

Tech Brief - 5G Connectivity from LEO

February 10, 2021

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GateHouse

Agenda

1. Introduction
2. 5G connectivity & market
3. Technologies
4. Standardization
5. System overview
6. Status and plan
7. Questions



GateHouse Group

1. Danish company founded in 1992
2. Mission critical software
3. 60+ employees
4. Strong economy

GateHouse SatCom

deliver software to BtB customers all over the world within satellite communication.

Further we deliver **expert capabilities** to The Danish Defence in both areas.

GateHouse Maritime

deliver software to BtB customers all over the world within maritime segments.

GateHouse Igniter

are start-ups based on carve-outs of the 2 main business areas and acquisitions within the Maritime area.

Customer Examples

Honeywell



COBHAM



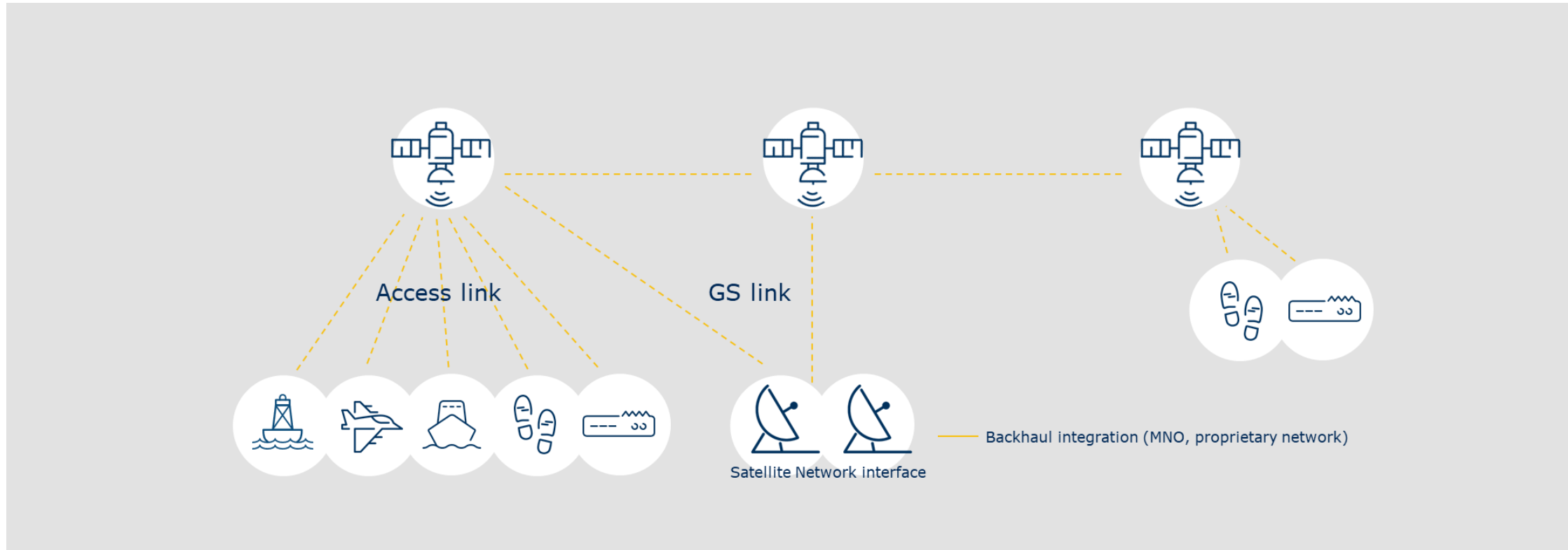
HUGHES





5G connectivity from LEO

Why space based connectivity ?



- The market demand real time tracking, monitoring and surveillance anywhere and anytime
- 90% of the earth is not covered by terrestrial network or affordable internet access

Satellite 5G market

- The satellite 5G market is expected to generate in the order of \$33 billion up to 2030
- Satellite IoT: Generate a total of \$12 billion accumulated to 2030 (not only 5G NB-IoT)
- Number of “in service” devices for satellite IoT is expected reach more than 40 million in 2030 (CARG ~21%)
- Space based IoT market is today served by the existing MSS, VSAT and smallsat operators

