

VHF Data Exchange System (VDES)

Småsatellitt forum 2015

Frode Storesund, Kongsberg Seatex AS



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Kongsberg Seatex - key figures

Established: 1984

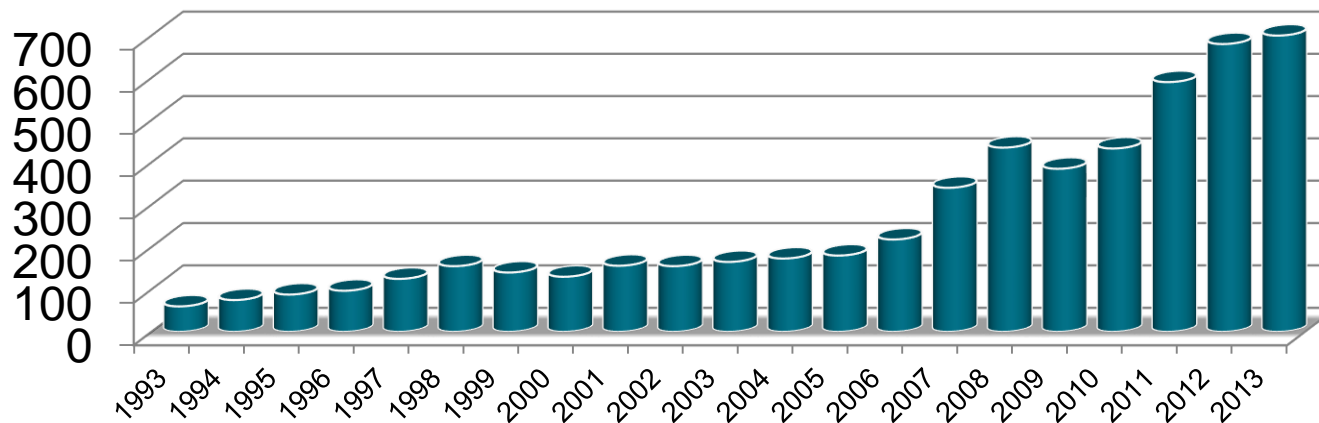
Main office: Trondheim, Norway

No. of employees: 115

Order Income 2012: 682 mill NOK

Export share: 80%

Order income (MNOK)



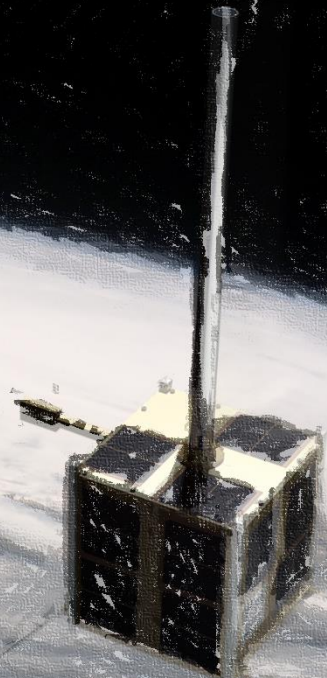
VDES

Sniktitt på AIS

AIS til VDES

VDES

eNavigation



KONGSBERG AIS products



AIS mobile stations



AIS portable units



AIS infrastructure



AIS for military and blue force users



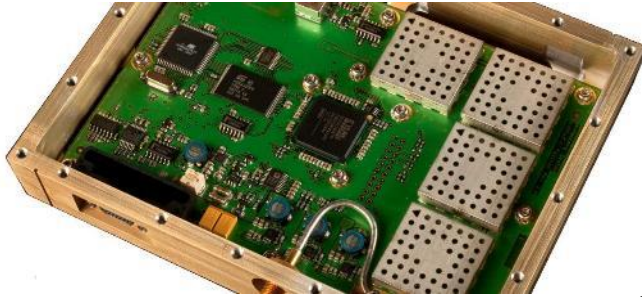
AIS space receivers





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1st gen space

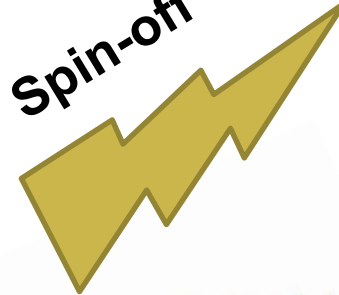
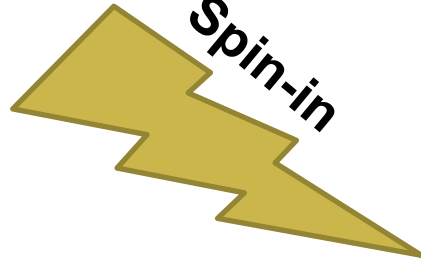
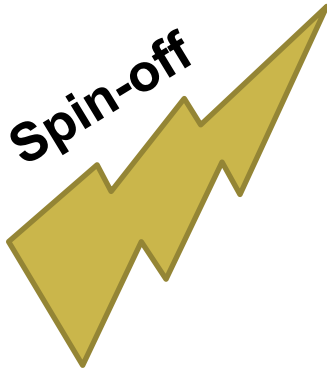


3rd gen space

Spin-off

Spin-in

Spin-off



2nd gen terrestrial

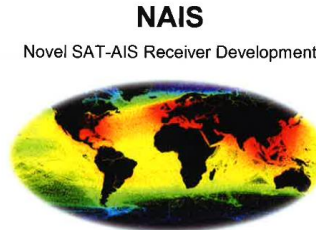
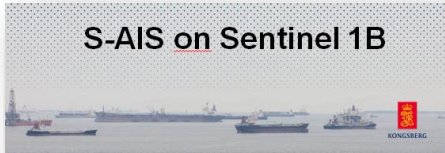
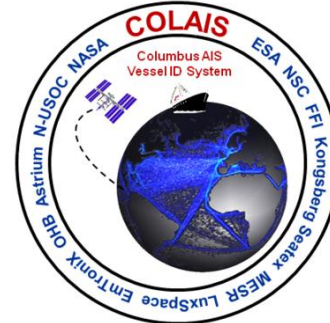


3rd gen terrestrial



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Selection of SAT-AIS activities



SAT-AIS φ B1

SMRS

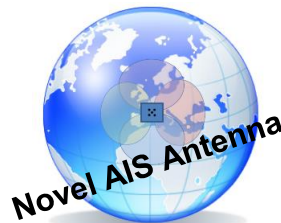


TRP



ESPAIS

European SPACE based AIS





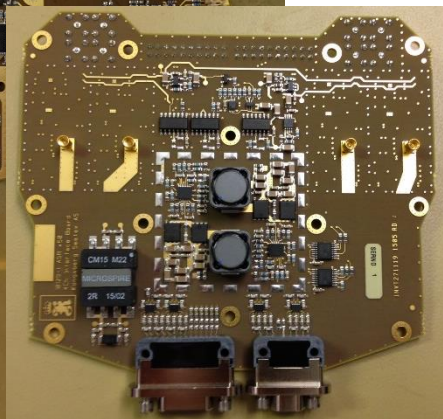
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NORSAT-1

