

INTRODUCTION

Advances in marine information technology over the last decades have been substantial and rapid. Unfortunately, in many cases these advances occurred in a piecemeal fashion resulting in a collection of purpose-built systems for vessel and land-based uses that, often, do not operate in an integrated manner. The International Maritime Organization (IMO) identified this issue as affecting the safety and efficiency of navigation and initiated a work program named e-Navigation to reduce the “confusion of profusion.” The goals of developing a strategic plan are to make the US Marine Transportation System safer, more secure, more reliable, more efficient, and more integrated.

The IMO initiative on e-Navigation is the impetus for this Strategic Action Plan. The IMO definition of e-Navigation is:

“...the harmonised 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”

This definition, with which the CMTS e-Navigation Task Team concurs, recognizes that e-Navigation is not about equipment, but is about the *integration of information*. There is and will be no such thing as an “e-Navigation system,” nor will there be a carriage requirement for an “e-Navigation box.” Eventually, equipment and systems may be required to be “e-Navigation compliant” but such requirements are yet to be developed.

The IMO and cooperating international bodies are developing user needs, an architecture, a gap analysis, and cost/benefit and risk analyses for e-Navigation. They will then develop an implementation plan based on those results. IMO e-Navigation will likely manifest itself not as a system but as standards, regulations, guidelines, training requirements, and data formats, that will be used by parties to the IMO, such as the U.S., to support a more integrated marine navigation information environment.

The IMO e-Navigation initiative motivates and informs the U.S. work applied in a national context in this Strategic Action Plan. Certain areas of focus are emphasized and brought forward for action while others are left to other nations and organizations to advance. Though the CMTS e-Navigation Task Team does not anticipate that there will be one, central physical system of equipment for e-Navigation, this Strategic Action Plan opens the door to address equipment issues and it includes internal navigable waterways whereas the IMO program does not.

The *U.S. e-Navigation Strategic Action Plan* (Strategic Action Plan) is a product of the U.S. Committee on the Marine Transportation System (CMTS). The CMTS is a Federal coordination body created by Presidential directive. Therefore, the work framed in this plan will be carried out by the individual member agencies as part of their statutory missions and using their independent budget authorities. However, since the purpose of e-Navigation is to provide an integrated information environment for marine transportation; the agencies, other stakeholders, and the intended beneficiaries will work in partnership to produce the intended outcomes.

VISION

The U.S. vision for e-Navigation is:

To establish a framework that enables the transfer of data between and among ships and shore facilities, and that integrates and transforms that data into decision and action information.

This Strategic Action Plan provides a framework to address the need to standardize data management, exchange and access capabilities for federal and regulated systems. The framework will improve the delivery of timely, reliable, and accurate information without burdening the navigation of the vessel. The framework will avoid duplicate reporting while enabling two-way communication between stakeholders, especially government and industry. The framework will enable the interoperability of federal marine information systems and provide for consistent service to stakeholders on all the nation's waterways. In addition to serving operational needs, program management and budgeting issues may also be served allowing for timely, well-informed resource decisions based on performance and use information.

GOAL

The ultimate goal of e-Navigation efforts in the U.S. is to:

Use timely and reliable information to make the U.S. Marine Transportation System operate better.

By "operating better" the U.S. Marine Transportation system will be:

Safer

e-Navigation will contribute to safer waterways, reducing accidents and environmental incidents through improved situational and traffic awareness both afloat and ashore. It will provide information for better decision making.

More Secure

e-Navigation will contribute to the Nation's security by delivering vital information in support of national maritime domain awareness while respecting privacy and protecting proprietary information.

More Reliable

e-Navigation will provide reliable information in a reliable manner. Conflicting information will be resolved and usable indications of confidence in the information will be provided. e-Navigation will also increase the reliability of traditional "hard" navigation infrastructure, by making better information available about the use and condition of waterways, navigation facilities (e.g., locks) and adjacent structures (e.g., bridges, terminals).

More Efficient

e-Navigation will provide for the more efficient use of information by better preparing it for decision or action. This will reduce negative impacts on bridge crews, and can include action information that supports efficient use of a waterway.

