

Seminar - Maritim Kommunikasjon

VHF Data Exchange and Maritime Broadband Radio

Sintef Ocean, 15th of February 2017



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PRESENTATION OVERVIEW



THIS IS KONGSBERG

VHF DATA EXCHANGE (VDES)

MARITIME BROADBAND RADIO (MBR)

THE KONGSBERG ORGANISATION

Business areas



KONGSBERG MARITIME

Global market leader within both offshore, merchant marine and subsea applications



KONGSBERG DEFENCE SYSTEMS

Modern product portfolio in growing defence and aerospace niches



KONGSBERG PROTECH SYSTEMS

Unrivalled global market leader in remote weapon stations



KONGSBERG DIGITAL

Developing the next generation of digitalized products and services

PRESENTATION OVERVIEW



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VHF DATA EXCHANGE SYSTEM (VDES)

MARITIME BROADBAND RADIO (MBR)

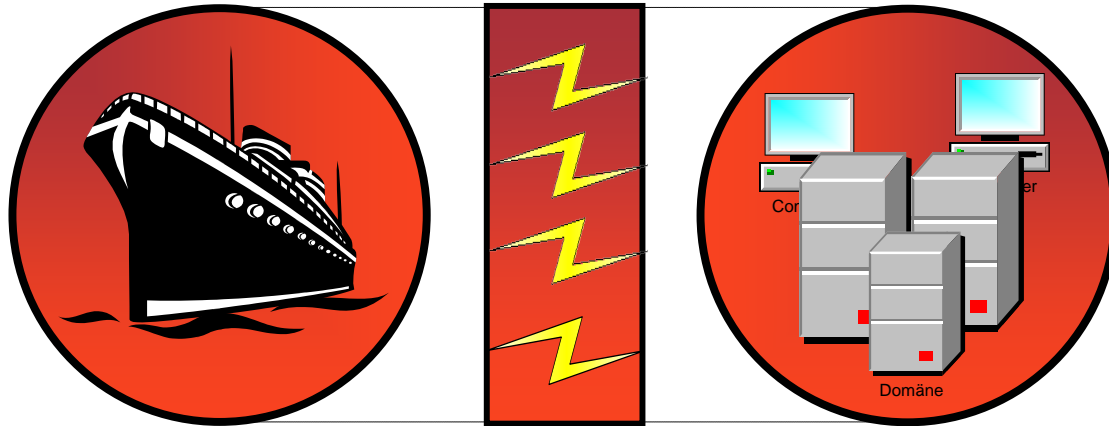


The three sided coin.....

A generic visualization of the e-nav architecture



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“harmonized collection,
integration, exchange,
presentation and analysis
of maritime information

onboard”

“harmonized collection,
integration, exchange,
presentation and analysis
of maritime information

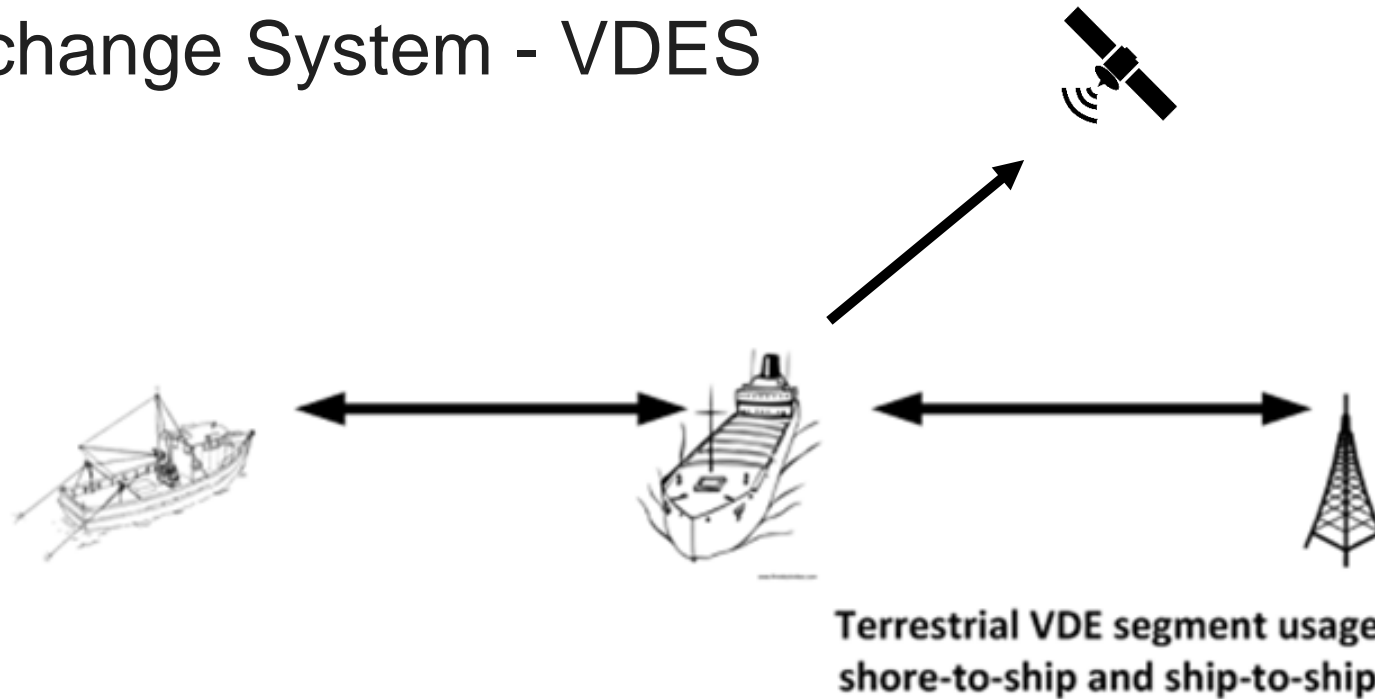
ashore”