ASR X50

4th generation SAT-AIS receiver

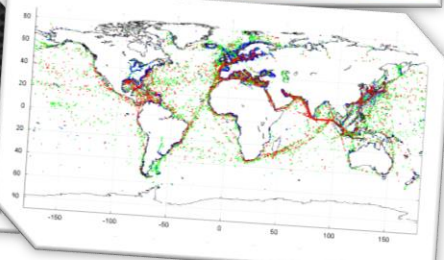
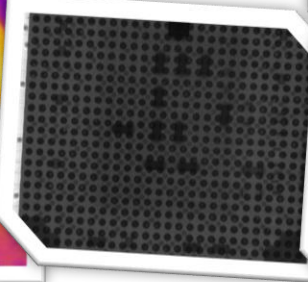
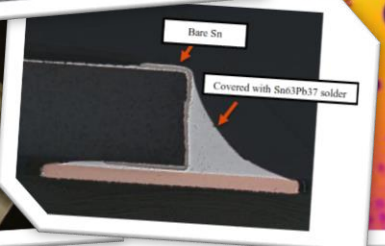
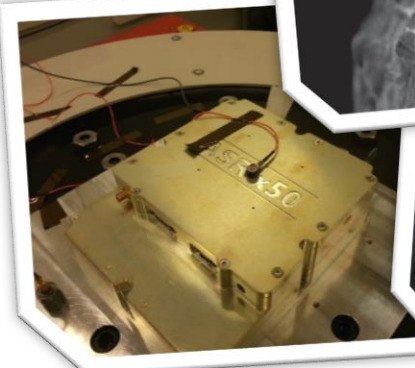
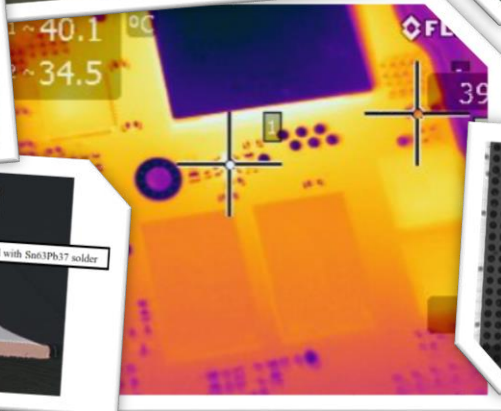
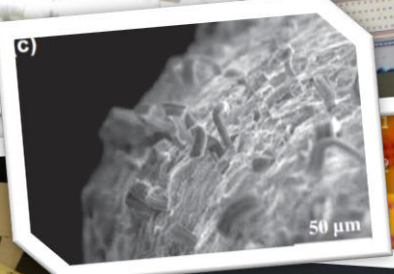
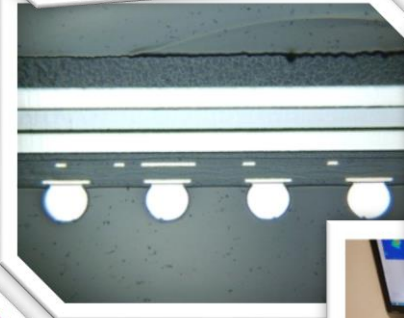
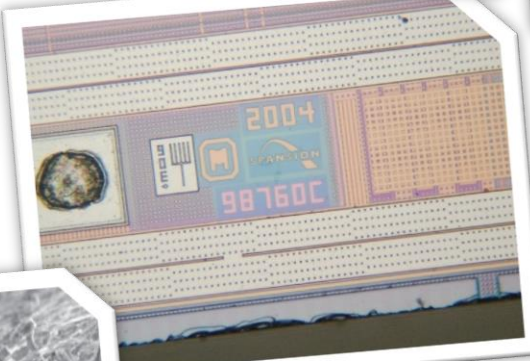
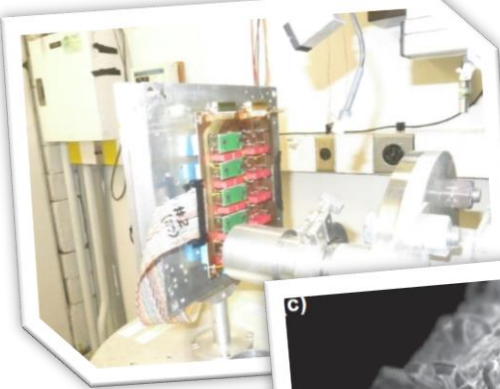
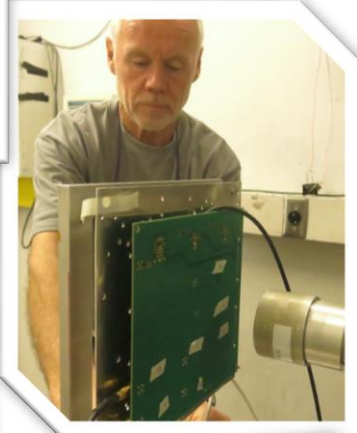
eXtended lifetime



Going the extra mile...



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ASR x50

Model philosophy

- Breadboards
- Elegant Breadboards
- Engineering Model
- Pilot Models
- EEE Parts Models
- Soldering Models
- Radiation Models
- Qualification Model
- Flight Models



Rapid iterations – Learning by testing



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ASR X50 Pilot Model

10 times as sensitive as AISat-1
Tolerate 10000 times stronger signals
Giant leap in vessel detection
7+ years design lifetime
Fully radiation hardened
Space qualified EEE Parts and Processes
Reliability with <250 FIT
Fully reconfigurable
Utilises only 35% of all DSP resources

Still smallsat initiative??



