The Port ENC – part of e-Navigation, RIS, VTS, AIS…
Results of the integrated EU research project EFFORTS

September 13-16, 2011, New Orleans, Louisiana, USA
The integrated EU research project EFFORTS (May 2006 – Oct. 2009)

Project acronym: EFFORTS
Project title: Effective Operation in Ports

Sub-Project 1
Navigation in Ports

- WP 1.1 TUG ASSISTANCE
- WP 1.2 PRECISE NAVIGATION AND MANOEUVRING IN PORTS
- WP 1.3 PORT ECDIS

The Subproject 1 “Navigation in Ports” aims at the improvement of safety and efficiency of navigation in ports and their access channels considering decreasing manoeuvring space (vessel size in relation to fairways and basins) versus increasing traffic and vessel sizes.
The Port ECDIS story starts with the question:

„Why a Port ECDIS?!“
Why a Port ECDIS – Port ENC?!

Ports are the hubs of global trade

with the need of the highest level of **topographic and hydrographic information** to fulfil special requests regarding safe and ease of navigation, manoeuvring, turning, docking, berthing etc.;

take into account the **special requirements Harbour Masters, Pilots, Ship Officers, Transport Execution and Port (Waterway) Maintenance and Organisation** have!

A safe and efficient arrival and departure of vessels which sail from berth to berth is most crucial for ports and their access channels (waterways)!
Why a Port ECDIS – Port ENC?! 

- Increase of vessel sizes versus
- less harbour and manoeuvre space,
- Minimum Under Keel Clearance and
- special requirements for minimum dredging
- call for the highest level of accuracy and reliability of digital chart information for navigation in fairways and ports currently not being met by equipment according to SOLAS V Carriage requirements!
Why a Port ECDIS – Port ENC?!

Port of Hamburg - less manoeuvre space

bulk vessel berthing
Why a Port ECDIS – Port ENC?!

Port of Hamburg - less manoeuvre space
bulk vessel docking manoeuvre
Why a Port ECDIS – Port ENC?!

ship operations in New Orleans and on the Mississippi River

Mississippi River Flood 2011
Barges battling the current at Vicksburg

Carnival Triumph 272m length during turning

large Mississippi Barges
Why a Port ECDIS – Port ENC?!  
(from the Associated Branch Pilots Webpage - 2011)

The "Genmar Minotaur", a 797-foot (243m) oil tanker " navigates the Mississippi River at Southwest Pass near Venice, La. June 2011

Captain Michael R. Lorino, JR  
President of Associated Branch Pilots  
→ a large amount of sediment narrows the fairway (from 750 to 200 foot)
Why a Port ECDIS – Port ENC?! 

also the Hamburg Port Authority produces on a digital way **paper charts** using special hydrographic mapping software.

other Ports and Waterway Authorities are working in a similar way!
Why a Port ECDIS – Port ENC?!

until today Harbor Masters, Pilots, the colleagues within the VTS centre and within the dredging office are often using for the daily job these up to date and large scale paper charts, because these charts are fulfilling precisely the nautical information requirements they have for this moment in the best way.
Why a Port ECDIS – Port ENC?! 

Imagine the following situation:

The Captain onboard of a Container Vessel must use for the ECDIS an official ENC produced by an official national hydrographic agency to fulfil SOLAS V carriage requirements!

The Harbor Master and the colleagues within the VTS centre are using the same (paper) chart as the Pilot.

Onboard of the Container Vessel a Pilot advises the Captain! The Pilot uses an up-to-date large scale (paper) chart, which is different from the official ENC, but contains much better information!

And the topographic information (chart) within the VTS can be different from the (paper) chart and ENC, because these systems are using a proprietary data format that must be updated by the colleagues within the VTS centre!
Why a Port ECDIS – Port ENC?!

and now you are sailing in a tricky situation!

- coordination onboard → but Captain is responsible, Pilot "only" advises
- coordination between the Traffic Centre, the Pilot and the Captain
- but together they have to solve a problem!

- on base of different information / charts!!

problematic!!
Why a Port ECDIS – Port ENC?!

and that is what we heart very often:

the Captain says: "Why we dont have that pretty good and precise information you bring onboard and use on shore?!"

how to solve that problem?! 

Our idea was:

use an existing data exchange standard (S57 / in future S100) and improve it to fulfill the user requirements of the Captain, the Harbor Master, the Pilot, the VTS centre, the Dredging community, the TUG operators and many other for using the same information at the same time!
Why a Port ECDIS – Port ENC?!

