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Paper for Consideration by HSSC

STATUS REPORT ON

Correspondence Group for Data Supply Chain Certification (DSCC-CG)

Submitted by:	Chair DSCC Correspondence Group (DSCC-CG)
Executive Summary:	This paper reports on the work of the RTCA Data Supply Chain Certification Correspondence Group (RTCA DSCC-CG) and the relevance of Data Supply Chain Certification in the hydrographic data supply chain. The paper invites the HSSC to establish a Working Group to develop an IHO quality standard for the nautical and chart data supply chain
Related Projects:	S-100 and S-101 development in IHO working groups

Introduction / Background

1.   The RTCA Observer at IHO presented in the past the idea of a "Data Supply Chain Certification" as a means of ensuring quality in a data supply chain to CHRIS and WEND. Both committees supported the concept and invited IHO Member States to participate in a correspondence Group convened by RTCA - the Data Supply Chain Certification Correspondence Group (DSCC-CG). A list of members of the Correspondence Group is shown at Annex A.

2.   HSSC1 invited further work from the DSCC-CG and invited it:

…. to continue studies on Data Supply chain Certification and provide a further report to HSSC2 with any compelling evidence on its necessity, particularly for value-added products, and a proposal for implementation within IHO. (HSSC2 Action 2)

In other words, to justify the need for Data Supply Chain Certification and how it could be applied to the hydrographic data supply chain.

3.   As a result of discussion in the group the DSCC-CG has identified key areas of concern, which led to the recommendation to establish an HSSC Working Group for Data Supply Chain Certification (DSCCWG)

Analysis/Discussion

Limitations of S-63 applicability

4.   One of the standards developed by RTCA is DO-200A that is used in aviation circles for Data Supply Chain Certification (DSCC) for advanced, high precision navigational data streams. As the S-100 series of standards evolve, the applicability of S-63 encryption will come under scrutiny. While the DSCC-CG agreed that data encryption supports the data quality concept, it highlighted some limitations when looking at the complete supply chain. Under certain circumstances currently being discussed in different IHO Working Groups the use of S-63 encryption is already being questioned. In any case, advanced data integration as well as the IHO supported SENC distribution will require data to be made available to parts of the supply chain in an unencrypted form. At least in these circumstances other methods are required to ensure quality and integrity within the supply chain.

Data integration

5.   As different data streams are combined in support of safe and efficient navigation, the data supply chain needs to ensure synchronization of the different data streams. The figure 1, taken from an SNPWG document, illustrates the possible future integration of nautical publications and ENCs. Further data integration, such as MIO, IENC or PortENC could be expected in the future.
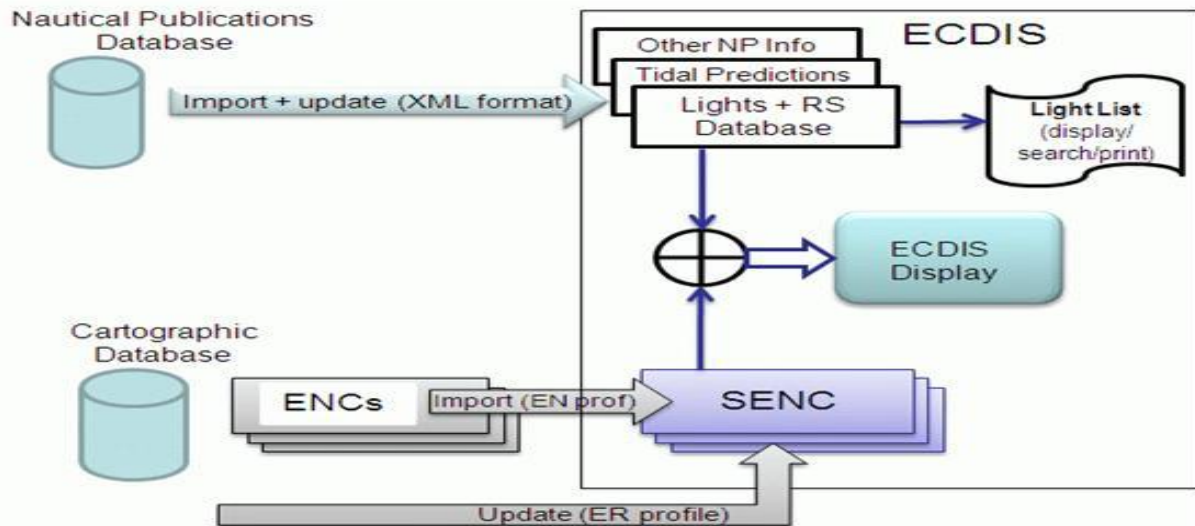

Figure 1 – Combining Nautical Publications and ENC data in an ECDIS

Source: Inclusion of Nautical Publications Information in the next ENC Product Specification (S-101) by *Tony Pharaoh - IHB*

Such integration is currently being executed in the unregulated market without any specifications. There must at least be assured data synchronization in the regulated SOLAS market. IHO Standards are therefore required to ensure consistent synchronization by all involved data service providers.