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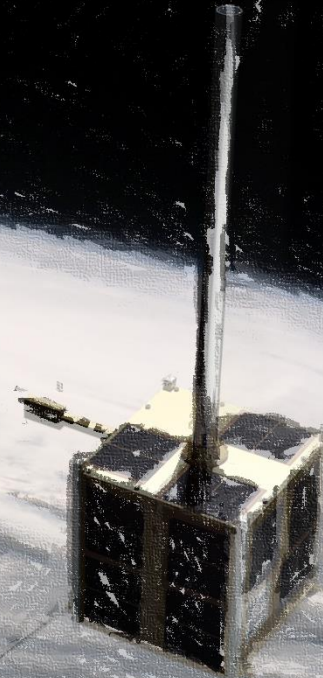
VDES

Sniktitt på AIS

AIS til VDES

VDES

eNavigation



AIS

Automatic Identification System

More than **100,000** vessels
might **collide** this very moment




Image Credit: Port of Singapore



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AIS **What are those** **ship doing?**



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VDES

**Seamless IMO
initiated digital data
communication**



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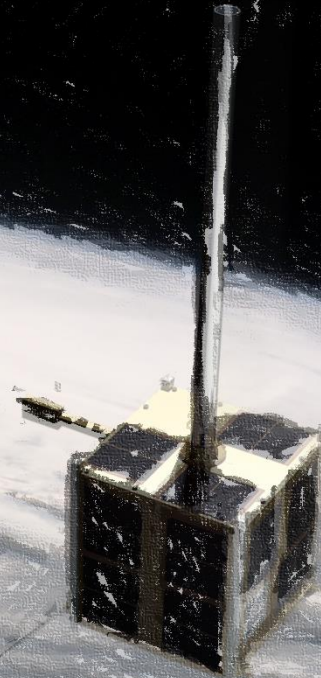
VDES

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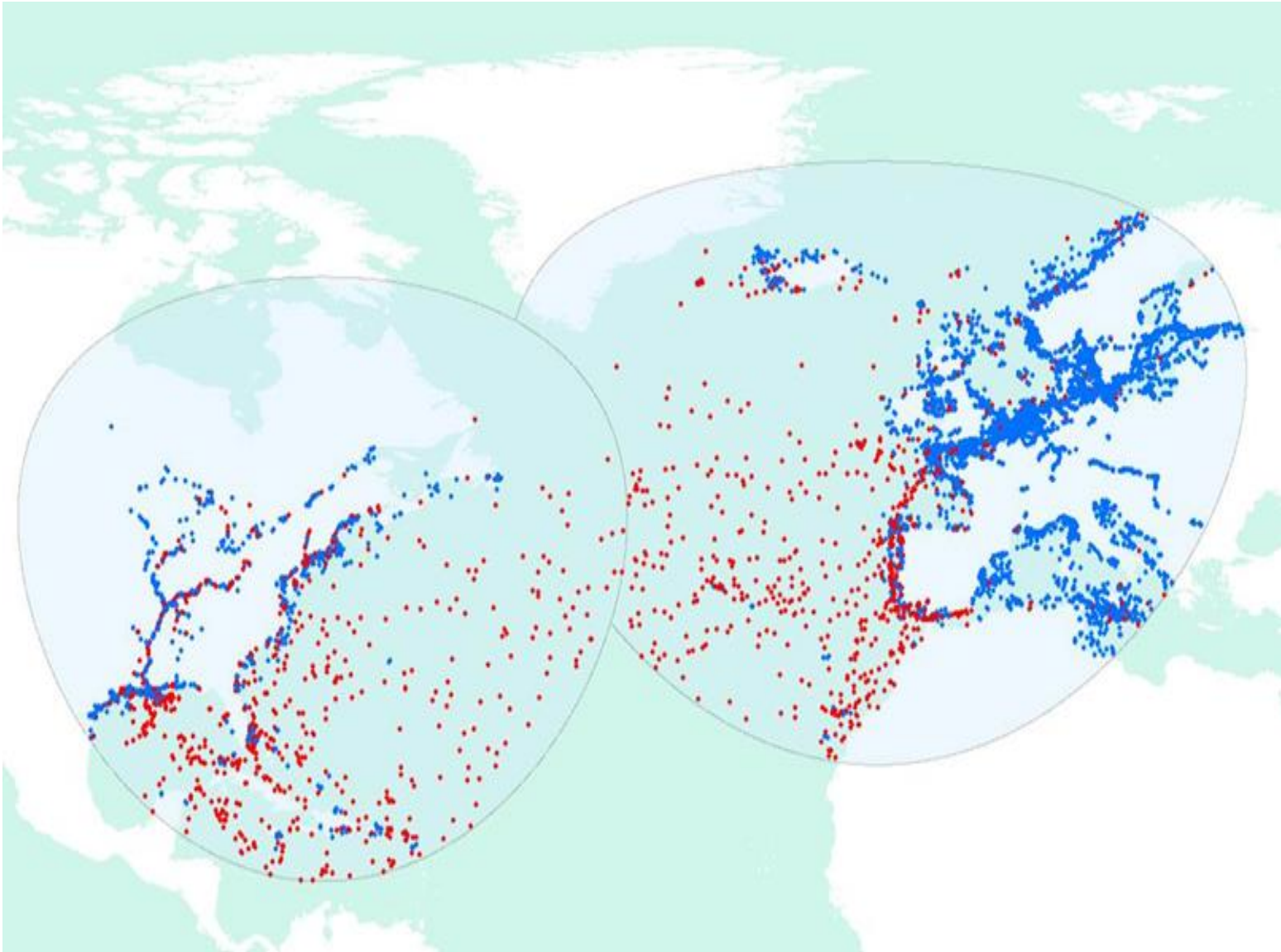




Hva er VDES

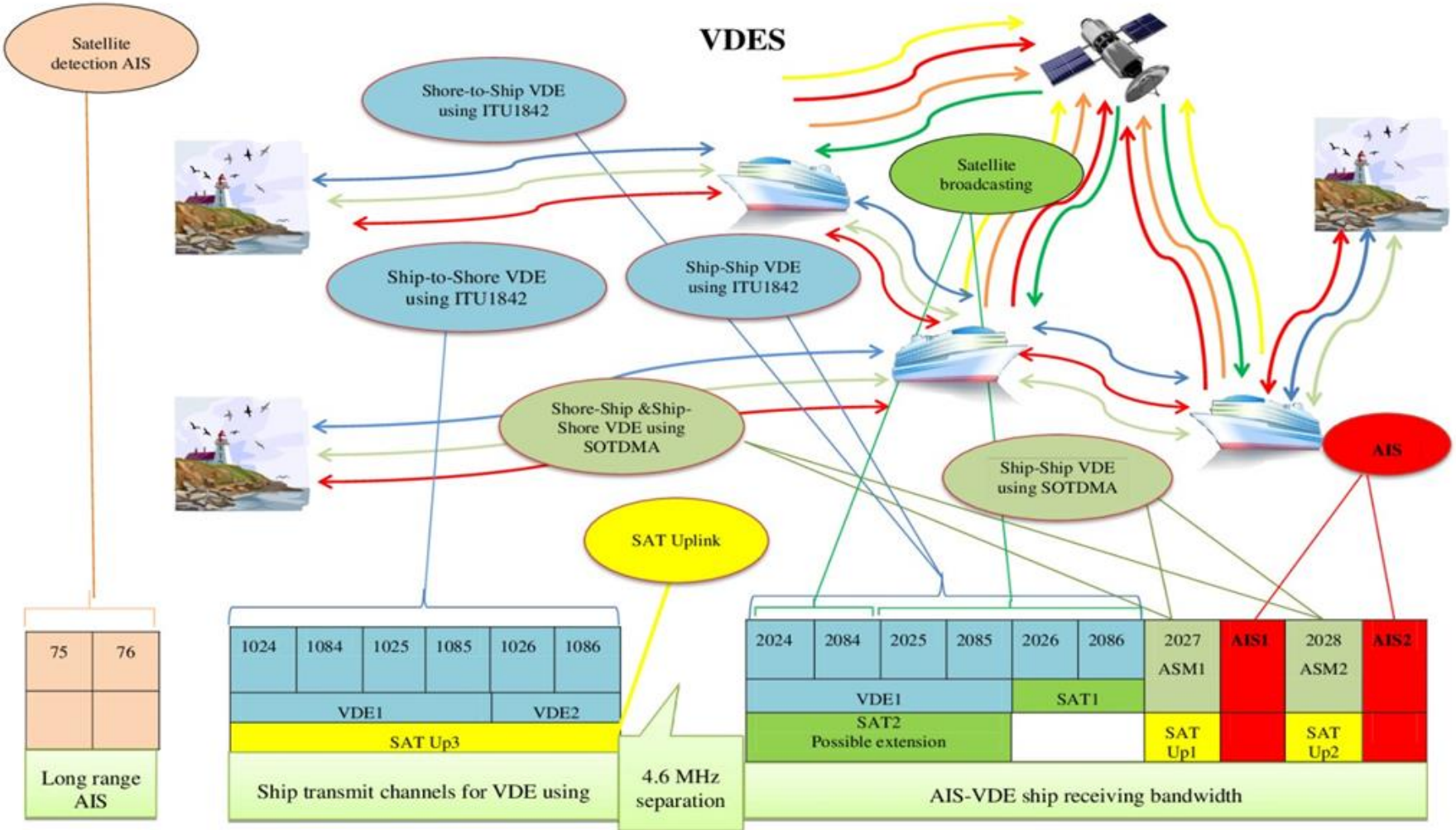
...forbedret AIS?

