Paper for Consideration by S-102 subWG

S-102 Improvements

Submitted by:	PRIMAR
Executive Summary:	Discussion points S-102
Related Documents:	S-102 IHO Bathymetric Surface Product Specification (Draft 2.0.0).
Related Projects:	

Introduction / Background

PRIMAR delivered a document containing discussion points to the subWG chair in august 2016. This document was then redistributed by the chair to members of S-102 subWG. As we are interested in further opinions, PRIMAR is presenting these topics for discussion in this paper. The topics are:

1. Coordinate systems
2. New edition coverage
3. Cancel cell mechanisms
4. File name suffix
5. File size
6. Safety of navigation
7. Display and Portrayal
8. Digital Signature
9. Edition versioning

Analysis/Discussion

1a Coordinate systems

Currently, S-102 files can be produced in any projected coordinate system supported in IHO S-100 Part 6 (Ref: 5.1 Introduction). Further, we find that several Coordinate System Codes are defined in the metadata Grid Parameters (Ref: Table A2 Coordinate system code).

S-102 defines the correlation the product has to ENCs and its primary purpose:

- The primary purpose of the Bathymetric Surface Data Product is to support safe navigation as an auxiliary aid to navigation that may be used together with an ENC.(2 Specification Scopes – Purpose)

Our concern is that having such a broad selection of coordinate systems available will create unnecessary challenges for the OEMs that need to support all of them.
The standard should be clear that when data are produced for primary purpose, the coordinate system used should be strictly limited.
This will avoid time-consuming recalculating and aligning in end user systems.

Suggestion 1a.1: Clarify that when data are produced for primary purpose – a limited set of coordinate systems should be allowed, like all UTM zones in WGS84 (or something newer). Add or refer to a list of allowable EPSGs. There should also be a polar stereographic coordinate system recommended to support data from arctic areas.

1b Coordinate systems

Based upon S-102 data received from various producers, there seems to be several ways to define coordinate systems in S-102. One should be enough. If the intent in paragraph 5.1 Horizontal Coordinate Reference System

is to restrict horizontal CRS used for S-102 instead of ENC, or to reflect S-102 regulation when being produced for primary purpose, this should be stated clearer.

Suggestion 1b.1: Define that coordinate system must be defined preferably with EPSG (WKT is to flexible) and nothing else.
Suggestion 1b.2: Define that CRS WKT must not contain undocumented EXTENSION currently seen in S-102 files delivered.

2 New edition coverage

In order to avoid confusion for end users and distributors when issuing new editions of a dataset, the new edition should cover the same area as the previous edition.

Suggestion 2.1: Define that a new edition must cover the same area as the previous.
This could be defined in 11.2.1 Datasets (e.g.: A new edition of a dataset must cover the same area as the previous edition).

3 Cancel cell mechanisms

Currently, a cancellation is described as a type of dataset file where the dataset is cancelled and is deleted from the system.
Further on, the fields replacedData (description: If a data file is cancelled it is replaced by another data file) and dataReplacement (description: Cell name) is defined in the S102_ExchangeCatalogue.

What if there is no replacement – how should such a cancel message be delivered? Should there be additional fields in the S102_ExchangeCatalogue carrying that information?
(Perhaps something like: removedData (description: A data file is cancelled and removed. There is no replacement file))

Could a cancelled products file name be reused? In our opinion there should be a one-time-use restriction. This for making it easier for distribution and end user system to handle data delivery and support. This will also avoid confusion between old and new products.

Suggestion 3.1: Clarify how a no replacement cancellation should be delivered and effectuated.
Suggestion 3.2: Do not allow reuse of a cancelled products file name.

4 File name suffix

S-57 and S-101 states that file extensions for updates start at 001 and increment until limit 999.

Currently, a file named NO123456.102 can be an S-102 file or an S-57 file with UPDN=102. If S-100 derived products shall use their product specification number as file name extension there will be conflict with all coming S-100 products as well.

Would it be possible to solve this by limit S-57/S-101 UPDN to 100 or lower? An UPDN>100 is rare. (For now, in our system, we look at the file content to figure out if a .102 file is S-57 with UPDN 102 or a S-102 file).

Perhaps the best would be to propose to S-100WG and ENCWG that those products should have an upper limit of 100 updates? This would prevent more complexity being added in the S-100 family to find another solution as to how the end user systems distinguish between the different products.

Based upon current experience with S-57, the data producers do not often produce 100 updates of their product before issuing a new edition. Therefore this restriction would probably not add to much extra work for them.

Suggestion 4.1: Address S-100WG and ENCWG to propose limit S-57/S-101 to UPDN < 100.

5 File size

Currently, S-102 is limited to 10MB. However, the S-102 files we have received from HOs are typically a few 100MBs. The largest file we have seen is 2.1GB.

We can understand that 10MB is a nice file size for the end user to transfer and OEM to handle, but a 10MB S-102 file will cover a very small area and/or have very low resolution.

Suggestion 5.1: Raise the file size limit from 10MB to at least 200MB.

