FDC

Terrestrial Broadband @ Sea

"We still have a long way to go"

Robert TREMLETT

MarCom

Research & Development	System & Equipment Suppliers	Industry and Authorities
ORIGO mobikom	telenor maritim radio	StatoilHydro
MARINTEK		KYSTVERKET
UNIVERSITY OF AGDER	NERA Nera Networks AS	NSB
ITS NORWAY	Teleplan	Statens vegvesen
Høgskolen i Telemark	EZEMBRA Infotainment Systems	Fjord1
SINTEF	SIS Star Information Systems AS	DCF
		KRISTIANSUND AND NORDMØRE HAVN THE CENTRAL PORT IN MID-NORWAY
NTNU Innovation and Creativity	MT Marine Technologies LLC	FOSEN TRAFIKKLAG
International partners:	Institute for Infocomm Research A*STAR; Politechnika Wrocławska	FDC; EU projects

Project information:

- Duration:
  2007-2010
  - Project Administrator:
    Mobikom
  - Project Manager:
    MARINTEK
- *25 partners*

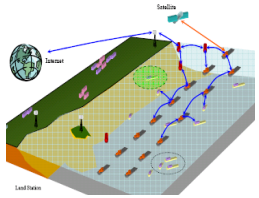
SEAMAX or WICAN What are they?

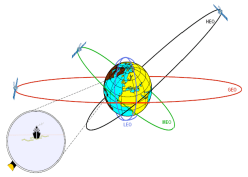
- SEAMAX - Concept for mesh networking at sea between vessels using broadband terrestrial omni directional communications to maximise.
  - Equality of information between all vessels
  - Range for dissemination of maritime safety and traffic information such as MSI
  - Range of detection of small vessels for Coast-Guard or Vessel traffic Services
  - Promulgation of VTS Traffic image to all vessels within the VTS area of coverage so ensuring they have the same information.
  - Provision of other services MSI / ENC updates ANSI etc when in range of gateway.
- WICAN - Concept of Wireless Coastal Network
- *Two complementary concepts, enhancement of safety of navigation & also providing ability for.*
  - *Monitoring of ATON's*
  - *Positioning of vessels in vicinity of suitably equipped ATON's??*

MarCom approach: Case orientation

User requirements and needs

Communication technologies





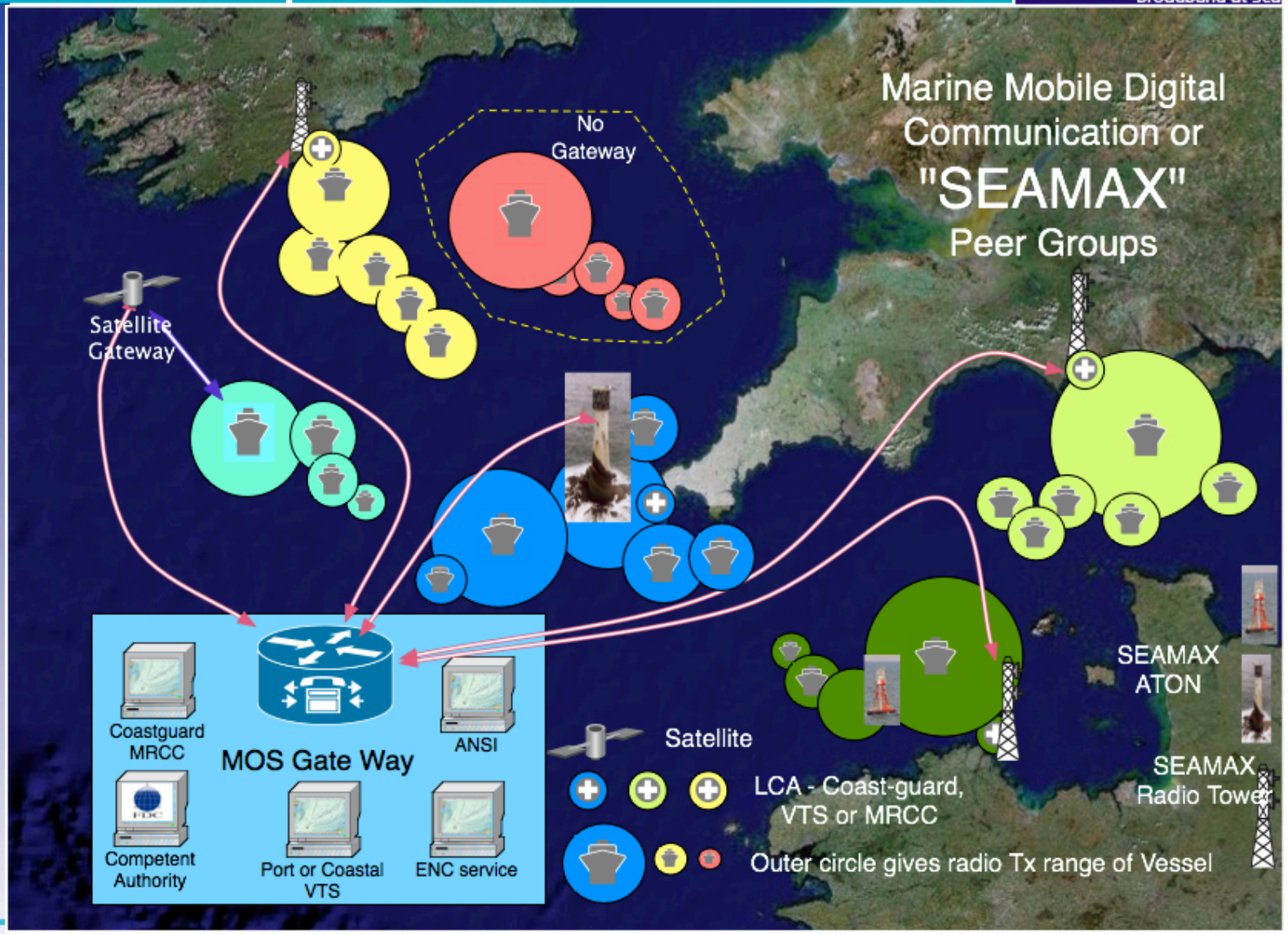
Requirements
Applications
Technologies
Demonstrations

