Joint IHO/IALA Workshop S-100/S-200 Product Specification Development & Portrayal

WORKSHOP REPORT
5 to 9 September 2022
Norwegian Coastal Administration
Ålesund, Norway

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Workshop Secretary

09 September 2022

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Report of the Joint IALA/IHO workshop on S-100/200 development and portrayal

Executive Summary

The joint IALA/IHO workshop on S-100/200 development and portrayal was held between the 5 and 9 September 2022 at the Norwegian Coastal Administration in Ålesund, Norway.

The workshop was very well attended with 78 participants from 17 countries.

The workshop participants considered the various presentations that were given and the work conducted in the WGs and it was concluded that:

- cooperation between the two international organizations is important to proceed with marine digitization, and in order to inform the shipping domain of the cooperation efforts between the two bodies. This could be facilitated by a possible joint workshop between international organizations such as IHO/IMO/IALA.

- continued coordination and closer collaboration between IHO, IALA, IMO and other relevant bodies is essential to achieve globally harmonized solutions for S-100/200 development and portrayal, this could be achieved by the use of rapporteurs at the IALA committee level.

- the transition from S-52 to S-101 portrayal is being progressed by IHO. Since IALA may have comments which can be put forward following the IALA ARM16 Committee meeting. This requires presentation of the draft portrayal symbols at the IALA ARM Committee meeting.

- it was agreed upon that S-201 should be the update source for AtoN data for use by hydrographic authorities.

- a clear and concise understanding of the purpose and use of S-125 was agreed upon. It was agreed that S-125 would be a suitable replacement for the List of Lights and Fog Signals and act as a bridging mechanism.

- the joint IHO/IALA development of S-125 should continue and the dataset should include, at a minimum, the same AtoN data contained in the S-101 Product Specification. S-125 should be tested at the earliest opportunity utilizing the services of the IHO Singapore lab that have been offered for this purpose.

- as there are differences in the frequency of when the S-101 data can be issued, which is to the best of the ability of the provider, the S-125 dataset should be updated at a frequency necessary to support navigational safety.

- content in S-124 and S-125 should be coordinated on a regional level, in order to minimize data duplication.

- integration of S-125 into ECDIS is a medium term outcome but it will need immediate action in order to meet that goal.

- IMO approved communication requirements (GMDSS) cannot efficiently communicate S-100 based data to mariners. In order to rapidly deliver time critical information to navigational equipment a secure broadband connection to the vessel is required in accordance with relevant IEC standards.

- there is a need for a range of marketing communication, covering the necessity to adopt S-100 digital services, in a way that reaches a wider audience, especially policy makers, to emphasise the benefits such as reduced emissions, reduced costs, optimized loading and improved safety of life at sea and challenges such as resource requirements.

- the skeleton that can form the basis of an IALA model course was defined. The proposed framework should be considered by the IALA academy for the creation of an S-100 training material and promotion.

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 4 of 39

- S-97 is an IHO document, but S-100 is e-Navigation universal. Therefore, S-97 could be updated to capture non IHO-context better. The workshop suggests that a formal procedure on how S-97 updates are triggered and communicated is set up.

- the IALA Secretariat should consider submitting an input paper to the S-100 working group before the December 2022 meeting recommending that an impact assessment should be made, on whether the S-100 Version 5.0.0 release requires an update of S-97.

- IALA should consider updating Guideline G1106 on S-2xx management to include version control and update procedures etc.

- IALA should consider requesting the S100P include S-2xx suite of data product specifications as part of their test-bed.

- IALA considers developing a roadmap covering S-2xx suite and also considers the possibilities of no-ECDIS related S-100 products.

Contents

Report of the joint IALA/IHO workshop on S-100/200 development and portrayal

1. INTRODUCTION

The joint IALA/IHO workshop on S-100/200 development and portrayal was held between the 5 and 9 September 2022 at the Norwegian Coastal Administration in Ålesund, Norway.

78 participants from 17 countries participated in the Workshop plus three members of the IALA secretariat. An analysis of the attendance is shown in graph format below:
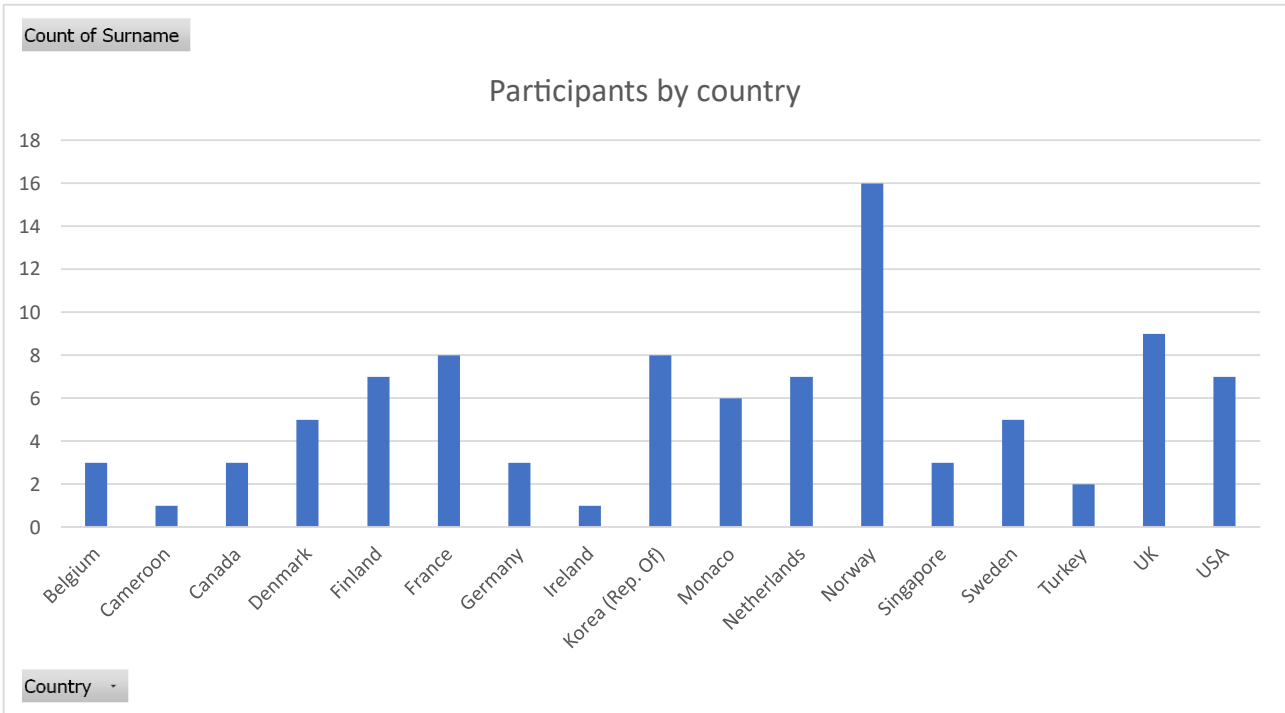
Workshop participants were provided with the details of the file sharing system which will be available for the exchange of documents, presentations and photographs.

2.   SESSION 1 – OPENING OF THE WORKSHOP

This session was chaired by Phil Day, Chair of the Workshop.

2.1   Welcome from NCA, Arve Dimmen - Director of Navigation Technology and Maritime Services NCA and IALA Council Member

Arve Dimmen, Director of Navigation Technology and Maritime Services, Norwegian Coastal Administration (NCA) welcomed participants on behalf of the NCA to Ålesund. He noted the current problems in the world and highlighted the need for meetings such as this to continue international collaboration. Arve Dimmen added that he hoped that cyber security would be considered in the workshop discussions.

The background and scope of the NCA was then highlighted to participants and the impact that a digital revolution was now upon these traditional AtoN. The arctic infrastructure currently monitoring the area for Norway was highlighted and the relation that this NCA work has with the workshop objectives.

Arve Dimmen concluded by underlining that meeting together is the most effective way of communicating and collaborating. He then wished the workshop well and hoped that participants enjoy their stay in Norway.

2.2   Welcome from IHO, Abri Kampfe – IHO Technical Director

Abri Kampfe, IHO Technical Director, congratulated the organizers of the workshop and welcomed the joint nature of IALA and IHO coming together in one event. He recalled the remarkable work that was conducted under the difficult conditions of the pandemic, particularly the road map for S-100 implementation. He hoped that the workshop would inform both organization's work programmes and that new friendships would be forged. Abri Kampfe concluded by wishing the workshop every success.

2.3   Welcome from IALA, Omar Frits Eriksson – IALA Deputy Secretary-General

Omar Frits Eriksson, IALA Deputy Secretary-General, welcomed participants to the workshop and expressed his happiness to see the interest that the event has garnered with some 90 experts and stakeholders with a keen interest in the development of Data Product Specifications.

He acknowledged that this was the first large scale workshop for IALA after the pandemic, and how excited IALA is about getting back to something which resembles our normal modus operandi.

Omar then provided a status update regarding the IALA NGO to IGO transformation project. Over the last ten years, IALA has worked on this project, which has been hard work and included three preparatory diplomatic conferences.

This culminated in a final Diplomatic Conference which took place in Malaysia in February 2020, just before the onset of the Pandemic.

The 52 Coastal States attending this conference agreed on the text of a new International Convention for the Association which transforms IALA from a Non-Governmental Organization NGO to an Inter-Governmental Organization, an IGO.

