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Paper for Consideration by ENCWG
S-57 to S-101 Malacca and Singapore Straits ENC Trial Conversion

Submitted by:	Pushidrosal, Indonesia
Executive Summary:	S-57 to S-101 Malacca and Singapore Straits ENC Trial Conversion
Related Documents:	S-57 Appendix B.1 (UOC 5.8.1.1): ENC Product Specification Annex A: Use of the Object Catalogue for ENC; S-57 to S-101 Conversion Guidance document”, edition 1.0.0 (S-65, Annex B)
Related Projects:	S-57 to S-101 Conversion Guidance document”, edition 1.1.0

Introduction / Background

MSS ENC is the joint production ENCs of Indonesia, Malaysia and Singapore, where Indonesia is currently the coordinator. It has 6 ENC cells, in which there are also high-density contours. As one of the most widely used ENCs by ships in the world, MSS ENC is also a priority for S-101 conversion.

This conversion trial, only uses the converter without filling in the new product profile, also to apply the new S65 appendix B, however. We will not discuss all the findings, but only the ones that stand out, considerably.

Analysis / Discussion

ENC, tools and conversion methods used:

- ENC Band 4: MS4BR2JS ed. 10 up. 13, Compilation Scale: 45000;
- Converter: ESRI S-101 Converter version 1.0.0.20 within S-101 FC 1.0.0 (It can't upload S-101 FC 1.0.2 downloaded from IHO Website);
- Validation: 7Cs Analyzer Version 4.2.0 Build 3, Reference: S-101 ENC Validation Checks, Ed. 1.0.0;
- Display: KHOA S-100 Viewer version 1.0.16

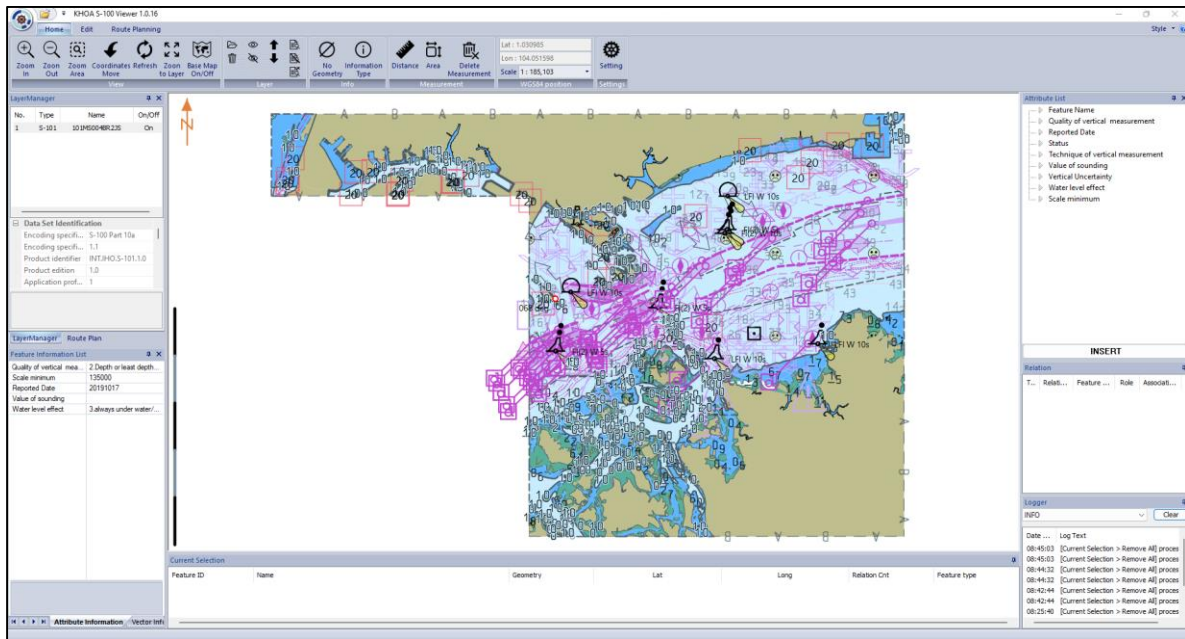


Fig.1 ENC 101MS004BR2JS.000 Display with KHOA Viewer.