- The common **IHO ECDIS standard for maritime ENC’s** supports navigation in the open sea, coastal areas and in **seaports** (like the Port of Hamburg)

- The **Inland ECDIS standard** for **Inland ENC’s (IENCs)** was developed for navigation on inland waterways and uses the same accuracy and quality definitions like the **maritime ECDIS standard**

- but both **without meeting the requirements port authorities have!**
Why a Port ECDIS – Port ENC?!

- **Port ENC** requirements go far beyond the current **maritime ECDIS** and **Inland ECDIS** standards regarding:
  - up-to-date-ness
  - quality
  - accuracy / uncertainties
  - large scale charts
  - chart features/objects and attributes
  - and reliability

of hydrographic data (Bathymetry) and geographic data (Topography).
Why a Port ECDIS – Port ENC?!

- For Port operations and also for the access channel / fairways, there are special requirements for **vertical and horizontal accuracy**

- The **same accuracy must be inherent in the underlying electronic charts** → Port ENC’s.

- At present, there is **no standard or extensions** considering the special requirements of port operations!

- That **call for a specific “Port ECDIS”** → Port ENC.
Why a Port ECDIS – Port ENC?!

- The Port ENC standard should be an independent but complementary standard to maritime ENC and Inland ENC.
- A Port ENC intended to align with the ongoing developments for maritime and Inland ENCs → S100
- Port ENC data should serve as the missing link between maritime and Inland ENCs because ports are often the link between maritime and inland shipping.
Why a Port ECDIS – Port ENC?!

- e-Navigation (…berth to berth navigation)
- Vessel Traffic Services (VTS)
- River Information Services (RIS)
- Automatic Identification Systems (AIS)
- Portable Pilot Unit (PPU)
- Dredging Monitoring System
- Route Planning Software
- Ship/TUG Handling Simulator

All these applications using spatial information (maps) to link navigational and other information together should/must use as core element a standardized Electronic Navigational Chart (ENC) to improve interoperability and to guarantee safe and ease of navigation for ports/harbors/waterways a special Port ENC is needed.
IHO Standards (S-57 & S-44)
IHO Standards (S-57 & S-44)

- IHO Standards do not provide significant topographic source data for integration in ENCs!
- No dedicated accuracy requirements are defined that apply for different navigational purposes / categories (e.g., port operations)
- Within **ENCs** and **Inland ENC’s**, the IHO S-57 **Zone of Confidence (ZOC)** assessment is used to describe the quality of only **bathymetric** data,
- **the Zone of Confidence (ZOC) is not used for topographic data!**
### IHO Standards (S-57 & S-44)

1. Co.34 Replace the existing ZOC table and the associated comments with the following:

"ZOC Table:

**S57 ECDIS definitions (Zone of Confidence - bathymetry)**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZOC</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td><strong>Position Accuracy</strong>&lt;sup&gt;2&lt;/sup&gt;</td>
<td><strong>Depth Accuracy</strong>&lt;sup&gt;3&lt;/sup&gt;</td>
<td><strong>Seafloor Coverage</strong></td>
<td><strong>Typical Survey Characteristics</strong>&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>A1</td>
<td>± 5 m</td>
<td>=0.50 + 1%d</td>
<td>Full area search undertaken. All significant seafloor features detected&lt;sup&gt;4&lt;/sup&gt; and depths measured.</td>
<td>Controlled, systematic survey&lt;sup&gt;6&lt;/sup&gt; high position and depth accuracy achieved using DGPS or a minimum three high quality lines of position (LOP) and a multibeam, channel or mechanical sweep system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth (m)</td>
<td>Accuracy (m)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>± 0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>± 0.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>± 1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000</td>
<td>± 10.5</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>± 20 m</td>
<td>= 1.00 + 2%d</td>
<td>Full area search undertaken. All significant seafloor features detected&lt;sup&gt;4&lt;/sup&gt; and depths measured.</td>
<td>Controlled, systematic survey&lt;sup&gt;6&lt;/sup&gt; achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder&lt;sup&gt;7&lt;/sup&gt; and a</td>
</tr>
</tbody>
</table>
## Minimum Standards for Hydrographic Surveys