Application areas

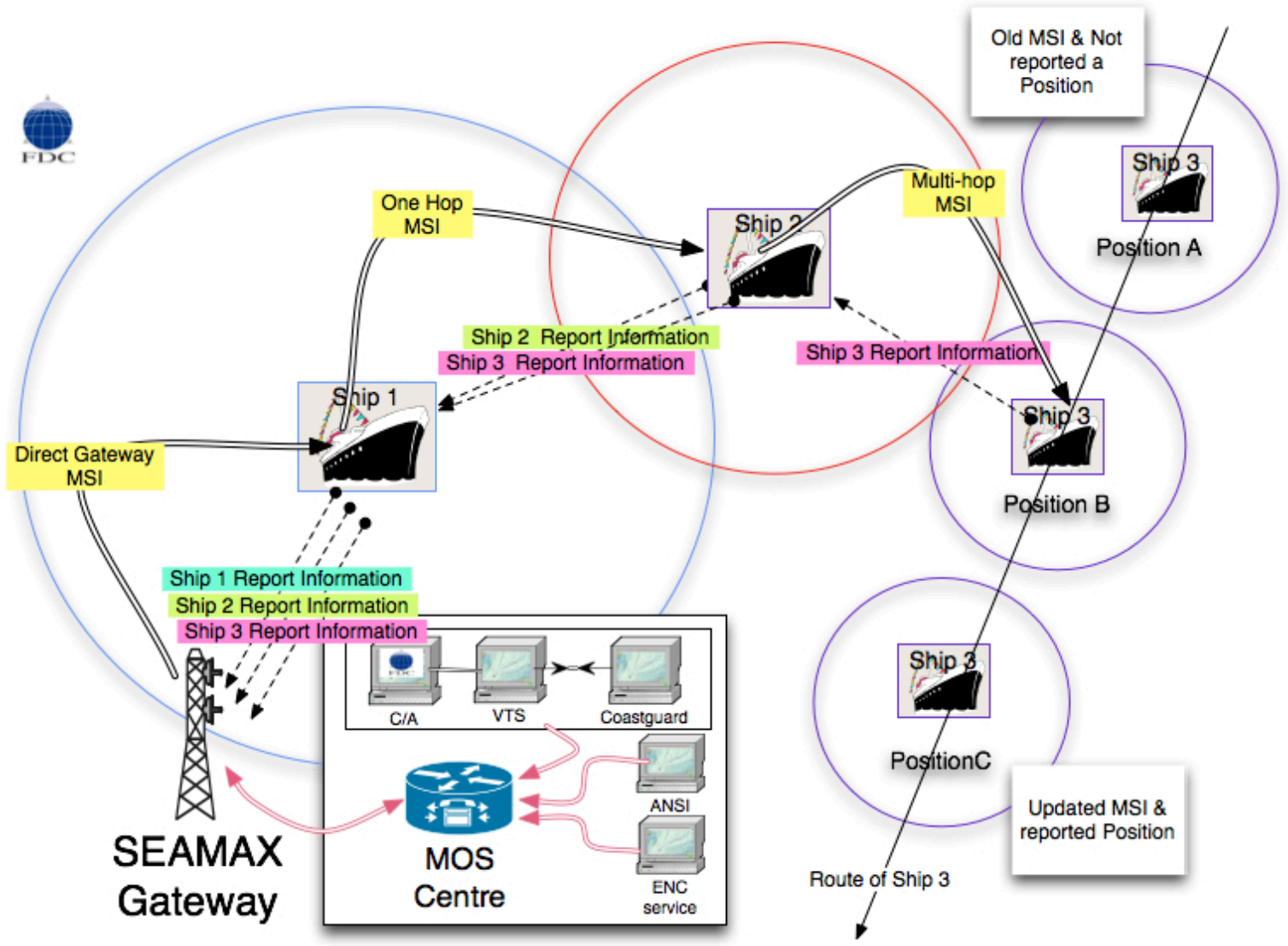
The MarCom WiCAN© Concept

•(Wireless Coastal Area Network)