AIS experience challenges at some locations in the world due to heavy traffic

Further, the e-Navigation concept identified new services with communication requirements

In order to solve this congestion, preserving the AIS main task and to arrange for new data services between shore and ships, more bandwidth is needed for data communication
→ introduction of VDES

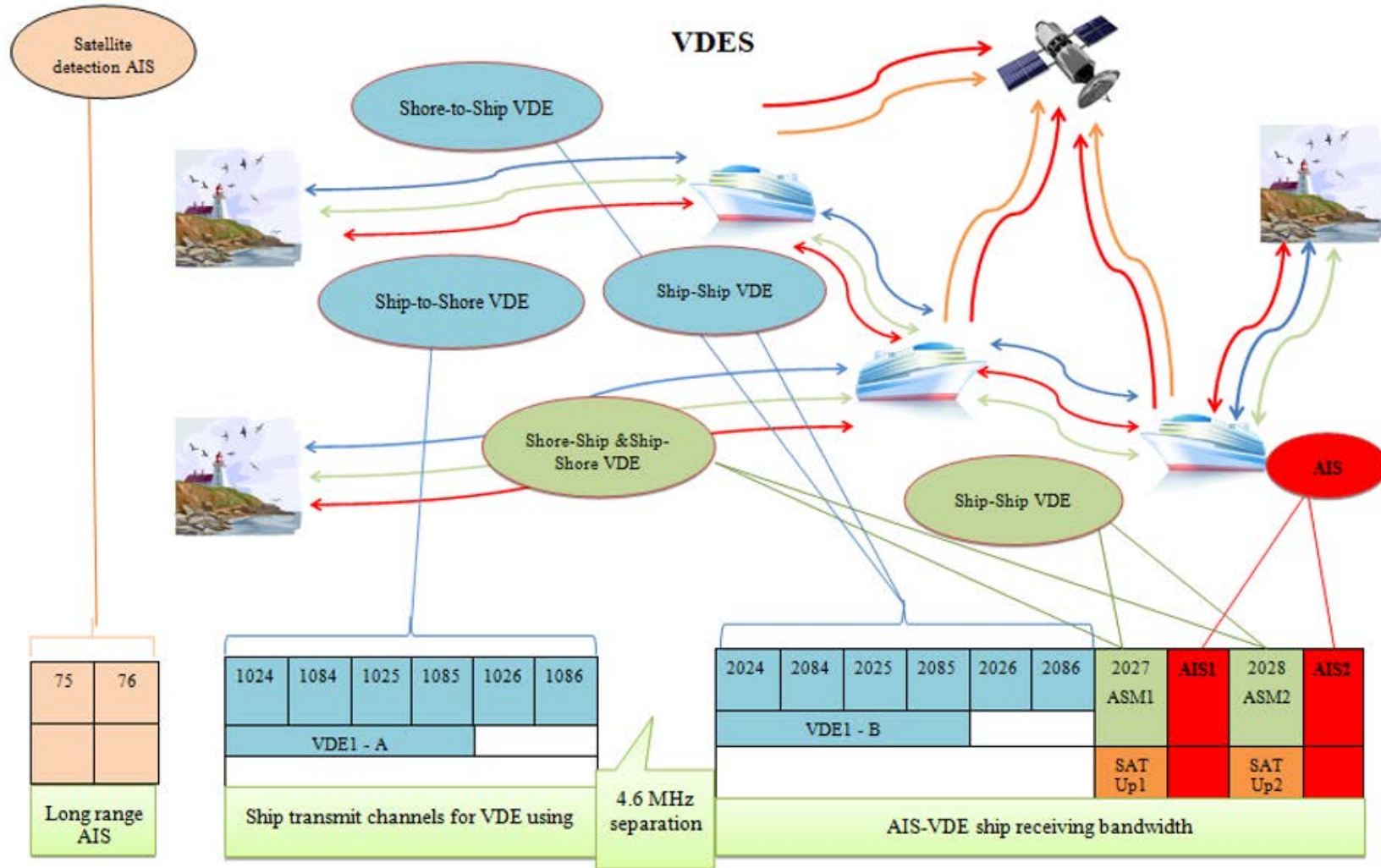
VHF Data Exchange System - VDES



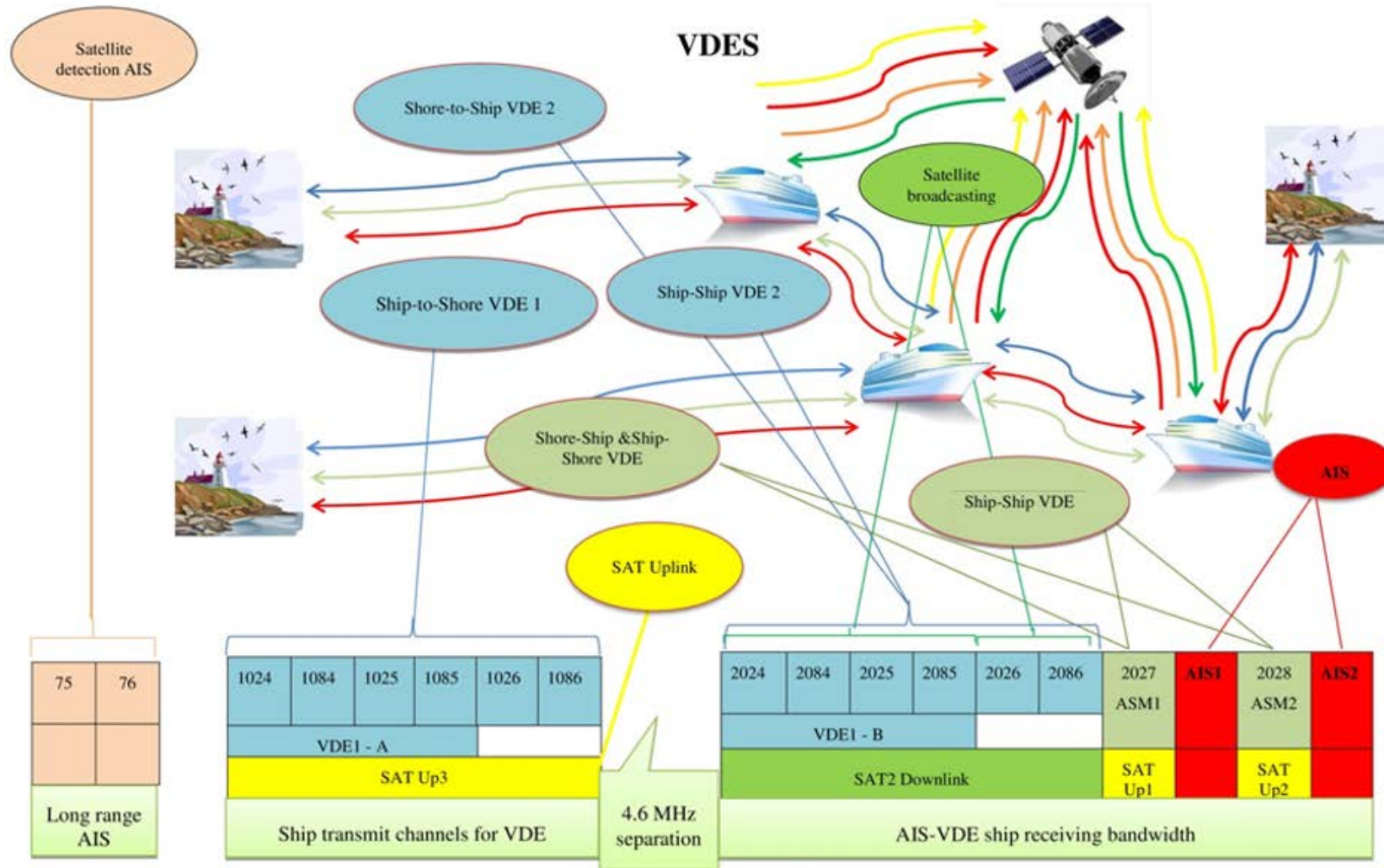
The VDE system covers the following;

1. Standard AIS channels, Ch. 1 and 2 (RX/TX) |
2. ASM - Application Specific Messages, binary and text messages, which is a part of the present AIS system (RX/TX)