- VDES – VHF Data Exchange System
 - Inkluderer:
 - AIS (Automatic Identification System)
 - ASM (Application Specific Messages)
 - VDE (VHF Data Exchange)
 - Systemet skal utformes på en slik måte at det ikke degraderer AIS (Safety of Navigation), men tvert i mot skjærme AIS kanalene for annen trafikk
 - Primærfunksjonene til AIS som er antikollisjon og tracking skal gå som vanlig på AIS 1 og AIS 2
 - Andre tradisjonelle «AIS tjenester» skal henvises til ASM kanalene
 - Tjenester med større krav til kapasitet / båndbredde skal gå på VDE





VDES og frekvensoversikt





Channel Plans under consideration

2 Channel Plans under consideration

2.1 Channel plan A

1084 157.225	1025 157.250	1085 157.275	1026 157.300	1086 157.325
VDE1				
SAT up3				

2024 161.800	2084 161.825	2025 161.850	2085 161.875	2026 161.900	2086 161.925	2027 161.950	AIS1 161.975	2028 162.000	AIS2 162.025
VDE1						ASM1		ASM2	
SAT Downlink						SAT up1	AIS1 uplink	SAT up2	AIS2 uplink



Plan B

2.2 Channel plan B

1084 157.225	1025 157.250	1085 157.275	1026 157.300	1086 157.325	2024 161.800	2084 161.825	2025 161.850	2085 161.875	2026 161.900	2086 161.925	2027 161.950	AIS1 161.975	2028 162.000	AIS2 162.025
VDE1					VDE1			Innovative Applications	ASM1		ASM2			
SAT up3 extension		SAT up3			SAT Downlink				SAT up1	AIS1 uplink	SAT up2	AIS2 uplink		



2.3 Channel plan C

1024	1084	1025	1085	1026	1086
157.200	157.225	157.250	157.270	157.300	157.325
SAT3 uplink		VDE-simplex			

4.6 MHz

2024	2084	2025	2085	2026	2086	2027	AIS 1	2028	AIS 2
161.800	161.825	161.850	161.875	161.900	161.925	161.950	161.975	162.000	162.025
SAT downlink						ASM1	Collision avoidance	ASM2	Collision avoidance
						SAT1 uplink		SAT2 uplink	



PLAN D

1023 157.150	1083 157.175	1024 157.200	1084 157.225	1025 157.250	1085 157.275	1026 157.300	1086 157.325	1027 157.350	87 157.375	1028 157.400	88 157.425
Regional or national VDE				Global VDE1				Voice	Voice	Voice	Voice
Ship-shore				Ship-shore				Bidirectional	Bidirectional	Bidirectional	Bidirectional
		SAT up3									

2023 161.750	2083 161.775	2024 161.800	2084 161.825	2025 161.850	2085 161.875	2026 161.900	2086 161.925	2027 161.950	AIS1 161.975	2028 162.000	AIS2 162.025
Regional or national VDE				Global VDE1				ASM1	AIS1	ASM2	AIS2
Shore-ship and ship-ship				Shore-ship and ship-ship				Bidirectional	Bidirectional	Bidirectional	Bidirectional
		SAT Downlink						SAT up1	AIS up1	SAT up2	AIS up2