SEAMAX Concept Studied in MARNIS



Mesh Networking

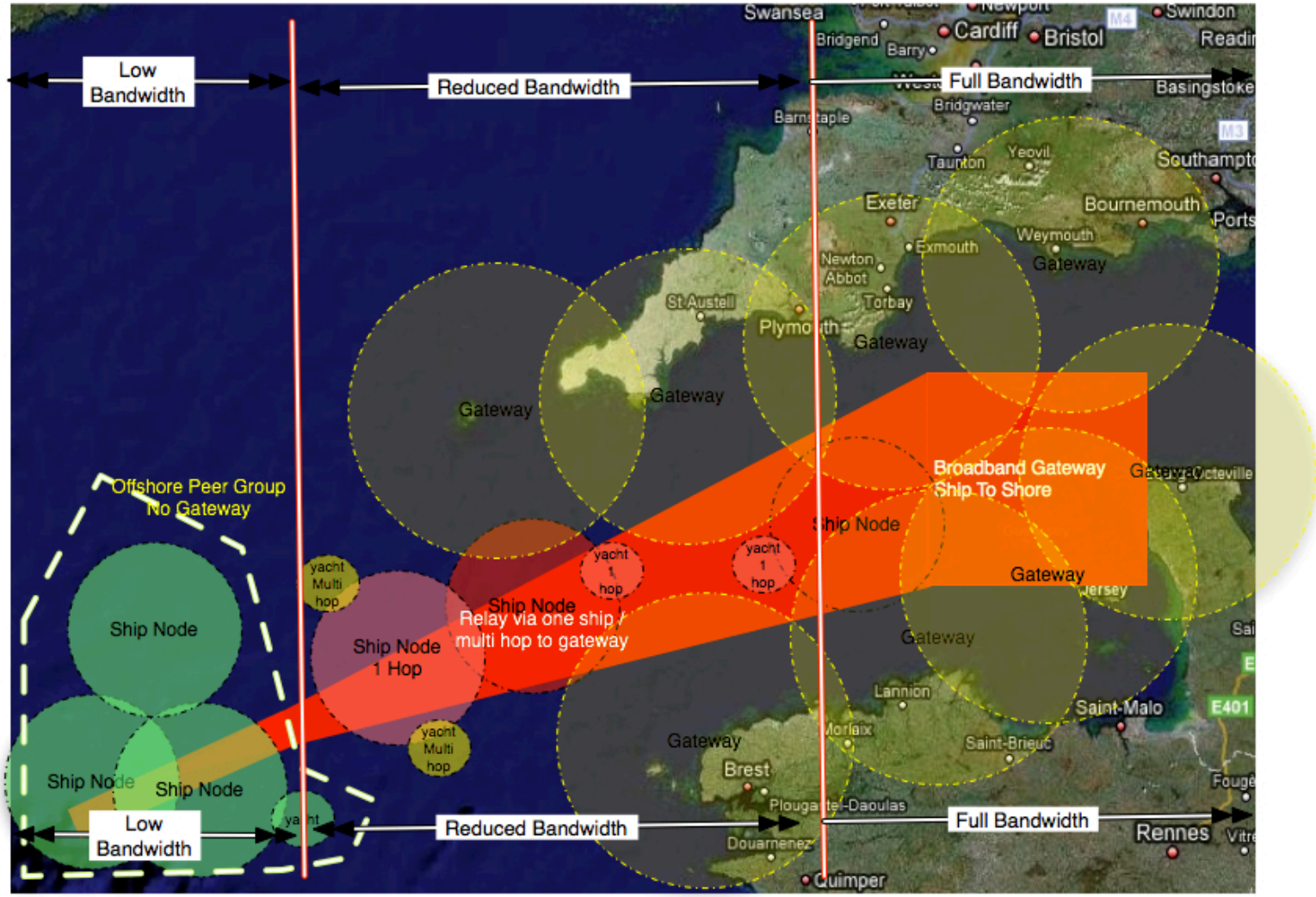


Mesh networking within Peer Groups

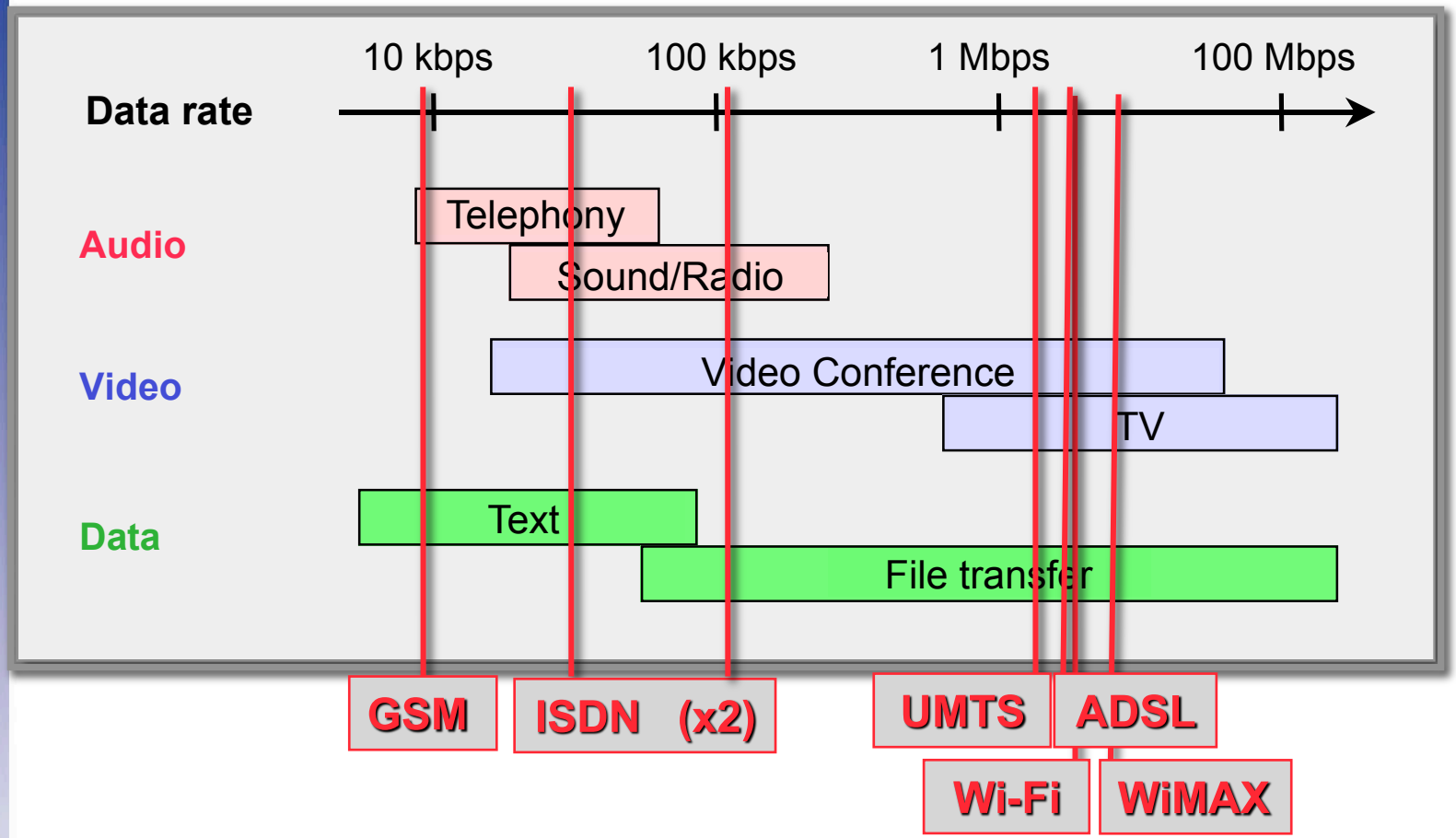
Peer group can be defined as a group of vessels that share common interest -

- Traffic,
  - VTS Traffic Image
    - Peer group size of VTS Coverage
  - Vessels In Proximity
    - Peer group size restricted by scaled distance
- Reporting and Broadcast of MSI and ANSI,
    - Peer group size of restricted only by ability to relay information within scaled region
- Gateway to Local Competent authority (Coastguard, VTS etc)
    - Can be provided through scaled peer group by relay or made directly if in range
    - Gateway can also be via suitable satellite.
- Peer groups contain ALL VESSELS and suitable ATONS in range of each-other.

New protocols needed



Basic telecom services and data rates



Market pull ⇨ 9 Case studies

- **Case1 - Monitoring on board ferries**
- **Case2 - Pilotage and maintenance of fairways, lighthouses and navigation marks**
- **Case3 – Integrated operations**
- **Case4 – Passenger information on trains and at roads**
- **Case5 – High Speed craft operations**
- **Case6 – Relay and mesh networking**
- **Case7 – Mobile on board LAN solutions**
