration of satellites needed (multiple satellites per day) to have the satellites ready in the needed time frame (not really existing in Europe at current point)
- Companies mostly vertical integrated equipment chain to secure in time/in performance delivery → which is poisonous for an agile and diverse technology and supplier landscape, which was till now the big strength of Europe)

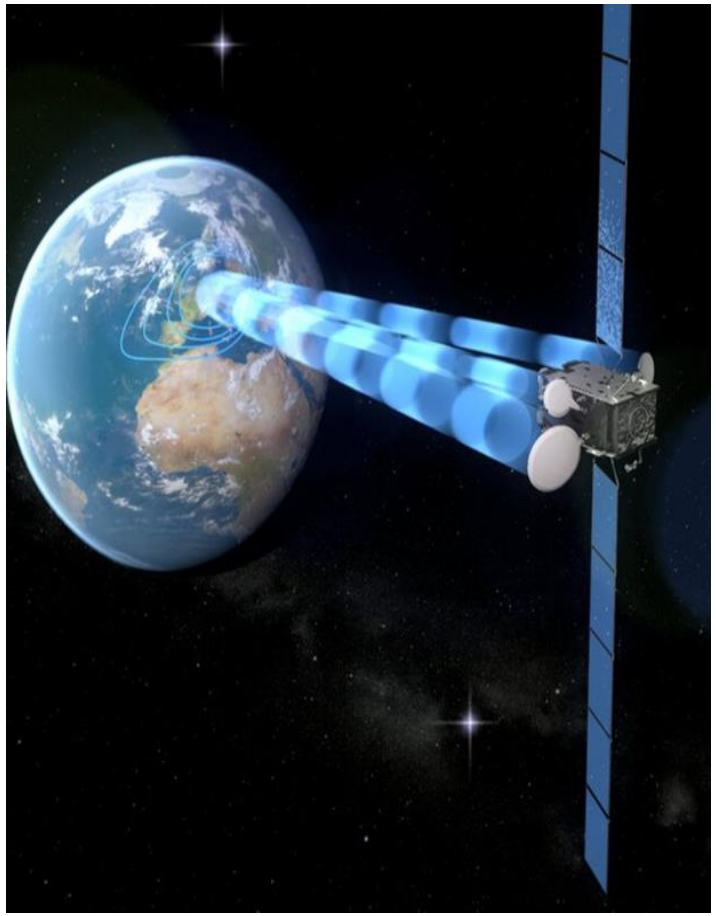
Alternative is to have an extreme robust, fast, reliable and multi-source Supply Chain

- ➢ Relatively new for Europe, especially risky for many smaller suppliers (if done after typical US contract example)

OHB OPEN QUESTION TO THE SATELLITE OPERATORS AND COMMUNITY FOR D2D

- OHB Group sees itself as **a partner of the satellite operators** (as well as the TN operators and scaling stakeholders) to support their business cases (OHB is not planning of operating an own D2D constellation business)
- The challenge remains:
  - What does the satellite operators require from space industry in the coming years? Technology and Production wise.
  - Are Operators and TN willing to help us to solve the issues for the satellite integrators and the supplier industry?
    - E.g. by participation in the profit of the operational phase or payments based on satellite lifetime and performance goals reached to give the space industry
    - Are there other solutions that can be contemplated together?

Otherwise in one decade will exists only space companies that are vertically integrated (or with fully dependent on one suppliers)?



THANK YOU!

OHB SE
Manfred-Fuchs-Platz 2-4
28359 Bremen
Germany

Phone: +49 421 2020 8
Fax: +49 421 2020 700
Email: info@ohb.de
Web: www.ohb.de