Conversion Result

The cell name MS4BR2JS in general directly changed to 101MS004BR2JS.000, the edition remains as it is (10th edition) but without updates, along with critical, error and warnings.

```

MS4BR2JS, Edition 10, Update 13 : Critical 0, Error 183, Warning 4720
├── Validation Parameters
├── Dataset Metadata
├── Dataset Entries : Warning 4
└── Feature and Geometry Entries : Error 183, Warning 4716
    ├── AtonLightCharacteristics : Error 1
    ├── InvalidAttributeValue : Error 1
    ├── MandAttrVal : Error 181
    ├── AnchoringProhibitedAchare : Warning 1
    ├── ChainFeatures : Warning 1
    ├── DeparesGapInDepthRange : Warning 248 (10 shown)
    ├── DepthRangeValdco : Warning 1
    ├── LndareNotUnassessed : Warning 1
    ├── NotTruncatedDataLimit : Warning 127
    └── VertexDensity : Warning 4337 (10 shown)
  
```

S-57 validation results

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Validation Results
├── 101MS004BR2JS, Edition 10, Update 0 : Critical 55, Error 142, Warning 4599
│   ├── Validation Parameters
│   ├── Dataset Metadata
│   ├── Dataset Entries : Error 1
│   └── Feature and Geometry Entries : Critical 55, Error 141, Warning 4599
│       ├── InvalidFeatureGeom : Critical 17
│       ├── MissingMandatoryAttribute : Critical 34
│       ├── OrphanPoint : Critical 3
│       ├── OrphanSurface : Critical 1
│       ├── AtonLightCharacteristics : Error 1
│       ├── AtonMarkHasColourPattern : Error 11
│       ├── DatasetNotRectangular : Error 121
│       ├── InvalidAttributeValue : Error 3
│       ├── NavlneCoincidentRectrcOrient : Error 1
│       ├── SoundgGreaterDrval2 : Error 4
│       ├── AnchoringProhibitedAchare : Warning 1
│       ├── ChainFeatures : Warning 6
│       ├── DeparesGapInDepthRange : Warning 248 (10 shown)
│       ├── DepthRangeValdco : Warning 1
│       ├── DuplicateFoid : Warning 6
│       └── VertexDensity : Warning 4337 (10 shown)
  
```

S-101 Validation Result

1. Found a critical error: feature UnsurveyedArea with geometry line. Critical Error occurs because there is an UnsurveyedArea feature that has a Line geometry. This feature arises due to the conversion of the Poonton Line on S-57 to the Poonton line and the UnsurveyedArea line on S-101. Suggest to: Pontoon geometry line is converted to Pontoon line only.

InvalidFeatureGeom : Critical 17

Object: 100/9225 (2010,1570694284,9999) **UnsurveyedArea**
Categories: Data Model and Topology
Message: **UnsurveyedArea** must not be of geometry type Line.
Suggested Solution: Use alternative geometry type or feature class.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, checks 20a and 517c

Object: 100/9226 (2010,1570694284,9999) **UnsurveyedArea**
Categories: Data Model and Topology
Message: **UnsurveyedArea** must not be of geometry type Line.
Suggested Solution: Use alternative geometry type or feature class.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, checks 20a and 517c

2. Found a critical error: Critical Error occurs on the Offshore Platform because the Water Level Effect is not filled. Based on the S-65 Annex B, the WaterLevelEffect becomes a Mandatory attribute on the Offshore Platform. But it is not on the UOC S-57, therefore, this error can only be fixed in S-101. Suggest to: automatically get the WaterLevelEffect above the water in the conversion.

Object: 100/3299 (2010,1570694289,20) **OffshorePlatform**
Categories: Attribute
Message: Mandatory attribute **waterLevelEffect** is missing from **OffshorePlatform**.
Suggested Solution: Add missing mandatory attribute. Leave value empty if unknown.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 507

3. Found a critical error: in the BeaconSpecialPurposeGeneral feature. The error occurs because the Beacon Shape attribute is not filled in S-101. It occurs because in S-57 BCNSHP = Lattice, whereas according to S-65 Annex B, Lattice is no longer an attribute on beacon shape S-101, but it becomes an Attribute in NatureOfConstruction. BCNSHP (4) Lattice will be converted to a BeaconSpecialPurposeGeneral Beacon on S-101, and left empty Beacon Shape attribute and Lattice will become an attribute in NatureOfConstruction. Suggest to: automatically get the the value of BeaconSpecialPurposeGeneral in the conversion.