Satellite M2M and IoT market

Service providers

VSAT

MMS

Smallsat

Segments

Logistics and transportation

Maritime

Oil & Gas

Agriculture

Others

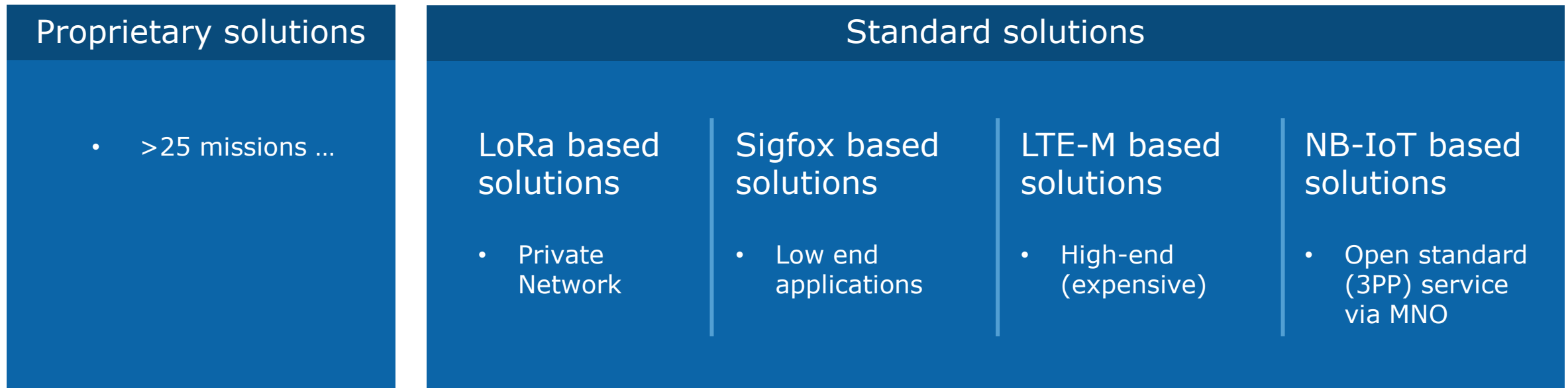
Mining

Utilities

Constructions

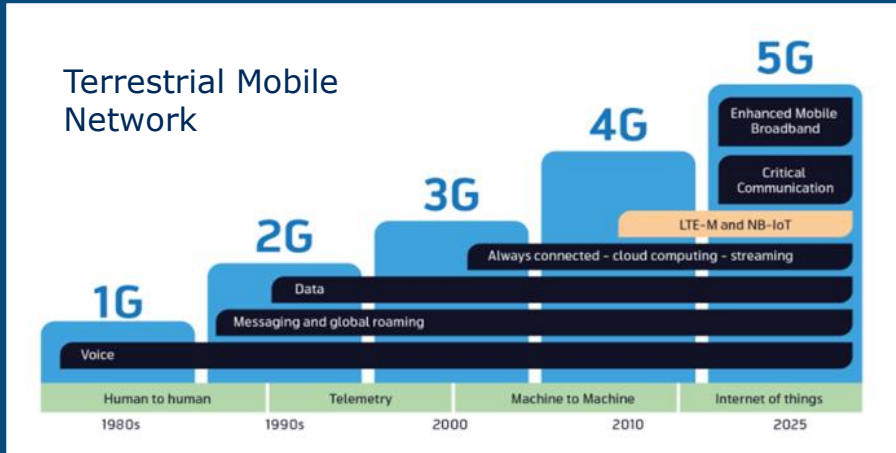
Consumer IoT

Trends for satellite based IoT connectivity - technologies



- Space industry have traditionally a tendency to focused on proprietary or adapted solutions
- 3GPP has a comprehensive process for the definition of standards
- However 5G NTN have the potential to be a real game changer in satellite communication