*(To be read in conjunction with the full text set out in this document.)*

<table>
<thead>
<tr>
<th>Reference</th>
<th>Order</th>
<th>Special</th>
<th>1a</th>
<th>1b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 1</strong></td>
<td>Description of areas.</td>
<td>Areas where under-keel clearance is critical</td>
<td>Areas shallower than 100 metres where under-keel clearance is less than 5% of depth</td>
<td>Areas shallower than 100 metres where under-keel clearance is less than 5% of depth</td>
</tr>
<tr>
<td><strong>Chapter 2</strong></td>
<td>Maximum allowable THU 95% Confidence level</td>
<td>2 metres</td>
<td>5 metres + 5% of depth</td>
<td>5 metres + 5% of depth</td>
</tr>
<tr>
<td>Para 3.2 and note 1</td>
<td>Maximum allowable TVU 95% Confidence level</td>
<td>$a = 0.25 \text{ metre}$</td>
<td>$a = 0.5 \text{ metre}$</td>
<td>$a = 0.5 \text{ metre}$</td>
</tr>
<tr>
<td><strong>Glossary and note 2</strong></td>
<td>Full sea floor search</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Para 3.6 and note 4</td>
<td>Recommended maximum Line Spacing</td>
<td>Not defined as full sea floor search is required</td>
<td>Not defined as full sea floor search is required</td>
<td></td>
</tr>
<tr>
<td><strong>Chapter 2 and note 5</strong></td>
<td>Positioning of fixed aids to navigation and topography significant to navigation. (95% Confidence level)</td>
<td>2 metres</td>
<td>2 metres</td>
<td>2 metres</td>
</tr>
<tr>
<td><strong>Chapter 2 and note 5</strong></td>
<td>Positioning of the Coastline and topography less significant to navigation (95% Confidence level)</td>
<td>10 metres</td>
<td>20 metres</td>
<td>20 metres</td>
</tr>
<tr>
<td><strong>Chapter 2 and note 5</strong></td>
<td>Mean position of floating aids to navigation (95% Confidence level)</td>
<td>10 metres</td>
<td>10 metres</td>
<td>10 metres</td>
</tr>
</tbody>
</table>

Mismatch between IHO S57 ECDIS Requirements +/- 5m and IHO S44 Special Order +/- 2m!

S57 ECDIS ZOC +/- 5m versus IHO S44 Special Order +/- 2m!

quay walls, bridges, locks etc. ?!
IHO Standards (S-57 & S-44)

One example is the official ENC of the Port of Hamburg.

- Produced and issued by BSH (Federal Maritime and Hydrographic Agency / Germany).
- It meets all the relevant ENC related standards and fulfills the requirements for maritime navigation (SOLAS V carriage requirements),
- but the ENC is too small in scale,
- does not have any bathymetric detail,
- not showing up-to-date information
- and poorly defined horizontal accuracy for topographic features such as quay walls, piers, pontoons, etc.
Comparison
HPA Basis Port ENC - BSH ENC

BSH ENC-cell Port of Hamburg
Federal Maritime and Hydrographic Agency
name: DE521500.000
date: 27.05.2005
scale: 1:15 000  → small scale!!
accuracy:
S-57 Object Class: M_QUAL
attribut: CATZOC = B (3) ±50m
**IHO Standards (S-57 & S-44)**

Comparison the official maritime ENC and the Port ENC

<table>
<thead>
<tr>
<th></th>
<th>Differences HPA - BSH</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>East (m)</td>
<td>North (m)</td>
<td>Distance (m)</td>
<td></td>
</tr>
<tr>
<td><strong>Fixed marks / navigational aids</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>-0.01</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td>-0.19</td>
<td>-0.62</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>MAX</td>
<td>0.15</td>
<td>0.56</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td><strong>Quay wall corner</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>-4.75</td>
<td>-3.65</td>
<td>7.79</td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td>-13.93</td>
<td>-17.15</td>
<td>2.42</td>
<td></td>
</tr>
<tr>
<td>MAX</td>
<td>6.84</td>
<td>4.35</td>
<td>17.67</td>
<td></td>
</tr>
<tr>
<td><strong>Pontoon corner</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>1.60</td>
<td>-2.89</td>
<td>8.05</td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td>-11.00</td>
<td>-11.69</td>
<td>3.84</td>
<td></td>
</tr>
<tr>
<td>MAX</td>
<td>10.42</td>
<td>19.74</td>
<td>22.30</td>
<td></td>
</tr>
</tbody>
</table>
IHO Standards (S-57 & S-44)