- **Case8 – The high north challenges**
- **Case9 – International shipping**

Use Case 1

1. Monitoring of ferries (domestics passengers and car ferries)

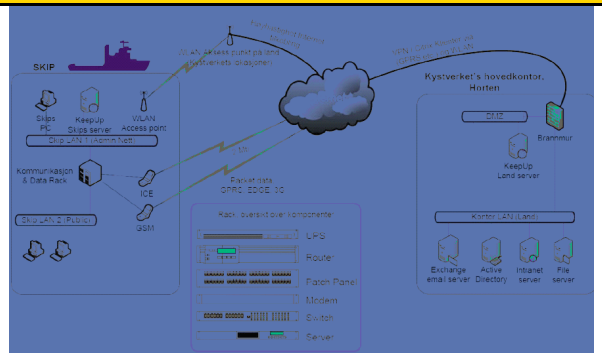
This case is focusing the challenges in monitoring installations on board ferr ies in domestic trade. We have planned to install technical equipment and to download performance status from a specific ferry to on -shore facilities , and return reports to the ferry based on analysis of the received data. The communication challenges will be on obtaining real-time data, and also exploit opportunities in using video means for technical operations.

	Technical	Reporting	Safety	Qualification	Monitoring
Monitoring of ferries (inland)	Technical mainenance	To governement	Equipment on board	Certification	Cargo
		To passengers			Passengers
		To ports			
		Deviation			

Use Case 2

1. Pilotage and maintenance of fairway s, lighthouse s and navigation marks

Case 2 is focusing the Norwegian Coastal Department s challenges in their pilotage services, and the maintenances of navigation marks like buoys and lighthouses. The applications will therefore cover navigation, remote monitoring and (partly) ship operation.