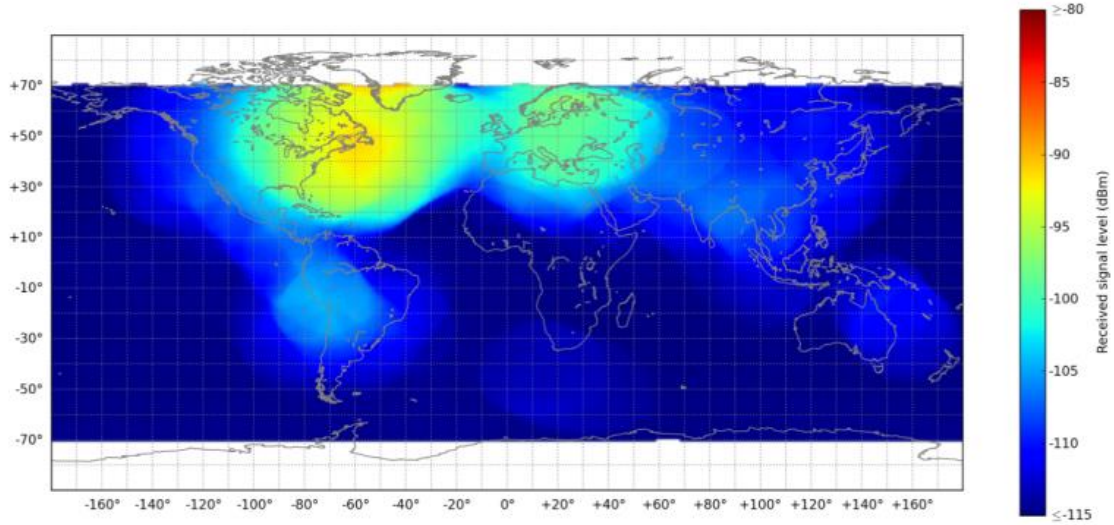


User Cases versus channel plan

No	Scenario	Priority distress	Priority Urgency	Priority Safety	Priority Routine	AIS / ASM	VDE	ship-ship	ship-shore (terr.)	Ship-shore (sat)	Shore-ship (Terr.)	Shore-ship (sat)	Channel plan A	Channel plan B	Channel plan C
1A	SAR communication (terrestrial)	x				x	x		x		x		Acceptable	Good	Poor
1B	SAR communication (satellite)	x				x	x			x		x	Good	Good	Good
2A	MSN / NM (T-&P-) (terr., small)		(x)	x		(x)	x				x		Good	Good	Poor
2B	MSN / NM (T-&P-) (terr., medium)		(x)	x			x				x		Good	Good	Poor
2C	MSN / NM (T-&P-) (sat., small)		(x)	x			x					x	Good	Good	Good
2D	MSN / NM (T-&P-) (sat., medium)		(x)	x			x					x	Fair	Fair	Acceptable
3A	Automated reporting (terr. Medium)				x		x		x				Good	Good	Good
3B	Automated reporting (terr. Large)				x		x		x				Good	Good	Good
3C	Automated reporting (sat Medium)				x		x			x			Acceptable	Acceptable	Acceptable
3D	Automated reporting (sat large)				x		x			x			Fair	Fair	Fair
4A	VTS services (small)			x		x	x		x		x		Good	Good	Poor
4B	VTS services (medium)			x		x	x		x		x		Good	Good	Poor
4C	VTS services (sat - small)			x			x					x	Good	Good	Good
4D	VTS services (sat - medium)			x			x					x	Acceptable	Acceptable	Good
5A	Download large publication (terr.)				x		x				x		Good	Good	Poor
5B	Download large publication (sat)				x		x					x	Fair	Acceptable	Good
6A	route exchange (ASM)			x		x		x					Good	Good	Good
6B	route exchange (VDE)			x			x	x					Good	Poor	Poor
Good	Channel plan supports use case well;														
Acceptable	Channel plan supports the use case with design considerations;														
Fair	Channel plan has limited support for the use case;														
Poor	Channel plan support may compromise use case;														



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Median signal level in empty timeslots experienced by the NORAIS Receiver on frequency 162.0 MHz on a 1° x 1° grid, integrated over 24.0 hours