The First State to sign the convention was France our Host Country who signed in January 2021.

The signature period for other States to sign the new Convention was set to twelve months and this period ended in January 2022 where we had a great signature ceremony where more than 50 States signed the convention and became the founding fathers of the new IALA as an Inter-Governmental Organization

The final sprint in this process is for as many Coastal States as possible to ratify or accede to the Convention.

IALA has currently nine ratifications and when they have 30 ratifications, IALA automatically transforms into an Inter-Governmental organization. This will be a very important milestone in the life of the organization.

Omar hoped that all will have a fruitful week and that the outputs of this workshop will serve everybody well in the months and years to come, working with e-Navigation services and the digital agenda in general.

He thanked the Norwegian Coastal Administration for hosting this event, especially Guttorm Tomren and the Steering Committee for putting together the an excellent program and of course he thanked the IHO team for cooperating and collaborating on making this workshop happen.

With that, he wished all a splendid workshop and hoped that at the end of the week all will find that this was time well spent.

2.4   Administration and safety briefing, Guttorm Tomren – Head of Section AtoN, NCA

Guttorm Tomren provided a safety and administrative briefing which can be found on the workshop fileshare. Presentations can be found on the fileshare here as PDFs. A list of participants can be found in Annex A.

2.5   Working programme of the week and expectations, Phil Day - Chair of the IALA ARM Committee

Phil Day, Chair of the ARM Committee and Northern Lighthouse Board Director of Operations, introduced the programme for the week (Annex B).

The expectation for the week is to produce a draft guideline on the future of DGPS/DGNSS, network and understand what is happening with DGPS and what options are available when deciding what to do with the service and infrastructure.

2.6   Introduction to S-100, Magnus Wallhagen - Deputy National Hydrographer, SMA

Official Electronic Navigational Charts (ENC) in the standardized IHO S-57 format have been used over 20 years now. In the beginning the revolutionary thing with electronic charts was that you could see the ship's position directly on the chart. However, the ENC of today is still more or less an electronic version of the paper chart and as such limited to the amount of information which originally was optimized to be portrayed on a paper. In addition separate systems and sources are needed for other navigational information such as weather, tide tables and navigational warnings with no connection to the ECDIS. With the prospect to enable more navigational information in navigational systems and integrate all navigational information in the same system the IHO took the initiative to develop the S-100 standard to become a framework for the development of digital products and services. Since then IMO has appointed S-100 as the base for e-nav Maritime Services and several other international organizations are now involved working on the development of different product specifications.

The "Introduction to S-100" gave an overview of what S-100 means for the maritime community, identified benefits and the main building blocks. Prioritized S-100 products will be described and how they could interact with each other. A timeline for the prioritized S-100 products will be presented as well as how IHO cooperate with the IMO and other international organizations to secure that the implementation of the future S-100 ECDIS will be as smooth as possible. To understand the different forums involved within IHO the presentation will also show an organizational overview of the technical working groups.

2.7   Introduction to S-200 series and MRN, Minsu Jeon – Technical Operations Manager, IALA

Minsu Jeon, IALA Technical Operations Manager, gave an introductory presentation on S-200 series and MRN. He focused on the development status of each product specification of the S-200 suite with the S-200 world illustration. The other part of the presentation covered the Maritime Resource Name (MRN), which is a naming scheme that can uniquely identify any maritime resource on a global scale.

3.   SESSION 2 – INTRODUCTION TO S-100

This session was chaired by Phil Day, Chair of the Workshop.

3.1   Introduction of IHO GI Registry – Yong Baek, Assistant Director, IHO

The IHO Geospatial Information Registry (GI Registry) includes an administration and governance framework that determines how the content of the various registers are managed (i.e. how items are included and

maintained in the registers). Items are classified into the community domains such as IHO, IALA, and WMO etc.

The GI Registry contains several Registers – Concept Register, Data Dictionary Register, Portrayal Register, Meta Data Register, Product Specification Register, and Producer Code Register – that include items of information that are relevant to those communities developing of S-100 based products and services.

The administration of this registry conforms to IHO Publication S-99 (Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry).

3.2 Review of existing IHO/IALA Product Specifications – Dave Lewald, Program Analyst - Navigation Systems, USCG

Dave Lewald summarised a range of topics and statuses of development with emphasis on portrayal.

3.3 S-98 Interoperability: S-1xx Product Specifications layering – Liz Hahessy, Specialkonsulent, Danish Geodata Agency

Liz Hahessy highlighted the importance of interoperability to provide a clear navigational picture to the mariner.

She introduced S-98 the IHO Standard on Data Product Interoperability in S-100 Navigation Systems and which products are relevant, describing the various parts of S-98.

She then provided an overview of how water level adjustment will operate on an S-100 Navigation System and the rules that will govern its use. The presentation finished by explaining the next steps for S-98.

3.4 Introduction to IHO / Singapore innovation and technology lab – Parry Oei, Adviser (Hydrography) in the Maritime and Port Authority of Singapore

The presentation covered a brief history on the establishment of the IHO. The composition of the Governing Board and the objectives of the IHO-Singapore Lab was then described.

It also provided a description of the 2 approved projects and a newly submitted proposal. The process for submission and approval of project proposals that are submitted to the Governing Board was briefly shared.

3.5 Question and answer session

A number of questions were then asked from the floor. Highlights included the following:

- It was noted that innovations in this area were greatly welcomed but consideration must be given to the training for users and other stakeholders.
- It was noted that there will be a transition period for the introduction of S-100 by 2029 where both S-100 and S-57 will be in place.
- It was also clarified that S-104 which concerns tidal information will be both predicted and live data.

4. SESSION 3 – SHARED EXPERIENCES (LESSONS LEARNED)

4.1 Development of Product Specifications by IHO-NIPWG – Eivind Mong, Senior Adviser for e-Navigation, Canadian Coast Guard

The presentation on the Development of Product Specifications by IHO-NIPWG gave a brief history of the development that explored how NIPWG S-100 product specifications were formulated. The presentation especially noted the discussions that were needed to conclude, in general terms, the relationship between NPubs and ENC, as well as how and where the information should be used during a voyage. The importance of understanding the user systems and the surrounding system architecture and distribution channels was highlighted for how it impacted the product specification development. Furthermore, an overview of all

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 11 of 39

NIPWG product specifications and their intended use with their development status was given along with future plans and timelines.

4.2 Development of S-101 – ENC – Jeff Wootton, Technical Standards Support Officer, IHO

Development of the S-101 ENC Product Specification commenced in 2009 with the initial concept for the S-101 data model. Unlike most other Product Specifications under development within the S-100 framework, S-101 development has been able to leverage off the implementation and practical experience gained from the introduction of the S-57 ENC Product Specification and the S-52 Specifications for Chart Content and Display Aspects of ECDIS.

The presentation will focus on the progress in the development of the various components of S-101 as it relates to the current operational Standards S-57 and S-52 as well as the relationship to other IHO Standards and Specifications. The challenges and lessons learned during the development of S-101 up to this time relate to both the adaptation of the current ENC and ECDIS Standards; and the experience gained during this development. New challenges include, but are not restricted to: interoperability with other S-100 based Product Specifications; availability of required tools to assist with development; availability of "native" test data; version control during development; new portrayal and performance requirements; access to appropriate resources and subject-matter expertise; and the S-57/S-101 "dual-fuel" concept.

4.3 Development of S-125 Marine Navigational Services – Sewoong Oh, Principal Research Engineer, KRISO

Sewoong Oh's presentation demonstrated how IC-ENC is working towards S-100 and supporting IC-ENC Members in their transition to S-100.

4.4 Development of S-201 Aids to Navigation – Eivind Mong

The presentation on the Development of S-201 Aids to Navigation gave a history of S-201 including the reasoning for why it follows the S-57 data model and not the S-101 data model. Explanations were given for how to use S-201, considering its main purpose is for exchange of AtoN information among shore based stakeholders and not for navigation including how it may be used for servicing of AtoN Systems. The presentation also gave examples of how standardization can benefit the AtoN community at large by creating an environment where standard software packages gives room for increased cooperation and improve the shareability of experience. Moreover, the presentation clarified the ongoing development of S-201 and motivation for recent changes, before concluding with future plans and challenge to AtoN Authorities to start using S-201 and considering it in their operations.

4.5 The Delivery of S-100 Data - Su Marks, S-100 Manager, IC-ENC

The presentation covered how IC-ENC is supporting its members in their transition to S-100.

4.6 Delivery of S-100 data by means of harmonised technical (enavigation) services' – Thomas Christensen, Secretary-General, MCP Consortium

The presentation explained how (using which standards and guidelines) data in the form of S-100 product specifications may be exchanged - in particular from shore to ship (including ECDIS), and how the MCP (Maritime Connectivity Platform) supports authentication and service discoverability in this regard. It also gave a status on the MCP and the development of various technical services for delivering S-100 data.

4.7 Development of S-211 – Port Call Message

There was no presenter for this topic.

4.8 Development of S-212 – VTS information – Wim Smets, Technical Manager, Agency for Maritime and Coastal Services of the Flemish Government

The presentation was called "Journey towards a Product Specification for a VTS Digital Information Service". In the presentation an insight was given on the different steps and pitfalls that we encountered since VTS45 regarding the development of the S-212 Product Specification.