Satellite Communications – Trend



Mobile-Industry



General increased focus on standardization in satcom



SatCom industry

5G NTN



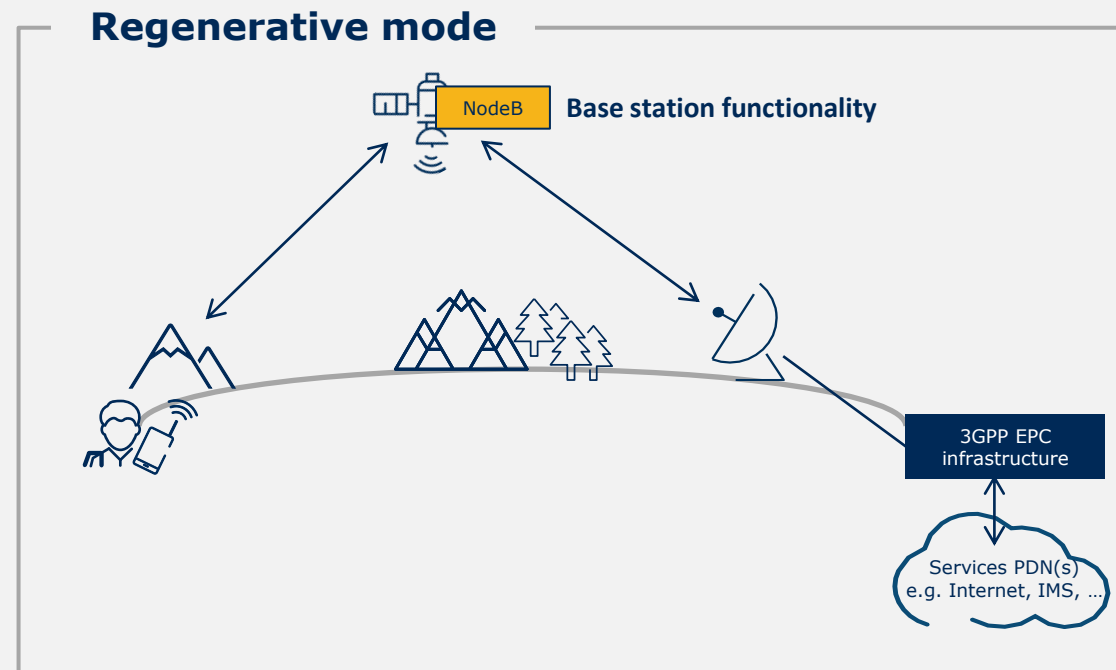
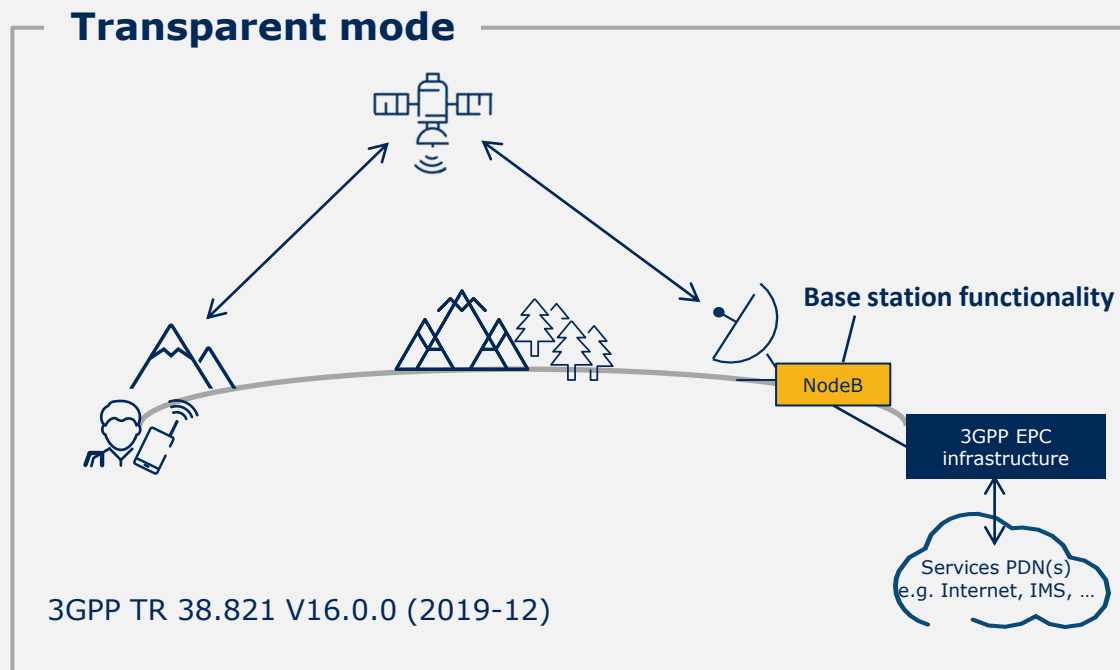
New world

(opportunities)

