Telenor Maritime

CTIO – Knut Fjellheim

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Customers and Market Segments

Passengers and Crew

Cruise Vessels

Ferries

Offshore Operations and crew

Oil & Gas

Wind Farms

Merchant/Fisheries

Merchant

Fishing Vessels

Adapting standardized, land-based technology to the maritime sector, 700+ vessel
Founded in 2002 - Located in Norway, Sweden, Finland, Singapore, Luxemburg, Malaysia and UK

Research and Innovation

Enablers for the digital transformation

- Connectivity & Mobility
- Local onboard eco system (PaaS)

Collaboration

- Research and innovation communities

“ Trends: Data consumption tripled 2020 to mid 2021,and more ship operation to be conducted remotely ”

Source: Report Thetius & Inmarsat

Telenor Maritime Digitalization

- Public & Private 5G network

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Unprecedented 4G/LTE coverage on the NCS

TM is a independent Mobile operator for maritime industry, using a range of different sim card for supporting customer needs (eg Vodafone, Telia)

Customer reference among others NCS: Mobile coverage for ROV to Oceaneering Control Centre

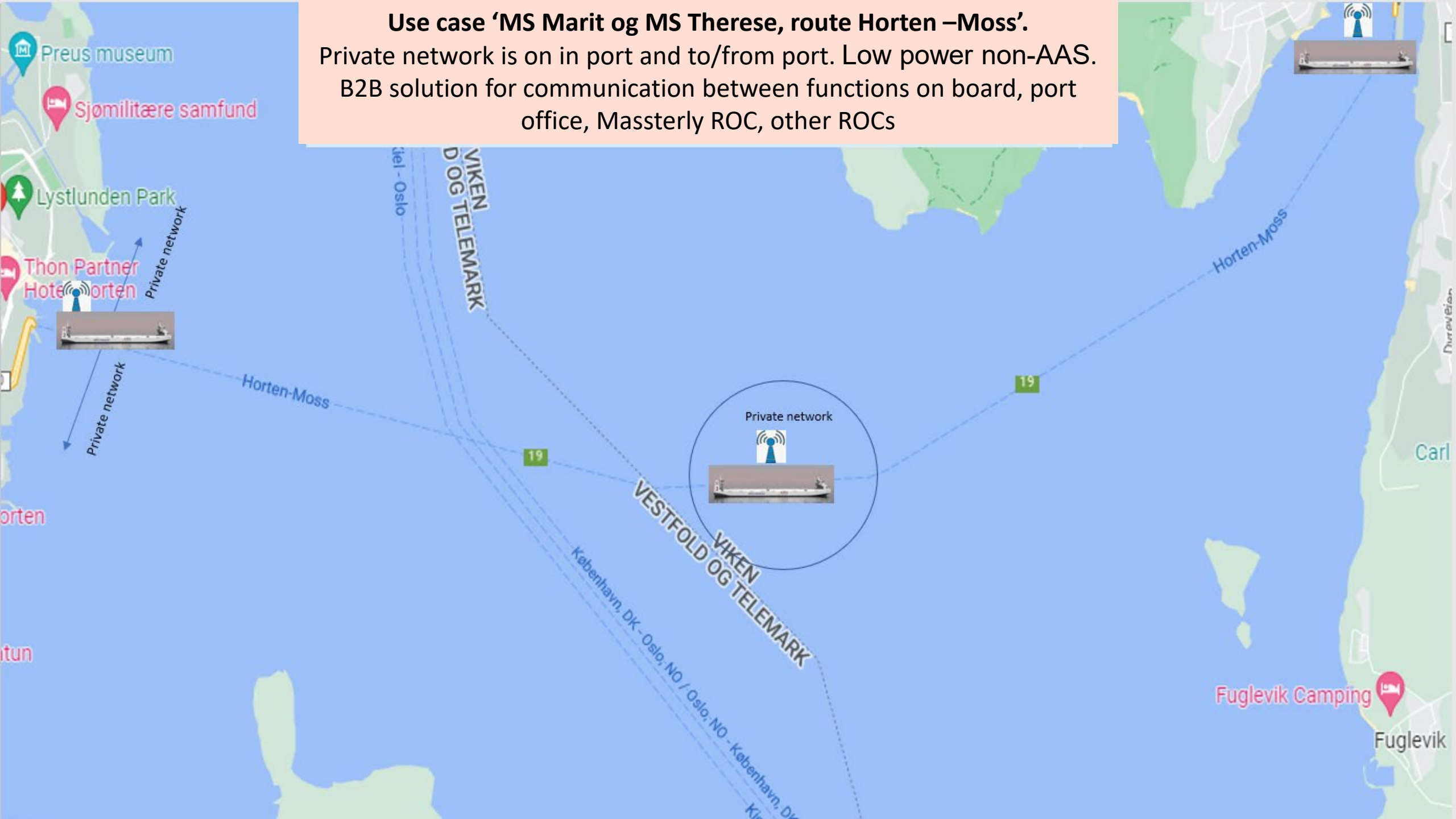
On the NCS, Telenor Maritime provide Privat network for Equinor installations, and also Public 4G / 5G Network Solutions in the North Sea, the Norwegian Sea and in the Barents Sea. Next to come will be Johan Castberg