- Comparison the official maritime ENC and the Port ENC

- Result:

  - the official maritime ENC is not suitable for special operations within the port area

  - to be fair, the official BSH - ENC has a different purpose to meet
    (usage band 5 - harbour)

  - but this ENC must be used for navigation as official ENC in the Port of Hamburg →
    SOLAS V carriage requirements!
The EFFORTS Work Package 1.3 - Port ECDIS - tasks
The EFFORTS Work Package 1.3 - Port ECDIS - tasks

**Task 1 – Potential user requirements → structured questionnaire**

**Task 2 - Port ENC - Technical specification**
- accuracy; precision of topography and aids of navigation; special new Port ENC objects (features and attributes); precise 3D depth information using Digital Terrain Models (DTM) technologies; 3D reference DTM (the Channel Reference Model CRM)

**Task 3 – Prototype of a Port ENC**
- Port ENC dataset of the Port of Hamburg, including precise Port ENC chart data, so named 3D - gridded bathymetry (in BAG format), bathymetric ENC's (bENC) and a 3D - channel reference model (CRM).

**Task 4 – Testing of prototype(s)**
- Tests on board of HPA survey vessels, during a docking process of a cruise liner and using the Port ENC in a PPU on board of a container vessel and some other functional tests (Hopper Dredger, Planning and Simulation, VTMIS etc.)
The EFFORTS Work Package 1.3 - Port ECDIS - tasks

Task 5 – Defining requirements for follow-up developments and standardization (Port ENC - Roadmap).

The outcome should be a proposal and comprehensive concept as basis and input for European / international standardization proved by validation and functional tests in the Port of Hamburg.
The EFFORTS Work Package 1.3 - Port ECDIS results
The EFFORTS Work Package 1.3 - Port ECDIS results

Gradation of the S-57 ENC products

- **maritime ENC (ENC)**
  - Standard exist
  - Product ID 1

- **Inland ENC (IENC)**
  - Standard exist
  - Product ID 10
  - +

- **Port ENC (PENC)**
  - new objects/features
  - Product ID 20
  - ++
As part of the EFFORTS project, there are a number of new port specific objects, as well as requirements for the accuracy of these objects. These new requirements will ensure that the Port ENC makes the most accurate data available to the port users.

The use of gridded bathymetry, channel outlines and channel depth model data will allow the users of the Port ENC to have an accurate and up to date 3D information of the depth situation within the port. This will improve both, safety of navigation as well as port maintenance.
The EFFORTS Work Package 1.3 - Port ECDIS results

- Potential users and requirements (structured questionnaire, study)
- Port ENC specification (documents)
  - Definition of present Data Quality in Standards used for ENC data (S57 versus S44 standard) – current situation
  - Port ENC Feature Catalogue → description of the Port ENC features
  - Port ENC Encoding guide → representation and symbolisation
  - Port ENC Product specification
- Port ENC prototype (software and dataset)
  - including a Port ENC viewer
- Tests with Port ENC prototype (based on basic dataset) and evaluation of tests (report)
- Port ENC follow-up requirements (document)
The EFFORTS Work Package 1.3 - Port ECDIS results

Results - overview:

- For Port operations a **precise Port ENC** is needed and required (known request and the result of the Port ECDIS questionnaire).
- We produced **high accuracy up-to-date "source based" charts** → based on local measurements (land surveying, digital high-resolution ortho photos...) and **not** on digitized small scale (old) paper charts including inaccuracies, uncertainties, problems regarding generalization et cetera.
- We produced **large scale charts** (1:500 up to 1:5000) with up-to-date information including special objects / features such as e.g. fenders et cetera for special port navigation and operation.
- We used **3 D depth information and possibilities** (Grid / Raster / TIN) and
- A designed / constructed **3D - Channel Reference Model (CRM)** → that represents the theoretical harbour bottom that must be maintained e.g. for dredged areas.
The EFFORTS Work Package 1.3 - Port ECDIS results

- Port ENC bathymetric and topographic data quality – suggestion

Object Class: **Accuracy of ENC data**

Acronym: m_aenc

Set Attribute_A: batacc; topacc;
Set Attribute_B: INFORM; NINFORM; ntxtds; txtdsc;
Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

The attribute batacc is from the type “enumerated”. There is one attribute value, this value is based on the IHO Standards for Hydrographic Surveys (Special Publication N° 44 Ed.5) and be called Special.