Key messages:

- Development of Product Specifications should be strictly coordinated by IALA
- Alignment with developments in operational and technical working groups (VTS and ENAV) is crucial
- Guidance is needed in order to finalize the current draft of the Product Specification to create a 1.0.0 version for testing

4.9   Development of S-401 – Inland ENC - Gert Morlion, Project Manager IWT Innovation,

The development of S-401 started almost simultaneously with the development of S-101. Because both are very similar, the IEHG decided to keep the S-401 in line with S-101 as much as possible. The consequence of this decision is that the S401WG always has to wait on the different development phases of S-101 before they can take a new step.

The current status of S-401 developement:

- In December 2019 the first edition of the Product Specification was been published.
- In June 2022 a first draft of the feature catalogue was created.
- In parallel the development of the portrayal catalogue is going on (style sheets, colour definitions, line styles, area fills, symbols are finalized, LUA scripts will be developed after testing tools are available).
- Although IEHG decided to use the DCEG instead of the Inland Encoding Guide, a new discussion has been initiated because of practical reasons.
- Conversion guidance is under development (mapping tables, document)
- Interoperability: S401WG is waiting on S101WG for a solution. Will S-401 as base cell be possible?

To conclude the issue of interoperability is raising a lot of questions which makes the further development of S-401 difficult. Nevertheless the S401WG is proceeding with all of the different topics.

4.10   Development of S-421 – Route Exchange - Hannu Peiponen, Technical Director, Furuno Finland Oy

The presentation explained what is S-421. It explained further the standardized use cases for S-421. The use cases facilitate successful interoperability between different systems both on board and in shore.

4.11   Question and answer session

A number of questions were then asked from the floor. Highlights included the following:

- It was noted that it would be most desirable for end users to be able to provide data in a two way system but this is not currently being developed.
- It was welcomed that S-421 could be possibly used for search and rescue patterns not just routes. This could be transmitted by SECOM, which will be discussed at IMO NCSR10 and participants that attend IMO should support this initiative.
- It was thought that local regulations will determine which types of charts will be used for inland waterways.

5.   SESSION 4 – REVIEW OF IHO, IALA RECOMMENDATIONS AND GUIDELINES

This session was chaired by Minsu Jeon, Technical Operations Manager, IALA.

5.1 IHO guidance documents – Yong Baek

To develop product specifications and services based on S-100, it is recommended to carry out the standard procedures to the development according to IHO S-97. IHO Publication S-97 is to assist in the creation of harmonized Product Specifications that are used within the e-Navigation eco-system. This guideline serves as a cookbook for anyone planning to develop or extend an S-100-compliant Product Specification and consists of three parts:

- Part A is an in-depth description of the various components of an S-100-based Product Specification;
- Part B describes the typical steps and activities involved in creating an S-100-based Product Specification. Part B describes the overall process; specific activities and tasks; and includes hints for solving specific problems while the Product Specification is being developed; and
- Part C describes the data quality measures deemed appropriate for use in S-100-based Product Specifications.

S-100 is underpinned by a Registry and component Registers based on ISO 19135. IHO Publication S-99 describes the roles, responsibilities and procedures for operating and managing the S-100 GI Registry and its component Registers.

5.2 IALA guidance documents – Peter Hooijmans, Information Manager, Netherlands Ministry of Infrastructure and Waterways

The presentation provided information and context about the different IALA guidance documents, their history and purpose with respect to the development of Maritime Service in the context of e-Navigation.

5.3 Question and answer session

A number of questions were then asked from the floor. Highlights included the following:

- It was acknowledged that there may be benefits to include route planning in the second phase of S-98.

- IALA should ensure that IALA guidance documents remain comprehensive for this area but avoids overlap of information.

- The IHO Product Specification Register can be used to store drafts and could therefore be used as a tracker to cross reference all the work being conducted on product specifications.

6. SESSION 5 – PORTRAYAL

This session was chaired by Dave Lewald, Program Analyst - Navigation Systems, USCG

6.1 Portrayal from the IHO perspective – Jeff Wootton

The principle focus for portrayal from an IHO perspective is on performance and display in Electronic Chart Display and Information Systems (ECDIS); however noting that within the S-100 Framework there is an increasing emerging focus on other navigational and monitoring systems applications. A key factor to be considered in all aspects of ECDIS portrayal is the new requirement to cater for the interoperability of multiple Product Specifications in a manner that will not cause confusion to the end-user.

The presentation focused upon the correlation between the current ECDIS content and display standards and the corresponding Standards and Product Specification components within the S-100 Framework. In addition, the importance of harmonization of portrayal between different S-100 based Product Specifications utilizing the Portrayal Register within the IHO Geospatial Information Registry was highlighted; as well as the importance of communication and cooperation on portrayal aspects between all Organizations and Working Groups involved in the development of S-100 based Product Specifications. The issue of reconciling current ECDIS portrayal with current technological and end-user expectations will also be discussed, taking into

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 14 of 39

account the current experience of the Mariner as the principle end-user and the transition to full S-100 based Product Specification coverage (principally S-101 ENC) through the "dual-fuel" concept.

6.2 Portrayal from the IEC perspective – Hannu Peiponen

This presentation explained the international rules for presentation of navigation related information. It also gave examples of symbols created by IEC and symbols specified by IMO. This presentation acts as guidance to create new symbols.

6.3 Portrayal from the IALA perspective – Guttorm Tomren

Guttorm provided an overview of portrayal from the perspective of IALA.

6.4 Cartographic charting – Dave Lewald

Dave provided a review of charting of AtoN in ENCs.

6.5 Q&A and brainstorming session

A number of questions were then asked from the floor. Highlights included the following:

- It was noted that S-101 isn't just for use in ECDIS and that S-101 has a lot of flexibility in portrayal.
- S-125 must be harmonized between IALA and IHO to ensure that it gets approved. It remains to be seen what more in S-125 should be done. One of the goals of S-201 is to reduce the burden on the Hydrographic Offices.
- There is a 'scale maximum attribute' is a feature in S-101 that has not been utilized yet and the areas indicating the direction of traffic in the Dover TSS in relation to the Varne Bank could be a good user case for this feature.
- It would be useful for S-100 training to be considered by IMO.
- The maintenance of data in S-200 should be kept in mind not just the implementation of it.
- It was suggested that S-201 should be a data model rather than consider portrayal within it.

7. SESSION 6 – MRN USER PERSPECTIVE AND OEM

This session was chaired by Dave Lewald, Program Analyst - Navigation Systems, USCG

7.1 MRN – The Way Forward - Guideline G1143 Unique Identifiers for Maritime Resources – Eivind Mong

The presentation MRN – The Way Forward - Guideline G1143 Unique Identifiers for Maritime Resources starts with a brief background of how G1143 came about and it's development history. It further gives a short overview of G1143 and what S-100 states about MRN. Then the presentation moves into a discussion on how to start using MRN and how it is backwards compatible with most current ID systems. It highlights the need for national cooperation to ensure the persistent use of identifiers from source. The importance of persistent identifiers in e-Navigation is discussed by showing how these may be used in various applications such as; addressing objects for informing about change; traceability of source of information; enable new data delivery structures considering the amount of data that can be anticipated in the future; enabling systems to identify the same object/set of information if received from different data streams. The presentation ends with a challenge to all data producers within the e-Navigation paradigm to start making use of the MRN framework.

7.2 MRN demonstration of practical application – Dave Lewald

Dave provided an overview of how the U.S. devised a schema to apply MRNs to all waterways in a parent-child relationship.

7.3 Introduction to International Coordination on Product Specification - Marianne Hagaseth, Senior Research Scientist, SINTEF Ocean

Marianne informed the workshop about the work being conducted in the IMO Facilitation Committee and ISO TC8 and how it relates to the S-100 framework.

7.4   Question and answer session

A number of questions were then asked from the floor. Highlights included the following:

- It was noted that MRN is not a concept in the Geo-spatial Registry yet.
- It was highlighted that in order for all countries to understand and develop these concepts they must be simple. The Compendium' and MRN's are good examples of this.
- It was asked if S-98, S-101 took into account dyslexic seafarers and it was noted that this had not been considered to date.

8.   ESTABLISH WORKING GROUPS

Phil Day, Chair of the Workshop, reminded participants of the three working groups and their suggested outcomes (Annex C). Participants then divided into three groups to begin the work.