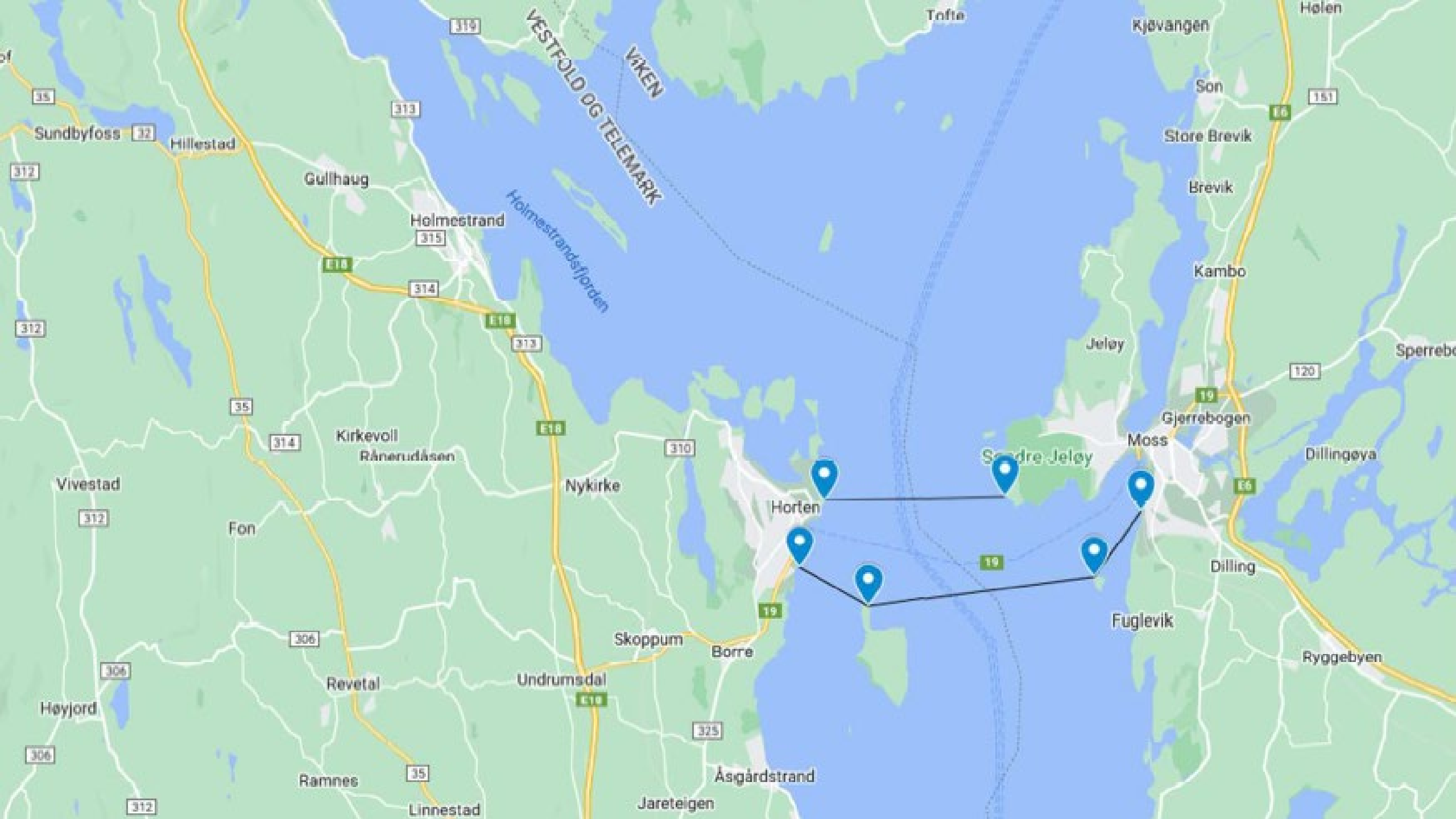
Using different backhaul solution depending on location and requirement, like Eutelsal, Telenor Satellit, One Web, Starlink, other – and customized Radio Link solution

Use case ‘MS Marit og MS Therese, route Horten –Moss’.