NTN: Non Terrestrial Network. Including 5G NB-IoT and 5G New Radip

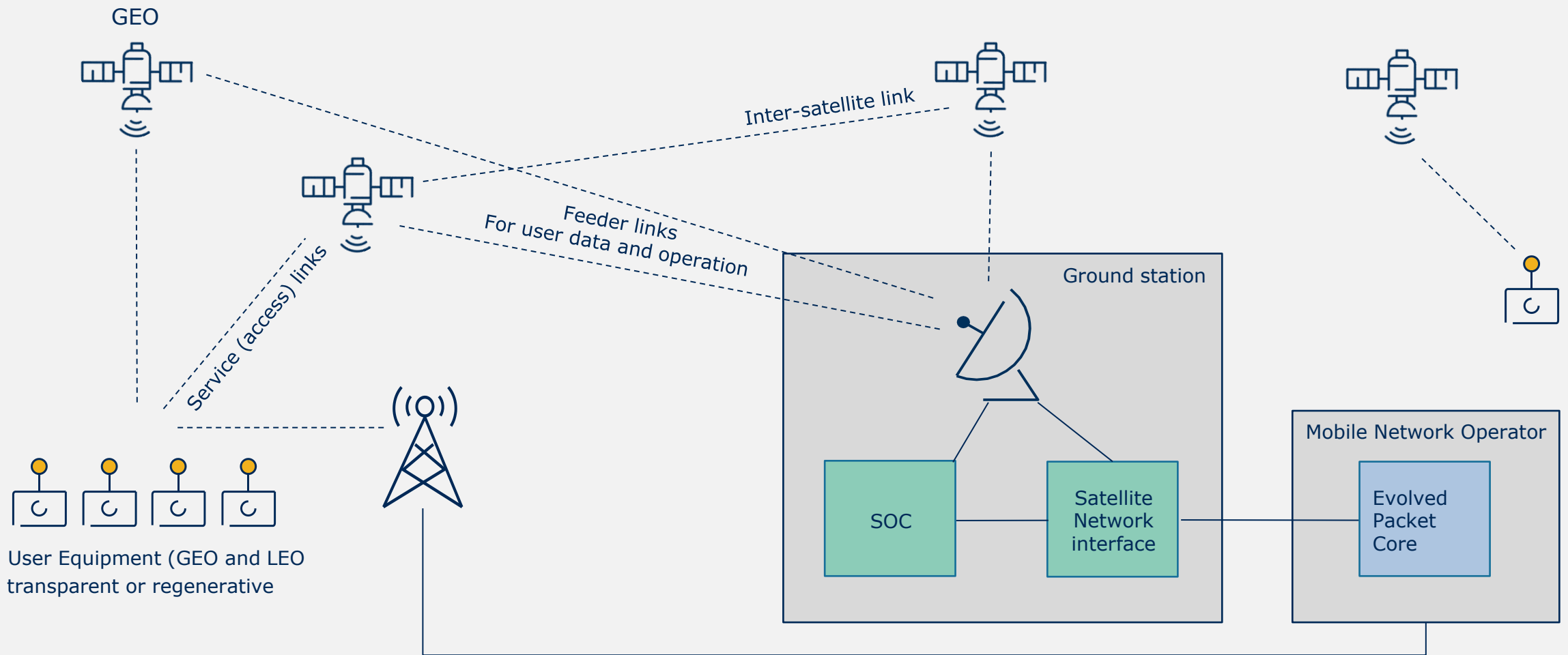
3GPP standardization – 5G NTN

Considering the Next Generation (rel-17 and rel-18) – two modes are defined



- In the 3GPP 5G NTN activities it in December 2019 decided to separate the New Radio (NR) and NB-IoT NTN which ensures the possibility to keep the HW cost and complexity down
- Spectrum is reserved for 5G NTN - 4 x 15MHz from WRC in November 2019