3. VDE terrestrial – Four 25kHz channels merged together in a 100kHz channel in order to facilitate a seamless data exchange beyond the capabilities of ASM (RX/TX)
4. SAT AIS - Transmission of position message (msg27) on Ch. 3 and 4 (TX).
5. VDE Satellite – Provide data exchange between ships and shore via satellite. Enables global coverage. VDE SAT should complement VDE Terrestrial when outside coastal coverage (RX/TX).

VDES elements agreed at WRC-15



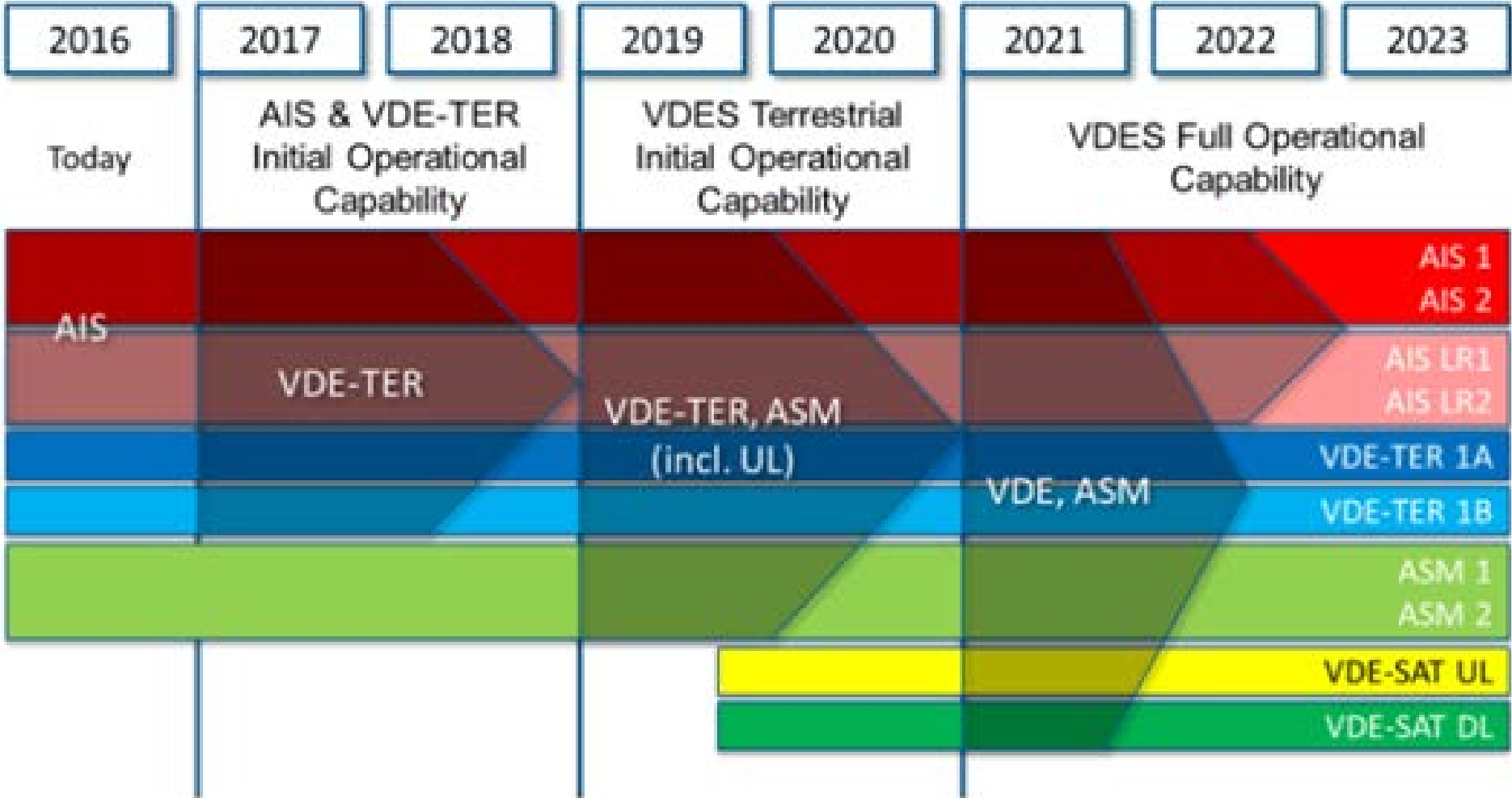
Full VDES capability





Implementation plan

ref. draft IALA Guideline VDES (technical)