Private network is on in port and to/from port. Low power non-AAS.

B2B solution for communication between functions on board, port office, Massterly ROC, other ROCs




VESTFOLD OG TELEMARK
VIKEN
Holmestrandsfjorden
Tofte
Kjøvangen
Hølen
Son
Store Brevik
Brevik
Kambo
Jeløy
Sperrebo
Gjerrebogen
Moss
Dillingøya
Dilling
Fuglevik
Ryggebyen
Horten
Nykirke
Kirkevoll
Rånerudåsen
Vivestad
Fon
Skoppum
Borre
Undrumsdal
Revetal
Høyjord
Ramnes
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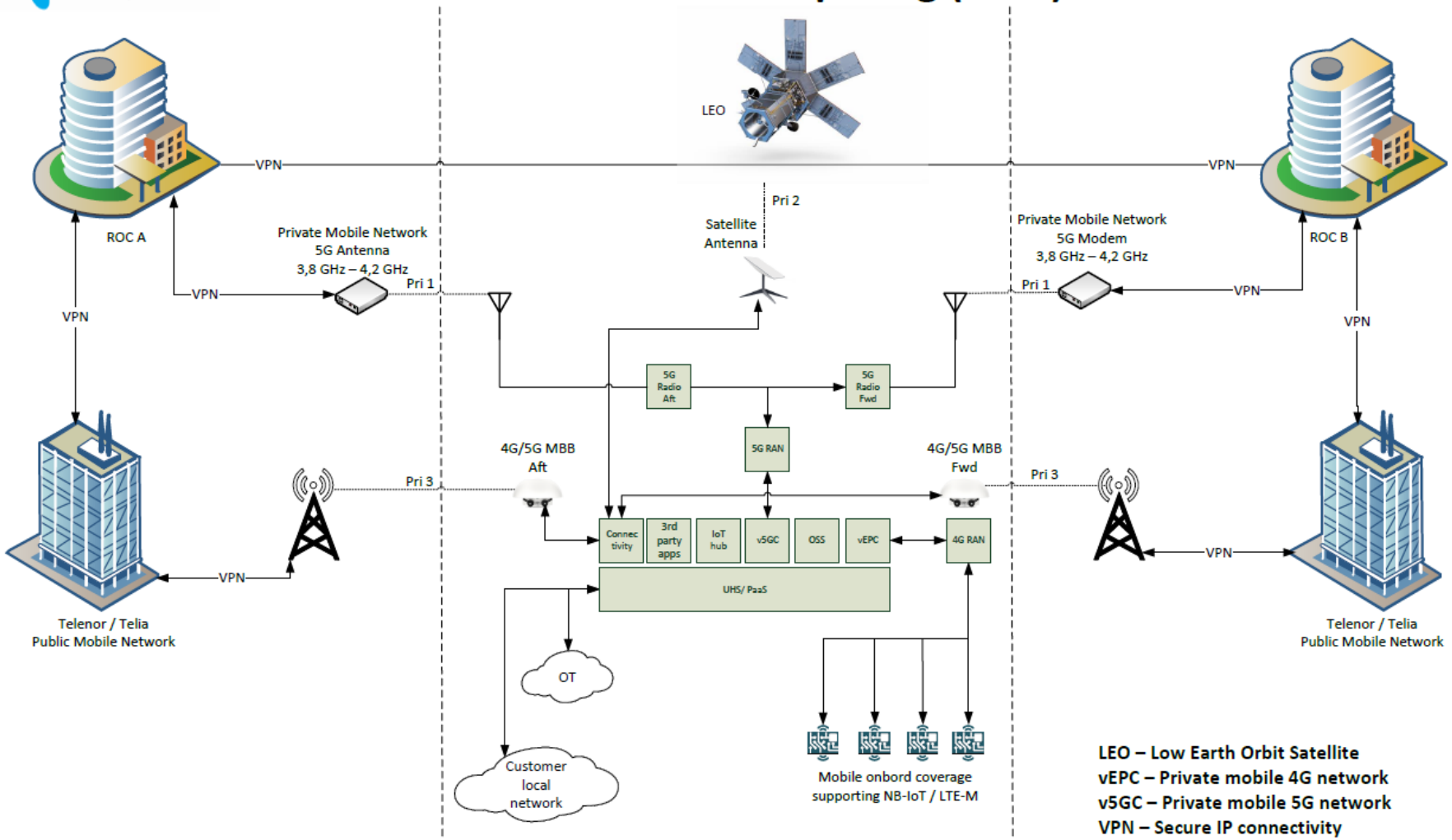
Multi Access EDGE Computing (MEC)