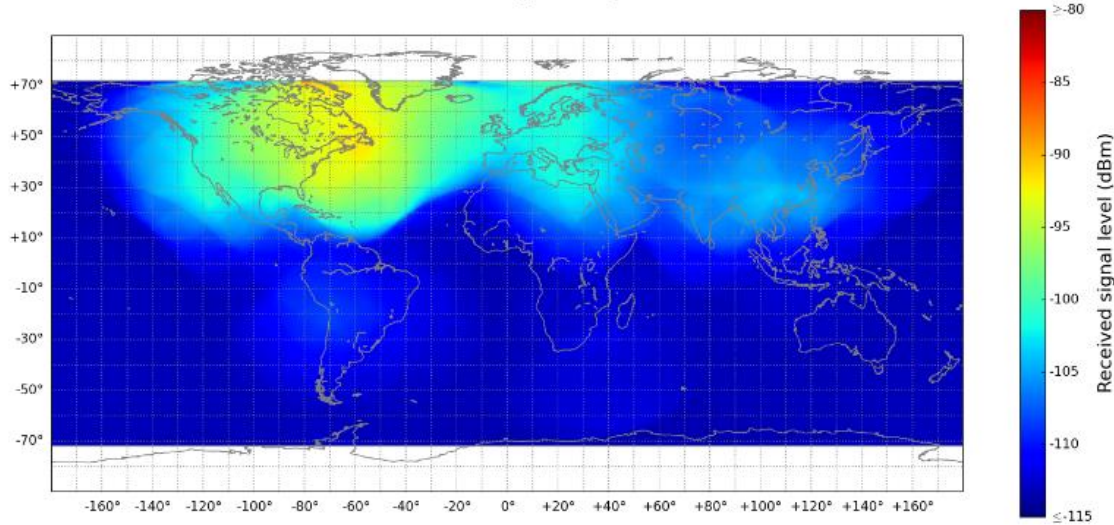
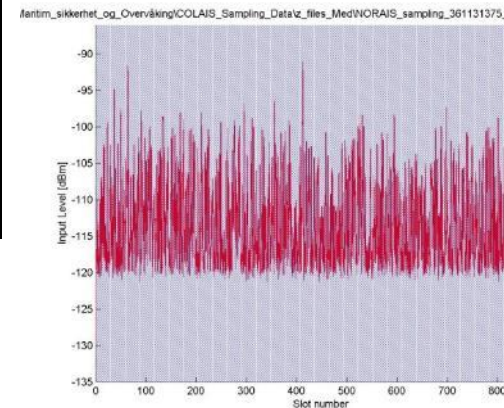
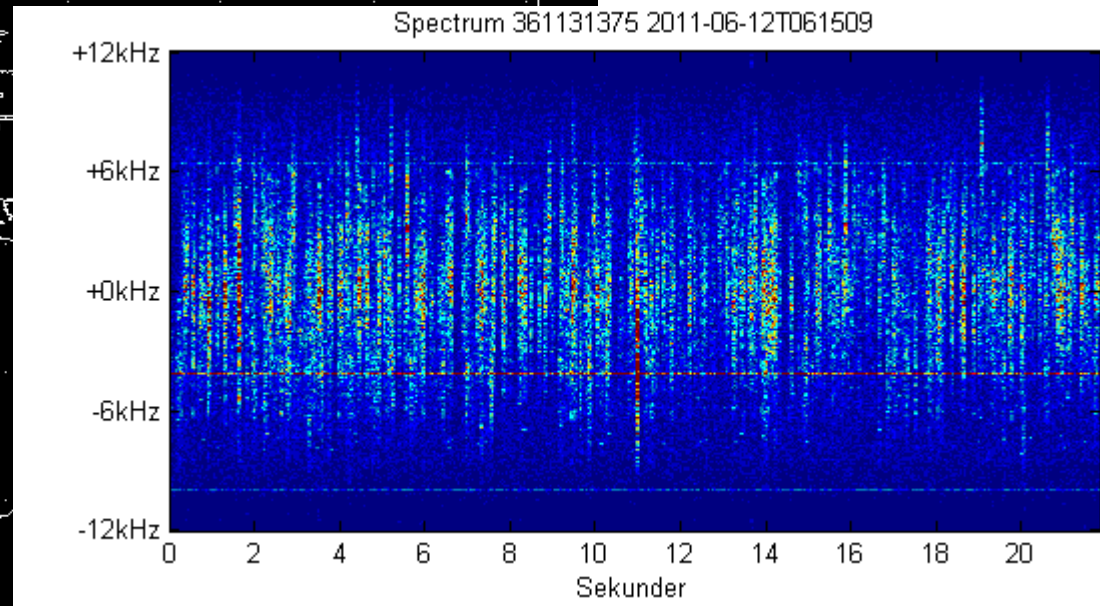
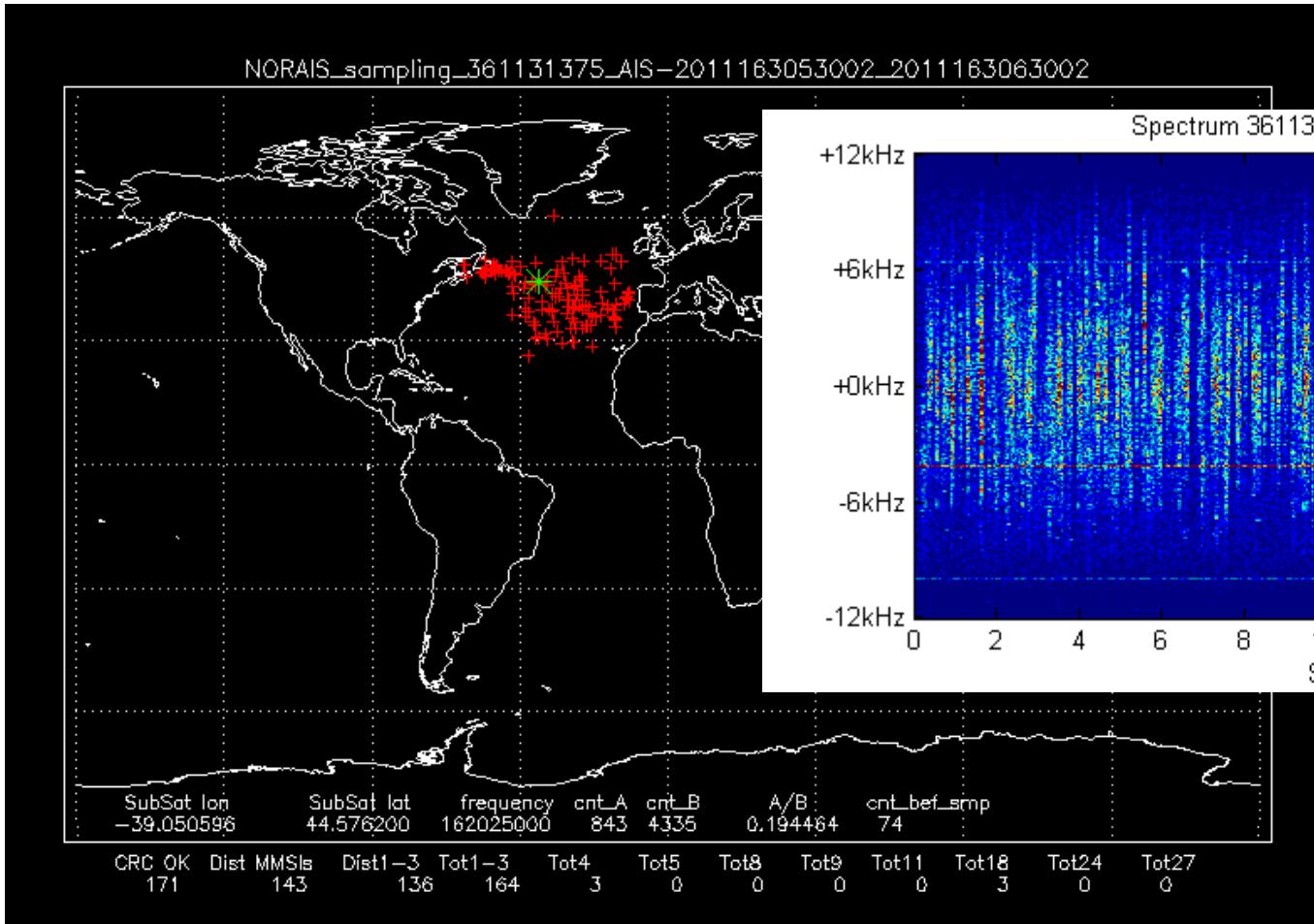


Figure 2. Measured signal level on 162.000 MHz in 2010 (top) and 2014 (bottom)