8.1   WG1 - Initializing and productizing of S-100 series data

The full working group report can be found in Annex D

8.1.1   Executive Summary

A list of the key outcomes and conclusions of the WG1 session follows:

- There is a real need for a simple brochure along the lines of what IHO already has (maybe even simpler) to describe what the S-100 series data product specifications are.
- "Marketing" has been identified is an additional action point, put forward in a way that users and stakeholders understand. A number of marketing papers, simple and in different levels would be beneficial.
- The advantages but also the necessity for the adoption of S-100 should be continuously communicated to policy makers, in a way which is aligned with the with the principles of each government.
- The skeleton that can form the basis of an IALA model course was defined. The proposed framework should be considered by the IALA academy for the creation of an S-100 training material and promotion.
- The IALA G-1106 document need to be updated, using references where appropriate to the more detailed S-97 documentation.
- S-97 is an IHO document, but S-100 is e-Navigation universal. Therefore, S-97 could be updated to capture non IHO-context better.
- The technical manager of IALA is recommended to submit a working group paper to the S-100 working group before the December 2022 meeting recommending that an impact assessment should be made, on whether the S-100 Version 5.0.0 release requires an update of S-97.
- WG1 suggests that a formal procedure on how S-97 updates are triggered and communicated is set up.
- WG1 suggests that IALA requests the S100P to include S-200 suite of data product specifications as part of their test-bed.
- A document, similar to the IHO "Roadmap for S-100 Implementation Decade (2020-2030)" could be also circulated by IALA.
- IALA should also define its own resolution for version control its own product specification phases.
- Now the time for some "story-telling". Circular letters, social media, training, and other methods can be used to convey a simple and clear message, using "marketing" language.
- The IHO prioritization of product specifications is adequate.
- Many of the participants commented that they do not fully understand how the S-100 series data products are structured and the inter-dependencies that exist (e.g. between S-98 and other

products). Therefore, a bit more effort is deemed necessary to make all the information more clearly visible and intuitive.

8.2   WG2 - S-201,124 and 125 development

The full working group report can be found in Annex E

8.2.1   Executive Summary

- As there are differences in the frequency of when the S-101 data can be issued, which is to the best of the ability of the provider, the S-125 dataset should be updated at a frequency necessary to support navigational safety

- The joint IHO/IALA development of S-125 should continue and the dataset should include, at a minimum, the same AtoN data contained in the S-101 Product Specification.

- Tasks and services for S-201, S-125, S-124 and S-101 were identified and the data flow between each task was finalized.

- Content in S-124 and S-125 should be coordinated on a regional level, in order to minimize data duplication.

- In the case where an S-124 NW and an S-125 AtoN Information overlap for the same aid, there was agreement that the S-124 NW should take priority over the S-125 AtoN Information.

- In the discussion regarding interoperability between S-125 and S-101, it was concluded that only the S-125 status change symbology and pick reports need to be included by overlay/interleaving.

- Cooperation between the two international organizations is important to proceed with marine digitization, and in order to inform the shipping domain of the cooperation efforts between the two bodies, it is recommended that the relevant working group and task group prepare presentations and demonstrations of S-201/S-125/S-124 data service.

8.3   WG 3 S-98 interoperability and Marine AtoN portrayal

The full working group report can be found in Annex F

8.3.1   Executive summary

It is expected S125 's purpose:

- update status on AtoN

- the transfer standard between AtoN provider and HO.

Uses cases

- use S125 outside ECDIS on another system - replicate S101 and also include update information. This is for when S101 is not in that system

- portrayal catalogue in ECDIS (magenta circle) ensure display with S101 for route monitoring and planning – needs a proposal

- all S125 displayed on ECDIS for route planning through S101

- printed List of lights is compulsory to be handled on board. It was expressed the possibility for S100 ECDIS to provide such nautical publication. S125 could then meet this requirement.

Gaps

- IMO legal communication requirements (GMDSS) cannot efficiently communicate S100 based data to mariners. There is a need of broadband communications for safety of navigation purposes.

- communication latency seen as a gap in the provision of data from the AtoN provider to the users (S201⬜S125⬜S101)

- IALA still does not have a S98 equivalent interoperability standard

- lack of system harmonisation between domains (eg. different portrayal for maritime and IWW navigation)

- integration of S125 into ECDIS is a medium term outcome but will need an immediate action to meet that goal: IALA submission to IHO

- there is a well stablish communications IALA/IHO and could be leveraged via rapporteurs in IALA committee level. A redefinition on the content of the meetings could be envisaged.

- need to identify use case for scale attribution in AtoN symbology

<u>Next steps</u>

- suggested that IHO representative inform about the updates on S1XX during the ARM Committee.

- closer collaboration in IALA ARM WG with IHO experts

- new symbol/portrayal proposal should be sent to IHO. The process starting in the IALA task group and finalising in the IHO WG needs to be understood by IALA.

- IALA needs to consider creating a S98 catalogue for AtoN.

9.   **WORKSHOP CONCLUSIONS**

The workshop participants considered the various presentations that were given and the work conducted in the WGs and it was concluded that:

- cooperation between the two international organizations is important to proceed with marine digitization, and in order to inform the shipping domain of the cooperation efforts between the two bodies.

- continued coordination and closer collaboration between IHO, IALA and other relevant bodies is essential to achieve globally harmonized solutions for S-100/200 development and portrayal, this could be achieved by the use of rapporteurs at the IALA committee level.

- The transition from S-52 to S-101 portrayal is being progressed by IHO. Since IALA may have comments which can be put forward following the IALA ARM16 Committee meeting. This requires presentation of the draft portrayal symbols at the IALA ARM Committee meeting.

- It was agreed upon that S-201 should be the update source for AtoN data for use by hydrographic authorities.

- a clear and concise understanding of the purpose and use of S-125 was agreed upon. It was agreed that S-125 would be a suitable replacement for the List of Lights and Fog Signals and act as a bridging mechanism.

- the joint IHO/IALA development of S-125 should continue and the dataset should include, at a minimum, the same AtoN data contained in the S-101 Product Specification.

- As there are differences in the frequency of when the S-101 data can be issued, which is to the best of the ability of the provider, the S-125 dataset should be updated at a frequency necessary to support navigational safety

- Content in S-124 and S-125 should be coordinated on a regional level, in order to minimize data duplication.

- integration of S-125 into ECDIS is a medium term outcome but it will need immediate action in order to meet that goal.

- IMO approved communication requirements (GMDSS) cannot efficiently communicate S-100 based data to mariners. In order to rapidly deliver time critical information to navigational equipment a secure broadband connection to the vessel is required in accordance with relevant IEC standards.

- There is a need for a range of marketing communication, covering the necessity to adopt S-100 digital services, in a way that reaches a wider audience, especially policy makers, to emphasise the benefits; such as reduced emissions, reduced costs, optimized loading and improved safety of life at sea.

- The skeleton that can form the basis of an IALA model course was defined. The proposed framework should be considered by the IALA academy for the creation of an S-100 training material and promotion.

- S-97 is an IHO document, but S-100 is e-Navigation universal. Therefore, S-97 could be updated to capture non IHO-context better. The workshop suggests that a formal procedure on how S-97 updates are triggered and communicated is set up.

- The IALA Secretariat should consider submitting an input paper to the S-100 working group before the December 2022 meeting recommending that an impact assessment should be made, on whether the S-100 Version 5.0.0 release requires an update of S-97.

- IALA should consider updating Guideline Gxxxx on S-200 management to include version control and update procedures etc.

- IALA should consider requesting the S100P include S-200 suite of data product specifications as part of their test-bed.

- IALA considers developing a roadmap covering S-200 product suite.

9.1   Review workshop report

The report was reviewed on-screen and agreed upon.

9.2   Closing of the workshop, Omar Frits Eriksson – IALA Secretary General

Omar Frits Eriksson thanked the workshop organizers and participants on behalf of IALA for all their energy and hard work. He took the opportunity to present a gift from IALA to the NCA as thanks for their efforts in hosting the event. There had been many important and interesting discussions that would benefit future IALA documentation. He wished all a pleasant weekend and a safe journey home.

9.3   Closing of the workshop - Abri Kampfer, Technical Director, IHO

On behalf of the IHO Abri Kampfer congratulated participants on an enjoyable and productive workshop. He extended his thanks to the NCA and presented them with a gift as a sign of appreciation.

9.4   Closing of the workshop – Phil Day, Director of Operations, Northern Lighthouse Board

Phil Day, Chair of the workshop, hailed the success of achieving the objectives of the workshop and the collaborative nature that the work had been conducted in. He wished all a safe journey home.

10.   SOCIAL EVENTS AND TECHNICAL VISIT

10.1   Workshop icebreaker

On Monday evening, following the workshop, participants were asked to bring some food or drink from their own country to share in the usual IALA way in the Norwegian Coastal Administrations offices in Alesund. As ever, this gathering was a great success, and all had the opportunity to taste a variety of different food and drink.

10.2   Workshop dinner at Alnes Lighthouse and Experience Centre

A wonderful dinner was enjoyed on Thursday evening at the Alnes Lighthouse and Experience Centre. The views and setting was a magnificent environment enhanced by the wonderful weather that participants enjoyed in Norway. Discussions were continued long into the night accompanied by the northern lights as a fitting backdrop.

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 19 of 39

10.3   Technical visit, tour to NTNU Maritime University and Kongsberg Digital

Participants had the opportunity to tour the to NTNU Maritime University and Kongsberg Digital. Presentations and demonstrations on a variety of projects including MASS, pilot training and simulation were given to attendees. These tours were well received and informative.