Application Specific Message (ASM)

TABLE A2-1

Minimum required time division multiple access transmitter characteristics

Parameter name	Units	Low setting	High setting
Channel spacing (encoded according to RR Appendix 18 with footnotes) ⁽¹⁾	kHz	25	25
ASM 1 (2027) ⁽¹⁾	MHz	161.950	161.950
ASM 2 (2028) ⁽¹⁾	MHz	162.000	162.000
Transmit output power	W	1	12.5

⁽¹⁾ See Recommendation ITU-R M.1084, Annex 4.

- Modulation GMSK until 1st of January 2019 (9,6 kbit/s)
- Modulation $\pi/4$ QPSK after 1st of January 2019 (19,2 kbit/s)

Terrestrial VHF Data Exchange (VDE)

Terrestrial VDE			
Channel	Units	Frq	Frq
1024/2024	MHz	157.200	161.800
1084/2084	MHz	157.225	161.825
1025/2025	MHz	157.250	161.850
1085/2085	MHz	157.275	161.875

TABLE A3-2

Modulation and coding schemes

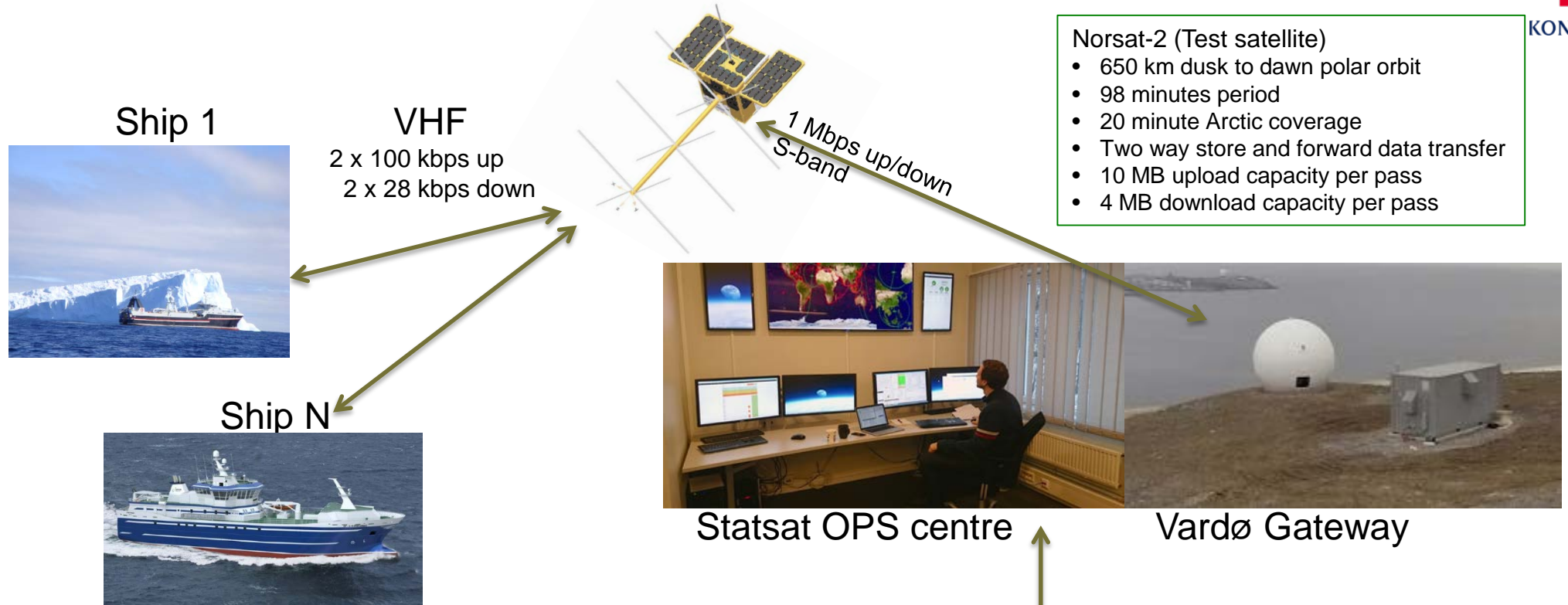
Modulation and coding scheme	Signal Information D_0, D_1, D_2, D_3 values	CQI value	Total throughput bitrate (kbits/s)* 25 kHz	Total throughput bitrate (kbits/s)** 50 kHz	Total throughput bitrate (kbits/s)*** 100 kHz
No transmission		0	–	–	–
MCS-1 ($\pi/4$ QPSK, CR = 1/2)	0, 0, 0, 1	1	38.4	76.8	153.6
MCS-2	0, 0, 1, 0	2	Placeholder for future MCS		
MCS-3 (8PSK, CR = 3/4)	0, 0, 1, 1	3	57.6	115.2	230.4
MCS-4	0, 1, 0, 0	4	Placeholder for future MCS		
MCS-5 (16QAM, CR = 3/4)	0, 1, 0, 1	5	76.8	153.6	307.2