More Integrated

e-Navigation will improve the federal collaboration on collecting information and providing an integrated marine transportation information infrastructure. The result should appear to the users as a single, outcome-oriented information service.

e-NAVIGATION FOCUS AREAS

Results from the international e-Navigation development effort will be applied in the U.S. as they become available. In addition, on-going U.S. activities, work on unique national issues, and proven areas of U.S. expertise will be advanced as a second leg of the national strategy to provide an integrated information environment. These areas of focus are:

Integrating Systems

Integrated systems will be achieved through creating and deploying a federal framework of data standards, information content, delivery means and decision support applications. E-Navigation will improve the connectivity of authoritative data sources, eliminate redundant data, and create real-time access by authorized users.

Seamless Data Exchange

Seamless data exchange will be achieved through improving the federal government's management of its data, and through the federal coordination of data submission requirements. Navigation information will automatically be "pushed" to mariners and shore users and will be delivered when it is needed.

Human-focused Interfaces

Human-focused interface research will be advanced towards configurable interfaces based on user and situational need. This will require system manufacturers, mariners, and offices ashore to collaborate on succinct, efficient displays and methods for displaying dynamic data and information.

Decision-focused information

Decision-focused information will be achieved by extending system capabilities to include more procedural and decisional functionality as opposed to simply data-consumption and display. The government, working with industry and capability providers (e.g., equipment and software

manufacturers), will help develop and codify the necessary procedures and decisions to be applied across all transportation systems.

Improved Connectivity

Improved connectivity will be achieved by using federal assets such as sites, bandwidth, authorities, etc. to see that existing U.S. communications infrastructure fully serves the critical marine transportation zones. High bandwidth, reliable connectivity, and affordability are the goals.

Inter-agency Information Coordination

Much of the marine transportation information environment is provided by or consumed by the federal government. Increased coordination among agencies, including data interoperability initiatives of the President's ocean policy initiative, will be used to provide consistent data, consistently formatted, and provided via common delivery systems.

THE NATIONAL e-NAVIGATION FRAMEWORK

The core of the U.S e-Navigation strategy is to develop a framework of components that, as they are incorporated into navigation systems, will cause to emerge a more integrated marine navigation information environment. Development of a framework, as opposed to directly mandating equipment and technologies is considered to be the optimal e-Navigation implementation strategy. This indirect strategy will have an integrating effect by exercising control of only a few key components.

The components of the framework that will come from the U.S. national e-Navigation effort will be standards, regulations, guidelines, training requirements, data and data formats, algorithms, procedures, certifications, inter-agency agreements, etc. The specific components to be produced will be selected as part of the U.S. effort itself. It is not expected that there will be a central clearing house of framework components, but that they will be publicly distributed and available for use by manufacturers, data providers, government agencies, and the maritime community to build systems and provide services. They will, in a sense, disappear into the infrastructure.

An example of a framework component could be an effort to reopen the standards for today's purpose-built bridge equipment (e.g. AIS, ECDIS, VDR, IBS, GMDSS, EPFS, BNWAS)¹ and rewrite those standards to permit and encourage the integration of their functions into a single piece of equipment, or facilitate their use in an integrated navigation system. A second example of a possible framework

¹ Automatic Identification System, Electronic Chart Display and Information System, Voyage Data Recorder, Integrated Bridge System, Global Maritime Distress and Safety System, Electronic Position Fixing System, Bridge Navigational Watch Alarm System.

component might be to expand the emerging International Hydrographic Organization data exchange standard S-100 to include NAVTEX² messaging. Beyond the use of standards, the U.S. e-Navigation effort might coordinate the consolidation of the vessel reporting requirements imposed by multiple federal agencies.

In addition to developing framework components, individual Agency initiatives for mission equipment will use the framework and oblige others to conform thus converging the community on an integrated information environment. For example, the U.S. Army Corps of Engineers envisions a River Information Services Center for inland waterway stakeholders to coordinate information sharing and to create a single distributed capability rather than multiple parallel systems. NOAA is experimenting with provision of navigation information via web services. Both, by their operation, will further the integration of information, distribution, and system operation.