Data update synchronization

Different data streams are expected to be integrated into ECDIS and INS in the not too distant future as described above. Once data contents are integrated, consistent and timely updates across all of the supporting data streams is essential to ensure situational awareness. If the update synchronization and integration is not performed correctly, the update chain will be broken and misleading or corrupted data may be displayed. Only a new standard with a holistic view on all of the data supply chain can address this issue. Without a standard it will not be possible to ensure this aspect of data quality for the end users - the mariners aboard ships.

Discussion since HSSC1

Since HSSC1 the DSCC-CG has developed a white paper summarizing the discussions to date and the outlook. The whitepaper is attached as Annex B. In addition a first working draft of a future standard with key components has been developed and is in discussion, especially how the proposed standard is related to ISO9000 and how additional specifications above and beyond ISO9000 could be used as default qualification criteria for anyone, HOs or RENCs, wishing to disseminate ENC further.

Conclusion

The discussion described above, together with further discussions in TSMAD and ECDIS/S-101 stakeholder workshops on this subject, clearly indicates the need to substantially increase confidence in quality throughout the complete data supply chain. As a result there is a clear need to define an appropriate standard.

A list of existing IHO standards that may be related to Data Supply Chain Certification (DSCC) is shown at Annex C.

Recommendations

The currently existing standards are adequate for S-57 ENCs under a certain distribution paradigm. The development of new product specifications based on S-100 such as S-101 in conjunction with the increasing need for data integration and synchronization of data updates across the data supply chain requires proper control of all aspects of that chain through the definition of a Data Supply Chain Certification standard. The DSCC-CG recommends that the HSSC establish a Working Group to define the parameters for such a standard. Proposed Terms of Reference for a Data Supply Chain Certification Working Group (DSCCWG) are shown in Annex D.

Action Required of HSSC

The HSSC is invited to:

      a.   **Note** the contents of this paper

      b.   **Establish** a Data Supply Chain Certification Working Group (DSCCWG) under the Terms of Reference in Annex D

Amplifying comments on Rev 1 to HSSC2-03C by the Chairman of DSCC-CG

Various editorial revisions have been made to this paper to make it easier to understand. The following additional information is provided to further justify the establishment of an IHO Data Supply Chain Certification WG.

   1. What is wrong with the current IHO arrangements?

      Existing quality standards such as ISO 9001 do not cover the full supply chain but only target the activities of individual data compilers rather than spanning the supply chain in which the products will pass. IHO product specifications are currently focused on the production and maintenance of stand-alone datasets by a single agency. S-10n data is more likely to be delivered to the end-user as integrated data streams or as data that will be incorporated as components of other products and services. The move to e-navigation and the increasing introduction of new data supply and distribution mechanisms will mean that the quality of the data made available on ship's bridges will increasingly rely on integrated, synchronised data streams. Data quality and integrity cannot be ensured by relying on the current standards that apply only to individual product specifications and production quality assurance processes.

   2. What needs to be done?

      A standard needs to be developed, which spans the full supply chain, ensuring the timely and quality assured delivery of all data required for safe navigation.

   3. What are the resources needed and the expected timescale?

      Existing relevant aeronautical standards could be adapted to meet the requirement. The DSCC-CG has already begun this task and has developed an outline standard in draft format. Developing a standard should be a high priority work item so that it can be adopted at about the same time as S-101 and similar product specifications are introduced. A target completion date for the first draft version of the standard should be the next HSSC meeting in 2011. This will allow a suitable period of time for full stakeholder consultation prior to the introduction of S-101 and other S-100-based product specifications.

Members of Correspondence Group for Data Supply Chain Certification

Countries/Organization	Contact Name
Belgium	Guido Dumon
Belgium	Natalie Balcaen
Brazil	Sebastiao Simoes de Oliveira
Canada	Marc Journault
Canada	Savi Narayanan
Canada	Michelle Grenier
Chair DPSWG	Jonathan Pritchard (UKHO)
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Chile	Patricio Carrasco Hellwig
Chile	Jesus Lopez
Chile	Enrique Silva
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Ecuador	Klever Gonzalez
Finland	Juha Tiihonen
France	Henri Dolou
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Idontech	Doug Obrian
Jeppesen	Eivind Mong
Netherlands	Erwin Wormgoor
Norway	Per-Arvid Jakobsen
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Primar	Kjell Olsen
Primar	Per-Arvid Jakobsen
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RTCA	Daniela Winterbauer
RTCA	Michael Bergmann
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USA	Chris Andreasen
USA	James (Jim) McGaughran