<table>
<thead>
<tr>
<th>ID</th>
<th>Meaning</th>
<th>Max. allowable THU</th>
<th>Max. allowable TVU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Special</td>
<td>±2 m</td>
<td>a = 0.25 m, b = 0.0075</td>
</tr>
</tbody>
</table>

Tab.1: allowable uncertainty for bathymetric data
The EFFORTS Work Package 1.3 - Port ECDIS results

Port ENC bathymetric and topographic data quality – suggestion

topacc Zone A

<table>
<thead>
<tr>
<th>ID</th>
<th>Meaning</th>
<th>Object class</th>
<th>Positional accuracy</th>
<th>Vertical accuracy</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zone A</td>
<td>(BCNCAR), (bncar), (BCNISD), (bcnisd), BCNLAT, bcllat, (BCNSAW), (bcnsaw), (BCNSPP), (bcnsp), bridge, cblohd, crseg, DRYDOC, FLODOC, flodoc, GATCON, gatcon, HULKES, hulke, lkhbn, MORFAC, PILPNT, PIPOND, PONTON, ponton, PYLONS, SLCONS, slcons, berths, BUISGL, HRBFAC, bhrfac, LNDMRK, NAVLNE, (RADLNE), RADSTA, RESARE, resare, (RSCSTA), RTPBCN, SILTNK, sistat, sistaw</td>
<td>± 0,1 m</td>
<td>± 0,1 m</td>
<td>Fixed object relevant for berthing, docking and lock passage</td>
</tr>
</tbody>
</table>

± 0,5 m | ± 0,5 m | Fixed object relevant for navigation (maneuvering, turning, towage) |
The EFFORTS Work Package 1.3 - Port ECDIS results

- Port ENC bathymetric and topographic data quality – suggestion

<table>
<thead>
<tr>
<th>ID</th>
<th>Meaning</th>
<th>Object class</th>
<th>Positional accuracy</th>
<th>Vertical accuracy</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Zone B</td>
<td>(BCNCAR), (bncar), (BCNISD), (bcnisd), BCNLAT, bcnlat, (BCNSAW), (bcnsaw), (BCNSPP), (bcnsp), bridge, cblohd, clrseg, DRYDOC, FLODOC, flocdoc, GATCON, gatcon, HULKES, hulkes, lokbn, MORFAC, PILPNT, pilpnt, PONTON, ponton, PYLONS, SLCONS, sicons, berths, BUISGL, HRBFAC, hrbfac, LNDMRK, NAVALNE, (RADLNE), RADSTA, RESARE, resare, (RSCSTA), RTPBCN, SILTNK, sistat, sistaw</td>
<td>± 0,5 m</td>
<td>± 0,5 m</td>
<td>Fixed object relevant for berthing, docking and lock passage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>± 2,5 m</td>
<td>± 2,5 m</td>
<td>Fixed object relevant for navigation (maneuvering, turning, towage)</td>
</tr>
</tbody>
</table>
The EFFORTS Work Package 1.3 - Port ECDIS results

- Port ENC encoding guide
  - representation and symbolisation

Port ENC highest quality level

Port ENC second highest quality level

→ CATZOC → accuracy

<table>
<thead>
<tr>
<th>ID</th>
<th>Bathymetric</th>
<th>Topographic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Tab.3: S-52 representation for the meta object “Accuracy of ENC data”
The EFFORTS Work Package 1.3 - Port ECDIS results

- Port ENC encoding guide
  - representation and
  - symbolisation

<table>
<thead>
<tr>
<th>Graphics</th>
<th>Encoding Instructions</th>
<th>Object Encoding</th>
</tr>
</thead>
<tbody>
<tr>
<td>PENC Symbolisation</td>
<td>A) The fender line and fenders should be associated using a C_ASSO collection object (refer to &quot;The Use of the Object Catalogue for ENC&quot; 15. Collection objects).</td>
<td><strong>Object Encoding</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Object Class</strong> = slcns (L)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(M) catslc = [21 (fender line)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(O) SCAMIN = [12000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C) SORDAT = [YYYYMMDD]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C) SORIND = (Refer to IEHG EG 1.3.1, Section B, General Guidance)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C) verdat = [3 Mean Sea Level]</td>
</tr>
</tbody>
</table>
The EFFORTS Work Package 1.3 - Port ECDIS results

- new Port ENC object (example)
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests using the Port ECDIS (Port ENC) prototype (based on basic dataset) and evaluation of tests (report)