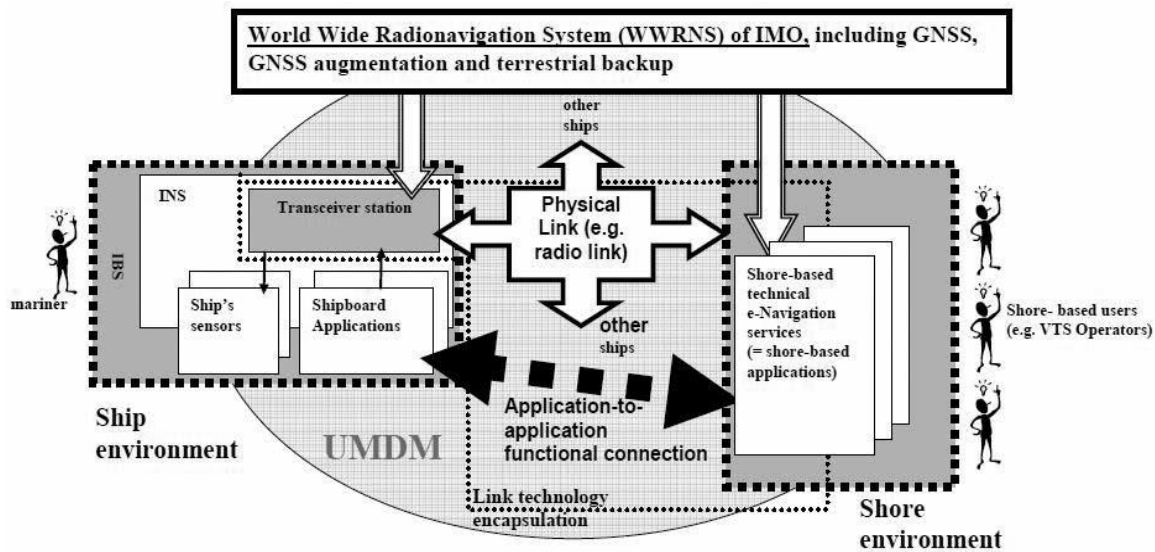


Figure 1- A Conceptual, e-Navigation Compliant Architecture Overview

Finally, as part of the U.S. e-Navigation effort, the federal government will provide some core systems and capabilities where the private sector is not well positioned to do so. Positioning, navigation, and timing (PNT) services, such as the Global Positioning System (GPS), is one example and official electronic charts and chart updating services is another. Such federal systems have always been a powerful force in causing systems, behaviors, and information to coalesce in a voluntary form of integration such as e-Navigation will produce.

² Navigational Telex

EXECUTION

The U.S. e-Navigation effort will be coordinated by the U.S. Committee on the Marine Transportation System or such entities as it designates, and with the lead Agency or Agencies also designated by the CMTS. Generally, the participants will work collaboratively, abide by the principles listed below, and encourage others to do so while keeping in mind the overall e-Navigation target benefits of increased reliability, safety and security. Members will also work with industry, standards-setting organizations, and international partners to enlist their contributions.

Work on the U.S. e-Navigation effort will be done by individual Agencies as part of their statutory mission and within existing budget authorities. Nothing in this strategy will detract from the authorities and responsibilities of any Agency. As part of the effort, detailed implementation and execution plans will be developed to identify, document, and prioritize framework components to be produced. This distributed approach is appropriate, since e-Navigation is a collection of infrastructure improvements rather than a monolithic system, and it is practical since e-Navigation is unfunded as a distinct activity. However, it will require strong leadership by the CMTS and the lead e-Navigation Agency or Agencies, as well as firm commitment from all individual participating agencies.

In order to support execution of this strategy, it should be aligned with other MTS strategic efforts. Appendix IV lists the objectives that are directly supported by this Action Plan in the National Strategy for the Marine Transportation System: A Framework for Action.

A core element of successful e-Navigation implementation is partnering across the spectrum of stakeholders. Federal e-Navigation partners will adhere to the following principles:

- Focus on meeting users' requirements.
- Develop a collaborative partnership with the MTS community.
- Make best use of existing systems and data.
- Review and implement low cost/no cost systems wherever possible but not at the expense of navigation safety.
- Encourage and support regular and frequent communications
- Be thoroughly transparent in decision-making activities
- Align with other national strategies that affect marine transportation.
- Align with international standards wherever possible.