White paper on the purpose of a Data Supply Chain Certification standard
Background

The Data Supply Chain Certification (DSCC) standard is proposed as a standard for use by all participants in the nautical data supply chain to ensure nautical data maintains its integrity and quality, and supports its intended application. It is a collaborative paper representing the nautical community's concern about ensuring data quality throughout the data supply chain model. Though it is not in and of itself the authority in maintaining and guaranteeing data quality, it is the standard by which data quality can be measured.

The DSCC standard is written with the assumption that an underlying quality management system (for example, ISO 9001-2008 Quality management systems - Requirements) is established and is operating effectively.   The nature of the data supply chain requires the implementation of processes, procedures, controls, and measures throughout the entire process to ensure that the nautical data complies with quality requirements. These processes, procedures, controls, and measures constitute "Quality Management."

Who is the DSCC standard for?

The DSCC standard is not limited to any particular process of the data supply chain (e.g., ENC distribution), however the DSCC standard operates within a data chain model, which follows data from origination through translation, maintenance, formatting, delivery, and finally the end use of the data.

- End-users can use the statement of quality DSCC provides to form an opinion of overall quality of data that they receive.

- HOs can use the DSCC standard to measure whether the data they supply complies with final user requirements based on the data quality characteristics that DSCC provides.

- HOs can use DSCC to measure whether data transmitted between internal departments retain the data quality needed for a particular use.

- HOs can use DSCC for measuring data quality in situations where they themselves are the end-user in the supply chain, such as when survey work has been outsourced.

- HOs can use DSCC standard compliant organizations to ensure their transmitted data retains the data quality expected for a particular end-use. This way, HOs ensure flexibility by allowing data supply organizations to package data in ways that best suit end-users changing demands, while retaining the same level of quality of data supply.

- Service Providers can use DSCC compliance as a measure of the quality of the work performed, thus ensuring Source Providers and End-Users of the quality of the data provided.

- Industry working groups (i.e., IHO working groups) can use the DSCC standard to ensure that when developing new transfer standards the necessary data integrity and quality measures are considered.

Does the industry need a standard for data integrity and quality?

The nautical data industry does not have a standard by which parameters should be measured to express the overall data integrity and quality.

While many existing standards used in the industry do take into account elements of data integrity and quality, there is no standard for expressing these characteristics, which are needed to ensure that a set of data complies

with user requirements at each iteration in the supply chain, starting at origination and ending with use of that data.

Ultimately, it is the responsibility of the users who use the data supplied by various organizations to take responsibility to ensure that the data meets the appropriate levels of quality. This said, by obtaining the data from an accredited supplier, who is accredited by an appropriate organization and can verify that the data meets the DSCC standards, the user can be reasonably assured that the quality of the data has been maintained. The requirements identified in the DSCC standard assist originators, suppliers, users, and regulatory authorities to meet their responsibility of assuring the integrity and quality of the nautical data being used in various applications.

The DSCC Standard proposes to use these seven (7) characteristics to express integrity and quality of data: accuracy, resolution, assurance level, traceability, timeliness, completeness and format. These are the same characteristics used in RTCA /DO-200A Standards for Processing Aeronautical Data, from which DSCC standard has been based.

- **Accuracy** – The degree of conformance between the estimated or measured value and its true value.

- **Resolution** – The smallest difference between two adjacent values that can be represented in a data storage, display, or transfer system.

- **Assurance Level** – Quantifiable value that communicates clearly what level of trust a user can place on the assessed data.

- **Traceability** – The degree to which a system or a data product can provide a record of the changes made to that product and thereby enable an audit trail to be followed from the end-user to the data originator.

- **Timeliness** – The degree of confidence that the data is applicable to the period of its intended use.

- **Completeness** – The degree of confidence that all of the data, needed to support the intended use, has been provided.

- **Format** – The process of translating, arranging, packaging, and compressing a selected set of data for distribution to a specific target system. A result of this process is a data structure that fulfills the characteristics of data quality.

Using ENC as an example, this is how the DSCC standard would measure how well the data integrity and quality has been retained in the supply chain:

- M_QUAL and CATZOC in ENCs provide measures of bathymetric data **accuracy**.

- Data Set Parameter field (DSPM) in the ENC data set header provides the measure of **resolution**.

- S-63 and/or CRC-32 provide measures of **assurance level** that the data has not been corrupted.