MEC	Multi Access Edge Computing					
Interconnection Diagram	DATE: 18.10.2022	KNF/KJV				
XXXXX-XI-01	01	telenor maritime	01	06.01.2022	Initial drawing	KJV

LEO – Low Earth Orbit Satellite
vEPC – Private mobile 4G network
v5GC – Private mobile 5G network
VPN – Secure IP connectivity
ROC – Remote Operation Center
OSS – Operation support system
RAN – Radio access network
MBB – Mobil broadband modem
UHS/PaaS – Application Hosting Platform

Telenor Maritime Digitalization

- Connectivity services

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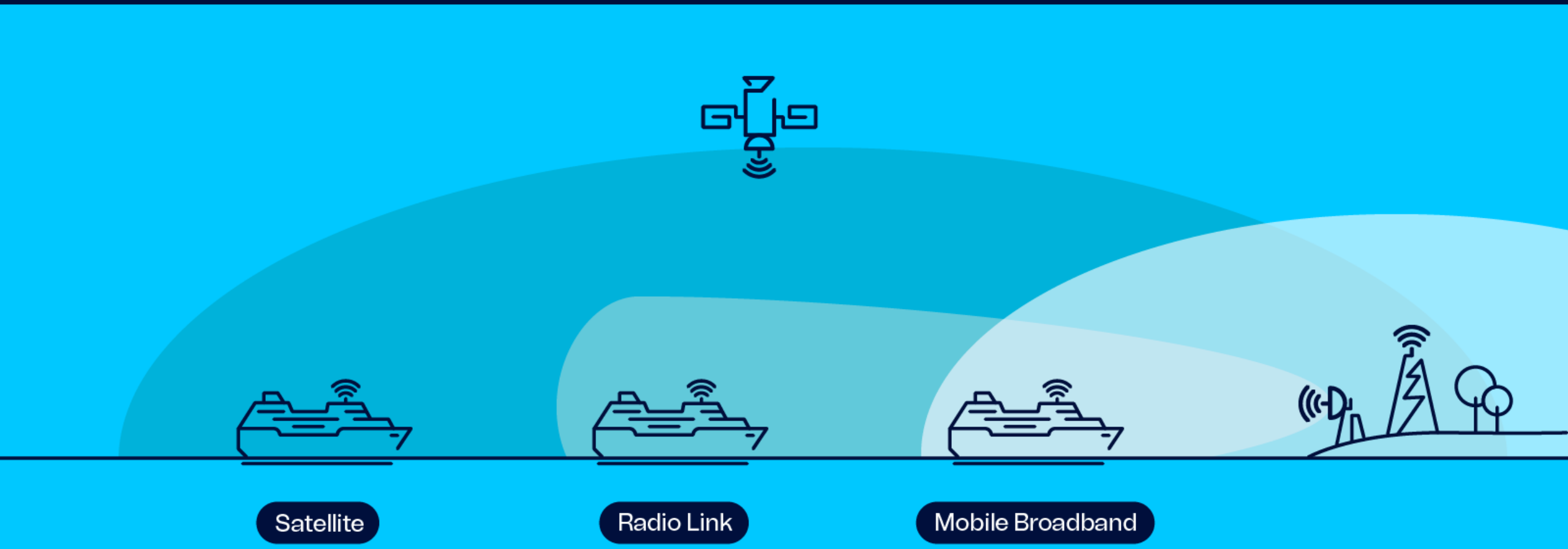
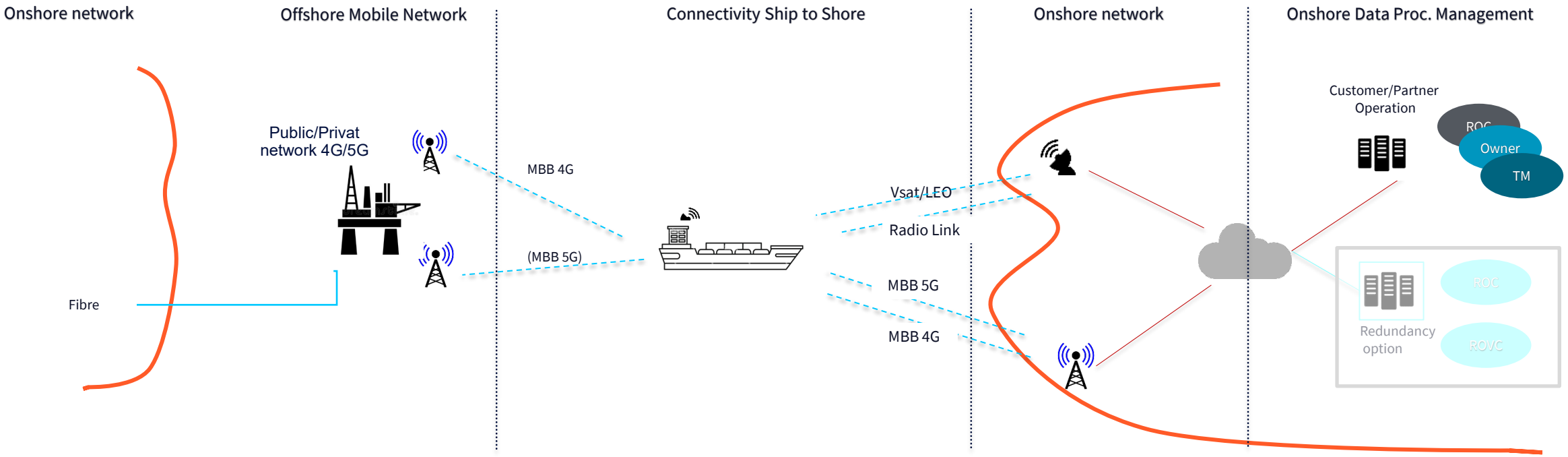
Telenor Maritime Hybrid Connectivity