System overview



Technical challenges in LEO

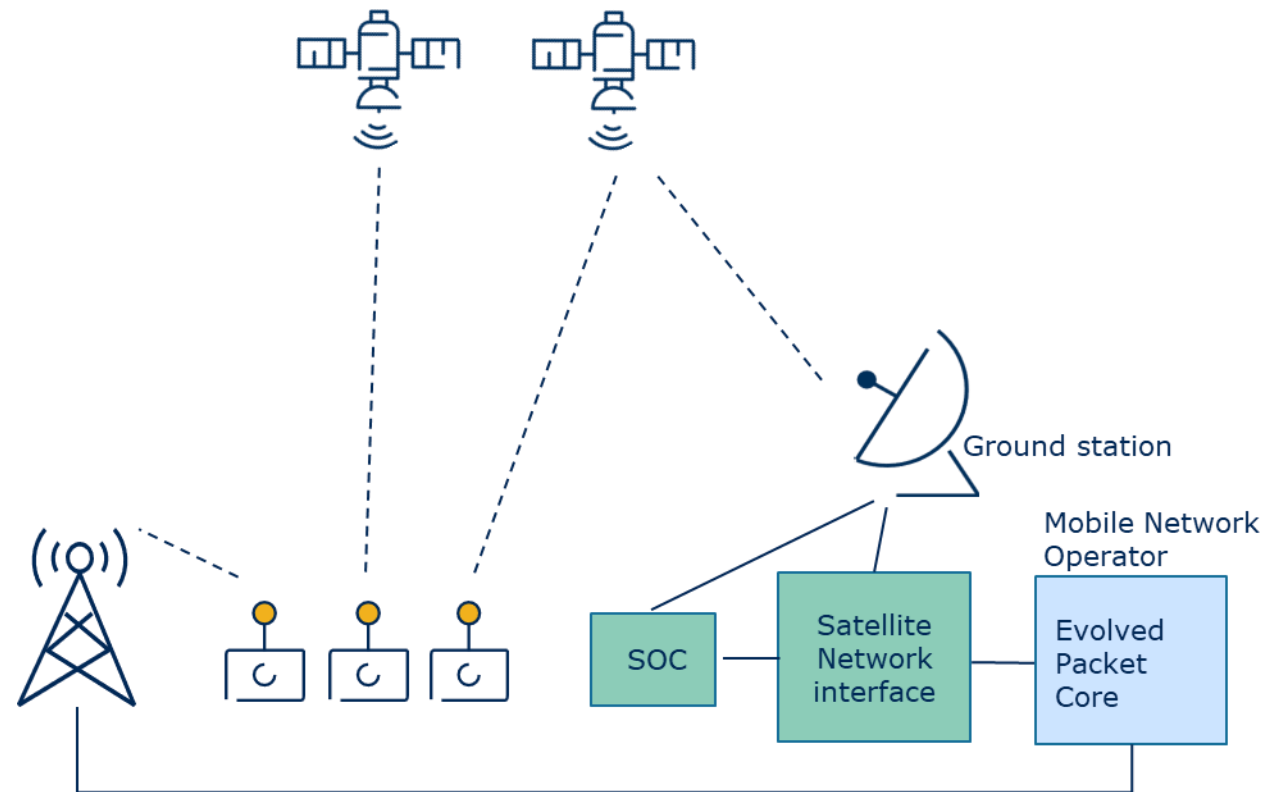
Objective - Commercial Quality

Connectivity – IoT Access link - LEO

1. Doppler (27.000km/h)
2. Latency & time drift
3. Link budget
4. Paging & Power consumption
5. Cell search and location (UE with GPS, UE w/o GPS)

