eNavigation -
A Standards Perspective

Radio Technical Commission for Maritime Services

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NMEA Convention & Expo 2009
What is RTCM?

- International non-profit scientific, professional and membership organization.

- RTCM has over 120 member organizations, including
  - Manufacturers
  - Government agencies
  - Associations
  - Ship owners and operators
  - Educational institutions
  - Sales and service providers

- **Special Committees** develop reports and standards for maritime radiocommunication and electronic navigation systems.
  - 10 active Special Committees maintain 13 current standards
  - Several new standards and reports under development
What is RTCM?

- RTCM supports development of international standards
  - International Maritime Organization (IMO)
  - International Telecommunications Union (ITU)
  - International Electrotechnical Commission (IEC)
  - International Hydrographic Office (IHO)
  - International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)
What is eNavigation?

“E-Navigation is the harmonized collection, integration, exchange, presentation and analysis of maritime information onboard 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.”

International Maritime Organization (IMO) definition based on proposal by International Association of Aids to Navigation and Lighthouse Authorities (IALA)
A Descriptive Model for E-Navigation

**E-Nav Core**

**Shipborne E-Nav system**

**Integrated communications**

- Includes AIS & LRIT data, standardised reports etc.

**Shore E-Nav system**

**Inputs**

- Real-time (or near real-time) update information
  - AtoN (e.g. position status)
  - Maritime Safety Information (MSI)
  - Radar
  - Position fixing systems
  - Ship sensors (e.g. heading, log etc)
  - Echo sounder
  - Sonar (optional)
  - Inertial navigation system
  - Ship to Ship & Ship to Shore & Shore to Shore communication
  - AIS data
  - Meteorological
  - Updates to charts & publications

1. Ship only

- Long-lead (reference) information
  - Digital charts & publications
  - AtoN infrastructure and relevant AtoN information
  - Predicted meteorological
  - Oceanographic and hydrographic data (e.g. Seasonal weather patterns, tides etc)

**Outputs**

- **Safe Navigation**
  - Enhanced: anti-collision and anti-grounding processes, route planning & monitoring, pilotage & berthing, underkeel clearance management, alert management

- **Efficiencies and other benefits**
  - Standardised and automated maritime reporting
  - Logistics efficiencies (including Port State Control, port operations)
  - Potentially reduced insurance costs
  - Improved security
  - SAR & pollution response
  - Strategic analysis for infrastructure refinement
  - Incident analysis and investigation
  - Reduced human inefficiencies & errors
  - Improved onboard efficiencies
  - Decision support mechanisms
  - Improved ship/shore cooperation
  - Sharing risk analysis between ship & shore
  - External buy-in and ensured use of E-Nav
  - other

**Data communications**
Traditional Navigation Tools

Sextant

Compass

Chronometer

Charts
Evolving Navigation Tools

Loran/Decca
Radar
- ARPA
- EPA
- ATA
Radio Direction Finder
Electronic Charts
- ECDIS
GPS/GLONASS
Automatic Identification Systems
Ship Security Alert Systems
Long Range Identification and Tracking
Navigation Equipment - Functional Diagram

- Transmitter
- Sensor
- Processor
  - Software
  - Database
- Human-Machine Interface
  - Control
Navigation Equipment - Functional Diagram
Navigation Equipment - Functional Diagram

- Transmitter
- Sensor

Processor
Software
Database

- Human-Machine Interface
  - Control

- Human-Machine Interface
  - Control
## Approach to Type Approval

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## Standards Development and Type Approval

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**Future →**
- Software
- Databases
- I/O Devices
A Descriptive Model for E-Navigation

**Inputs**

- **Real-time (or near real-time) update information**
  - AtoN (e.g. position/status)
  - Maritime Safety Information (MSI)
  - Radar
  - Position fixing systems
  - Ship's sensors (e.g. heading, log etc.)
  - Echo sounder
  - Sonar (optional)
  - Inertial navigation system
  - Ship to Ship & Ship to Shore & Shore to Shore communication
  - AIS data
  - Meteorological
  - Updates to charts & publications
  1. Ship only

- **Long-lead (reference) information**
  - Digital charts & publications
  - AtoN infrastructure and relevant AtoN information
  - Predicted meteorological, oceanographic and hydrographic data (e.g. Seasonal weather patterns, tides etc.)

- **Organisational**
  - Training & procedures
  - Quality management processes
  - Data access and security protocols
  - Conventions, Regulations & Guidelines (IMO, ITU, IALA, & IHO)
  - Communication protocols (ITU)
  - International standards (ISO, IEC, others)
  - Legal instruments

**Outputs**

- **Safe Navigation**
  - Enhanced:
    - Anti-collision and anti-grounding processes
    - Route planning & monitoring
    - Pilotage & berthing
    - Underkeel and air-draft clearance management
    - Alert management

- **Efficiencies and other benefits**
  - Standardised and automated maritime reporting
  - Logistics efficiencies (including Port State Control, port operations)
  - Potentially reduced insurance costs
  - Improved security
  - SAR & pollution response
  - Strategic analysis for infrastructure refinement
  - Incident analysis and investigation
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  - Sharing of risk analysis between ship & shore
  - External buy-in and ensured use of E-Nav
  - Other
Toward an eNavigation Standards Model

• Standards need to create the framework so that eNavigation can evolve
  • Do we know what new technologies will arise?

• Challenges
  • Concept of type approval may have to change as radically different functions can be accommodated by a software change, rather than hardware
  • Paradigm shift
  • Develop network and communication technologies to support the evolution of eNavigation
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