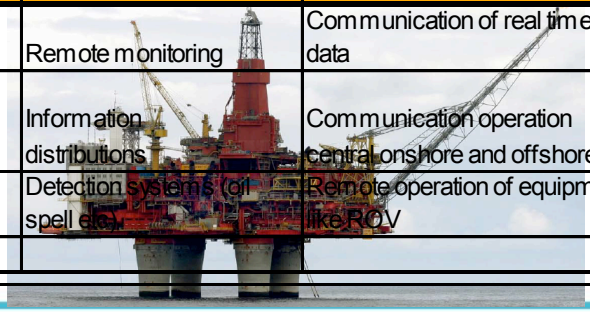
	Remote monitoring	Navigation	Ship operation
Pilot age and maintenance of fairway, lighthouse and fairway objects	SMS	Navigational warning	Operation, admininistration and management
	AIS	AIS	

Use Case 3

1. Integrated Operations (IO's)

Integrated operations comprise a case where we are aiming for a more complete cooperation among the actor s involved in offshore operation , especially with in the oil industry. The objective is to achieve collaboration across disciplines, companies, organizational and geographical boundaries, made possible by real -time data and new work processes, in order to reach better and safer decisions – faster .

	Supply	Enviornmental monitoring	Information capture and communication
Integrated operation	Work in real time	Remote monitoring	Communication of real time data
	All relevant actors involved in the decision process	Information distributions	Communication operation central onshore and offshore
	Interactive tool for cooperation	Detection systems (oil spell etc)	Remote operation of equipment like ROV
	Real time data		



Use Case 4

1. Passenger information on train s and at road s

In case 4 we aim at obtaining communication solutions having similarities with those meeting the maritime needs. Therefore we are exploiting train operation s as well as road operations in order to identify the communication challenges they are facing. The applications heading for in this case will mainly be position -based information and information exchange , along with info tainment services to the passengers .

	Reporting	Monitoring	Entertainment
ssenger information on train and at road	Time and deviation	Remote monitoring	Public information
	Traffic information	Information distributions	Advertisement
	Position information	Technical monitoring	Remote operation of equipment like ROV
		Safety monitoring	General entertainment

Use Case 5

1. High-speed craft operations

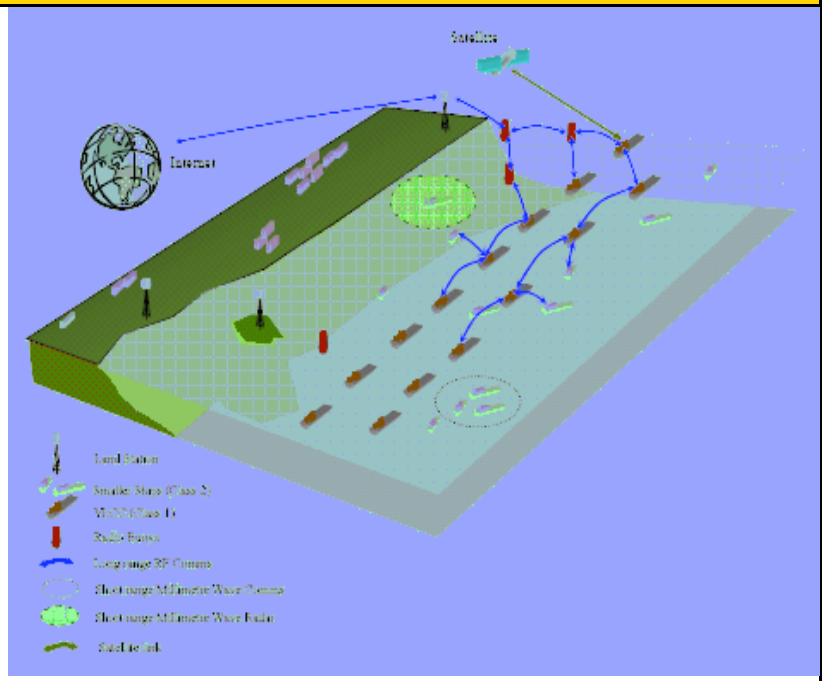
The high-speed craft operations case comprises following applications areas; technical maintenance, navigation, infotainment and ship operation. This case is also highly focusing communication challenges where roaming and handover incidents are frequent, since the speed of these vessels are high (ref. also trains and cars). Severe requirements apply to reliable navigation data, where real-time processes and frequent updating represent crucial issues.

	Technical maintenance	Navigation	Entertainment	Ship Operation
Speed boat operation	Technical monitoring	Fairway	Public information	Laws and enforcement
	Decision support	AIS	Advertisement	Remote monitoring ticket machinery
	Video conferance	Metrology	Remote operation of equipment like ROV	Traffic data
		Real time and frequently updated	General entertainment	Order and maintainence list