Execution in alignment with international efforts is critical for success. The U.S. plays a key role on several international bodies involved in the e-Navigation concept. Of note, the Coast Guard currently chairs the IMO Safety of Navigation Subcommittee and the IALA e-Navigation Committee; USACE has representatives on

IMO, IALA, IEC; NOAA represents the U.S. at the International Hydrographic Organization. These activities will continue.

BENEFICIARIES OF e-NAVIGATION

This e-Navigation Strategy is intended to help implement the National Strategy for the Marine Transportation System:

“The United States Marine Transportation System will be a safe, secure, and globally integrated network that, in harmony with the environment, ensures a free-flowing, seamless, and reliable movement of people and commerce along its waterways, sea lanes, and intermodal connections.”

and the National Export Initiative which looks to:

“...enhance and coordinate Federal efforts to facilitate the creation of jobs in the United States through the promotion of exports.”

The immediate beneficiaries of an integrated marine transportation information environment are:

American Exporters and Consumers via Facilitated Trade

Through increased efficiency and safety, the cost of trade transportation will be lower thus contributing to the competitiveness of the U.S. supply chain in support of the economic well-being of the populace.

Maritime User Community

Vessel operators, business managers, shore-based facilities, and government entities at all levels will avoid the direct costs of accidents, achieve lower training costs from integrated decision-focused information, and realize more efficient operations enabled by better information.

Equipment Suppliers

A reduction in the number of special purpose systems will reduce design and support costs compared to today’s situation. Further, an integrated information environment will allow manufacturers to focus on functionality and usability as opposed to repeatedly re-solving data ingestion, reformatting, and reconciliation issues.

Government/Shore Authorities

Governments at all levels will have an integrated marine information environment that will facilitate their management of ports, improve traffic control, and reduce the complexity and costs of their marine information systems.

SUMMARY

The U.S. e-Navigation strategy is to:

- develop a framework of components that, when incorporated into equipment and systems will improve the integration of marine navigation information;
- participate fully in the international effort on e-Navigation and implement its results in the U.S.

The work will be done under the coordination of the CMTS by its member Agencies as a part of their existing mission responsibilities.

The outcome from the successful execution of this strategy is an improved integration of marine navigation information. By “making it all work together” an increase in the safety of navigation, maritime security, protection of the environment, and the reliability and efficiency of the marine transportation system is expected to be achieved.

APPROVAL AND REVIEW DATES

This strategy was approved by the CMTS Coordinating Board on July 13, 2011. Federal implementation began with this approval and will continue unless disapproved by the CMTS principals. This strategy will be implemented and continuously reviewed and improved through a CMTS e-Navigation Integrated Action Team.

Appendix I – Agency Specific e-Navigation Capabilities/Responsibilities

The US Coast Guard (USCG) provides agency operational expertise in a number of key components associated with e-Navigation:

- Aids to Navigation (AtoN) provision
- Automatic Identification System (AIS)
- Long Range Identification and Tracking (LRIT) system
- Electronic transmission of strategic maritime information to assist navigation planning in Vessel Traffic Service (VTS) Areas of Responsibility (AOR)
- Maritime Safety Information (MSI)
- Lead Federal agency role in international maritime organizations, such as the IMO and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA). The USCG also provides expertise in maritime communications issues at the International Telecommunications Union Radiocommunication Sector (ITU-R)
- Custodian and operator of the Nation's Differential GPS network.

