7th ENC WG MEETING

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

Agenda Item 4.14

Wellington, New Zealand 21 - 22 November 2022

IHO

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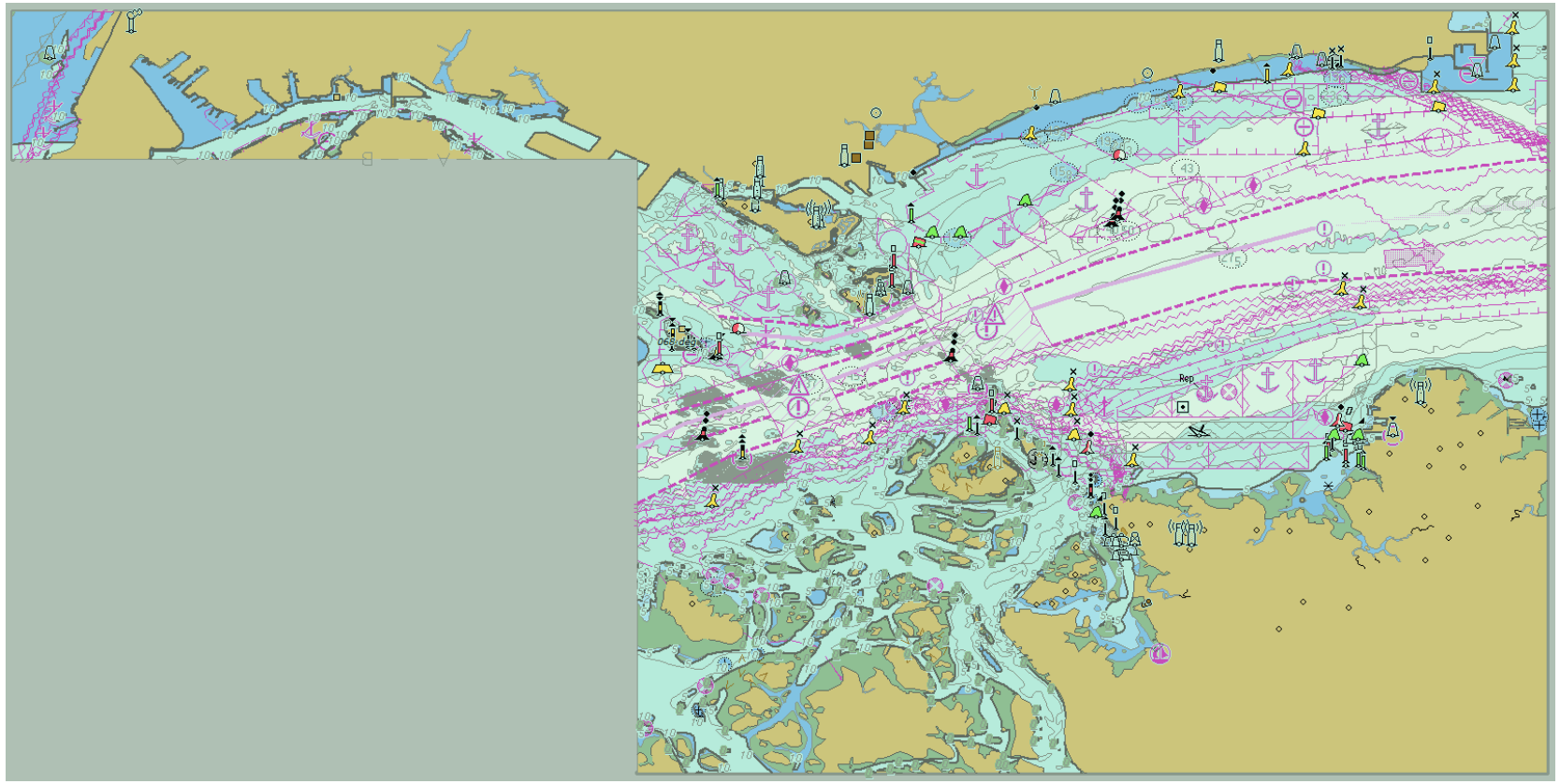
INTRODUCTION / BACKGROUND