Service portfolio TM Connectivity Services

High level service description value chain - from onboard access network to date-/remote centre



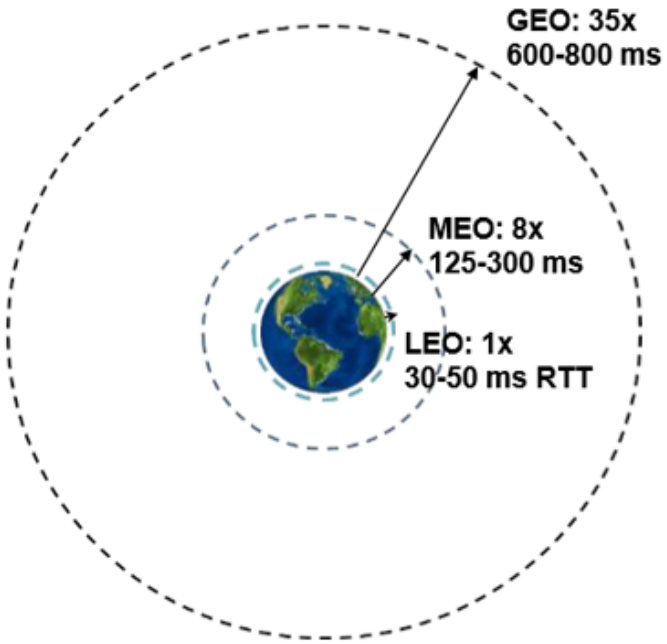
Onboard	Conn. Services onboard	Connectivity to shore	Onshore network	Customer/Operation Controll
Access network onboard, incl mobile, wifi, IoT networks Onboard edge processing Data collection, local storage, and cloud solution Independend Telco operator Privat 4G/5G Networkk solutons	Connectivity platform: -Operation Priority, redundancy, bundling backhauls etc. Remote Access Remote configuration and monitoring	4G MBB 5G MBB Vsat Radiolink LEO and next generation Vsaat	Secure Internet and Core Network via Telenor global comm.centres Landside TN infrastructure & network Cyber Secure services and routing End2end redundancy options	RoC - Remote ship operation and monitoring Owner – Data optimisation and surveillance TM – Connectivity Management Control (NOC), SLA, 24/7, support Other 3rd part stakeholders

LEO Technology

Delivers low latency critical for terrestrial networks

LEO ~20x lower latency than GEO

1x = 1,000 km



Low Latency enables security and service quality

Enables 4G/5G end-to-end encryption (**IP Sec + Encryption eNodeB to Sec Gateway).** No need to split encryption tunnels

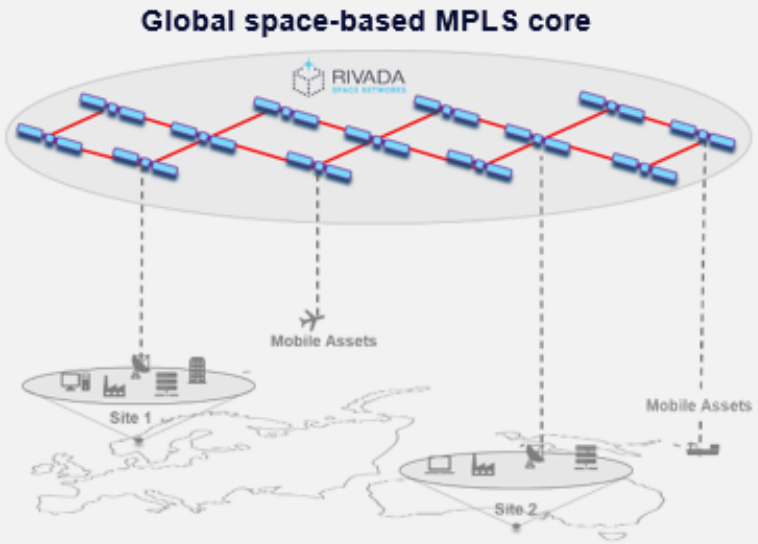
Seamless VPN or encrypted email usage

Seamless use of e-commerce, from browsing products to checking out

Requirement for Voice over LTE (VoLTE)