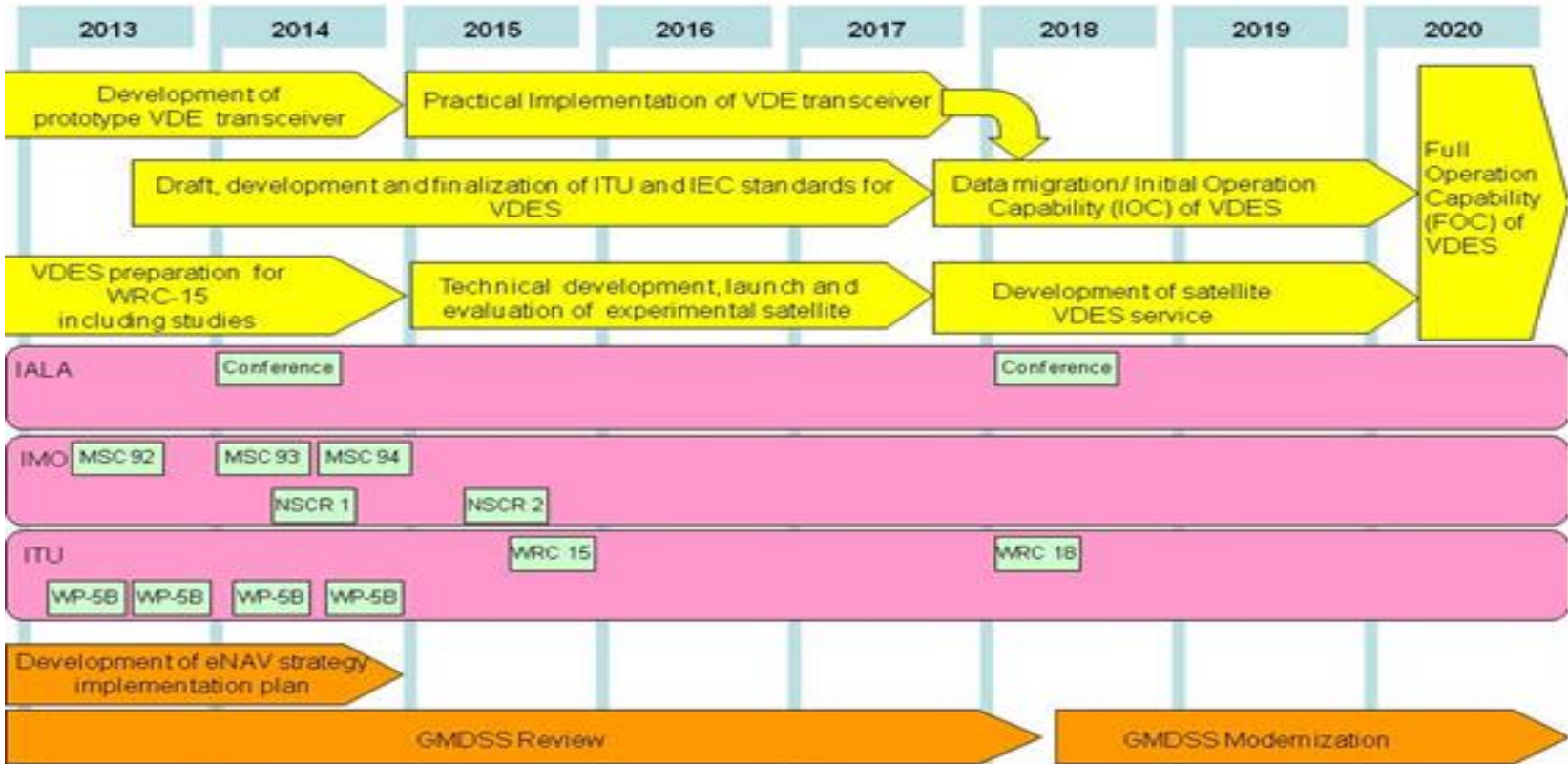


Medium density area





ROADMAP





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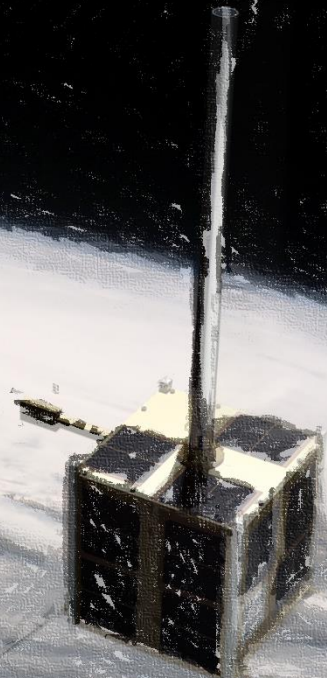
VDES

Sniktitt på AIS

AIS til VDES

VDES

eNavigation





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e-navigation

enhanced safety of navigation
and efficiency of shipping



KYSTVERKET
NORWEGIAN COASTAL ADMINISTRATION

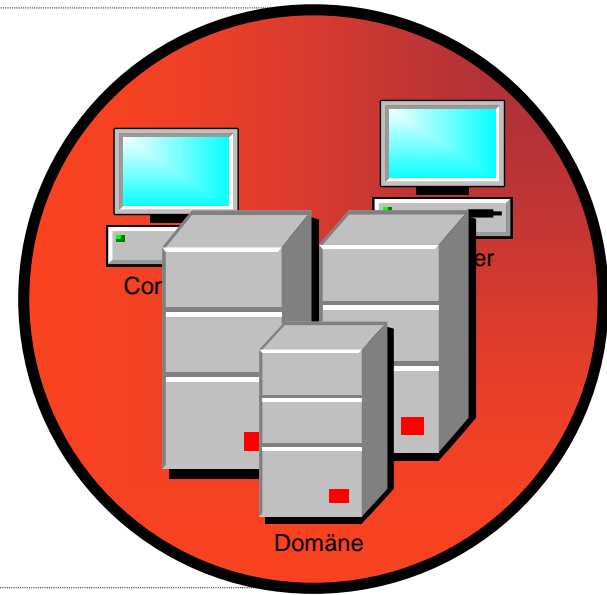
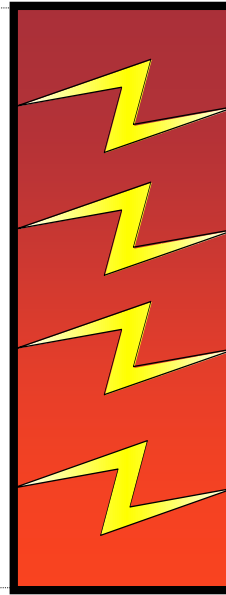
Tre sider av en mynt...

En generisk framstilling av eNav arkitektur



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

onboard”



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

ashore”