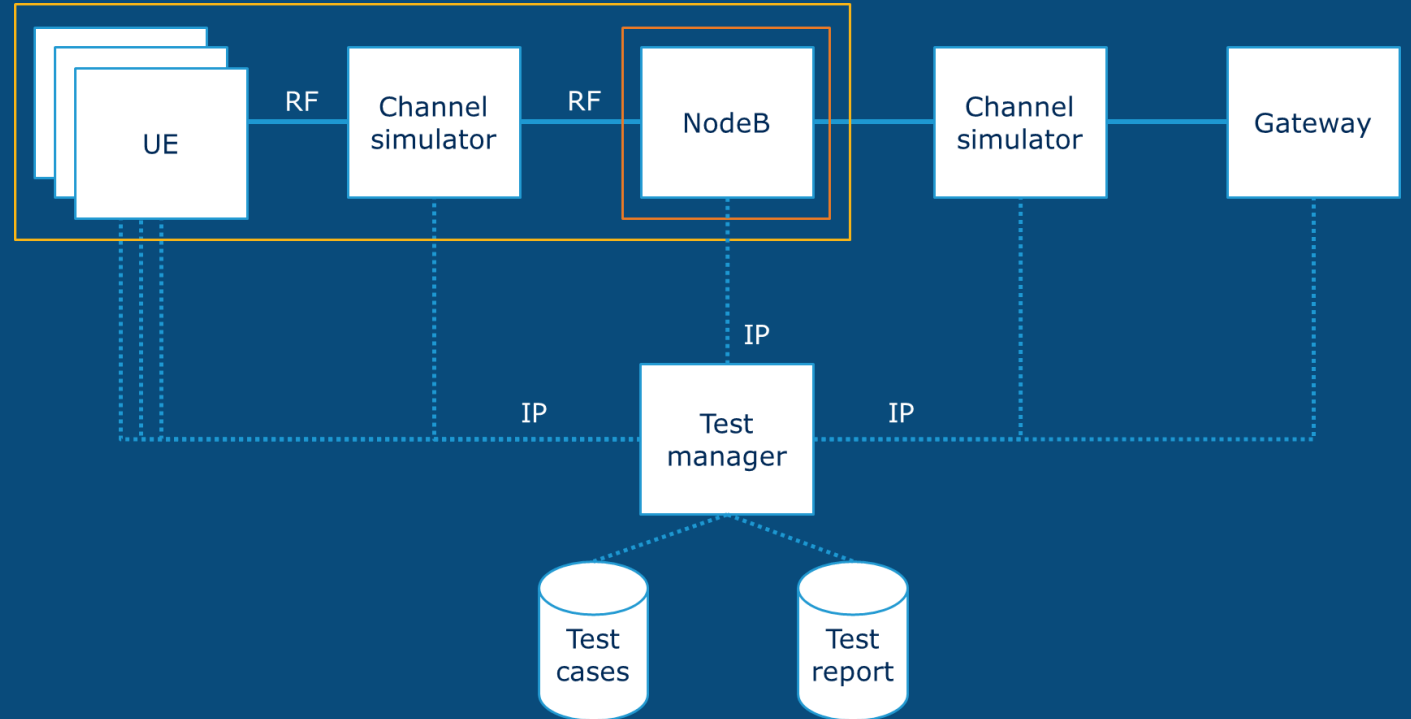
Backhaul integration with core network

1. Discontinued access (only 5 to 10 minutes access when fly over a GS)
2. Core Network integration



Testbed for 5G NTN

- Complex systems require extensive testing
- Having a testbed representing real conditions save money and time
- Repeat test cases and reproduce dynamic test scenarios
- Conformance testing
- Regression testing
- Flexible and scalable

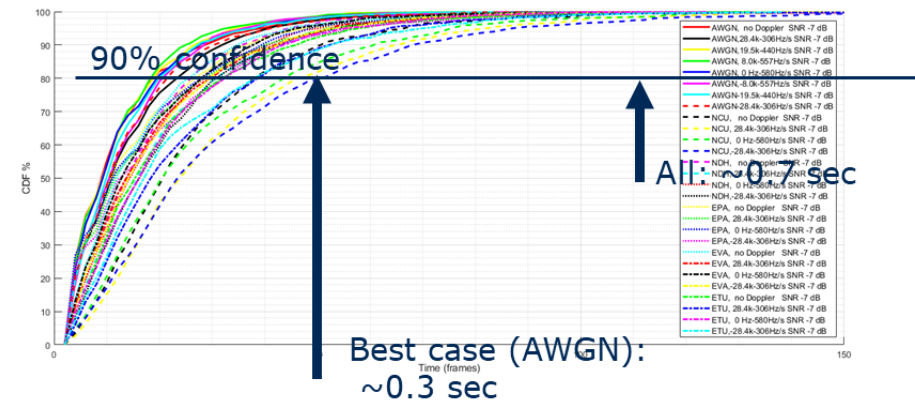


GateHouse NB-IOT waveform development



Current status:

1. Full system implementation in simulation environment
2. Lab demonstration in Q1 2021
3. IOD is expected Q2 2021 (In Orbit Demonstration)
4. GateHouse Waveform: ready for service Launch end 2022



Achieve a sustainable business

- Standardization will be a key factor in achieving sustainable business in the massive satellite communication market
- The standardization will drive scalability and globalization of satellite communication in the future
- Operators can move their focus from technical challenges to focus on services and core business.
- A standard solution will save cost, support scaling the business remove the struggles



Gatehouse SatCom is the leading global and independent partner in providing satellite communication terminal SW (5G, BGAN,).



Thank you
for your time



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