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ANNEX B   TECHNICAL PROGRAMME

DAY 1 – Monday 5 September 2022

Time [CEST]	Topics	Chair or Speaker
13:00 – 14:00	Registration	
14:00 – 15:20	**Session 1 – Opening of the Workshop**	**Chair: Phil Day, Chair of IALA ARM Committee**
5 min	Welcome	Arve Dimmen (NCA IALA Council member)
10 min	Welcome from IHO & IALA	Abri Kamfer (IHO), Omar Frits Eriksson (IALA)
5 min	Administration and Safety Briefing	Guttorm Tomren
20 min	Technical programme for the week and expectations	Phil Day
20 min	Introduction to S-100	Magnus Wallhagen
20 min	Introduction to S-200 series and MRN	Minsu Jeon
15:20 – 15:30	Group photo	
15:30 – 16:00	Break	
16:00 – 17:45	**Session 2 – Introduction to S-100**	**Chair: Phil Day**
20 min	Introduction of IHO GI Registry	Yong Baek
20 min	Review of existing IHO/IALA Product Specifications	Dave Lewald
20 min	S-98 Interoperability: S-1xx Product Specifications layering	Liz Hahessy
20 min	Overview of IMO Maritime Services in the context of portrayal	Jon Leon Ervik
20 min	Introduction to IHO / Singapore innovation and technology lab	Parry Oei
5 min	Q/A session	Phil Day
17:45– 19:30	Workshop Icebreaker - bring something from your own country to share! Venue: NCA Offices	

DAY 2 – Tuesday 6 September 2022

Time [CEST]	Topics	Chair or Speaker
09:00 – 12:30	**Session 3 – Shared Experiences (lessons Learned)**	**Chair: Phil Day**
10 min	Welcome to the day	Phil Day
15 min	Development of Product Specifications by IHO-NIPWG	Eivind Mong
15 min	Development of S-101 – ENC	Jeff Wootton
15 min	Development of S-125 Marine Navigational services	Sewoong Oh
15 min	Development of S-201 Aids to Navigation	Eivind Mong
15 min	The delivery of S-100 data	Su Marks
15 min	Delivery of S-100 data by means of harmonised technical (e-navigation) services'	Thomas Christensen
15 min	Q&A session	Phil Day
10:55-11:15	Break	
15 min	Development of S-211 – Port Call Message	TBC
15 min	Development of S-212 – VTS information	Wim Smets
15 min	Development of S-401 – Inland ENC	Gert Morlion
15 min	Development of S-421 – Route Exchange	Hannu Peiponen
15 min	Q&A session	Phil Day
12:30 – 13:30	Lunch	
13:30 – 14:30	**Session 4 – Review of IHO, IALA Recommendations & Guidelines**	**Chair: Minsu Jeon**
20 min	IHO guidance documents	Yong Baek
20 min	IALA guidance documents	Peter Hooijmans
20 min	Q&A session	Minsu Jeon
14:30 – 15:00	Break	
15:00 - 17:00	**Session 5 – Portrayal**	**Chair: Dave Lewald**
20 min	Portrayal from the IHO perspective	Jeff Wootton
20 min	Portrayal from the IEC perspective	Hannu Peiponen
20 min	Portrayal from the IALA perspective	Guttorm Tomren
20 min	Cartographic charting	Dave Lewald
20 min	Q&A and brainstorming session	Dave Lewald
20 min	Review of the day	Phil Day
17:00 onwards	Free time	

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 23 of 39

DAY 3 – Wednesday 7 September 2022

Time [CEST]	Topics	
09:00 – 10:30	**Session 6 – MRN user perspective and OEM**	**Chair: Dave Lewald**
30 min	MRN – The Way Forward - Guideline G1143 Unique Identifiers for Maritime Resources	Eivind Mong
30 min	MRN demonstration of practical application	Dave Lewald
30 min	Introduction to International Coordination on Product Specification	Marianne Hagaseth
10:30 – 11:00	Break	
11:00 – 12:30	**Session 7 – Harmonizing IHO & IALA PS Development**	
30 min	Establish Working Group goals	Abri Kampfer and Phil Day
60 min	Working groups: - WG 1 Initializing and productizing of S-100 series data - WG 2 S-201,124 and 125 development - WG 3 S-98 interoperability and Marine AtoN portrayal	Eivind Mong Sewoong Oh Jorge Arroyo
12:30 – 13:30	Lunch	
13:30 – 14:30	**Session 8 - Harmonizing IHO & IALA PS Development continued**	
60 min	Working groups: - WG 1 Initializing and productizing of S-100 series data - WG 2 S-201,124 and 125 development - WG 3 S-98 interoperability and Marine AtoN portrayal	Eivind Mong Sewoong Oh Jorge Arroyo
14:30 – 15:00	Break	
15:00 – 17:00	**Session 9 - Harmonizing IHO & IALA PS Development continued**	
120 min	Working groups: - WG 1 Initializing and productizing of S-100 series data - WG 2 S-201,124 and 125 development - WG 3 S-98 interoperability and Marine AtoN portrayal	Eivind Mong Sewoong Oh Jorge Arroyo
17:00 onwards	Free time	

DAY 4 – Thursday 8 September 2022

Time [CEST]	Topics	
09:00 – 10:30	**Session 10 - Harmonizing IHO & IALA PS Development continued**	
90 min	Working groups: - WG 1 Initializing and productizing of S-100 series data - WG 2 S-201,124 and 125 development - WG 3 S-98 interoperability and Marine AtoN portrayal	Eivind Mong Sewoong Oh Jorge Arroyo
10:30 – 11:00	Break	
11:00 – 12:00	**Session 11 – Conclusion of the WGs in plenary**	**Chair: Abri Kampfer**
60 min	Working groups: - WG 1 Initializing and productizing of S-100 series data - WG 2 S-201,124 and 125 development - WG 3 S-98 interoperability and Marine AtoN portrayal	Eivind Mong Sewoong Oh Jorge Arroyo
12:00 – 13:00	Lunch	
1300 – 1700	**Technical visit**	
	Technical visit to: - NTNU Maritime University - Kongsberg Digital	
19:00 onwards	**Workshop Dinner**	**Alnes Lighthouse and Experience Centre**

DAY 5 – Friday 9 September 2022

Time [CEST]	Topics	Chair or Speaker
09:00 – 11:10	**Session 12 – Workshop review and conclusions**	**Chair: Abri Kampfer and Phil Day**
120 min	Review of working group findings and Q and A	WG Chairs
	Workshop conclusions	Abri Kampfer and Phil Day
10 min	Closing of the workshop	Abri Kampfer, Omar Frits Eriksson and Phil Day

ANNEX C   WORKSHOP WORKING GROUP OUTCOMES

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and the International Hydrographic Organization (IHO) in association with the Norwegian Coastal Administration (NCA) are hosting a joint workshop on S-100/200 development and portrayal to be held in Ålesund, Norway, from 05 to 09 September 2022.

In order to achieve the workshop objectives the participants will divide into three Working Groups (WGs). The titles and chairs of these WGs are:

- WG 1 Initializing and productizing of S-100 series data - WG 2 S-201,124 and 125 development - WG 3 S-98 interoperability and Marine AtoN portrayal	Eivind Mong Sewoong Oh Jorge Arroyo

The outcomes that are expected from these WGs have been identified as:

WG1 - Initializing and productizing of S-100 series data:

- Training of WG members on S-100 series specifications
- Create an initial 'how to' document on initializing S-100 services to form the basis of an IALA model course
- Identify any needed updates to S-97
- Communicate IHO Prioritization of product specifications
- Contribute to the proposals for the workshop conclusions
- Submission of WG report to the Workshop Report

WG2 - S-201,124 and 125 development:

- Continue development of S-201,124 and 125 with the anticipation of delivering mature versions of the product specifications
- Draft an output paper describing the data flow between the S-201,124 and 125 product specifications for potential incorporation in IALA / IHO documentation
- Draft an output paper describing the interoperability of S-201, 124 and 125 with S-101
- Contribute to the proposals for the workshop conclusions
- Submission of WG report to the Workshop Report

WG 3 S-98 interoperability and Marine AtoN portrayal:

- Introduce Working Group members to the latest version of S-98
- Identify gaps in S-57 portrayal of existing AtoN taking into account developments at the IHO ENC WG / S-101 Project Team
- Consider and document Working Group conclusions on S-125 capabilities and interoperability in relation to portrayal and other aspects.
- Consider and document portrayal harmonization between S-101 and S-201
- Establish if there is a need for a shore based version of S-98
- Consider and document the AtoN Authorities role in relation to the portrayal of AtoN on an ENC
- Contribute to the proposals for the workshop conclusions
- Submission of WG report to the Workshop Report

ANNEX D   WG1 - INITIALIZING AND PRODUCTIZING OF S-100 SERIES DATA REPORT

Chair: Eivind Mong

Vice-chair: Nikolaos Vastardis

Around 25 participants were welcomed to WG1.

The outcomes worked towards by WG1 were:

- Training of WG members on S-100 series specifications
- Create an initial 'how to' document on initializing S-100 services to form the basis of an IALA model course
- Identify any needed updates to S-97
- Communicate IHO Prioritization of product specifications

The WG discussions and conclusions for each of these outcomes are addressed below.

Training of WG members on S-100 series specifications

The chair, Eivind Mong shared the experiences of the Canadian authorities, while introducing S-100. Sources for S-123, S124 and S-125 were initially utilised. In most cases the Hydrographic Service is responsible for supplying these, but this is not the case for all countries e.g. in Canada. Therefore, there can be no definite rules suggested on how to structure a government. The S-100 information bundles however, were not created with a governmental structure in mind, hence, the previous division of labour in S-100 might be to be re-adjusted.