The National Oceanic and Atmospheric Administration (NOAA) provides:

- Gathering and management of high resolution hydrographic survey data as core information for use in e-Navigation systems
- Compilation and provision of paper nautical charts and official electronic charts and updates
- Compilation and provision of printed and electronic Coast Pilots and updates
- Weather forecasts and expertise.
- Development of standards, systems, and use of the results to produce digital nautical publications that can be used by e-Navigation systems.
- Participation in the drafting of national and international standards for electronic charts and chart systems
- Research into the provision of additional navigation information, e.g. via AIS binary messages
- Participation in national and international efforts to define and evolve the e-Navigation concept
- Installation and operational support of real-time systems (PORTS) to collect additional digital information of use to mariners
- Research, development, and production of operational hydrodynamic models the output of which would be usable by e-Navigation systems
- High accuracy geodetic reference system
- nowCoast - a web mapping portal to real-time coastal observations and NOAA forecasts
- vDatum - a vertical datum transformation tool

The US Army Corps of Engineers (USACE) is responsible for coastal and inland navigation infrastructure, and provides:

- Coastal waterway infrastructure, including channel configuration and dredging
- Inland waterway management, including operation of locks and dams
- Provision of River Information Services (RIS)
- Research and development of new RIS capabilities and services
- Differential GPS along the inland system.
- Hydrographic surveying
- Inland electronic navigational charting for inland waterways.
- Development of the next generation inland electronic navigational chart
- Channel framework for coastal harbors.
- Waterway usage statistics.
- National Master Docks archive and data access
- Development of the national docks database
- Lock Performance Management System database and archive
- Development of the Lock Operator Management Application
- Enterprise Coastal Infrastructure Database archive
- Navigation and Coastal Databank

Appendix II – Federal e-Navigation projects, programs and regulatory efforts

Automatic Identification System (AIS)

The Automatic Identification System (AIS) is arguably the most significant advancement in maritime navigation and operations since the advent of radar. As its use become more widespread and accepted, mariners are finding more innovative ways to apply its capabilities. Manufacturers are refining their products with more and improved features. International regulatory and technical bodies are expanding the roles and uses of AIS. In order to fully incorporate AIS into e-Navigation, the U.S. Coast Guard needs to expand the mandatory carriage of AIS, allow the use of Class “B” devices and have access to a nationwide network of AIS receive/transmit sites.

The network of transceiver sites will need to include coverage of any waters where the benefits of e-Navigation are to be realized.

River Information Services (RIS) and other information centers

e-Navigation needs to extend its services and capabilities to all waters, offshore, coastal and inland, including the navigable rivers in the interior of the nation. Therefore, e-Navigation must have a robust river information services center. Successful realization of the e-Navigation strategy vision can only be accomplished on the inland waterways through the implementation of a robust River Information Services (RIS) Center.

RIS is a non-structural method of improving inland waterway reliability, efficiency, and safety. The RIS Center will be the U.S. focal point for the efforts of public and private inland waterway stakeholders to coordinate information sharing and create a single distributed capability rather than a number of parallel systems. The RIS Center will be a Government – Industry partnership; key Federal partners will be USACE, USCG, NOAA, USGS, IRS and CBP.

The RIS Center will be a physical Center that aggregates and distributes information from a broad network of participants to provide real time information about lock conditions, hydrodynamic and meteorological conditions, ice and debris, notice to mariners, waterway security, and real time chart updates all targeted with providing the mariner with up to date information to decrease casualties, resulting damages, and unscheduled lock closures while increasing efficiency and communications amongst all the waterway users and stakeholders.

Other centers for distributing navigation information will be considered for coastal, near-shore and inshore waters as well. This network will rely on existing infrastructure at Coast Guard Sector Command Centers and Vessel Traffic Services.

These distribution centers will obtain navigation safety related data from a network of sources and sensors and deploy information in digital format to users. This information will include route specific weather forecasting and traffic encounters.

Deployment of additional meteorological and hydrological sensors is necessary. Management and funding of the existing sensor network must be centralized and made stable.

Data standards and information sharing

In order to facilitate the increased need for information exchange, a robust infrastructure is not the only thing needed. Information providers and users must use commonly-agreed standards for data, regardless of the means by which that data is transferred. To this end, existing efforts such as the Federal Initiative for Navigation Data Enhancement (FINDE) and Federal-Industry Logistics Standardization efforts must be used and expanded. The success FILS/FINDE has had amongst USCG, USACE, Industry and several other agencies should serve as a foundation for expanded efforts encompassing additional e-Navigation related data and stakeholders

These efforts must also be cognizant of, and to the extent possible comply with existing and developing international e-Navigation data standards such as the IHO S-100 and e-Navigation Universal Maritime Data Model (UMDM).