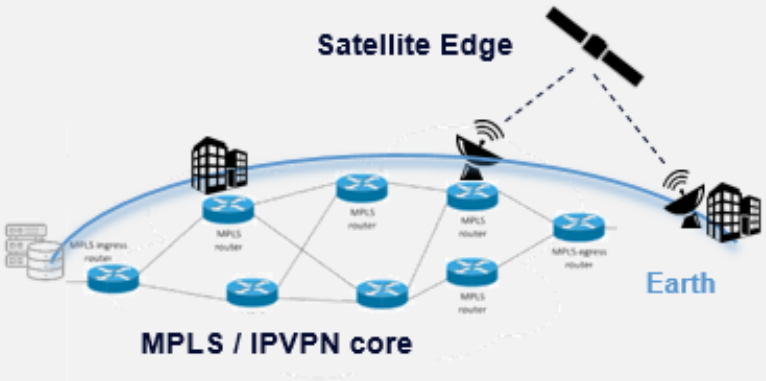
No delay loading content heavy webpages or social media applications

LEO satellite concepts



MPLS Core in the Sky

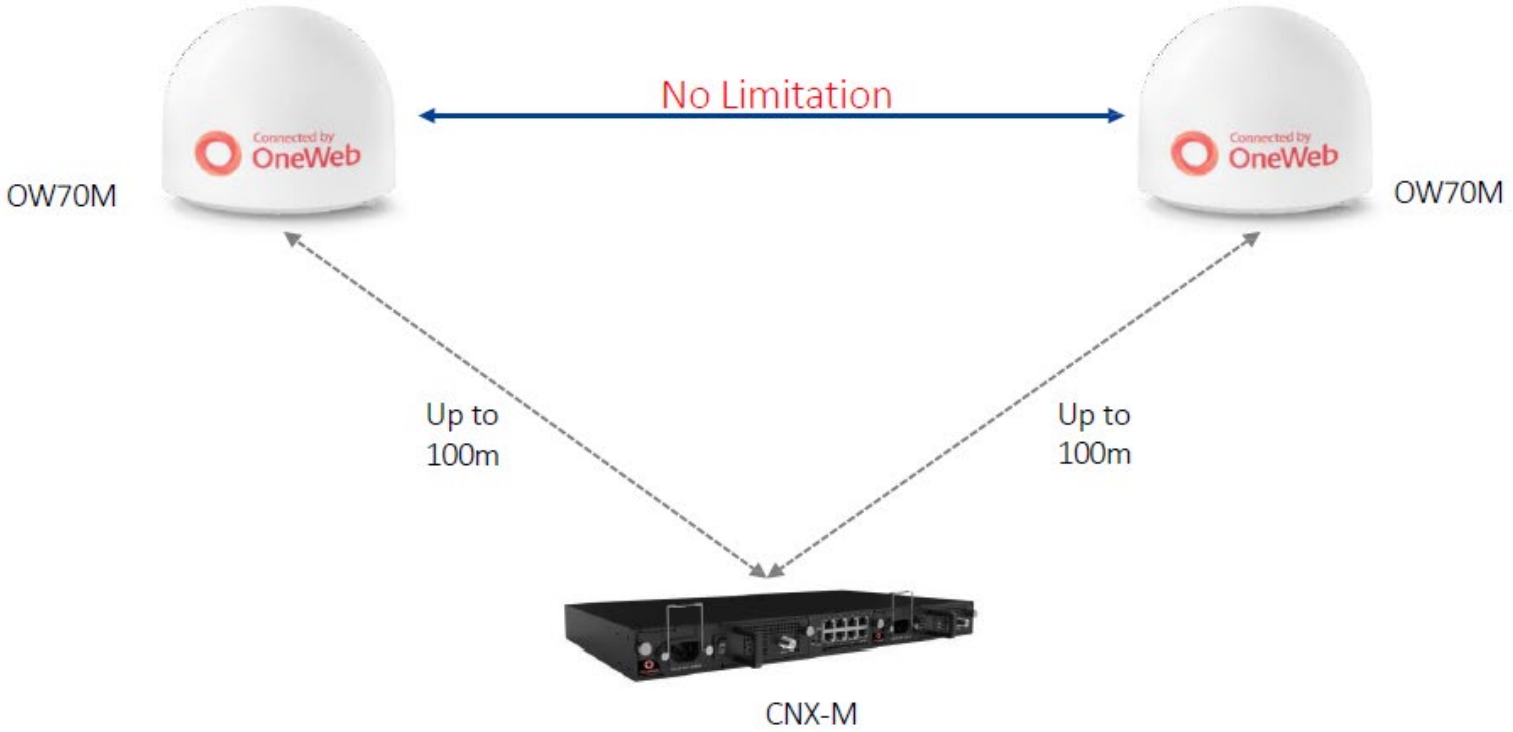
- Full end-to-end MPLS
- Owned and managed by single provider (Rivada Space Networks)
- Earth-to-space local loop feeds directly into space-based MPLS
- Global uniform access to mobile and fixed sites