Since S-100 series data products do occasionally overlap (intentionally), the governmental organizations that share the producer responsibilities are advised to hold regular coordination meetings. These can be quite useful for providing consensus on how to proceed with the implementation, as well as to create the necessary collaboration environment. A silo mentality is discouraged, as the goal is to create a single pipeline of information. These platforms might also help resolve issues, such as with the use of multiple national languages, as there can be terms for which translation is not always straightforward.

A number of S-100 product specifications were introduced in more depth, focusing on the ones identified as high priority in the IHO "Roadmap for S-100 Implementation Decade (2020-2030)" Annex 2 document. S-164, containing a set of common test S-100 series datasets for ECDIS, stood out as an example where more predictable updates might be required (potentially monthly). Harmonisation of S-164 with S-98 also needs to be considered. A special mention was made to the IHO GI Registry, where released and draft versions for product specifications can be found.

During WG1, the question was also raised on whether all the provided S-100 services should be free of charge or not. It was decided that this is another matter to be handled separately by the member states.

Conclusions

The WG1 IALA members agreed that there is a real need for a simple brochure targeting senior management level individuals along the lines of what IHO already has (maybe even simpler) to describe what the S-100 series data product specifications are. The purpose of this brochure is to raise awareness of S-100 and the urgency to assign the necessary resources to provide services needed support the commitment made to IMO.

"Marketing" has been identified is an additional action point, put forward in a way that users and stakeholders understand. A number of marketing papers, simple and in different levels would be beneficial:

1. One for supporting funding/ministerial use,
2. One for the directors/upper management
3. One for co-workers
4. And finally one for users, including VTS operators

Finally, WG1 members agreed that the advantages but also the necessity for the adoption of S-100 should be continuously communicated to policy makers. Highlighting the benefits of the S-100 adoption can be made more effective, if performed in a way that is aligned with the principles of each government. This is also crucial factor for securing funding for the next phases of the S-100 roll-out.

<u>Create an initial 'how to' document on initializing S-100 services to form the basis of an IALA model course</u>

The course is to be comprehensive and modular, so that is can be adopted by several audience groups e.g. manager groups, technical groups or administrative groups etc. The duration of each training session is also dependent on the audience and the depth to be achieved. The proposed framework should be considered by the IALA academy for the creation of an S-100 training material and promotion.

Content

1. General overview of the S-100 world
   a. Motivation and benefits behind the move towards the S-100 world
      i. Enables digitalization of information used to enhance situation awareness, safety of navigation, efficiency (economy), environmental protection
         1. Enables provision of Maritime Services in the context of e-Navigation
         2. Data Harmonization (in the e-Navigation context)
         3. Global Interoperability (in the e-Navigation context)
         4. Benefits beyond e-Navigation
      ii. MASS dependency on S-100/e-Navigation
      iii. Improved competitiveness through digital services
   b. What are the national obligations
   c. What are the domains impacted and who are the domain administrators/owners
   d. Who are the stakeholders
      i. IHO as owner of S-100
      ii. Role of IMO
      iii. Role of IALA
      iv. Role of IEC
      v. Who are the users and what are their needs
         1. Regulated Systems
            a. ECDIS
            b. VTS
         2. Unregulated Systems
            a. MSDI
            b. ECS
            c. PPU
            d. Data Production Tools
            e. WEB/WMS/WFS
            f. Fleet Management Systems
            g. Etc. (many systems)

     e. Impacts of adopting S-100 world

        i. Impacts on different governmental organizations

1. AtoN authorities

2. Hydrographic offices

3. Waterway Authorities

4. Ports

5. VTS

6. Ice Services

7. Meteorological Sevices

8. Search and Rescue

9. Environmental Protection Agencies

10. Regulatory Bodies

11. Customs (?)

12. Law Enforcement

        ii. Impacts on users

1. Pilot Organizations

2. Chart Users

        iii. Doesn't change the data acquisition, but does change/add products and services

        iv. Training needs of users and operators

        v. Change management for operational use

2. Implementing S-100

     a. Best Practice

     b. How it is used in system and equipment development (any change has consequences for implementation)

     c. Outreach to stakeholders of systems where S-100 is implemented

     d. Distribution and establishing services

        i. Regional ENC Coordination Centres

3. Architecture of the S-100 world

     a. S-100 Product Specifications

     b. S-100 Framework

        i. IHO S-97

        ii. IALA G-1106

        iii. IHO S-99

        iv. IHO S-98 &B S-100 Part 16

     c. IHO GI Registry

        i. Users, Roles, and Responsibilities

        ii. Feature Catalogue Builder

      d.   Maritime Resource Name (MRN)

      e.   User Systems (ECDIS, ECS, shore based systems, etc)

            i.   Content vs Carrier (updatable feature and portrayal catalogues)

      f.   Technical Services

      g.   IMO Maritime Services

4.   Technical Parts

      a.   S-100 Introduction

      b.   S-100 Encoding Formats

            i.   ISO 8211

           ii.   GML/XML

          iii.   HDF5

          iv.   How to add additional encoding formats

      c.   Change Management

<u>Identify any needed updates to S-97</u>

The IHO S-97 document was introduced to the WG1 members. This contain the IHO guidelines for creating data product specifications. The IALA equivalent is the G-1106 guideline document.

The issue of portrayal and more specifically the concept of additional portrayals was discusses, for example for use by other organizations such as NATO. It was found technically possible, but the regulatory and user implications should be considered.

Conclusions

An initial conclusion was the IALA G-1106 document need to be revised. The internal IALA processes can be retained and potentially updated where required. The description for producing data product specifications however, can just be removed and references to the much more detailed S-97 documentation can be made.

A key point is the S-97 is an IHO document, but S-100 is e-Navigation universal. Therefore, S-97 could be updated to capture non IHO-context better. For example, muti-language support and data streaming are not included. This is because the current document was written based on the S-100 Version 3.0.0 experience. Since Version 3.0.0 however, a lot of changes took place in the S-100 specification that have not been captured. Some of the language can also be tweaked to make the description more system-agnostic. The technical manager of IALA is recommended to submit a working group paper to the S-100 working group before the December 2022 meeting. An initial impact assessment should be made, on whether the S-100 Version 5.0.0 release requires an update of S-97.

Another good point made relates on the way that updates on S-97 and S-100 are communicated to the stakeholders and interested organizations. As S-97 is shared between the S-100 working groups, WG1 suggests that a formal procedure on how S-97 updates are triggered and communicated is set up. All stakeholders are however responsible for submitting change proposals. Additional tools through the IHO GI Registry such as email lists could be employed for the communication.

An additional recommendation of WG1 to the workshop is to include that IALA requests the S100P to include S-200 suite of data product specifications as part of their test-bed.

<u>Communicate IHO Prioritization of product specifications</u>

The chair, Eivind Mong presented the IHO "Roadmap for S-100 Implementation Decade (2020-2030)" Annex 2 document to WG1. This clearly defines the priorities of IHO and its member states, as well as their responsibilities. It also includes the S-100 series data product specifications of primary interest for the IHO, planned to be delivered between 2020 and 2030. These are classified as:

- First Step – Route Monitoring Mode

- Critical Framework
- Second Step – Route Planning Mode

It has been communicated to the WG1 members that IHO and IALA could learn from each other's strengths. IHO is really good at providing answers to the questions of who, what, where and how as a system architecture to develop product specifications and services. Where IALA members could contribute however, is their expertise on the technical service specification/implementation and the capability to establish machine-to-machine services.

Conclusions

WG1 has agreed that the compilation of a document, similar to the IHO "Roadmap for S-100 Implementation Decade (2020-2030)" could be also created by IALA for the IALA domain of S-100 based products and services. This would benefit the release of S-100 series data products, with a certain degree of predictability, further enhanced by version development timelines.

Version 1 has been identified by IHO as fit for testing, i.e. system manufacturers can use version 1 of a data product, without an expectation that this will turn operational right away. After a number of iterations, working groups can decide to release the next version. From version 2 onwards however, an impact assessment, provided member state approval, an impact assessment is required. IALA should also define its own official resolution for version control its own product specification phases (effectively it already does follow the IHO example).

A key conclusion of this session was that it is now the time for some "story-telling". Circular letters, social media, training, and other methods can be used to convey a simple and clear message, using "marketing" language. An example would be:

"The future of navigation is here, it is S-100, and everyone is adopting it… so must you!"

The IHO prioritization of product specifications is adequate.

Other considerations

Many of the participants commented that they do not fully understand how the S-100 series data products are structured and the inter-dependencies that exist (e.g. between S-98 and other products). Therefore, a bit more effort is deemed necessary to make all the information more clearly visible and intuitive. A number of suggestions by WG1 is:

- A general overview document including the structure, vision, purpose and interdependencies of S-100 series data products should be made available.
- A video presentation for the S-100.
- Workgroups that work on the product specifications need to submit them to the IHO GI Registry as soon as possible.
- Links to the data products should be available from the IHO webpage.
- Public version-control repositories (such as in the case of S-101) should be made available.
- A mechanism similar to the IHO Circular Letter can be employed by IALA to inform its members on important S-100 developments.

Executive Summary

A list of the key outcomes and conclusions of the WG1 session follows:

- There is a real need for a simple brochure along the lines of what IHO already has (maybe even simpler) to describe what the S-100 series data product specifications are.

- "Marketing" has been identified is an additional action point, put forward in a way that users and stakeholders understand. A number of marketing papers, simple and in different levels would be beneficial.

