Basic concept of e-Navigation

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Digital@Sea and e-Navigation
Developments in the maritime domain

IALA Strategy - Current drivers and trends, Ed 2.0

- Increased Digitalization, including big data and future communication;
- Development of autonomous, automated and unmanned vessels;
- Need for increased connectivity and interoperability;
- Cyber-crime vulnerability and cyber security;
- Changes in trade patterns due to global economic developments;
- Large cruise ships going to remote locations like the Arctic;
- Competing use of the oceans (Marine Spatial Planning); and
- Demand for efficiency in the transport chain.
- High demand for sustainable and environmentally friendly operations and development.
- The world’s changing climate.
Definition of e-Navigation

“The harmonized collection, integration, exchange, presentation, analysis of maritime information on board and ashore by electronic means to enhance berth to berth navigation and related services, safety and security at sea, and protection of the marine environment”
The vision of e-navigation

On board
Navigation aids

Communications

Coastal (ashore)
Marine Aids to navigation infrastructure
e-Navigation 7 Pillars

The international e-Navigation concept

- Architecture / Human Element / Generalities
- Shipboard Equipment "fit for e-Navigation"
- Maritime Service Portfolios (MSPs)
- Communication Services
- Resilient PNT
- Shore-based Infrastructure "fit for e-Navigation"
- Common Maritime Data Structure (CMDS)

IMO e-Navigation Strategy (MSC85/26, Add.1, Annexes 20/21), IMO NAV Reports/WPs; IMO e-Nav CG; IMO e-Navigation SIP (2014)

IMO overarching e-Navigation Architecture represented as “7 Pillars”
The e-navigation Strategy Implementation Plan (SIP)

5 prioritized solutions;

• improved, harmonized and **user-friendly bridge design**;
• means for **standardized and automated reporting**;
• improved reliability, resilience and integrity of **bridge equipment** and navigation information;
• **integration and presentation of available information** in graphical displays received via communication equipment; and
• improved **Communication of VTS Service Portfolio** (not limited to VTS stations).
Multiple Initiatives

- STM Validation
- IHO S-100 and IALA S-200
- Smart Navigation
- VDES development
- FERNS role and reach
- R-Mode using VDE signals and MF
- VDE trials, in E2 etc.
- RTZ
- VTS IMO A.857(20) revision
- EfficienSea 2
- SBAS

- IMO HGDM, description of MS
- IMO SIP
- Maritime Single Window initiatives
- MASS projects and study groups
- International PortCDM Council
- MRN
- Maritime Connectivity Platform (MCP)
- VDES Satellites already in orbit
- AMRDs and MAtoNs
- BalticWeb and APPweb
- Etc.
e-Navigation flow – shore to ship

Marine information
(Converting information into digital data)

Collection
- CMDS
- Maritime Services
- MCP
- IALA NET

Analysis
- AI
- Dynamic assessment
- Risk assessment

Presentation
- S-100/200
- Portrayal
- S-mode

Integration
- S-100/200
- MCP
- Clouding

Exchange
- Satellite
- VDES, AIS, ASM
- Broadband (LET-M, IMT(3GPP))

Cyber security
MS – TS – DMS

Maritime Service Specification

Technical Service Specification

Data Model Specification

VTS
LPS
MSI
Pilotage
Tug
VSR
TMAS
MAS
NCS
NPS
INS
MIS
RHEIS
SAR
AtoN
PNT

IMO Guideline
IALA G1128
IHO UHDM

2021-11-10-Wed
e-Navigation hierarchy

Maritime Information System (e.g. MCP)

MS 1
- Product Specification H
  - Service Z Specification
  - Service X Specification
    - Service X1 Technical Design
    - Service X2 Technical Design
    - Service X Instance X1A
    - Service X Instance X2A

MS 2
- Product Specification C
  - Service Y Specification
    - Service Y1 Technical Design
    - Service Y Instance Y1A
    - Service Y Instance Y1B

MS 3
- Product Specification B
  - Service W Specification
    - Service W1 Technical Design
    - Service W Instance W1A

Communication layer (VDES/LTE/AIS?/etc)
Tony’s pizza  

TS Instance description

Phone No.  (Service registry (e.g. MCP))

TS Specification

TS Design description

Service provider

Data Model

Ingredient (S-100) + Recipe(PS) = Food (Product)

Service user
e-Navigation hierarchy

Maritime Information System (e.g. MCP)

MS 1
- Service Z Specification
- Service X Specification
- Service X1 Technical Design
- Service X Instance X1A

MS 2
- Service Y Specification
- Service Y1 Technical Design
- Service Y Instance Y1A

MS 3
- Product Specification B
- Service W Specification
- Service W1 Technical Design
- Service W Instance W1A

Product Specification A

Communication layer (VDES/LTE/AIS?/etc)
QUESTIONS?
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