- Transmitted output power 1 to max 25W for vessel, 12.5 to max 50W for shore
- Typical communication range for terrestrial VDE is 20-50 NM

Future Arctic VHF Data Exchange Satellite System



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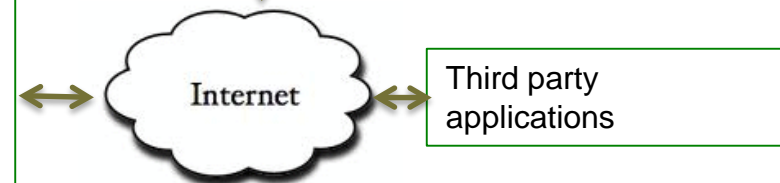


- Norsat-2 (Test satellite)**
- 650 km dusk to dawn polar orbit
 - 98 minutes period
 - 20 minute Arctic coverage
 - Two way store and forward data transfer
 - 10 MB upload capacity per pass
 - 4 MB download capacity per pass

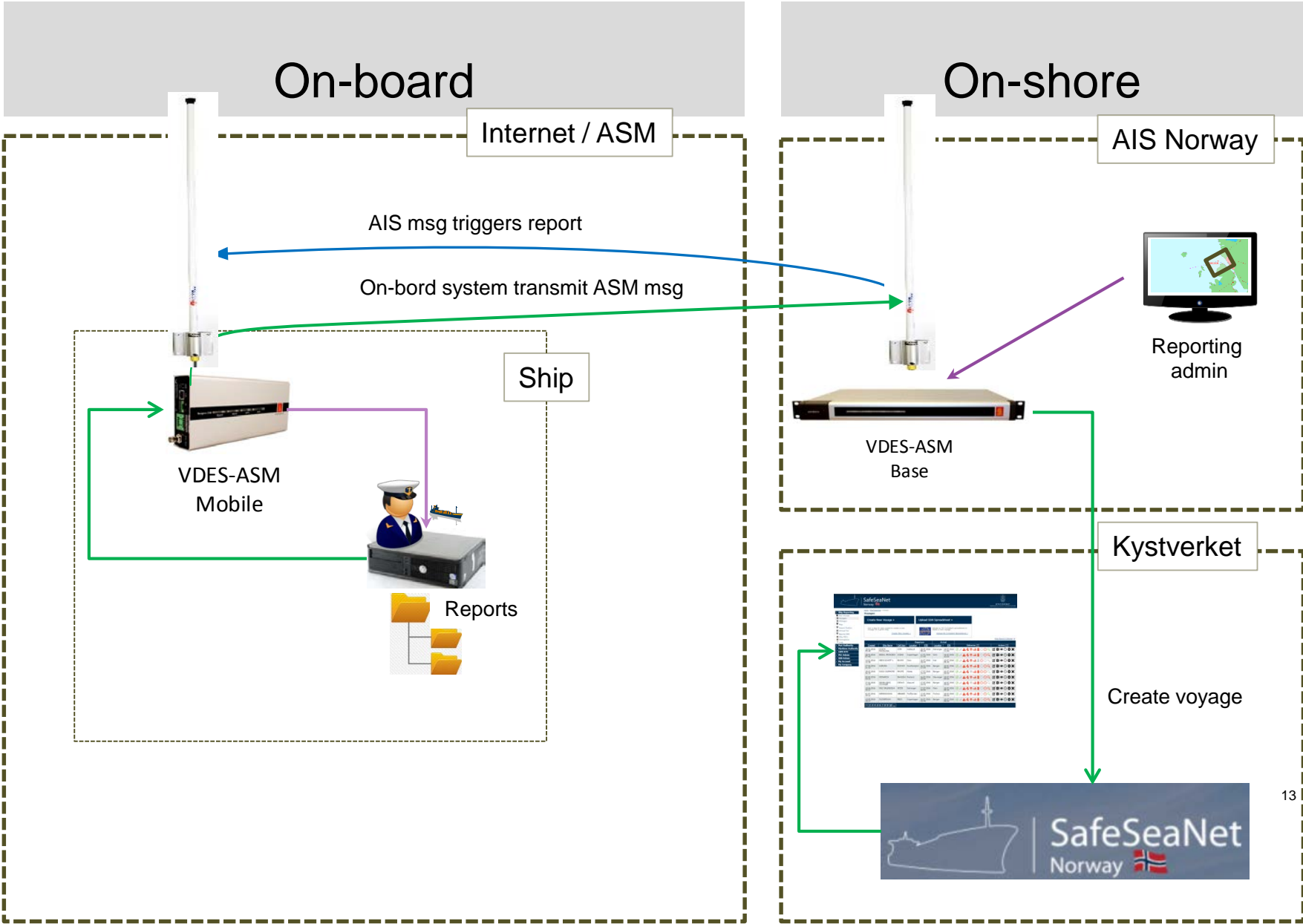
IMO eNav service portfolio

- VTS Information Service (IS)
- Navigational Assistance Service (NAS)
- Traffic Organisation Service (TOS)
- Local Port Service (LPS)
- Maritime Safety Information Service (MSI)
- Pilotage Service
- Tugs Service
- Vessel Shore Reporting

- Telemedicine Assistance Service (TMAS)
- Maritime Assistance Service (MAS)
- Nautical Chart Service
- Nautical Publications Service
- Ice Navigation Service
- Meteorological information Service
- Real time Hydrographic and Environmental info Service
- Search and Rescue Service (SAR)



