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A plan for testing and verification of important components of e-Navigation and associated technical solutions

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Introduction

This report is intended to describe the overall plan for the testing period(s).

It should include a rough schedule and a description of how tests of the different e-Navigation services are to be realized.

It should include an outline of communication architecture.

It should also include a description of the different test participants (vessels, VTS, harbour, pilots, etc.), which tests they will participate in and what is expected of them.

It should also include a description of the partners and associated partners (e.g. Iridium, Telenor) tasks and if possible milestones and deadlines for specific services.

Description of partners and tasks

The testing and gathering of test results will be conducted by different partners depending on the area in question.

Testing in the sound will be coordinated by DaMSA and SMA.

Testing in the Gulf of Finland will be conducted by FMA and EMA.

Testing in the Bay of GDansk will be conducted by MOG.

Testing in the remaining part of the Baltic sea, will be conducted by DaMSA.

Overall test schedule

The tests are expected to start in Q3 2010 and will at least run until Q3 2011. This period may be prolonged.

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The Baltic Sea & the Sound

Description of participants

Scandlines

M/F Prins Joachim (Gedser-Rostock):

Planned test equipment:

???

Equipment	Manufacturer	Model
ECDIS	Transas	Navi-Sailor 3000 with TX97 charts
Radar 1	Sperry Marine	Vision Master FT ARPA S-Band Chart Radar with ENC C-Maps
Radar 2 (2 pcs.)	Sperry Marine	Vision Master FT ARPA X-Band Radar
AIS	Saab	R4-AIS Vessel Transponder With integrated Pilot plug
GPS (2 pcs.)	Trimble	DSM 132 Receiver
Full integration between AIS-Radars-ECDIS.		

M/F Tycho Brahe (Helsingør-Helsingborg):

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Planned test equipment:

- PPU
- 3G
- VHF Data
- Satellite
- Broadband

Equipment	Manufacturer	Model
ECDIS	OSE	Ecpins 4000 5.1
Radar 1 (2 pcs.)	Sperry Marine	BridgeMaster type E, 10 cm.
Radar 2 (2 pcs.)	Sperry Marine	BridgeMaster type E, 3 cm.
AIS (2 pcs.)	Saab	R4 AIS
GPS (2 pcs.)	Saab	R4 Navigatonn system
Gyro (2 pcs.)		Anschütz Standard 14
Gyro and GPS is connected to radar AIS, GPS, Gyro and anemometer AIS is connected to gyro		

DFDS

Ferries between Copenhagen and Oslo

Pearl of Scandinavia:

Planned test equipment:

- PPU
- 3G
- VHF Data
- Satellite (only on 1 DFDS ferry)
- Broadband

Equipment	Manufacturer	Model
ECDIS	SAM Electronics	1100 multi (dual ECDIS)
Radar 1	SAM Electronics	1100
Radar 2 (2 pcs.)	SAM Electronics	1100
AIS	Saab	R4 AIS Vessel
GPS 1	Leica	MX 412 DGPS
GPS 2	Leica	MX 400 GPS

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Crown of Scandinavia:

Planned test equipment:

- PPU
- 3G
- VHF Data
- Satellite (only on 1 DFDS ferry)
- Broadband

Equipment	Manufacturer	Model
ECDIS	Sam Electronics	
Radar 1	Atlas	1000
Radar 2	Atlas	1000
AIS	Saab	R4 AIS Vessel
GPS 1	Sam Electronics	Debeg 4422
GPS 2	Sam Electronics	Debeg 4422

Stena Line

Stena Carisma (ferry fitted with SSPA Dynamic Predictor):

Planned test equipment:

- PPU
- 3G
- VHF Data
- Broadband

Equipment	Manufacturer	Model
ECDIS (2 pcs)	IMTECH	ECDIS 3500, 2006
Radar 1	IMTECH	ARPA 3500, 2006
Radar 2	IMTECH	ARPA 3500, 2006
AIS	SAAB	
GPS 1	Trimble	7400 MSI, 1996
GPS 2	Trimble	7400 MSI, 1996

Herning Shipping

Bitten Theresa:

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Planned test equipment:

- PPU
- 3G
- VHF Data
- Satellite (only on 1 Herning Shipping vessel)
- Broadband

Equipment	Manufacturer	Model
ECDIS (2 pcs.)	Maris	Mk 6
Radar 1	Furuno	MV 201 CR ARPA (X-band)
Radar 2	Furuno	MV 201 CR ARPA (X-band)
AIS	Saab	R4-AIS Vessel Transponder
GPS (2 pcs.)	Furuno	GP-80

Vitta Theresa:

Planned test equipment:

- PPU
- 3G
- VHF Data
- Satellite (only on 1 Herning Shipping vessel)
- Broadband

Equipment	Manufacturer	Model
ECDIS (2 pcs.)	Maris	Mk 5 Chartpilot 9000
Radar 1	Kelvin Hughes	5000 EPA
Radar 2	Kelvin Hughes	5000 ATA
AIS	Saab	R4-AIS Vessel Transponder
GPS	Simrad	GN 30
GPS	Raytheon	RAYSTAR 590
AIS GPS	ASB	R4 Class A

Svitzer

Sigyn:

Planned test equipment:

- ???
-

Equipment	Manufacturer	Model
ECDIS (dual)	Transas	TRANSAS NS 3000 (Ugentlig opdatering fra TRANSAS)
Radar 1 (bagbord)	Kelvin Hughes	Racal Decca Bridge master. 3 cm
Radar 2 (styrbord)	Kelvin Hughes	Racal Decca Bridge master. 3 cm
AIS	Saab	SAAB R4
GPS	Philips	AP Navigator Mk 7
GPS	Simrad	Simrad GN 33

Gyro	Sperry MK-37 MOD D/E	
Auto Pilot	Sperry ADG 3000 VT	
Echo sounder	Furuno FE-680	
Log	Furuno Doppler Speed log DS-70	
Magnet kompas	Brøndberg & Tandrup A/S	
Immarsat C	Sperry H2095/H2098	GMDSS
MF/HF Radio	Sperry Compact HF SBB RE 2100	GMDSS
HF DSC	Sperry Compact HF SBB DSC RM2150	GMDSS
Stationary VHF	4 psc. Sperry Compact VHF RT 2048	GMDSS
VHF DSC	2 psc. Sperry Compact VHF DSC RM 2042	GMDSS
Navtex Reciver	JRC Type NCR-330	GMDSS
Portable VHF	3 pcs. SAILOR 3520	GMDSS
Portable VHF	1 pcs. Entel HX 590	
Portable VHF	2 psc. MOTOROLA GP 340	
Iridium Sattelite Phone	Sailor Type SC 4150	
LRIT	ESL	

Fenja:

Planned test equipment:

- PPU
- 3G
- VHF Data
- Broadband

Equipment	Manufacturer	Model

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ECDIS (dual)	Transas	NS4000
Radar X-band	Decca Bridgemaster	ARPA
Radar X-band	Decca Bridgemaster	
AIS	?	?
GPS	Litton	LMX 400 DGPS
GPS	Litton	LMX 400 GPS
AIS GPS	ASB	R4 Class A
EPIRB	Jotron	TRON 40S
EPIRB	Jotron	TRON 45SX
SART	Jotron	TRON SART
SART	Jotron	TRON SART
VHF Portable (gmdss)	Sailor	SP3520
VHF Portable (gmdss)	Sailor	SP3520
VHF Portable (gmdss)	Sailor	SP3520
Compact GMDSS alarm unit	Sperry	C2149
VHF transceiver	Sperry	RT2048
VHF transceiver	Sperry	RT2048
VHF transceiver	Sperry	RT2048
VHF transceiver	Sperry	RT2048
MF/HF SSB Transceiver	Sperry	RE2100
MF/HF SSB DSC controller	Sperry	RM2150
Navtex	McMurdo	Nav 7
Inmarsat-C Transceiver	Sperry	H2095B
Inmarsat-C Message terminal	Sperry	H2098B
Inmarsat-C Monitor	Sperry	H1253D
Inmarsat-C Printer	Sperry	H1252A
LRIT	Thrane & Thrane	TT-3000LRIT
Iridium tlf.	Sailor	SC4150
Echosounder	Sperry	ES5000
Autopilot	Sperry	ADG 3000 VT
Gyro	Sperry	MK 37 VT
Magnet kompas	Cassens & Plath	
Log	Sperry	SRD 331