Use Case 6

1. Vessel-to-Vessel (V2V) Relay and Mesh networking

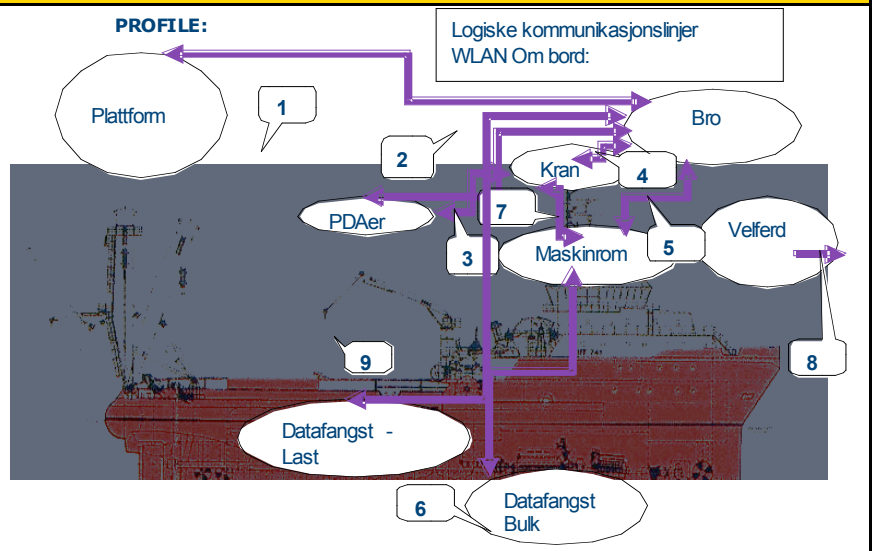
This case comprises technology demonstations aiming at coverage area extension and flexibility enhancement by applying a system enabling mobile stations to communicate with a base station through intermedia te relay stations . It is focusing handover problems, as well as the mixture of fixed and mobile nodes interconnected via wireless links to form a multi -hop ad-hoc network, amongst ships, marine beacons and buoys.



Use Case 7

1. Mobile on -board LAN -solutions

Case 7 is focusing mobile on -board LAN solutions satisfying the vessels needs for local infrastructure and services . This case will be a supporting case for many of the others and will give input to the on -board communication challenges. It will emphasize the use of hand -held equipment , and additionally information exchange amongst the ship s crew ,, as well as with the command centres.



Use Case 8

1. The High North challenges

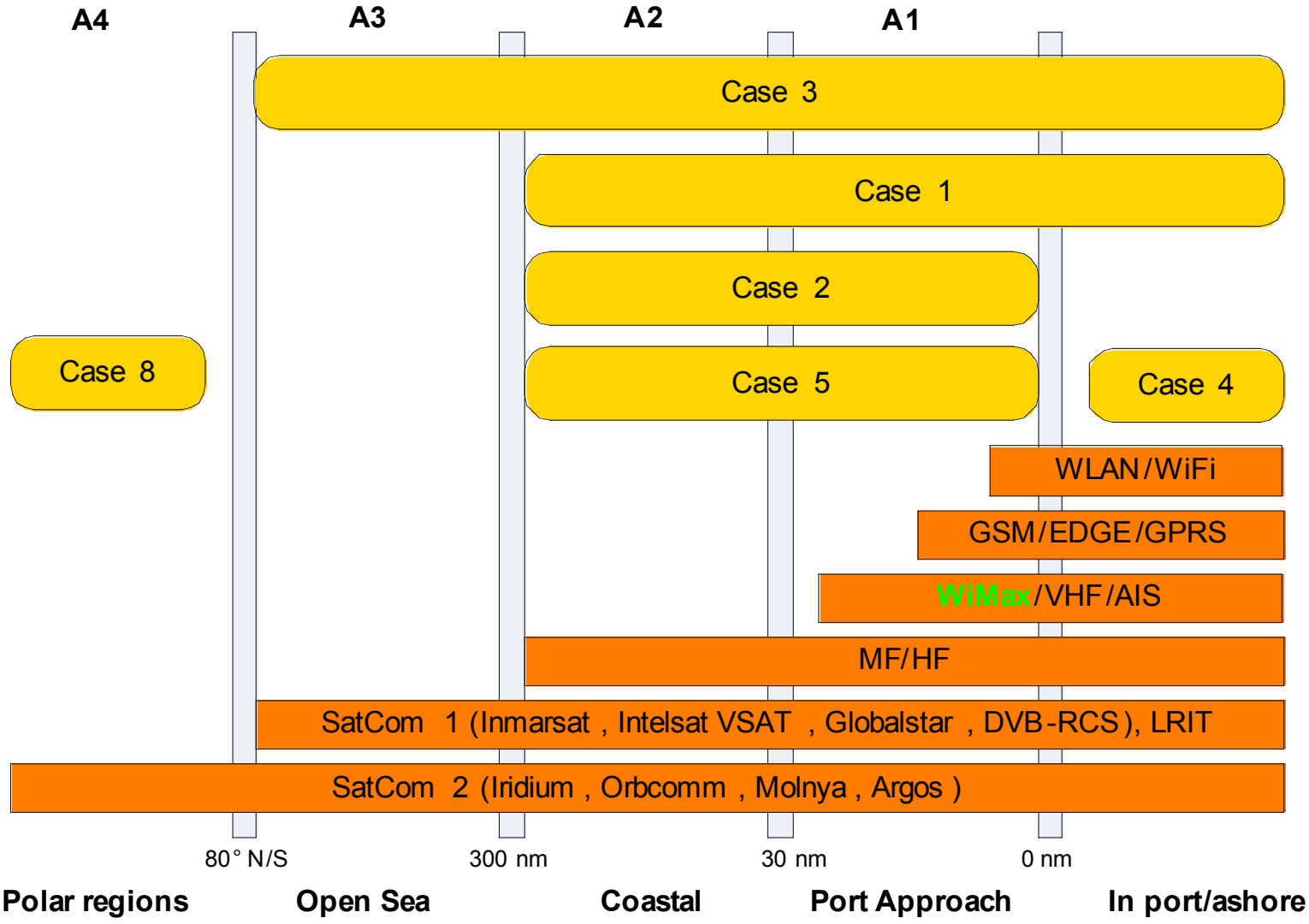
This case will examine the challenges faced by maritime operation s in the High North , and assess adaptions from the other cases to these vast, harsh and highly demanding region s. Some of the major focus areas are: monitoring of maritime operations and the environment, security and territorial surveillance and control, met eorology, a nd safety and rescue (SAR) operations.