Automatic Ship Reporting – Testbed SETUP -UPDATED

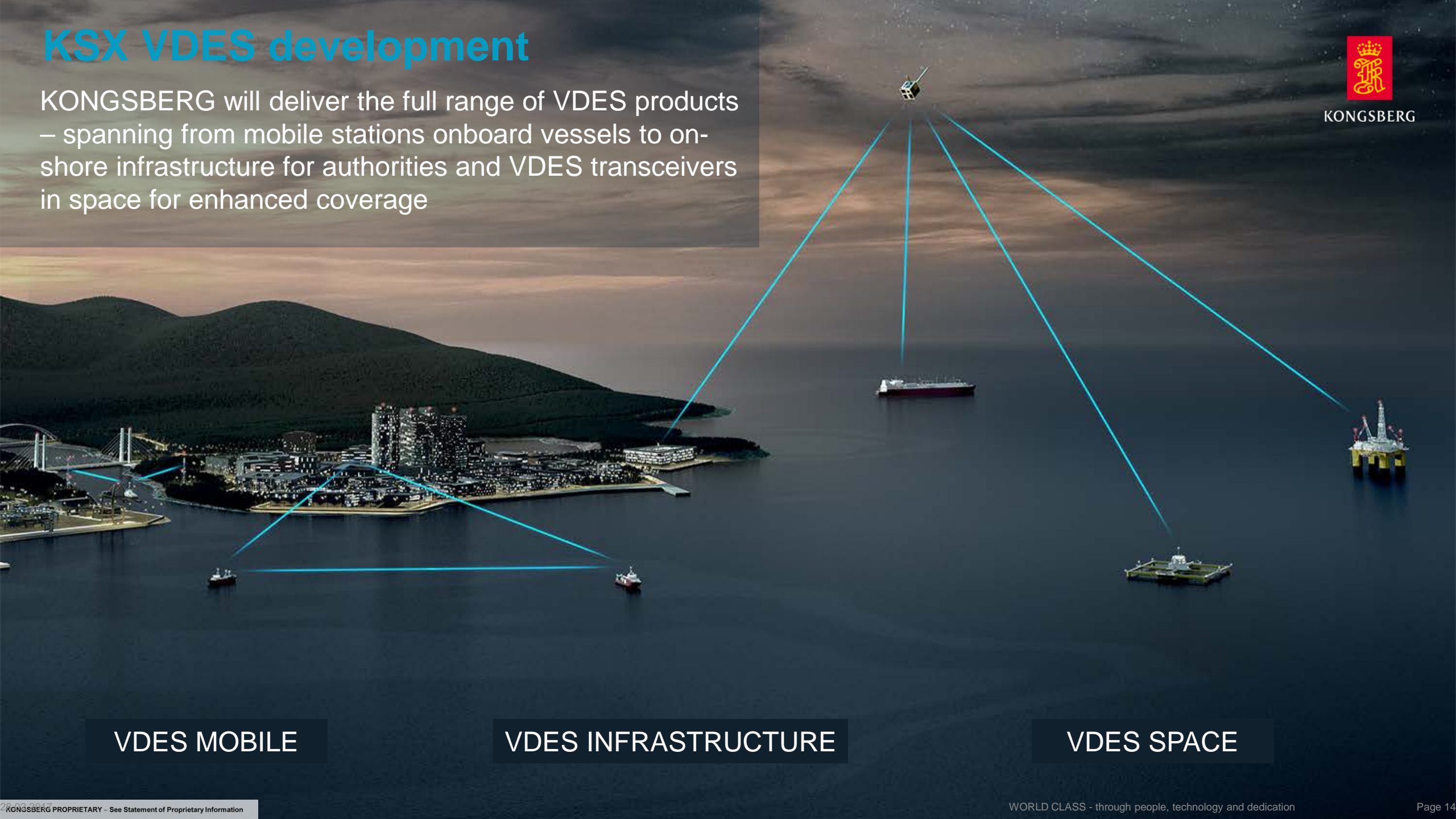


KSX VDES development

KONGSBERG will deliver the full range of VDES products – spanning from mobile stations onboard vessels to on-shore infrastructure for authorities and VDES transceivers in space for enhanced coverage



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VDES MOBILE

VDES INFRASTRUCTURE

VDES SPACE

PRESENTATION OVERVIEW



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VHF DATA EXCHANGE (VDES)

MARITIME BROADBAND RADIO (MBR)

MARITIME BROADBAND RADIO

The Revolution in Marine Interconnectivity



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PHASED ARRAY FOCUSED RADIO BEAM

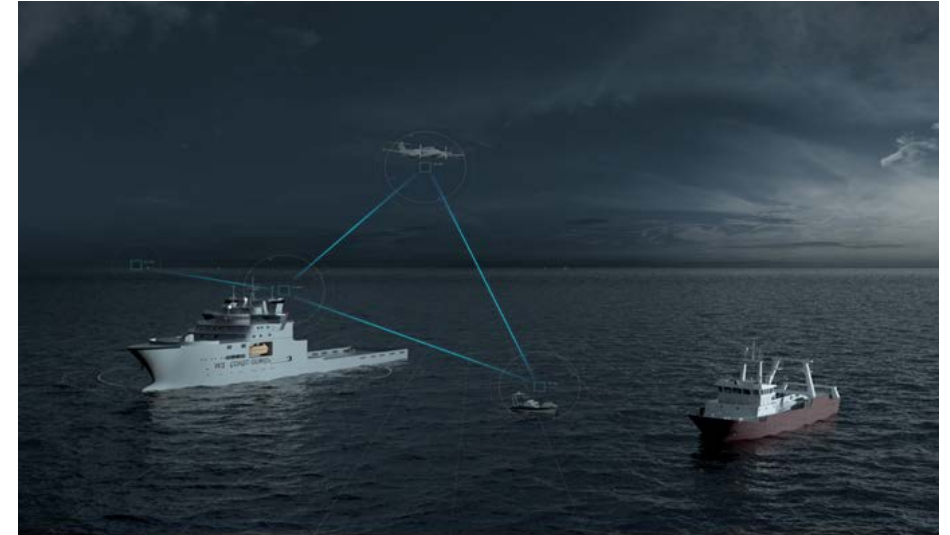


The need for more data communication capacity...