- FOID, SORDAT/SORIND, producer codes, ENC updates (ER files), records at originators and records at service providers all work together to provide measures of **traceability**.

- DATSTA/DATEND, PERSTA/PEREND, ENC updates (ER files), delivery of data from a service provider through for example a real time updating service all provide measures of **timeliness**.

- Mandatory attributes to ensure proper function of data elements, M_COVR and proper bundling of data elements into products with coverage demanded by end-users by service providers all provide measures of **completeness**.

- SENC conversion by a service provider and packaging of data to supply end user with needed data elements are measures of **format**.

The DSCC standard aims at providing a complete expression of data quality through all parts of the data supply chain, regardless of the type of data.

How will the data integrity and quality indicators be used?

The Nautical Data Quality requirements and the integrity of the data should be communicated and agreed to in one of two methods: Data Quality Requirements (DQRs - Customer supplied requirements), or a Data Definition Document (DDD - supplied data characteristics.) These two documents describe the Accuracy, Resolution, Assurance Level, Traceability, Timeliness, Completeness and Format and how the data complies with the intended use. In short, the customer provides their requirements based on their intended use (i.e., situational awareness vs. primary navigation use), or, the data supplier communicates to the end-user what is available and how the data can be used.

Existing standards related to Data Supply Chain Certification (DSCC)

	Title or Description	Relevant maintenance body
S-4	Regulations of The IHO for International (INT) Charts and Chart Specifications of the IHO (Plus INT 1, INT 2, INT 3)	CSPCWG
S-11 Part A	Guidance for the Preparation and Maintenance of INT Chart schemes	CSPCWG
S-52	Specifications for Chart Content and Display Aspects of ECDIS	DIPWG
S-57	IHO Transfer Standard for Digital Hydrographic Data	TSMAD
S-58	Recommended ENC Validation Checks	TSMAD
S-63	IHO Data Protection Scheme	DPSWG
S-64	Test Data Sets for ECDIS	TSMAD, DPSWG, DIPWG
S-65	ENC Production Guidance	TSMAD
S-100	IHO Hydrographic Geospatial Standard for Marine Data and Information	TSMAD
S-100 Hydro FCD & Portrayal Registers	individual entries in S-100 Hydro FCD and Portrayal registers	Hydro register control body
S-101	ENC Product Specification	TSMAD
S-101	Nautical Publications Information in the next ENC Product Specification	SNPWG

Proposed Terms of Reference

HSSC Working Group on Data Supply Chain Certification
(DSCCWG) - Terms of Reference

1. **Objectives**
   a. Review the current Maritime Data Supply Chain for electronic navigational charts (ENCs) and associated digital nautical publications (DNPs), identifying and documenting the different steps within this chain.
   b. Review data supply chain certification standards and best practices in other areas, like RTCA-DO-200A in aviation for their applicability in the maritime sector.
   c. Develop a proposal for IHO consideration on a standard for Data Supply Chain Certification relating to ENCs, DNPs and other data streams for safety of navigation at sea.

2. **Authority**
   a. This WG is a subsidiary of the Hydrographic Services and Standards Committee (HSSC). Its work is subject to HSSC approval.

3. **Procedures**
   The WG should;
   a. Develop a standard for certifying a data supply chain, or part thereof.
   b. Develop a product specification for validating up-to-dateness of a database in an ECDIS system.
   c. Define a standard for validating the completeness of data used in an ECDIS system for the intended voyage.

4. **Composition and Chairmanship**
   a. The WG shall comprise representatives of IHO Member States (M/S), Expert Contributors and Accredited NGIO Observers.
   b. Decisions should generally be made by consensus. If votes are required on issues or to endorse proposals presented to the WG, only M/S may cast a vote. Votes shall be on the basis of one vote per M/S represented.
   c. Expert Contributor membership is open to entities and organisations that can provide a relevant and constructive contribution to the work of the WG.
   d. The Chair and Vice-Chair shall be a representative of a Member State.The election of the Chair and Vice-Chair shall be decided at the first meeting after each ordinary session of the Assembly and shall be determined by vote of the Members of the working group present and voting.
   e. If the Chair is unable to carry out the duties of the office, the Vice-Chair shall act as the Chair with the same powers and duties.
   f. Addition Expert Contributors shall seek approval of membership from the Chairman.
   g. Expert Contributor membership may be withdrawn in the event that a majority of the WG members agree that an Expert Contributor's continued participation is irrelevant or unconstructive to the work of the WG.
   h. All members shall inform the Chairman in advance of their intention to attend meetings of the WG.
   i. In the event that a large number of Expert Contributor members seek to attend a meeting, the Chairman may restrict attendance by inviting Expert Contributors to act through one or more collective representatives.