Remark:
- All the tests running very successful
- Delivering very promising results
- Demonstrating the outstanding quality and accuracy of the developed Port ENC!!
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II

"bow – print"
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - functional test during docking manoeuvre

Onboard ENC – (inaccurate)  new Port ENC – (precise)
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU (Marimatech) test onboard of a Container vessel

Container Vessel → Yang Ming Uberty (Length 333.5m - Breadth 42.8m - Draught: 11.0m).
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU test onboard of a Container vessel
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU (Marimatech) test onboard of a Container
The EFFORTS Work Package 1.3 - Port ECDIS results

Tests - PPU (Marimatech) test onboard of a Container vessel
The EFFORTS Work Package 1.3 - Port ECDIS results

Innovative aspects
Innovative aspects

The Port ENC – should / **must** be a core component for **e-Navigation**

**DRAFT STRATEGY FOR THE DEVELOPMENT AND IMPLEMENTATION OF E-NAVIGATION**

1 **DEFINITION AND SCOPE**

1.1 E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.

1.2 E-navigation is intended to meet present and future user needs through harmonization of marine navigation systems and supporting shore services.
The EFFORTS Work Package 1.3 - Port ECDIS results

- Innovative aspects

- The proposed **Port ENC standard** has a far higher density of information, allowing more precise navigation / manoeuvring et cetera.

- The proposed **Port ENC standard** introduces additional data models and includes information not available in current standards,
  - like 3D - gridded bathymetry (in BAG format) and
  - 3D - Channel Reference Model (CRM) and supports the
  - bENC (bathymetric ENC)
  - allowing new usages. New data representations allow for new visualization methods (3D) and new functionality for better data analysis.

- The proposed **Port ENC standard** can increase and improve the interoperability of harbor related tasks
The EFFORTS Work Package 1.3 - Port ECDIS results

the Port ENC & the Port ECDIS viewer - examples

This software must not be used as an aid to navigation.

The Efforts Port ECDIS Viewer was designed and developed exclusively as a demonstrator. The idea is to give an impression how Port ECDIS data can be visualized and how Port ECDIS data can help to make Operations in Ports more effective.

In no event shall the manufacturer be liable for any other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of inability to use, or the use, of the Software, even if the manufacturer has been advised of the possibility of such damages. In any case, the manufacturer’s entire liability shall be limited to the amount actually paid by you for the software.

The manufacturer disclaims all warranties, either expressed or implied, including but not limited to implied warranties of fitness for a particular purpose, with respect to the Software, the accompanying manual(s) and written materials.

Moreover General Terms and Conditions of SevenCs GmbH (as of July 2009) must be accepted when using this software.

OK
Port ENC
Standard Chart
Port ENC Standard Chart

3D - Channel Reference Model
Port ENC
Standard Chart

3D - Gridded Data
[BAG]

3D - CRM vs. depth
3D view
Bathymetry
3D view Channel Reference Model
3D view
Bathymetry versus CRM
The Port ENC – proposal for a new Port related ENC standard
The Port ENC – proposal for a new Port related ENC standard

- *Systems Thinking* led to the *proposal* and *comprehensive concept* for a new Port ENC standard

- This *Smart System / Technology* idea can be currently *only a first step*!
The Port ENC – proposal for a new Port related ENC standard

- A maritime ENC is issued under the authority of a national Hydrographic Office (HO), a Port ENC should be issued by a corresponding Port Authority.

- Both, an HO and a Port Authority are “competent authorities.” Each has a responsibility to provide the best available data to ensure safe and efficient navigation for their area of responsibility.
Final statement

It must be reliable and clear, that the Harbour Master, the Pilot, the Captain and all other user can trust the topographic and bathymetric information within the Port ENC!

So the Port ENC can be used as a trustful reference system for navigation!

Motto: "If the vessel sails on land the positioning of the vessel is inaccurate, not the Port ENC!"
Developing a Port ECDIS - a challenge mastered!!

🎉 Thank you for your attention!!
Kontaktdaten

on behalf of the

HPA Hamburg Port Authority AöR

Neuer Wandrahm 4

20457 Hamburg

Germany

www.hamburg-port-authority.de

Dieter Seefeldt (Ret.)
Phone.: +49 40 677 19 43
Mobile: +49 170 218 36 40
E-Mail: Dieter.Seefeldt[at]DieSee.com