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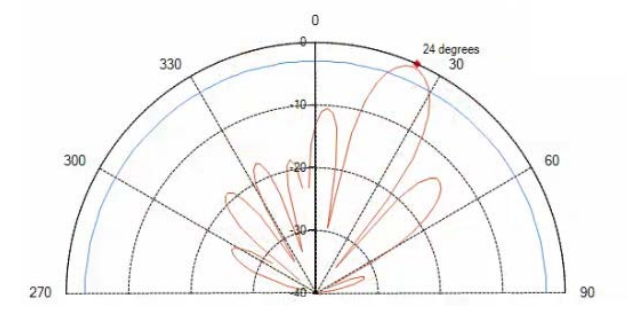
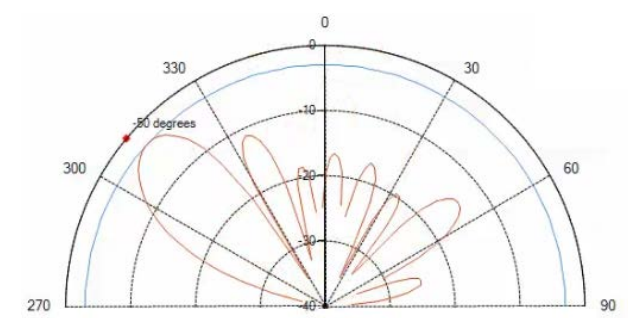
- VDES solves a lot in connection with e-navigation services
- Services and applications to be accomplished on VDES must be carefully designed with the limited capacity in mind
- Other safety critical and demanding operations will require more bandwidth, more robustness, more flexibility, higher level of security...





Beam forming by antenna arrays

- With a phased array antenna the radio beam can be shaped to increase gain in specific directions
- The beam can be focused instantaneously by software both for transmission and reception