MSS ENCs are most widely used ENCs by ships in the world

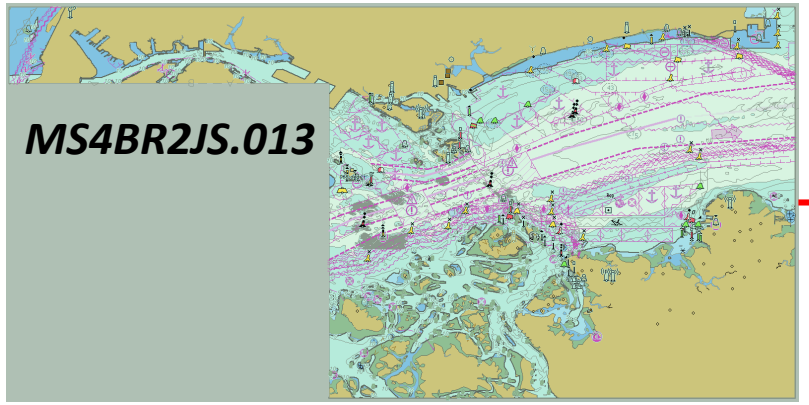


MS4BR2JS ed. 10 up. 13

Compilation Scale : 45.000

ANALYSIS / DISCUSSION

ENC, tools and conversion methods

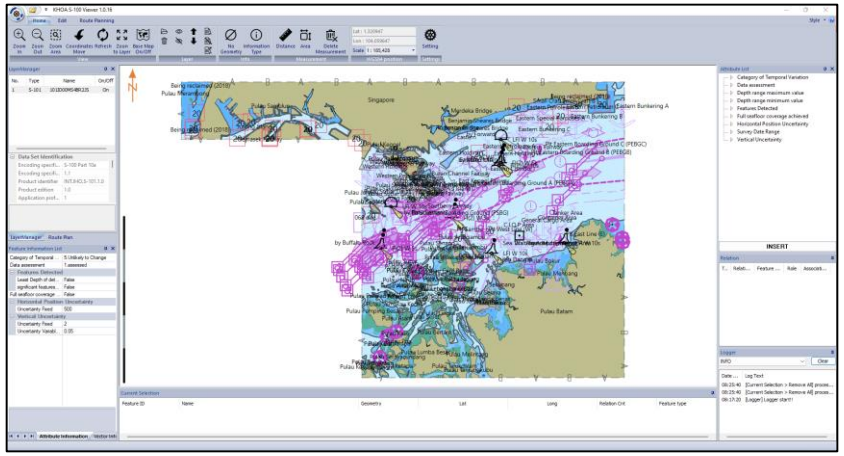


Convert to S-101

Use ESRI
Version 1.0.0.20

Validate with 7Cs Analyzer
Version ***4.2.0 Build 3***
Reference: S-101 ENC Validation Checks, Ed. 1.0.0

101MS004BR2JS.000



- <u>ENC Band 4:</u> MS4BR2JS ed. 10 up. 13, Compilation Scale: 45000;
- <u>Converter:</u> 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);
- <u>Validation:</u> 7Cs Analyzer Version 4.2.0 Build 3, Reference: S-101 ENC Validation Checks, Ed. 1.0.0;
- <u>Display:</u> KHOA S-100 Viewer version 1.0.16

IHO CONVERSION RESULT

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S-57 validation results

- 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-101 Validation Result

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)