Use Case 9

1. International shipping

International shipping represents a case where e-Navigation, ship operation and emergency management will be focused. The operation areas are normally far from the shipowners office s, within different time zones, and face different challenges compared to operation s in domestic waters. Therefore requirements pertaing to remote assistance, decision support and operational instruction s are different from the other cases prime areas.

Case findings v technology

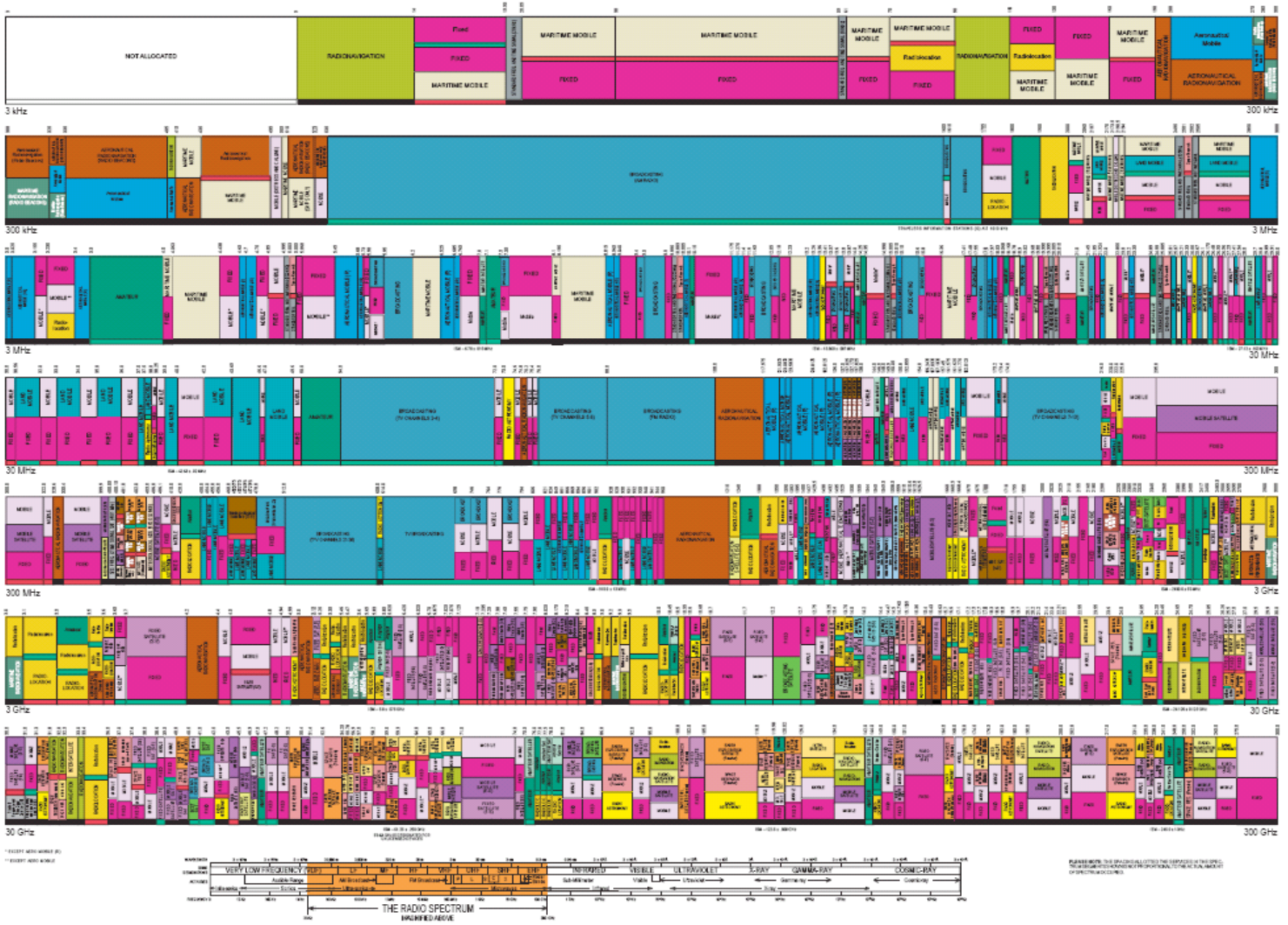


A1-A4 = GMDSS
Nm = Nautical Miles

Conclusions on capacity requirements

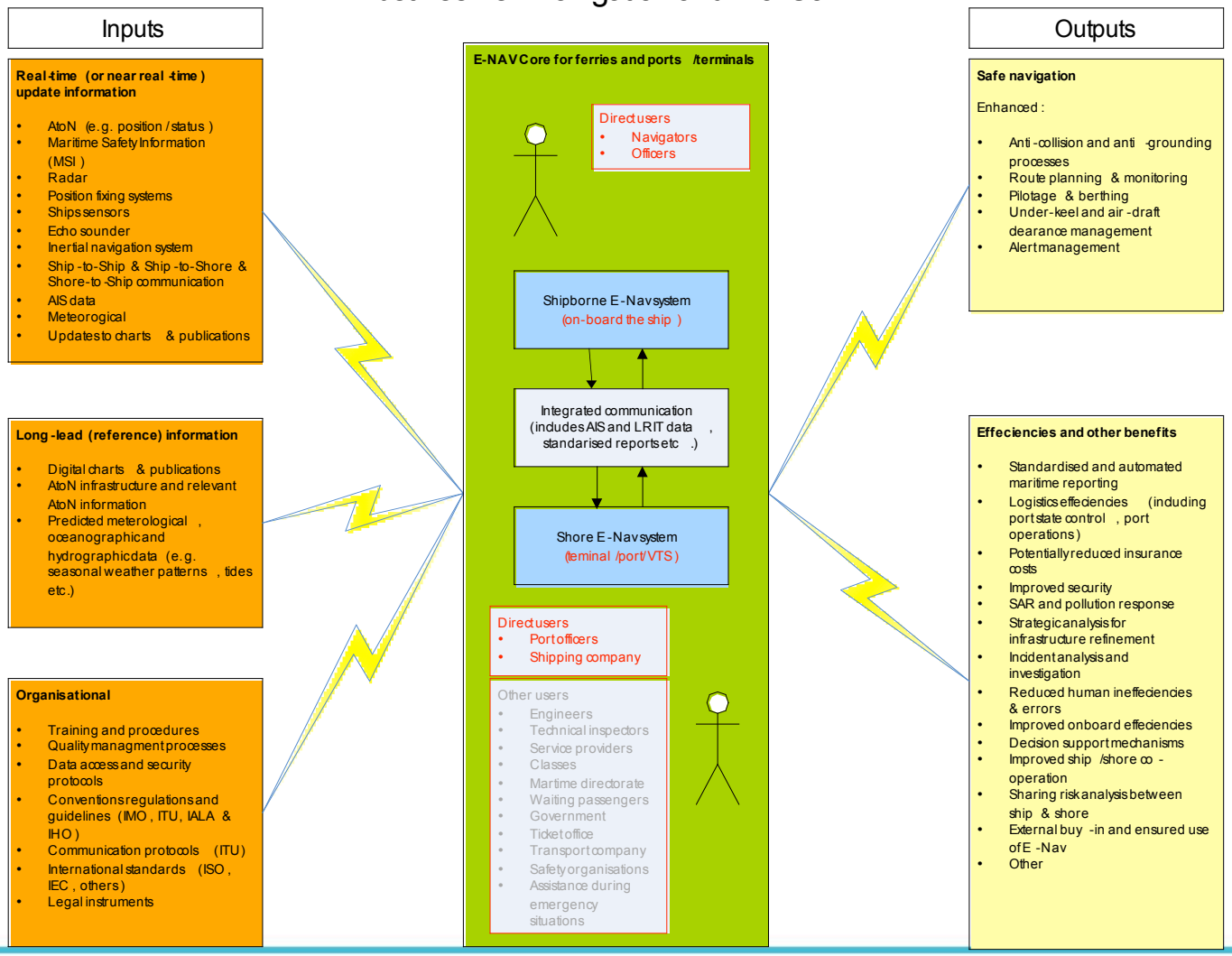
Communication Solution	Technical maintenance	Reporting	Safety and monitoring	Training / qualification	Infotainment
WiFi (IEEE 802.11)	In ports/terminals	With internet access: continuously	On-board monitoring and in ports/terminals	Yes	Yes
GSM/EDGE/GPRS	When WiFi/WiMax is not available (expencive)	When WiFi/WiMax is not available (expencive)	Not applicable	Not applicable	Not applicable
UMTS	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
CDMA 450 MHz ("Ice")	Not applicable	Continously	Yes, due to OK BW	Not applicable	Not applicable