Beam forming radiation patterns



Facts and numbers



IP- based data networking



15 Mbps Payload



Point to point and point to multipoint

Beyond Line-Of-Sight

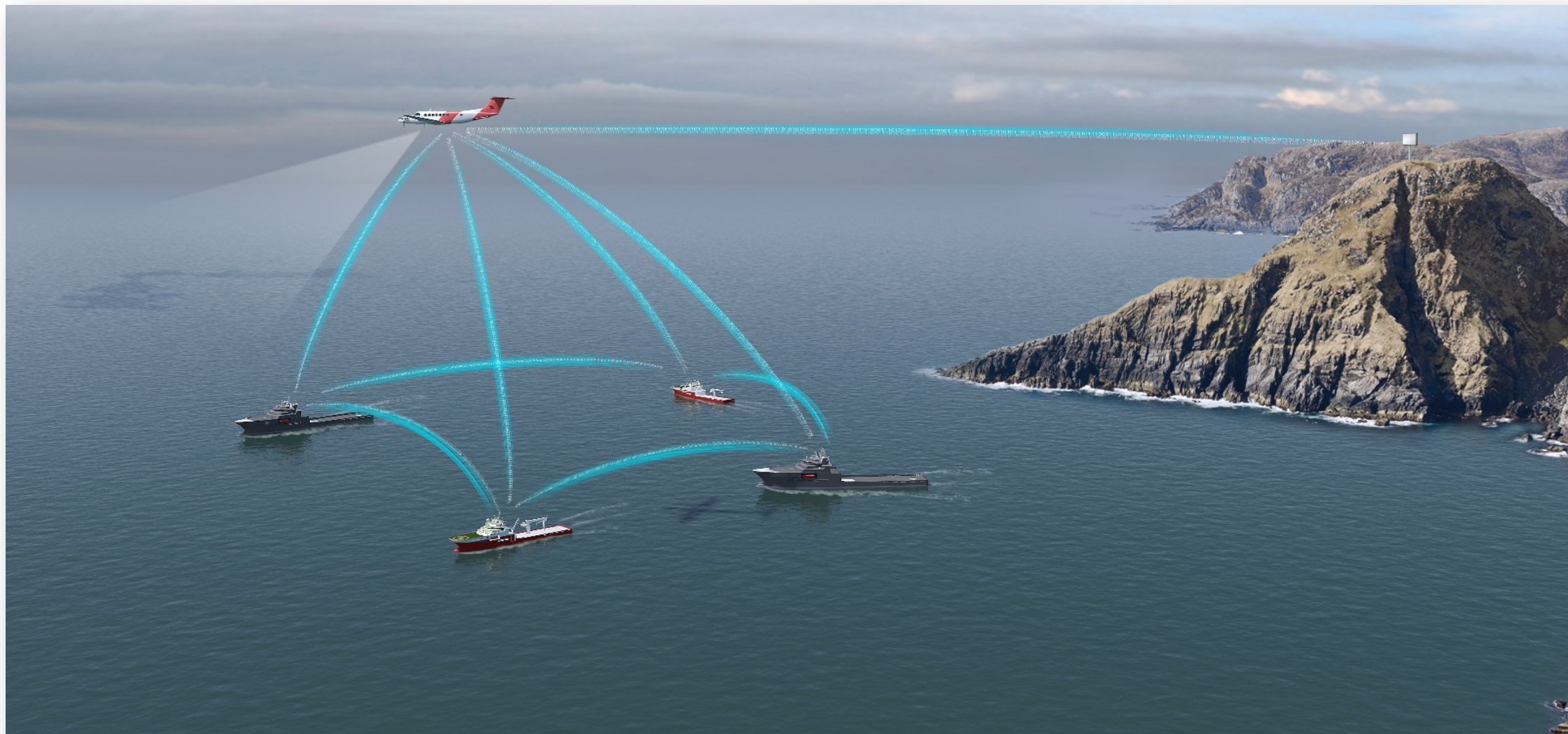


Deterministic Latency





Application example: Oil-spill detection and recovery

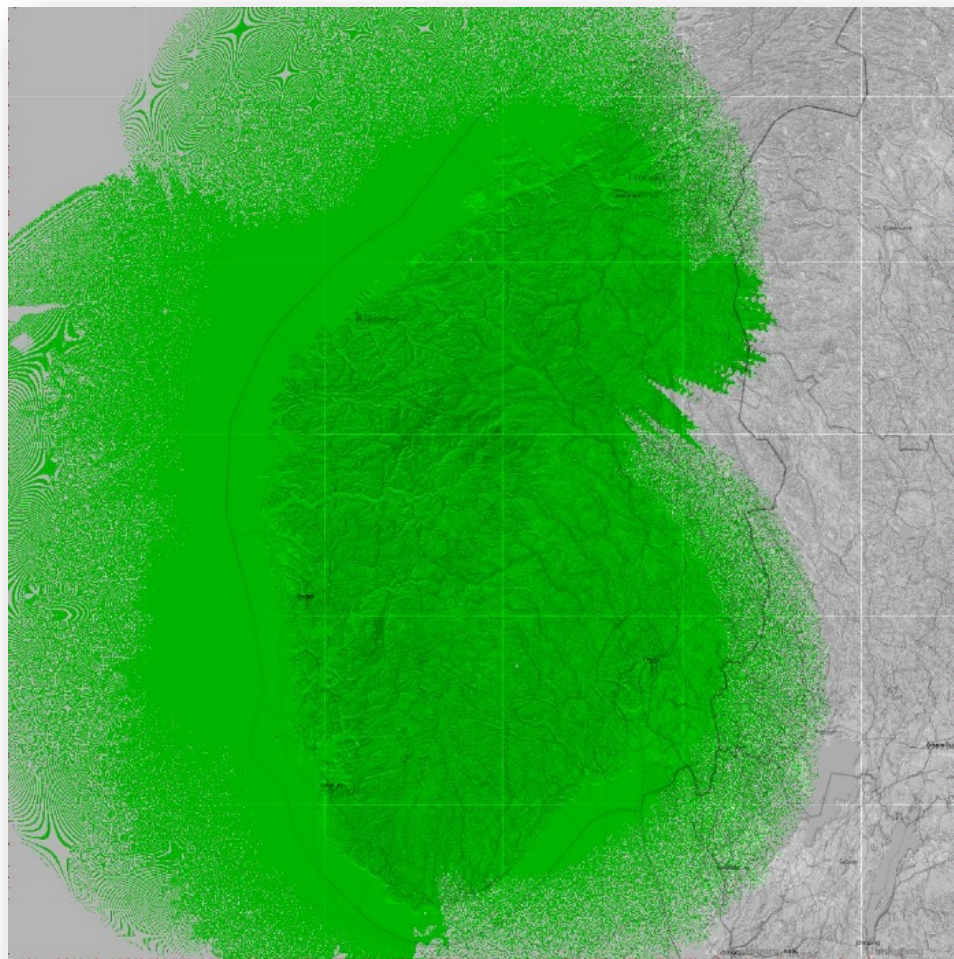




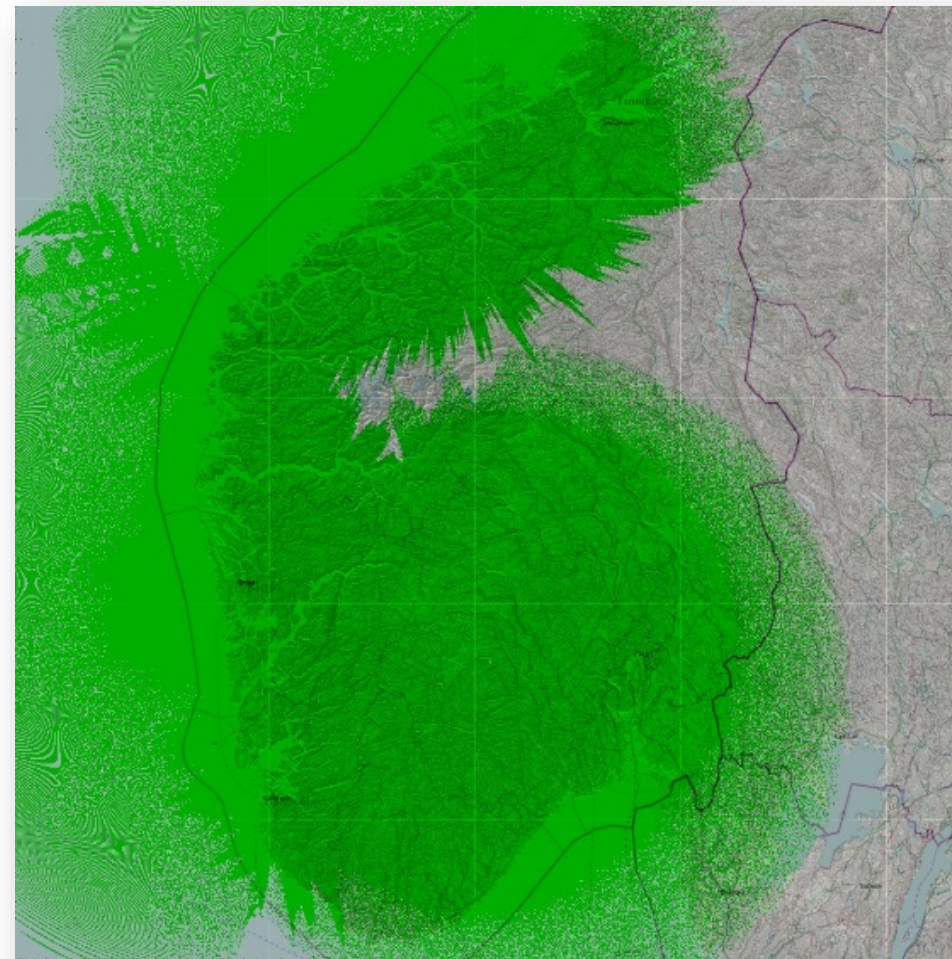
Ground installations, air to ground coverage



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Coverage at 15 000 feet AGL



Coverage at 4 000 feet AGL
(Standard mission altitude)



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Q & A

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