6 Safety of navigation

There are several gridding options available when extracting a grid from the surface (terrain model). Some of them are:

> Basic Weighted Mean – Inverse distance weighting
> Shoalest Depth – The shoalest sounding near the node is used
> Shoalest Depth True Position – Shoalest depth in true position

When producing an ENC, the shoalest depths in the surveys are considered most important (because those are most critical for navigation purposes). When creating depth models the shoalest depths are given highest priority, likewise also when generalization processes are done. All decisions taken as to decide how deep an area is, how to generate contours etc – are always taken having in mind safety of navigation.
When producing an S-102 product for primary purpose, the same mindset should be reflected (safety of navigation) when it comes to how the elevation values in the grid are populated.

Suggestion 6.1: Describe the importance of keeping safety of navigation in mind when creating S-102 for primary purpose.
Suggestion 6.2: Recommend/Restrict which methods should be used for grid extraction algorithm in primary purpose products.

7 Display and Portrayal

There needs to be rules established when it comes to interaction between S-102 and the ENC (and other S-1xx products as well). Work on this topic is already ongoing in the S100WG, looking into how various S-100 products should interact in end user systems.
Are there any special considerations that should be given for S-102?
As referred to in the minutes from the SubWG meeting in February 2015, two types of portrayal should be defined:
1. Ramp of colors cut into the ENC replacing skin-of-the-earth features
2. A two color scheme depicting safe/unsafe waters based on a mariner provided context parameter

Consideration must be given to topics as lost/cluttered information, presentation of symbols (conflicting symbology) and color shades (day, dusk, dawn view).

Suggestion 7.1: If specific considerations should be given when it comes to display and portrayal, they should be defined and S-100WG should be informed.

8 Digital Signature

The IHO DPSWG (Data Protection Scheme Working Group) was responsible for amending the IHO S-63 Data Protection Scheme. DPSWGs activities have now been relocated to a project team under the IHO S100WG.

We probably have to await the final results from their work. We can probably expect, or require, that they define the necessary data elements which will be required to operate the S-63 protection scheme on any types of hydrographic datasets. Their result will become a part of the S100 standard and used by S102.

The current version of S-63 is specifically focusing on protecting S57 ENC exchange sets. If we assume the same data elements will be re-used in S10x, the current S100/S102 definition of digital signatures is incomplete. If we assume the existing definition of a S63 digital signature will be reused for S100, we are proposing that a S100_DigitalSignature class is established. It will contain all the attributes required to authenticate a digital signature for a file. Each digitally signed S102 file must have an instance of the DigitalSignature class.

Role	Name	Description	Mult	Data type
Class	S100_DigitalSignature		-	-
Attribute	DSsignaturepartR	Data Server signature of datafile	1	CharacterString
Attribute	DSsignaturepartS	Data Server signature of datafile	1	CharacterString
Attribute	SAsignaturepartR	Scheme Administrator signature of the data server certificate	1	CharacterString
Attribute	SAsignaturepartS	Scheme Administrator signature of the data server certificate	1	CharacterString
Attribute	BIGp	P parameter used by Digital Signature Algorithm	1	CharacterString
Attribute	BIGq	Q parameter used by Digital Signature Algorithm	1	CharacterString
Attribute	BIGg	G parameter used by Digital Signature Algorithm	1	CharacterString
Attribute	BIGy	Data Server public key	1	CharacterString

Note the following:
- This example assumes the current S-63 digital signature definition is re-used in S100. It does not support other types of data protection schemes, or Data Server organisations not verified and approved by IHO
- The example takes into consideration that an exchange set can include hydrographic data which have been produced by multiple hydrographic offices and consequently need different data server certificates to authenticate correctly
- The DPSWG must also define how encryption/decryption keys shall be defined and exchanged. One possibility will be to continue to use the existing mechanisms because of it widespread implementation, but define product sections within the permit file which will hold the required permit keys

Suggestion 8.1: Establish an S_100DigitalSignature class that contains all attributes required to authenticate a digital signature for a file.

9 Edition versioning

Currently, there is a placeholder for editionNumber within the S102_DatasetDiscoveryMetaData in an S102 Exchange set, where there is metadata information about all the individual datasets existing in the exchange catalogue.

For better compatibility with existing systems for S-57 data handling and distribution services, there is a requirement to have edition information carried individually in every dataset.

Up until now there has been produced S-102 datasets only. Exchange catalogues are still only theoretically described, and not being produced by the test data producers.

When receiving data sets where dataset file name is equal to an existing, already delivered dataset, we have to compare the content of the datasets looking for differences to decide whether there is new information added. If we find new information we assume we have a new edition, if not we have a redelivery of existing data. Edition information carried within every individual dataset would solve this issue.

Suggestion 9.1: Incorporate edition information within the dataset files.

Recommendations
PRIMAR recommend that the issues being raised are discussed further in the subWG.

Action Required of S-102 subWG
The S-102 subWG is invited to:
Consider the suggestions being proposed in this paper.