Electronic Navigational Charts

Shipboard and shoreside display of information will require highly accurate and up to date electronic charts based on recent hydrographic surveys that include accurate and current information on aids to navigation and physical geography. There also needs to be a concurrent effort to develop and deploy digital nautical publications that can be used by e-Navigation systems.

Highly accurate charts will need to be based on a high-accuracy geodetic reference system, nationwide; including inland electronic navigational charting for inland waterways. The Government needs to pursue further development of “nowCoast” - a web mapping portal to real-time coastal observations and NOAA forecasts and “vDatum” - a vertical datum transformation tool.

Positioning

e-Navigation will be dependent on waterway users’ ability to accurately fix their position to a degree of accuracy relative to the risk and in any weather conditions they are likely to encounter. To this end, precise positioning services would need to be expanded into the inland waterway system.

Integration of e-Navigation into “traditional” Aids to Navigation service delivery

As the concept of e-Navigation takes hold among practicing mariners, it forces the need to reexamine traditional aids to navigation and service delivery systems to determine if the Coast Guard is delivering an appropriate mix of traditional and electronic services. The need for mariners to be able to fix their position, determine a safe course to steer and avoid unseen dangers will persist. However, the ways in which the Coast Guard can deliver services to enable these basic requirements will change as users adapt to technological advancements. The hardware that Coast Guard aids to navigation professionals use to mark waterways with visual

references has been on a continual course of improvement and modernization. This effort should not abate regardless of developments in e-Navigation. However, this effort should continue to progress in a unified and coordinated manner that captures and advertises the efficiencies of new AtoN-related technologies, fosters coordinated integration and testing efforts, and implements policy that will continue to provide the best service available to the mariner.

As e-Navigation tools and best practices are developed, refined and further deployed, the Government needs to concurrently develop means to measure the effectiveness and efficiency of these tool and practices.

Alignment with international e-Navigation efforts

Finally, it should remain paramount that e-Navigation is a global concept. The U.S. Government should continue to participate and contribute to e-Navigation developments in international organizations, such as IMO and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

Appendix III – Data / Information Life Cycle

Many systems and data sets in the maritime environment, both aboard and ashore, were developed independently and from a data / information perspective, generally do not work together. There are four phases in the data / information life cycle:

- Create,
- Share,
- Use, and
- Archive

There are challenges in each of these data phases.

Create

Mariners entering ports are often required to submit duplicate reports with similar content to multiple agencies as well as to commercial interests such as port services and fleet managers in different formats or by different methods. There is a distinct lack of data sharing between agencies, and the same data may be requested in different formats or resolutions. Because there is no consolidated reporting that could reduce or eliminate duplication of effort, this is adding to the administrative burden on the navigator when he or she should be focusing attention on navigation. In addition, shipboard and shore-side data is also “created” by sensors, such as radar, hydro/met, etc.

Creating waterway use statistics requires lock operators to communicate with vessel pilots to obtain cargo information that often is not available. Hours and days are then spent after a vessel locking obtaining accurate information from barge companies on cargo. Automated methods for identifying vessels and barges and linking with the authoritative source for accurate cargo information on what each barge is carrying via the internet can significantly improve the accuracy of the waterway use statistics being created.

Share

The internet provides a great opportunity to link data and information across the MTS stakeholders, but a framework of standards and data formats need to be created. There are also issues related to security and how to maintain propriety information yet ensure the appropriate groups may share data effectively between government and industry or industry to industry.

Data or information must be exchanged between ship and shore in the e-Navigation environment. Currently, expensive or scarce (e.g., SATCOM) for-fee channels may be used when other lower cost (e.g., VHF) frequencies may be available. Different satellite communications systems are usually incapable of talking to each other.

Even when systems share the same frequencies, often data / information standards differ, again precluding interaction.

