Paper for Consideration by the HSSC-10

IEC Activities affecting HSSC

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Executive Summary:	This paper is about concerns of IEC about cyber security, guidance from IEC about future inclusion of S-100 into IEC 61174 ECDIS standard, information about IEC activities related to IHO and finally an idea of an item to be discussed in a stakeholders forum meeting.
Related Documents:	ENCWG3-5.x_S-63_needs_extension_of_authentication S-100WG3-9.3.1_Cyber_Security_and_Authentication_Issues S-100WG3-9.3.3_Preconditions_of_IEC_to_consider_inclusion_of_S-100_into_ECDIS_standard
Related Projects:	N/A

Data cyber security requirements

Introduction / Background / Analysis / Discussion

Maritime cyber security is a hot topic. IMO has published circular IMO MSC-FAL.1 Circ.3, Guidelines On Maritime Cyber Risk Management, 2017 and resolution IMO MSC.428(98), 2017. The MSC.428(98) specify that Cyber risk is one of the issues to be addressed by ISM-code and that Periodical audit of vessels for ISM-code shall include **audit of management of cyber risk from 1st Jan 2021.**

Response of industry related to the rules include **BIMCO** et.al., The Guidelines on Cyber Security Onboard Ships, 2017 and **DNV-GL**, Class Program DNVGL-CP-0231, Jan 2018. The Class Program reference existing standards such as IEC 61162-460, which requires authentication of data files and executables.
IEC has initiated drafting of new standard **IEC 63154** Cyber security for which the timeline is:

- Drafting by the workgroup until **1st quarter of 2020**
- IEC approval process consisting of CDV and FDIS comments & votings from summer 2020 to the **publishing planned for 2nd quarter of 2021**

Within foreseeable future an ECDIS onboard a SOLAS vessel cannot accept ENC charts and updates unless they can be authenticated. For HO this means a need to **provide authentication of all data products from HOs to vessels**

IHO has had S-63 for S-57 ENC charts. Current edition is 1.2.0, year 2015. The S-63 includes authentication of ENC chart and incremental update files (.000, .001, .002, etc.), but miss authentication of

- Protocol related files such as Catalog.031, Products.txt, readme.txt, etc.
- Auxiliary files of ENC charts (*.txt and *.tif)

There is a need for a new revision (1.3.0) of the S-63 to cover authentication of all files which are part of the delivery package

IEC has submitted separate input papers both for ENCWG and S-100WG. See attached papers

- ENCWG3-5.x_S-63_needs_extension_of_authentication
- S-100WG3-9.3.1_Cyber_Security_and_Authentication_Issues

Action Required of HSSC

The HSSC is invited to:

1. Note the information provided
2. Consider requesting ENCWG to draft new revision of S-63 to include authentication of all data files included into the data set
3. Consider to inform S-100WG about
    - The urgent need to include solution for cyber security in the baseline of the S-100
    - That the cyber security solution shall include all data files of a delivery package

- Consider to request S-100WG to include enough technical details as pointed by IEC about cyber security into the next major edition 4.0.0 of S-100

Data quality – Different points of view

Introduction / Background / Analysis / Discussion
Quality means many different things depending of the context and who is speaking. Quality could be:

- Data quality
- Product quality
- Accuracy of data
- Minimizing of mistakes or failures
- Repeatability in the manufacturing process
- Repeatability of a service
- More expensive raw material
- Etc.

In this paper the quality is **Compliance with set rules.**

There are lessons learned from establishing publishing and usage for S-57 ENC charts.

In the begin there was only S-57 for the object model and S-52 for the presentation. S-57 itself included only simple checksum which was usable to check the integrity of the content (i.e. that content of the file is at receiver same as at producer, but no protection for hacking as the simple checksum can be recalculated). In the begin there was no method to check that S-57 charts at the producer were compliant with set rules.

Not checked content is a risk for receiver and viewer as it may cause software crash or deadlock. Early manufacturers of ECDIS created their own input checks for S-57. Further original IHO rules required to detect unknown objects and unknow attributes and to report this to the user. Result was a lot of warnings from ECDIS input process and users were not able to judge, if their charts were legal or not. This cause a lot of confusion in the market.

Then IHO declared that ECDIS should not create warnings causing confusion for the user. RENCs assumed the role of checking compliance with the rules before accepting ENC chart into their delivery.

This further caused a need to make a common interpretation of the compliance. As result IHO started to develop S-58 as common consensus about what is exactly compliance with the rules.

The lesson learned is that the **source of data need to perform validation of the output before delivery to the users** and that the **validation shall be based on international standard**.

Quality assurance (QA) means a process how to enforce the agreed level of quality. IMO has published Guideline on Software Quality Assurance (SQA) for e-Navigation IMO MSC.1/Circ.1512, year 2015. Elements of IMO SQA include:

- Product quality, for example, compatibility, reliability and security
- Data quality which include also conformance to relevant international standard

SQA might be seen as limited to onboard ECDIS, but that is too narrow view as shore-based production systems are also part of the overall SQA.

Current QA for S-57 ENC charts and updates is based on use of S-58 by producers and RENCs to check conformance to S-57. Signature defined in S-63 is used to check that onboard ECDIS has received the ENC charts as published by the producer. This check of signature is called as authentication

Method to ensure **QA for current S-57 ENC charts has been defined by IHO** but the **method to ensure QA for new S-100 based products is not yet defined**. The Ed 3.0.0 of S-100 includes no specific part to set common rules for checking conformity with international standards.