FINDINGS

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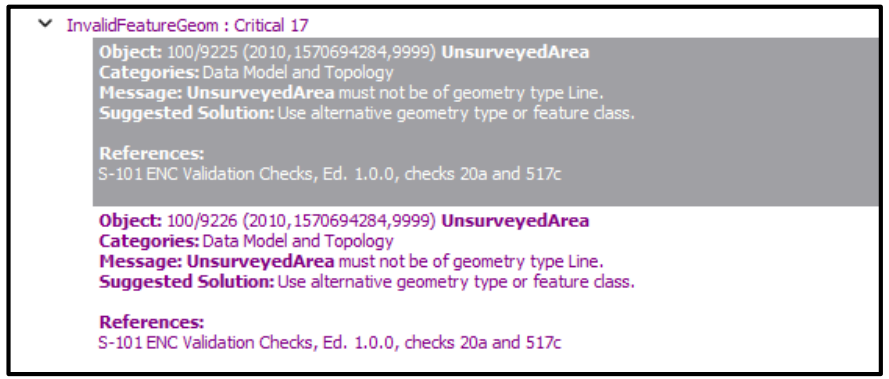
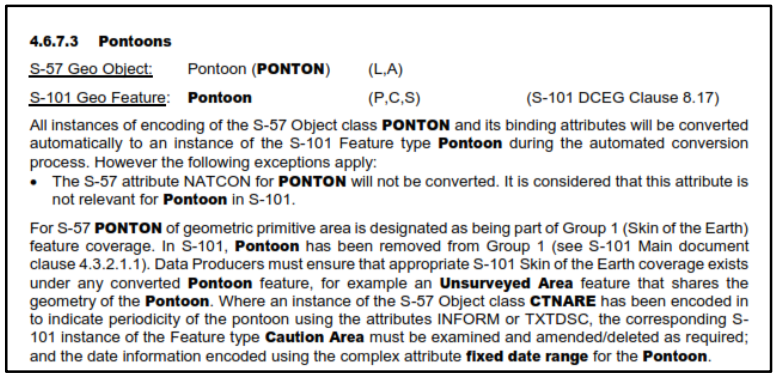
1. critical error: feature UnsurveyedArea with geometry line. Critical Error occurs because there is an UnsurveyedArea feature that has a Line geometry. This feature arises due to the conversion of the Poonton Line on S-57 to the Poonton line and the UnsurveyedArea line on S-101.





4.6.7.3 Pontoons

S-57 Geo Object: Pontoon (**PONTON**) (L,A)

S-101 Geo Feature: **Pontoon** (P,C,S) (S-101 DCEG Clause 8.17)

All instances of encoding of the S-57 Object class **PONTON** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Pontoon** during the automated conversion process. However the following exceptions apply:

- The S-57 attribute NATCON for **PONTON** will not be converted. It is considered that this attribute is not relevant for **Pontoon** in S-101.

For S-57 **PONTON** of geometric primitive area is designated as being part of Group 1 (Skin of the Earth) feature coverage. In S-101, **Pontoon** has been removed from Group 1 (see S-101 Main document clause 4.3.2.1.1). Data Producers must ensure that appropriate S-101 Skin of the Earth coverage exists under any converted **Pontoon** feature, for example an **Unsurveyed Area** feature that shares the geometry of the **Pontoon**. Where an instance of the S-57 Object class **CTNARE** has been encoded in to indicate periodicity of the pontoon using the attributes INFORM or TXTDSC, the corresponding S-101 instance of the Feature type **Caution Area** must be examined and amended/deleted as required; and the date information encoded using the complex attribute **fixed date range** for the **Pontoon**.

PONTON	Line		2
PONTON	Line	If CONVIS = *1* (visually conspicuous) or CONRAD = *1* (radar conspicuous)	3
PONTON	Area		NOT SET
PRCARE	Point/Area		NOT SET

PONTON (Line Geometry) S-57 Appendix B.1: ENC Product Specification Annex A: Use of the Object Catalogue for ENC Edition 4.2.0 – April 2020

Suggest to: Pontoon geometry line is converted to Pontoon line only.

FINDINGS

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2. 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 WateLevelEffect 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.

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.

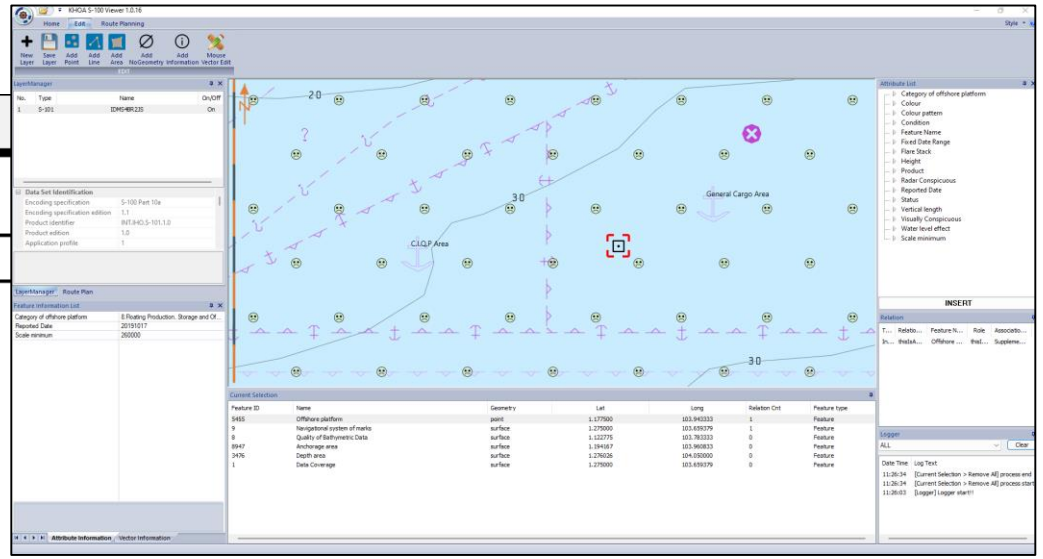
References:
S-101 ENC Validation Checks, Ed. 1.0.0, check 507