Network Edge over Satellite

- Applicable to all existing and currently planned GEO, MEO, LEO Type II and III satellite solutions
- Satellite link serves as (last-mile) local-loop only
- 90% of network connectivity is terrestrial IP VPN or MPLS at best
- Same security and data sovereignty issues as terrestrial IPVPN / MPLS

Maritime offering - residential

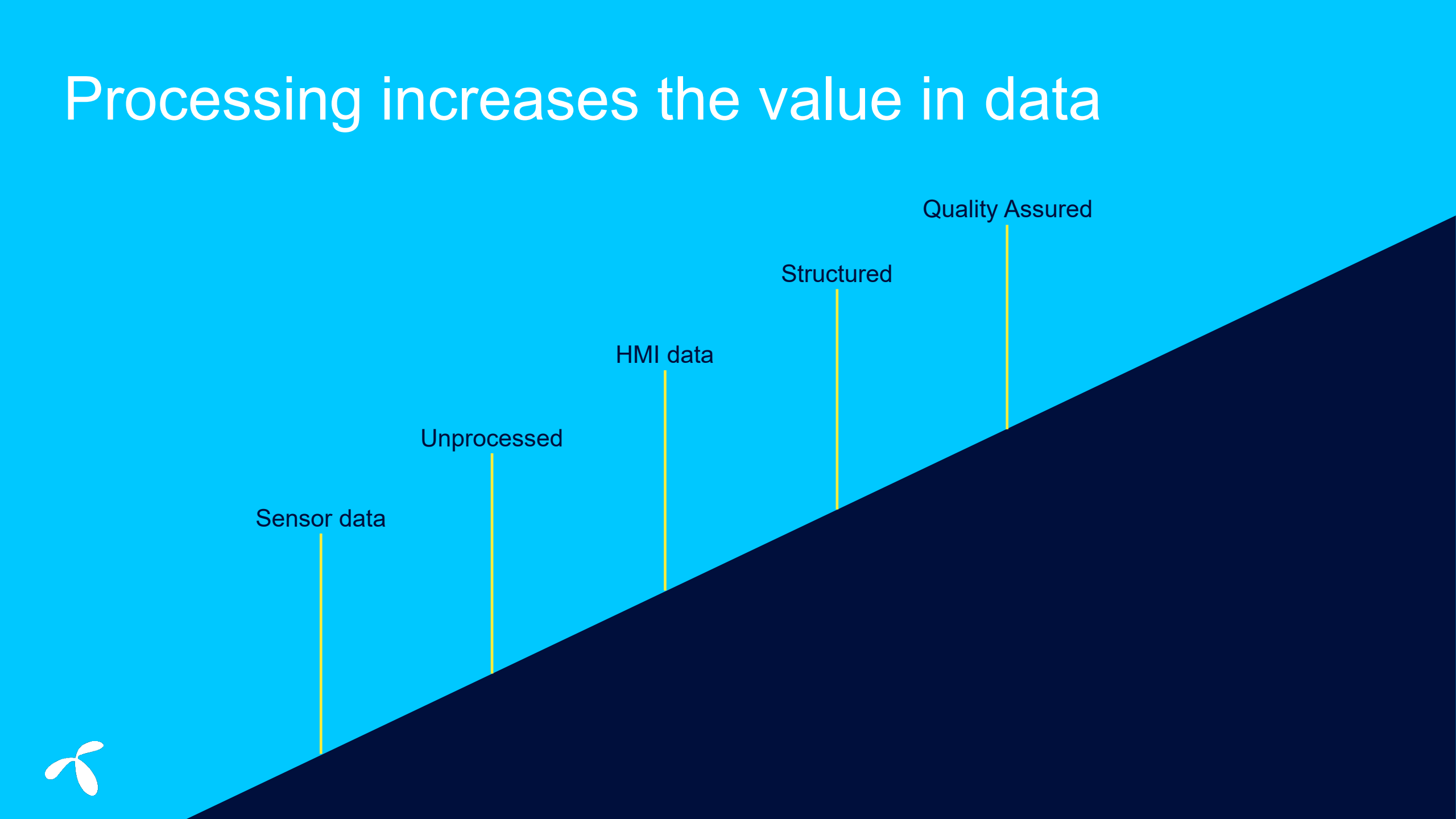


Video:

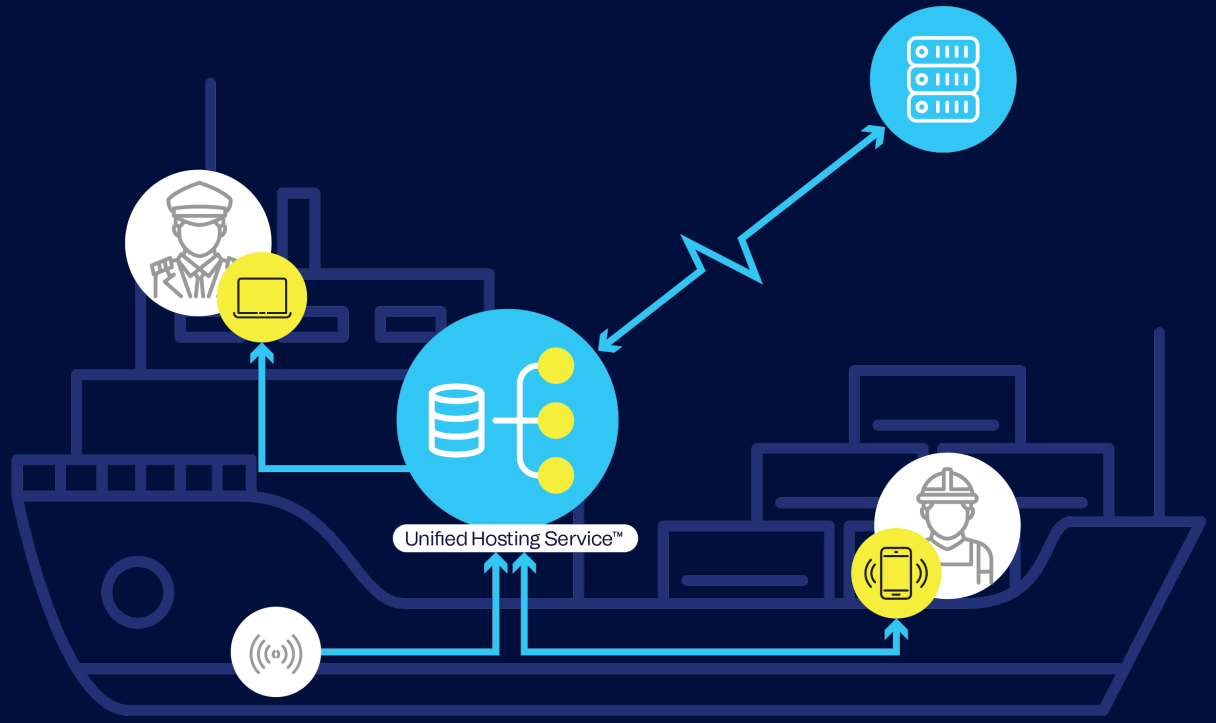
Starlink maritime solution in action

Digitalization – one fifth of the solution

Processing increases the value in data



Local onboard secure eco-system



Connectivity Modules	Private Network Access network	Operation Process Digitalization Services
Platform (PaaS)		

Module based Digital Transformation


API

Collaborations

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Research and Innovation Communities

Strategic focus	Partners and Cooperations	Deliverables
Technology & Innovation 	Leading Satellite Operators Oil & Gas, Wind, Aquafarms Shipowners and OEM`s	Next Generation Satellites - LEO Standardized 5G for maritime network Digitalization and Integrated Solutions
Research & Academia 	European Space Agency (ESA) Norwegian Research Council Academia and EU programs	Standardized 5G for maritime network, 5G EMERGE Tamper Proofing, Smart Contract, Vidameco 5G over Satellite based communication, MIMO
Compliance & Regulators 	Class Societies and Regulators European Council for Communication (EU/ECC) Norwegian Communications Authority (NKOM)	Next generation Cyber Security Solution Regulation of Maritime Mobile 4G/5G for Operators Privat 5G network licenses and solutions

Sustainability

We are committed to the UN's Sustainable Development Goals (SDG), and we support the UN Global Compact Principles. We focus on the goals where either our products, or our employees and company have an impact.

Takk for meg

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