Object: 100/9165 (2010,1570694312,69) **BeaconSpecialPurposeGeneral**
Categories: Attribute
Message: Mandatory attribute **beaconShape** is missing from **BeaconSpecialPurposeGeneral**.
Suggested Solution: Add missing mandatory attribute. Leave value empty if unknown.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 507

Object: 100/9187 (2010,1573603518,1) **BeaconSpecialPurposeGeneral**
Categories: Attribute
Message: Mandatory attribute **beaconShape** is missing from **BeaconSpecialPurposeGeneral**.
Suggested Solution: Add missing mandatory attribute. Leave value empty if unknown.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 507

4. Found an error: in the BuoyIsolatedDanger feature. The error occurs because the topmark of a buoy isolated danger has a color pattern. At UOC, it is not recommended to fill in COLPAT at TOPMAR, but if it is not filled in or the contents are different from the body, an error will occur. Suggest to: Not to become an error.

▼ AtonMarkHasColourPattern : Error 11

Object: 100/9128 (2010,1570694312,31) **BuoyIsolatedDanger**
Categories: Aids To Navigation and Attribute
Message: colourPattern must not be present for the topmark of an isolated danger mark within IALA region A.
Suggested Solution: Encode colourPattern.

References:
S-100 ENC Validation Checks, Ed. 1.0.0, check 1729
IALA Maritime Buoyage System and Other Aids to Navigation, 2010

5. Found an error: The error occurs because CATZOC = C in S-57 is converted to QoBD in S-101 with Attribute CategoryOfTemporalVariation = 4 (Likely to Change). Based on S-65 Annex-B, all CATZOC except “U” will be converted with the contents of CategoryOfTemporalVariation = 5 (Unlikely To Change) and CATZOC:U will be filled with 6 (Unassessed). Suggest to: to update the converter.

▼ InvalidAttributeValue : Error 3

Object: 100/7 (2010,1570694276,8) **QualityOfBathymetricData**
Categories: Attribute
Message: Value 4 (Likely to Change) for attribute categoryOfTemporalVariation is not allowed for feature class QualityOfBathymetricData.
Suggested Solution: Remove invalid attribute values.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 2000

Object: 100/19 (2010,1570694276,20) **QualityOfBathymetricData**
Categories: Attribute
Message: Value 4 (Likely to Change) for attribute categoryOfTemporalVariation is not allowed for feature class QualityOfBathymetricData.
Suggested Solution: Remove invalid attribute values.

References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 2000

6. Found an error: error occurs is probably because there is a void in the attribute of orientation uncertainty which has not been mentioned in S65 Annex B. Suggest to: update S65 Annex B regarding the orientation uncertainty.

▼ NavlineCoincidentRectrcOrient : Error 1

Object: 100/6199 (2010,1570694300,146) **NavigationLine**
Categories: Topology and Attribute
Message: NavigationLine and RecommendedTrack are coincident, but the values of orientation.orientationValue are not equal.
Suggested Solution: Amend the value of orientation.orientationValue of either the NavigationLine or RecommendedTrack.

Related Objects:
100/6272 (2010,1570694300,224) **RecommendedTrack**
120/5949

References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 1787

- There are also some topology gaps on the KHOA Viewer with no explanation as this was not occur on the S57 editor.

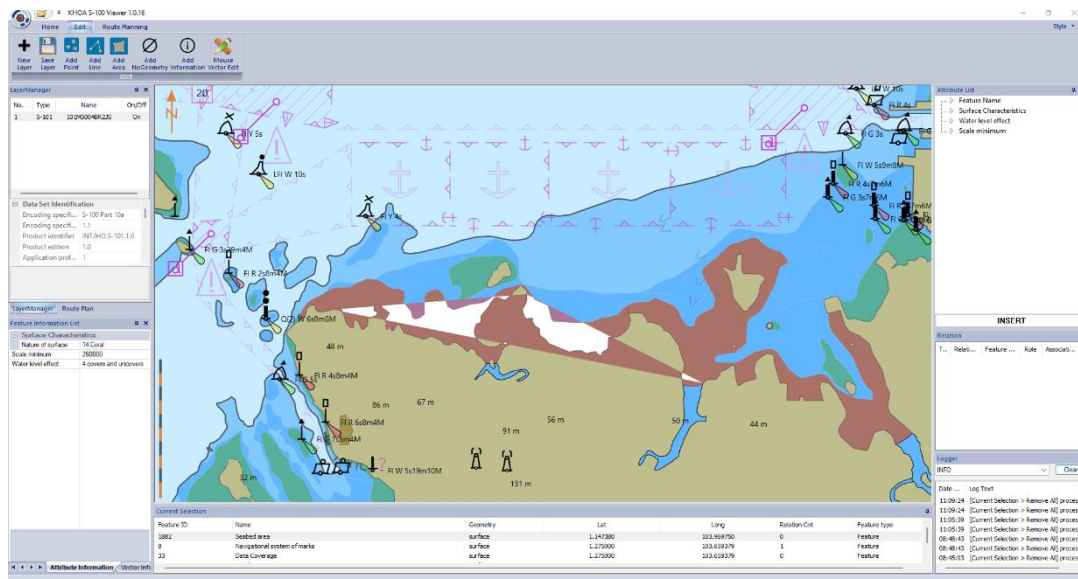


Fig.2 ENC 101MS004BR2JS.000 Display with KHOA Viewer within topology gap.

Conclusion and Recommendations

From the results of the S-57 to S-101 ENC MS4BR2JS conversion, it was found that there were several errors that had not been accommodated in S-65, Annex B. Therefore, some improvements are needed specially to reduce more works on the S-57 (ready conversion). In addition, it is hoped that the hydrographic offices could immediately carry out conversion trials with the availability of converter facilities that are always updated with changes in the related standards.

Action required of ENCWG

The ENCWG is invited to:

Discuss this paper and its recommendation.