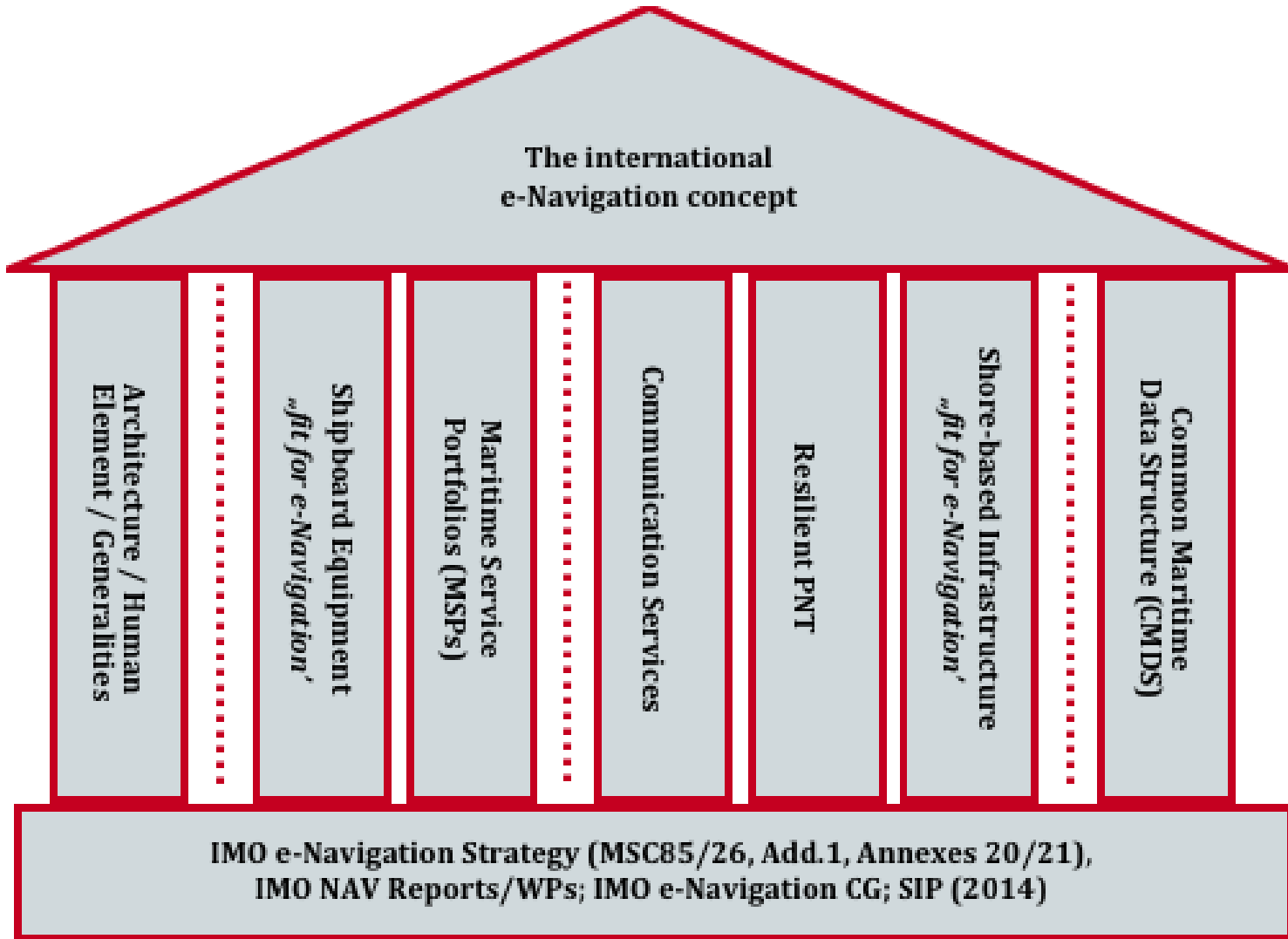


Bakgrunn og visjon

- IMO's visjon for e-navigation, IMO MSC85 (MSC 85-26-Add.1) bekrefter et behov for en kommunikasjonsinfrastruktur som tilrettelegger for sømløst/transparent informasjonsoverføring mellom skip, mellom skip og land / land og skip. Dvs. Navigatøren/operatøren bestemmer ikke det kommunikasjonssystem som benyttes, men setter kriteriene for valg av kommunikasjonsbærer, hvorpå dette velges automatisk. (Maritime Cloud – DMA)

e-navigation Strategy Implementation Plan (SIP)

- *S1: improved, harmonized and user friendly bridge design;*
 - *S2: means for standardized and automated reporting;*
 - *S3: improved reliability, resilience and integrity of bridge equipment and navigation information;*
 - *S4: integration and presentation of available information in graphical displays received via communications equipment; and*
 - *S9: improved communication of VTS Service Portfolio.*
-
- e-navigasjon er globalt og maritimt
 - Et system som er uten kostnad når det brukes



IALA og eNav

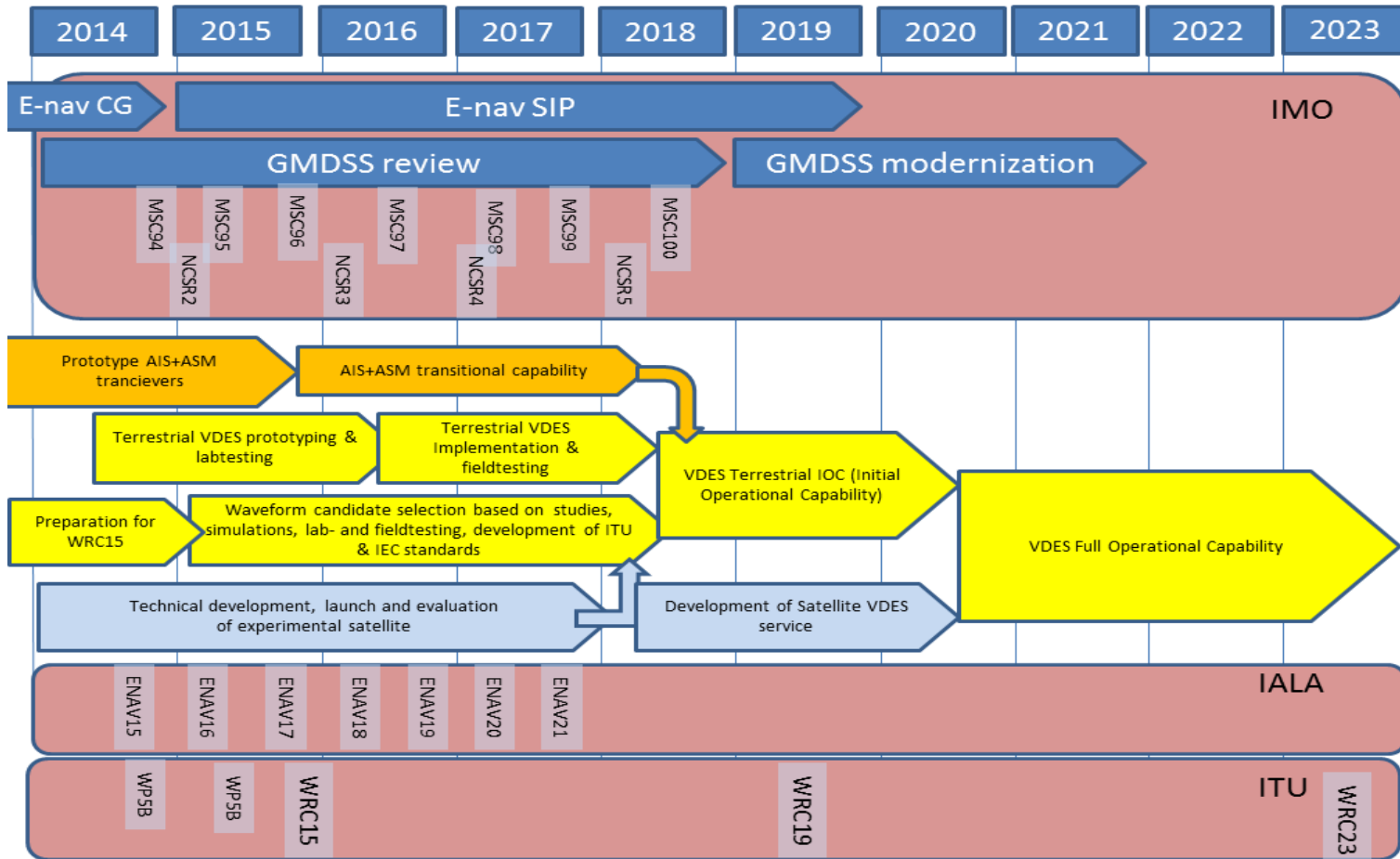
Kommunikasjon og AIS

- God relasjon med andre standardiseringsorganer som IEC og ITU
- Relevant erfaring
- Sentral rolle i eNav standardiseringen
 - PNT
 - **Kommunikasjon**
 - MSP/meldingsstruktur
 - Land infrastruktur
- IALA fokus: En løsning som bygger videre på AIS
→ **VDES**





Proposed VDES progress timeline



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