VHF/BIIS	Not applicable	Not appl icable	Not applicable (low BW)	Not applicable	Not applicable
DAB	Not applicable	Not applicable	Not applicable	Not applicable	Yes, info. provider
WiMax (IEEE 802.11)	In ports/terminals	With internet access: continuously	On-board monitoring and in ports/te rminals	Yes	Yes
VHF Digital Data	When WiFi/WiMax is not available	Continuously	Not applicable (low BW)	Not applicable	Not applicable
Low BW over short waves/VHF/Telex	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
VHF/AIS	When WiFi/WiMax is not available	Mandatory reporting	Not applicable	Not applicable	Yes, info. provider
Local network on board (DECT/WiFi)	Continuously, to be used for internal tech. reports	Continuously for internal reporting	Internal communication between r escue assistance vessels and own vessel	Yes	Yes
LRIT	Not applicable	Mandatory reporting	Not applicable	Not applicable	Not applicable
UHF Digital Data	When WiFi/WiMax is not available	?	Not applicable	Not applicable	Not applicable

Wireless Broadband - Technical Challenges: Crowded radio spectrum



eNavigation and challenges

A descriptive model for the interaction between e -Navigation and MarCom



Improved situation awareness through e-navigation could have prevented this disaster.

I sailed on her in 1975