IMO requires that legal equipment onboard are of "approved type". It is assumed that one day IEC is requested to create type approval standard for equipment being compatible with S-100. Open issues today include:

- Who shall do the check of conformity – the viewer onboard (for example ECDIS) or the producer at shore ?
- Shall the check be based on international consensus or individual implementation by each manufacturer ?

Recommended solution based on lessons learned with S-57 is that the conformity checks shall be performed at shore by the producer (S-58 or equivalent) and that the integrity of the already conformity checked content shall be protected in delivery chain by signature (S-63 or equivalent).

IEC has submitted separate input paper for S-100WG. See attached paper

- S-100WG3-9.3.3_Preconditions_of_IEC_to_consider_inclusion_of_S-100_into_ECDIS_standard

Action Required of HSSC

The HSSC is invited to:

1. Note the information provided
2. Consider to inform S-100WG about
    - Need to include requirement for QA of the products in the baseline of the S-100. For example, as a new "part" included into the next edition 4.0.0 pf the S-100
    - Need to define method of calculation of the signature in the baseline of the S-100. The equivalent of the "checksum" of the S-57 is already changed as "digital signature" in the published edition of the S-100, but the method of how to calculate the signature is missing
3. Consider to request S-100WG to include enough technical details as pointed by IEC about QA into the next major edition 4.0.0 of S-100

What is needed for IEC 61174 to include S-101, S-102, etc. into a future edition

Introduction / Background / Analysis / Discussion

What is required for legal use by SOLAS vessels ? IMO requires equipment being of "approved type". Flag country of the vessel "approves" installation. Should the "approval" be based on international standards or on case-by-case ad-hoc opinion of individual inspector.

Next issue is "*if just object model is enough*" as Product Specification ? The answer is that just object model is enough only for testbed projects and feasibility study prototypes to test ideas

Real *full-scale service or delivery* requires that **Cyber security** aspects are included into the solution (IMO MSC-FAL.1/Circ.3 Guideline on maritime cyber risk management), that **SQA** aspect are included into the solution (IMO MSC.1/Circ.1512 Guideline on SQA and HCD for eNavigation) and that **Harmonized presentation** is included into the solution (IMO MSC Interim Guidelines for harmonized display of navigation information received via communication equipment, NCSR-5, Feb 2018)

Matureness of a Product based on S-100 is a combination what is available in S-100 baseline for every S-10X product and what is available in the Product Specification itself. Below is a draft **check list to help evaluation if everything needed for SOLAS class use has been specified**.

Expected functionality

- Is the functionality limited for "just display" ?
- Even "just display" requires selectors controlling what is displayed or how items are displayed
- Warnings and indications with time limits associated with the up-to-dateness of the data
- If required, alerts or indications based on the content of the product
- If required, requirements for pick reports
- If required, rules for interoperability (to be displayed together, how to display together, etc.)

Details of service

- File name and folder conventions

- Up-to-dateness information
- Authentication method, including method of pre-sharing of related key(s)
- If used, method of encryption and method of managing of decryption keys

Format of the S-10x product

- Machine readable feature catalogue
- Machine readable portrayal catalogue
- Machine readable schema
- If required, machine readable alerts and indications catalogue
- If required, machine readable interoperation catalogue

Test data and expected results

- Similar to style of "S-64"

I recently attended IHO NIPWG-5, Mar 2018, meeting. One issue discussed in the meeting was **transfer method from shore to vessel**.
if the S-100 baseline and associated S-10X product specifications include signature and the signature is used both to verify legal source and integrity of the content then number of "hops" between HO as producer and ECDIS onboard is insignificant as the signature guarantees that the onboard versions is as published by the HO. **Under this condition no need to specify transfer method from shore to vessel by IHO**.

IEC has submitted separate input paper for S-100WG. See attached paper

- S-100WG3-9.3.3_Preconditions_of_IEC_to_consider_inclusion_of_S-100_into_ECDIS_standard

Action Required of HSSC
The HSSC is invited to:

1. Note the information provided
2. Consider to inform relevant IHO workgroups developing S-10X Product Specification about information given in this presentation

IEC TC80 plans about S-10x Product Specifications

Introduction / Background / Analysis / Discussion
IEC TC80 has established WG17 to address CMDS (Common Maritime Data Structure). The workgroup was created in October 2015. Convenor is Dr. Kwangil Lee (KMOU, Korea). Within IEC TC80 all CMDS works related with shipborne system will be handled in this workgroup. IEC TC80 applied and was granted S-100 domain ownership in December 2016

Short-term work plan covers years from 2018 to 2020 is to draft S-421 Route Plan Exchange. The base is already published Route Exchange, IEC 61174 Ed4 ECDIS, Annex S, extended by ideas from Testbeds, especially STM validation and SMART navigation. Timeline is:

- Drafting by the workgroup until 1st quarter of 2020
- IEC approval process consisting of CDV and FDIS comments & votings from summer 2020 to 2nd quarter of 2021

IEC TC80 plan later to contribute to the development of the S-100 framework for non-GI information, but today the ideas within WG17 are not mature enough.

IEC TC80 attends the IMO/IHO HGDM process.

Action Required of HSSC
The HSSC is invited to:

1. Note the information provided

Stakeholder forum

I recently attended IHO NIPWG-5, Mar 2018. Based on the discussions I have got an idea for one topic at stakeholder forum:

There was a lively debate about digital Nautical Publications. Should the digital version be published as enriched ENC or be published as multiple overlays intended to be used together with ENC ?

I think that it might be a good idea to ask industry what their view for digital Nautical Publications is. As industry I mean ship owners and equipment manufacturers.