Mars:

Planned test equipment:

- PPU
- 3G
- VHF Data
- Broadband

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Equipment	Manufacturer	Model
ECDIS	Adveto	2009
Radar 1	Furuno	FR - 2115
Radar 2	Furuno	1833C
AIS	Furuno	FA - 100
GPS	Furuno	GP - 80 GPS Navigation
Gyro Compass	Furuno	Sattelit Compas SC - 60
Magnetic Compass	C. Plath	Type 11. Reflecta 1.
Speed Log	Anthea	
Echo Sounder	Furuno	FE - 700
Autopilot	Furuno	NP -60
VHF (2)	Furuno/SAILOR	FM - 2721 / RT2048
VHF DSC	Furuno	FM - 8500
MF/HF		
MF/HF DSC		
GMDSS Alarm		
Inmarsat-C		
Satellite Telephone		
Emergency VHF - Portable (2)	SAILOR	SP 3520
UHF - Portable		
SART	McMurdo	RT 9
EPIRB (2)	McMurdo	E3
anemometer	DEIF A/S	Malling 879,3 C
Self Powered Telephone	Amplidan	Series 9000
VHF	Motorola	GM 360
VHF	Sailor	RT 2048
RPM Counter (2)	NORIS	RQ960-014

Wisby Tankers

Wisby Wave:

Planned test equipment:

- PPU
- 3G
- VHF Data
- Satellite
- Broadband

Equipment	Manufacturer	Model
ECDIS	SAM Electronics	Full ECDIS Integrated
Radar 1	SAM Electronics	10 cm, ECDIS overlay
Radar 2	SAM Electronics	3 cm, ECDIS overlay
GPS (2 pcs)	SAM Electronics	

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Radar, and ECDIS full integrated 2 NMT internet router

DaMSA (2 pcs. Buoy tenders)

Poul Løvenørn:

Planned test equipment (only on one DaMSA vessel):

- PPU
- 3G
- VHF Data
- Satellite
- Broadband

Equipment	Manufacturer	Model
ECDIS	Kelvin Hughes	Manta2000 ECDIS Desktop ECDIS 6000 Display
Radar 1	Kelvin Hughes	Nucleus X/S Band 3 cm
Radar 2 (pcs.)	Kelvin Hughes	Nucleus X/S band 10 cm
AISGPS	Kelvin Hughes	AISGPS positioning system
GPS/DGPS	Kelvin Hughes	MX 412
Radar, AIS and ECDIS full integrated MAN NR-N 100 Marine Navigator		

Jens Sørensen:

Planned test equipment (only on one DaMSA vessel):

- PPU
- 3G
- VHF Data
- Satellite
- Broadband

Equipment	Manufacturer	Model
Map	Sodena Chart Plotter	C-Map
Radar 1	SAM Electronics	Radar S-Band
Radar 2 (pcs.)	SAM Electronics	Radar X-Band
AISGPS	Kelvin Hughes	
GPS/DGPS	Leica	MX 412

Garmin GPS map 292

Proposed solutions to be tested

The solutions that are candidates to be tested in the test bed are described in the document 'description of identified e-Navigation services'. This document describes all the possible solutions, but it is not likely that they all will be tested. Therefore a priority have been given, which is as follows:

Mandatory services and features:

Meteorological and Oceanographic information (METOC)

Exchange of routes (ship-ship, ship-VTS and VTS-ship)

Maritime Safety Information (MSI)

Notices to Mariners (NtM)

AIS and AtoN's – priority, presentation and symbols

This will include the new draft proposal from IMO on AIS functionality[1]

High priority services and features:

SSPA Dynamic predictor (ship-ship and ship-VTS)

No-go areas and maybe-go areas

Radar/AIS positioning system (GNSS backup)

Chart corrections

Lighthouses / conspicuous landmarks

CPA/TCPA and collision avoidance tool

3D view and presentation of objects

AtoN's - theoretical visual observation range

Display of Radar information – target sharing

Risk assessment tool (for VTS)

[1] This is described in the IMO documents ' Draft SN Circular - Guidance on the use of AIS Application-Specific Messages, NAV55/21/Add 1' and ' Draft SN/Circular on Guidance for the presentation and display of AIS Application-Specific Messages information, NAV55/WP.6'.