- The advantages but also the necessity for the adoption of S-100 should be continuously communicated to policy makers, in a way which is aligned with the with the principles of each government.

- The skeleton that can form the basis of an IALA model course was defined. The proposed framework should be considered by the IALA academy for the creation of an S-100 training material and promotion.

- The IALA G-1106 document need to be updated, using references where appropriate to the more detailed S-97 documentation.

- S-97 is an IHO document, but S-100 is e-Navigation universal. Therefore, S-97 could be updated to capture non IHO-context better.

- The technical manager of IALA is recommended to submit a working group paper to the S-100 working group before the December 2022 meeting recommending that an impact assessment should be made, on whether the S-100 Version 5.0.0 release requires an update of S-97.

- WG1 suggests that a formal procedure on how S-97 updates are triggered and communicated is set up.

- WG1 suggests that IALA requests the S100P to include S-200 suite of data product specifications as part of their test-bed.

- A document, similar to the IHO "Roadmap for S-100 Implementation Decade (2020-2030)" could be also circulated by IALA.

- IALA should also define its own resolution for version control its own product specification phases.

- Now the time for some "story-telling". Circular letters, social media, training, and other methods can be used to convey a simple and clear message, using "marketing" language.

- The IHO prioritization of product specifications is adequate.

- Many of the participants commented that they do not fully understand how the S-100 series data products are structured and the inter-dependencies that exist (e.g. between S-98 and other products). Therefore, a bit more effort is deemed necessary to make all the information more clearly visible and intuitive.

ANNEX E   WG 2 S-201,124 AND 125 DEVELOPMENT REPORT

Chair: Sewoong Oh

Vice-chair: Bridget Gagné

Around **21** participants were welcomed to WG2.

The outcomes worked towards by WG2 were:

- Continue development of S-201,124 and 125 with the anticipation of delivering mature versions of the product specifications
- Draft an output paper describing the data flow between the S-201,124 and 125 product specifications for potential incorporation in IALA / IHO documentation
- Draft an output paper describing the interoperability of S-201, 124 and 125 with S-101

The WG discussions and conclusions for each of these outcomes are addressed below.

<u>Continue development of S-201, S-124 and S-125 with the anticipation of delivering mature versions of the product specifications</u>

GML encoding of the S-201 dataset does not support delta change updates, which brought up the question of how changes to this dataset should be handled. For example, if there are 200 AtoNs, but only 1 of them has a change, would the AtoN data provider need to send information for all 200 AtoNs or just the 1 with the change? It was mentioned that the AtoN data provider has the choice of whether to send a "delta change" file for that 1 AtoN or resend the entire dataset. It was noted that the system should be able to determine what has changed from the current dataset vs the newly-provided dataset and make the update accordingly. The source date in feature level could be a means of identifying which AtoN was updated when resending the entire dataset. It was mentioned that the entire S-201 dataset is simple and stable for the purpose of sharing AtoN information onshore. Since the S-201 dataset is for exchanging between AtoN authority and hydrographic office, the working group agreed that there are no limits like bandwidth availability.

The S-201 data file naming convention indicates that there are 8 characters that can be used freely by the AtoN data provider to provide a unique file name. It was mentioned that the year, month and day could be used here, which led to the question of how would the system know if the dataset provided is an updated dataset. Would it be based off the dataset file name? Or would it be based off the date of the file? The assumption is that if the AtoN data provider issues the entire S-201 dataset, the recipient would refer to the latest version of the dataset available.

It was noted that S-125 information overlaps with S-101 information. Other than the status change of the aids and keeping in mind that S-125 is conceptually described as an extended List of Lights, what else could S-125 be providing that S-101 does not? For example, does S-101 cover the seasonality of a buoy? This is information that is currently captured in the List of Lights, but not in S-57 ENC.

The S-125 PS mentions that this dataset is to be updated more frequently than the S-101 dataset. In the case where the S-101 dataset is updated on a daily basis, what should be the frequency of updates of S-125 and would S-125 still be useful, which emphasizes the previous point to elaborate on what information S-125 offers that S-101 does not. As there are differences in the frequency of when the S-101 dataset can be issued, which is to the best of the ability of the provider, the S-125 dataset should be updated at a frequency necessary to support navigational safety.

During discussions, the Working Group noted that IMO SOLAS V Regulation 9 specifically requires coastal states to provide among other things, a List of Lights and notices to mariners, in satisfying the needs of safe navigation. Therefore, the joint IHO/IALA development of S-125 should continue and the dataset should include, at a minimum, the same AtoN data contained in the S-101 Product Specification. It was further agreed that in addition to information related to the AtoN design state, that the 4 identified statuses (Discrepancy, Temporary Change, Proposed Change, and Advanced Notice of Change) with attribution (i.e. missing, relocated, etc.) should also be included in the S-125 dataset.

There was no comment on the development of S-124 NW PS.

In conclusion, the WG was encouraged to review the S-201, S-125 and S-124 Product Specifications and provide comments. WG noted that S-125 data has benefits like AtoN status and frequent updates than S-

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 33 of 39

101 ENC, but more work is required to determine what is the additional AtoN information that S-125 offers that would be beneficial to the mariner when compared to the AtoN information available in S-101.

<u>Draft an output paper describing the data flow between the S-201, S-124 and S-125 product specifications for potential incorporation in IALA / IHO documentation</u>

Maritime data considered in the data flow are AtoN for info exchange aspects, AtoN for nautical aspects, navigational warning and ENC. The WG chair mentioned that it is difficult to indicate a specific organization in the flow diagram because each country has a different organization for managing maritime data. It was agreed to indicate a task responsible for each maritime data instead of indicating a specific organization on the data flow.

The WG reviewed and exchanged views on the data flow included in the document below

- S-125 Marine AtoN Product Specification – Vision outline

- Technical Specification for the Provision of Navigational Warning to End-users

- Technical Specification for the Provision of AtoN Information Service to End-users

Status changes like discrepancy and temporary changes are issued by the NAV Warning task and provided by S-124 data, and status changes like proposed changes and advance notice of changes are issued by the AtoN task and provided by S-201 data. All AtoN changes is provided by S-201 data to the Nautical information Task and ENC Task. Each task provides S-125 data and ENC data like S-57 and S-101.

The WG noted the proposed data flow and agreed it should be refined further through cooperation between IHO and IALA.
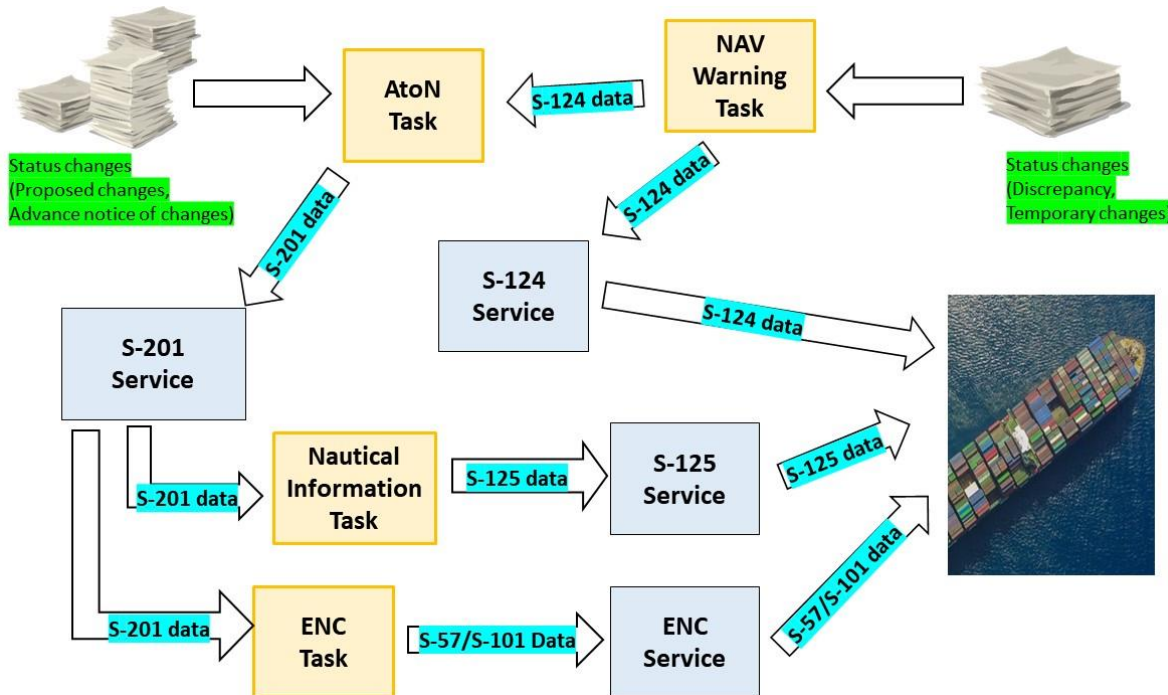

Fig. 1. Data flow between the S-201, S-124 and S-125 product specifications

Note: The responsibility for each task should be decided on a national level.