There is a proliferation of shipboard systems and equipment, many of which are required through domestic and international regulation. In most instances, these are stand-alone systems and not integrated. Many ships are fitted with fleet management systems that can automatically update the ship-owner on the location and status of the ship. However, these are commercial systems, usually proprietary, and the communications link, e.g., satellite, is charged to the owner at a per message unit rate. These do not take advantage of free communications links when geographic position, frequency and bandwidth considerations may allow alternatives to satellite or other commercial communications. Most importantly, there is no commonality between the various commercial fleet management systems. They are generally incapable of communicating data across systems either because of disparate communications links or data formats. So there is no clearinghouse of navigation-related information, only a preponderance of data sets and expanding, differing formats. However, the International Hydrographic Organization (IHO) has developed its S-100 Geospatial Information Data Registry which allows for other domains to operate under its framework. The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) has been developing a Universal Maritime Data Model (UMDM) that is likely to be considered as a domain under S-100.

The National Information Management System (NIMS) is called for in the National Ocean Policy and e-Navigation will need to be compatible with it. Furthermore, e-Navigation data will need to be consistent with the existing and evolving Federal Geographic Data Committee standards, where applicable.

Use

The ultimate utility of e-navigation will be judged by how data and information is used to improve the reliability, safety, and security of the MTS. A variety of different displays are needed today by operators ashore and afloat because portrayal systems are not integrated. Human factors and other user requirements may not have been adequately considered in the development of displays and controls or in the number of keystrokes required to access data. Training is often scarce or not available making it difficult to go from one ship or station to another due to wide differences in user systems.

Because fleet management systems are multi-purpose platforms designed primarily with the ship-owner in mind, the utility of such a system to the mariner may be minimal. Providing the mariner navigation information is a secondary, uncoordinated, and perhaps unintentional benefit. There is generally the lack of a navigation data (and information) framework.

Numerous pilots' organizations have embraced automatic identification system (AIS) based Portable Pilot Units (PPUs). These may be loosely integrated with shipboard systems but there are numerous variations used by foreign and domestic pilot organizations and the information available on the PPU is usually kept separate from the navigator on the ship.

Many systems fitted today focus primarily on information technology guidelines and on the transmission of as much data as possible. However, when data are transformed into information, it may not be presented in the most usable format for the mariner and could contribute to information overload. But despite providing a lot of information to the mariner, some useful elements are still missing, such as dynamic measurement of vessel draft, real-time monitoring of channels, and detailed real-time hydrographic-meteorological information (beyond point measurements).

Finally, training on these systems is often done on-the-job, and because systems vary from ship to ship, training cannot be uniform.

Archive

Included in a National plan is who will record and maintain data that is identified as needed beyond when it was created and used. Many types of data are stored by government agencies or industry because of statutory requirements, but much more is stored to support missions and because once produced its value is too great to discard.

**Appendix IV – The U.S. e-Navigation Strategic Action Plan is Aligned with the
Following Objectives of the
CMTS National Strategy for the Marine Transportation System:
A Framework for Action (2008)**

Capacity:

- Work collaboratively to address Federal statutory, regulatory, and institutional requirements in order to improve MTS performance;
- Publish valid, reliable, and timely data on the MTS including cargo movements, capacity, and productivity;
- Facilitate standardized terminologies, interpretations, and flow-through models to foster increased productivity.

Safety and Security

- Coordinate existing Federal navigation programs to ensure collaboration, reduce duplication, and standardize terminology and presentation;
- Deliver timely, relevant, accurate navigation safety information to mariners, including real-time information systems to improve navigation safety and efficiency and reduce the risk of accidents;
- Encourage, coordinate, and support navigation technology research and development to enhance navigation safety;
- Enhance and improve existing frameworks that plan for, operate, maintain, and mitigate risks to vessels and the environment, and respond to accidents and natural disasters;

Resilience and Reliability

- Provide coordination, expertise, and resources to ensure continuity of operations, essential public services, and the resumption of commercial marine activities following a disruption.
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Members of the CMTS e-Navigation Task Team

- **US Coast Guard (Task Team Leader)**
- **US Army Corps of Engineers**
- **National Oceanic and Atmospheric Administration**
- **National Transportation Safety Board**
- **Maritime Administration**
- **Oceanographer of the Navy**
- **Research and Innovative Technology Administration**
- **CMTS Executive Secretariat**

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