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Automatic and/or simplified exchange of administrative information

S-mode

VHF communication and identification

Other interactive functions – Pilot
Graphic display of reliability and precision

Test Overview

This section provides an overview of the different services and functions that is expected to be tested and gives some overall insight into how and by whom. The following characteristics are describing the testing of each service/functions:

Isolated test: Tests will be possible to be performed independently. I.e. a single test user may test this service/function independent of other test users. This will of course require minimal planning. Timeframe can vary from short term to long term.

Coordinated test: These test require coordination between several test users. This will obviously require more planning.

Long Term: These tests are expected to be conducted over a longer period. Possibly several months.

Short Term: These are expected to be conducted over a shorter period. Probably a couple of weeks. These will most likely be coordinated.

Finally the tests are divided into which environment they will be tested in. The following categories are anticipated:

Own crew: The tests are conducted by the normal crew on the ship.

Extra crew: The tests are critical, and if performed live on a ship, it will require additional crew members.

Simulation: The tests are critical, and are therefore best conducted in a simulation environment

	Vessels	VTS
Meteorological and Oceanographic information	Isolated Long term	

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	Vessels	VTS
(METOC)	Own crew	
Exchange of routes (ship-ship, ship-VTS and VTS-ship)	Coordinated Short term Own crew / simulation	Coordinated Short term Own crew / simulation
Maritime Safety Information (MSI)	Isolated Long term Own crew	Isolated Long term Own crew
Notices to Mariners (NtM)	Isolated Long term Own crew	Isolated Long term Own crew
AIS and AtoN's – priority, presentation and symbols	Isolated / coordinated Short term / long term Own crew	Isolated / coordinated Short term / long term Own crew
SSPA Dynamic Predictor, info exchange or similar (ship-ship and ship-VTS)	Coordinated Short term Own crew / Simulation	Coordinated Short term Own crew / Simulation
No-go areas and maybe-go areas	Isolated Long term Own crew	
Radar/AIS positioning system (GNSS backup)	Isolated Long term Own crew	
Chart Corrections	Isolated Long term Own crew	
Lighthouses / conspicuous landmarks	Isolated Long term Own crew	
CPA/TCPA and collision avoidance tool	Coordinated Short term Extra crew / Simulation	
3D view and presentation of objects	Isolated Long term Own crew	Isolated Long term Own crew
AtoN's - theoretical visual observation range	Isolated Long term Own crew	Isolated Long term Own crew
Display of Radar information – target sharing	Coordinated Short term Own crew	

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	Vessels	VTS
Risk assessment tool (for VTS)		Coordinated Short term Extra crew / Simulation
Automatic and/or simplified exchange of administrative information	Isolated Long term Own crew	
S-Mode	? ? ?	? ? ?
VHF communication and identification	Coordinated Short term Own crew	Coordinated Short term Own crew
Interactive Functions - Pilot	Coordinated Short term Own crew[2]	
Graphic display of reliability and precision	Isolated Long term Own crew	Isolated Long term Own crew

[2] This function will of course only be tested on vessels using pilots.