<u>Draft an output paper describing the interoperability of S-201, S-124 and S-125 with S-101</u>

During the discussions it was concluded, that the main added value of S-125 consist of the AtoN status information of that is not available in ENC. It was also concluded, that updating of data in ENC is very different among producers. Interoperability was discussed, mainly between S-101 and S-125. The suggested method of replacing existing AtoN data in the ENC by interoperability functionality was questioned by the

group. The use of S-125 data merely as an overlay was considered a big enough first step to implement instead of data replacement. As an option for replacement of data, portrayal of only the status data, and not replacing nor duplicating actual existing AtoN symbology was generally accepted. It was noted, that the actual dataset could still contain a full set of AtoN data, although only status would need to be portrayed on ECDIS. The status indicator symbol would merely be flagging and not obscuring the ENC symbol. Interoperability could be enhanced at a later stage, but this was not further discussed.

Content in S-124 and S-125 should be coordinated on a regional level, in order to minimize data duplication.

During the discussion between S-124 and S-125 interoperability, the WG reviewed the proposed S-125 status change symbology and determined that these symbols and accompanied pick reports were suitable for use to replace the S-124 NW. In the case where an S-124 NW and an S-125 AtoN Information overlap for the same aid, there was agreement that the S-124 NW should take priority over the S-125 AtoN Information.

In the discussion regarding interoperability between S-125 and S-101, it was concluded that only the S-125 status change symbology and pick reports need to be included by overlay/interleaving.

<u>Other considerations</u>

It was suggested that the "Temporary Change" (T) and "Discrepancy" (D) status changes in S-125 could be part of route monitoring mode, in addition to the 4 statuses being part of route planning mode. This relates to the "T" and "D" statuses being initially promulgated as an S-124 NW before being converted into S-125 AtoN Information as shown in the proposed data flow between S-201, S-125 and S-124.
The proposed portrayal for S-125 was presented to the WG and there was general agreement with the proposal. It was suggested that the "T" for the aid status change "Temporary changes" should be changed to "TC" as "T" by itself could be mistaken for "Trial mode." To be discussed further within the task group. Additional consideration that it could be worth pursuing S-125 to cover Notices to Mariners type of information and possibly expanded to include other types of MSI. Other Product Specifications should be kept in mind, such as S-131, before potentially adding non-AtoN-related Maritime Safety Information to S-125.

<u>Executive Summary</u>

- As there are differences in the frequency of when the S-101 data can be issued, which is to the best of the ability of the provider, the S-125 dataset should be updated at a frequency necessary to support navigational safety

- The joint IHO/IALA development of S-125 should continue and the dataset should include, at a minimum, the same AtoN data contained in the S-101 Product Specification.

- Tasks and services for S-201, S-125, S-124 and S-101 were identified and the data flow between each task was finalized.

- Content in S-124 and S-125 should be coordinated on a regional level, in order to minimize data duplication.

- In the case where an S-124 NW and an S-125 AtoN Information overlap for the same aid, there was agreement that the S-124 NW should take priority over the S-125 AtoN Information.

- In the discussion regarding interoperability between S-125 and S-101, it was concluded that only the S-125 status change symbology and pick reports need to be included by overlay/interleaving.

- Cooperation between the two international organizations is important to proceed with marine digitization, and in order to inform the shipping domain of the cooperation efforts between the two bodies, it is recommended that the relevant working group and task group prepare presentations and demonstrations of S-201/S-125/S-124 data service.

Chair: Jorge Arroyo

Vice-chair: Jaime Alvarez

The outcomes worked towards by WG3 were:

- Introduce Working Group members to the latest version of S-98

  The group discussed the interoperability of S98 with S101 and its potential to be adapted for non EDCIS ENC or uses such as VTS and other shore based systems S100 based systems agnostic on manufacturer ie open source

- Identify gaps in S-57 portrayal of existing AtoN taking into account developments at the IHO ENC WG / S-101 Project Team

- Consider and document Working Group conclusions on S-125 capabilities and interoperability in relation to portrayal and other aspects

- Consider and document portrayal harmonization between S-101 and S-201

- Establish if there is a need for a shore based version of S-98

  - o   Each domain should build their catalogue

- Consider and document the AtoN Authorities role in relation to the portrayal of AtoN on an ENC

The WG considerations and conclusions for each of these outcomes are addressed below.

Executive summary:

It is expected S125 's purpose:

- • Update status on AtoN

- • the transfer standard between AtoN provider and HO.

Uses cases

- • Use S125 outside ECDIS on another system - replicate S101 and also include update information. This is for when S101 is not in that system

- • Portrayal catalogue in ECDIS (magenta circle) ensure display with S101 for route monitoring and planning – needs a proposal

- • All S125 displayed on ECDIS for route planning through S101

- • Printed List of lights is compulsory to be handled on board. It was expressed the possibility for S100 ECDIS to provide such nautical publication. S125 could then meet this requirement.

Gaps

- • IMO legal communication requirements (GMDSS) cannot efficiently communicate S100 based data to mariners. There is a need of broadband communications for safety of navigation purposes.

- • Communication latency seen as a gap in the provision of data from the AtoN provider to the users (S201→S125→S101)

- • IALA still does not have a S98 equivalent interoperability standard

- • lack of system harmonisation between domains (eg. different portrayal for maritime and IWW navigation)

- • integration of S125 into ECDIS is a medium term outcome but will need an immediate action to meet that goal: IALA submission to IHO

- there is a well stablish communications IALA/IHO and could be leveraged via rapporteurs in IALA committee level. A redefinition on the content of the meetings could be envisaged.

- Need to identify use case for scale attribution in AtoN symbology

Next steps

- Suggested that IHO representative inform about the updates on S1XX during the ARM Committee.

- Closer collaboration in IALA ARM WG with IHO experts

- New symbol/portrayal proposal should be sent to IHO. The process starting in the IALA task group and finalising in the IHO WG needs to be understood by IALA.

- IALA needs to consider creating a S98 catalogue for AtoN.

Introduce Working Group members to the latest version of S-98

In general what was considered, any notable discussion highlights and conclusions of the working group.

The group discussed the interoperability of S98 with S101 and its potential to be adapted for non EDCIS ENC or uses such as VTS and other shore-based systems S100 based systems agnostic on manufacturer ie open source. The need for harmonization of systems where Seaborne and inland water ways overlap was agreed as necessary and achievable.

Identify gaps in S-57 portrayal of existing AtoN taking into account developments at the IHO ENC WG / S-101 Project Team

In general what was considered, any notable discussion highlights and conclusions of the working group.

The group considered a wide range of portrayal issues on ECDIS including those of AIS/VDES and navtex noting that there was no mandatory connection required to navtex or AIS. Attendees were encouraged to support mandatory connectivity through IMO. Approx 6 items were identified by the group as requiring review within the current S101 version.

- Colour inclusion in buoyage to match MBS

- Leading line length

- Sector light length

- Better depiction of complex sector lights that include transition zones at colour boundaries

- Port entry light depiction.

It was recognised that it is some years from an S125 of S201 managing portrayal of Aton and that in the meantime a conventional approach to changing this particular depictions was required. Discussions on the process for requesting portrayal changes took place. It became clear that IALA needed to make appropriate submissions to IHO on each of these to ensure formal consideration.

Consider and document Working Group conclusions on S-125 capabilities and interoperability in relation to portrayal and other aspects

In general what was considered, any notable discussion highlights and conclusions of the working group.

The purpose and intent of S125 was discussed. It was explained that the S125 layer would if implemented overwrite the S101 layer Aton. However IHO was as yet undecided if this would be acceptable and in any event this needed IMO approval as a PS. It was clarified that any implementation on SOLAS vessels was some years away though individual nations domestic fleet could be treated differently.

Consider and document portrayal harmonization between S-101 and S-201

In general what was considered, any notable discussion highlights and conclusions of the working group.

S201 can have portrayal included but remains at the discretion of the IHO as to whether it is included in S101.

Report of the Joint IALA/IHO workshop on S-100/200
development and portrayal
Page 37 of 39

<u>Establish if there is a need for a shore based version of S-98</u>

In general what was considered, any notable discussion highlights and conclusions of the working group.

It was identified that S98 could be adapted for shore based S100 enabled systems along with appropriate PS such as for VTS to provide for non SOLAS services.

<u>Consider and document the AtoN Authorities role in relation to the portrayal of AtoN on an ENC</u>

In general what was considered, any notable discussion highlights and conclusions of the working group.

Currently the S101 portrayal remains within the IHO control and changes should be requested through established IALA to IHO or member state Aton authority to member state HO. If S125 is implemented portrayal could be managed through S125 noting the IMO transition requirement of minimal change from S57.

IALA should review interoperability levels– then, inform IHO about the level of interoperability needed. There is a need to develop catalogues. All the catalogues are required otherwise, the upgrade is complicated.

<u>Other considerations</u>

Any other business considered by the WG that should be noted in the report.
The transmission of Data to vessels as chart updates or S125 and S124 was discussed at length. It was noted that VDES and Navdat lacked the bandwidth to transmit this data and that for successful direct streaming to Ecdis internet based connections would be required. The proposal for the handshake system need to achieve this safely had been been included by IEC in recent route exchange proposals at IMO. These had been rejected. It was proposed that the handshake be reintroduced at IMO as a means to facilitate these services. The process for internet based chart corrections was explained.
The benefit of including people from IHO on ARM committee meetings was recognised, along with IALA/IHO meetings on regular basis. A rapporteur from IHO to the ARM Committee for sharing progress would be highly appreciated. Potential for a workshop in circa 2 years to continue the discussions was proposed.

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