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The Bay of Gdansk

Description of participants

1. We can offer 2 ships to be used for required time..

A) Buoy tender s/v **Zodiak**

Photo:

Dimensions:

54 m x 10,8m draught 4.5 m

B) Hydrographic survey ship, buoy tender **Tucana**

Photo :

Dimensions : 23m x 5.8m, draught 3.5m

Navigation equipment

- Gyro-compass Plath 10;
- DGPS -Trimble NT 200D, RTK -R7 Trimble
- radar/ARPA Anritsu;
- PC+ENC - NaviSailor NS4000, Transas Marine.
- echosound

2. **Polygon:** Gdansk Bay : 3 big ports (Gdansk, Gdynia -2 merchant, Gdansk PP for mass transport, VTS,
3. **Traffic Separation Schemes**: 2-3
4. **Voice Communication -** in dedicated channels

Test schedule

Traffic

- AIS testing with the use of Safety Related Messages , Binary messages - to facilitate automatic/manual acquisition and VTS procedures
- Available software: statistics of traffic, traffic cros-sections, ship tracking
- Local VDL loading tests
- SSRM for ship to ship communication
- Traffic Separation Schemes validation (how ?) optimization **with Mockup Soft…?**

Search And Rescue

- possible tests of AIS SART equipment

Aids to Navigation

- AtoN for TSS - Setting zones with virtual and/or synthetic AIS AtoNs

5. E-navigation Shore to Ship feedback communication – to be established (tbe) and tested (tbt) for throughput, capacity:

- Establishing WiFi (WiMax) for ports or Gdansk Bay TSS zones -tbe
- Satellite mobile -tbe
- GSM /3G - (tbt),

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The Gulf of Finland

Description of participants

Estonian Maritime Administration

Sektori, buoy tender

Equipment	Manufacturer	Model
ECDIS	Hydro Service AS (Norway)	D-kart NAVIGATOR 9000 version 7.41
Radar 1	Rcal Marine Electronics LTD	RACAL-DECCA AC.S.2490MT
Radar 2 (2 pcs.)	SIMRAD A.KONGSBERG CO.	SIMRAD RA53
AIS	SIMRAD A.KONGSBERG CO.	SIMRAD A170
GPS (2 pcs.)	MAN TECHNOLOGIE AG	SATLOG DEBEG 4124
	SIMRAD A.KONGSBERG CO.	SIMRAD GN33
Full integration between AIS-Radars-ECDIS. Internet connection: GSM/GPRS 900Mhz, CDMA 450 Mhz		

Eva, buoy tender

Equipment	Manufacturer	Model
ECDIS	Morintech	DkartNavigator 2002 Version:6.32
Radar 1	Raytheon	R1210XX
Radar 2 (pcs.)		
AIS	Saab/Leica	R3-AIS/MX420
GPS(2pcs.)	JRC	J-NAV500
Full integration between AIS- ECDIS. Internet connection: GSM/GPRS 900Mhz, CDMA 450 Mhz		

Finnish school ship

Katarina

Equipment	Manufacturer	Model
ECDIS	Furuno ANTA	EC 1000
Radar 1	Selescan	1024 ARPA S-Band
Radar 2	Selesmar	MM 950 24 ARPA X band

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GPS (2 pcs)	Furuno	GP-80
DGPS (2 pcs)	Northstar	942 DGPS
DGPS	Phillips	AP
UNS devices with ANTS, EMRI, Anshutz Gyro, Northstar DGPS, SAL, AIS, Selescan 1024, ECDIS uses Admiralty ARCS updated maps.		

Test schedule

Phase 1 (trials may start 2009 to first half of 2010):

- Synthetic AIS AtoN from up to 25 floating AtoN-s through Estonian AIS network;

- SR messages M12/14 on the basis of status messages of Finnish AtoN-s from selected Estonian AIS base stations;

- Filtering Russian M17 messages through (Estonian) Valaste AIS base station (they exist) and making some relevant investigations.

Phase 2 (trials may start in second half of 2010):

- Broadcasting of M8, containing tidal and hydro-meteo information;

- Broadcasting of M17 for Ristna and Narva dGPS stations;

- Using NRTK instead of Ristna and Narva for broadcasting M17;

- Using AIS network for transmission of NRTK corrections for positioning of sounding system for hydrographic survey;

- Using built-in acceleration sensors for measuring floating AtoN static and dynamic tilt and "in-AtoN" detecting collisions and sinking (under the ice);

- Using built-in acceleration sensors for measurement (assessment) of wave height;

- Using GPRS connection (usual monitoring data communication) for transmission of NRTK corrections and find Z-coordinate variation for navigational buoys.

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