11.7.2 Offshore platforms (see S-4 – B-445.2; B-445.4 and B-445.5)

If it is required to encode a permanent offshore platform (fixed or floating), it must be done using the object class **OFSPLF**.

Geo object: Offshore platform (**OFSPLF**) (P,A)
Attributes: CATOFP COLOUR COLPAT CONDTN CONRAD CONVIS DATEND DATSTA
HEIGHT - for fixed platforms, referred to the vertical datum (see clause 2.1.2).
NATCON NOBJNM OBJNAM PRODCT STATUS ~~VERACC~~ ~~VERDAT~~
VERLEN - for floating platforms, referred to the sea level.
INFORM NINFOM

Feature	Mandatory Attributes
Obstruction	**water level effect** at least one of: **height**; **value of sounding**
Offshore Platform	**water level effect**



Suggest to: automatically get the WaterLevelEffect above the water in the conversion.

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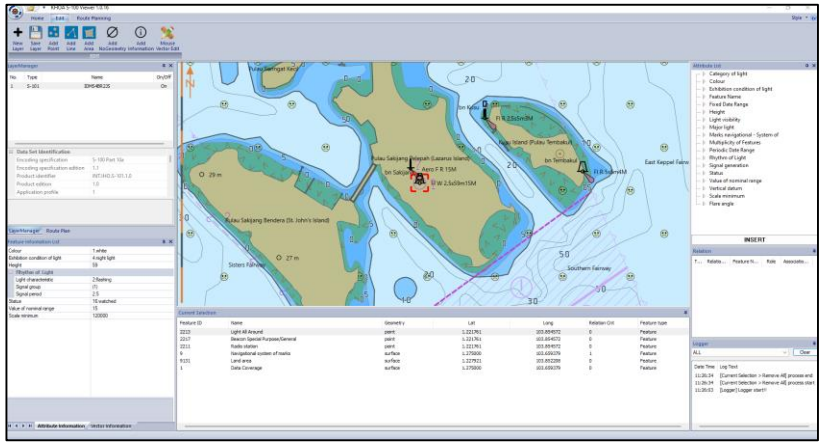
3. critical error: in the BeaconSpecialPurposeGeneral feature. The error occurs because the Beacon Shape attribute is not filled in S-101. It occurs because in S-57 BCNSHP = Lattice, whereas according to S-65 Annex B, Lattice is no longer an attribute on beacon shape S-101, but it becomes an Attribute 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.

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



Attribute	Object	Allowable Attribute Values
BCNSHP		1-2-3-4-5-6-7 [Value 4 converts to new value 11 for attribute **nature of construction**]

- The S-101 attribute **nature of construction** includes the new enumerate value *11* (latticed). This information is encoded in S-57 on **BCNSPP** using the mandatory attribute BCNSHP value *4* (lattice beacon), which is not an allowable value for the mandatory attribute **beacon shape** in S-101. Data Producers will be required to evaluate their converted S-101 data and populate **beacon shape** with an appropriate allowable value.

In S-65 Annex B, there is no specific provision for replacing the BCNSHP Lattice for S-101. Converter does not directly convert Lattice into an attribute of NatureOfConstruction, but must be filled in S-101

Suggest to: automatically get the the value of BeaconSpecialPurposeGeneral in the conversion and or Lattice on NatureOfConstruction.

IHO BCNSHP

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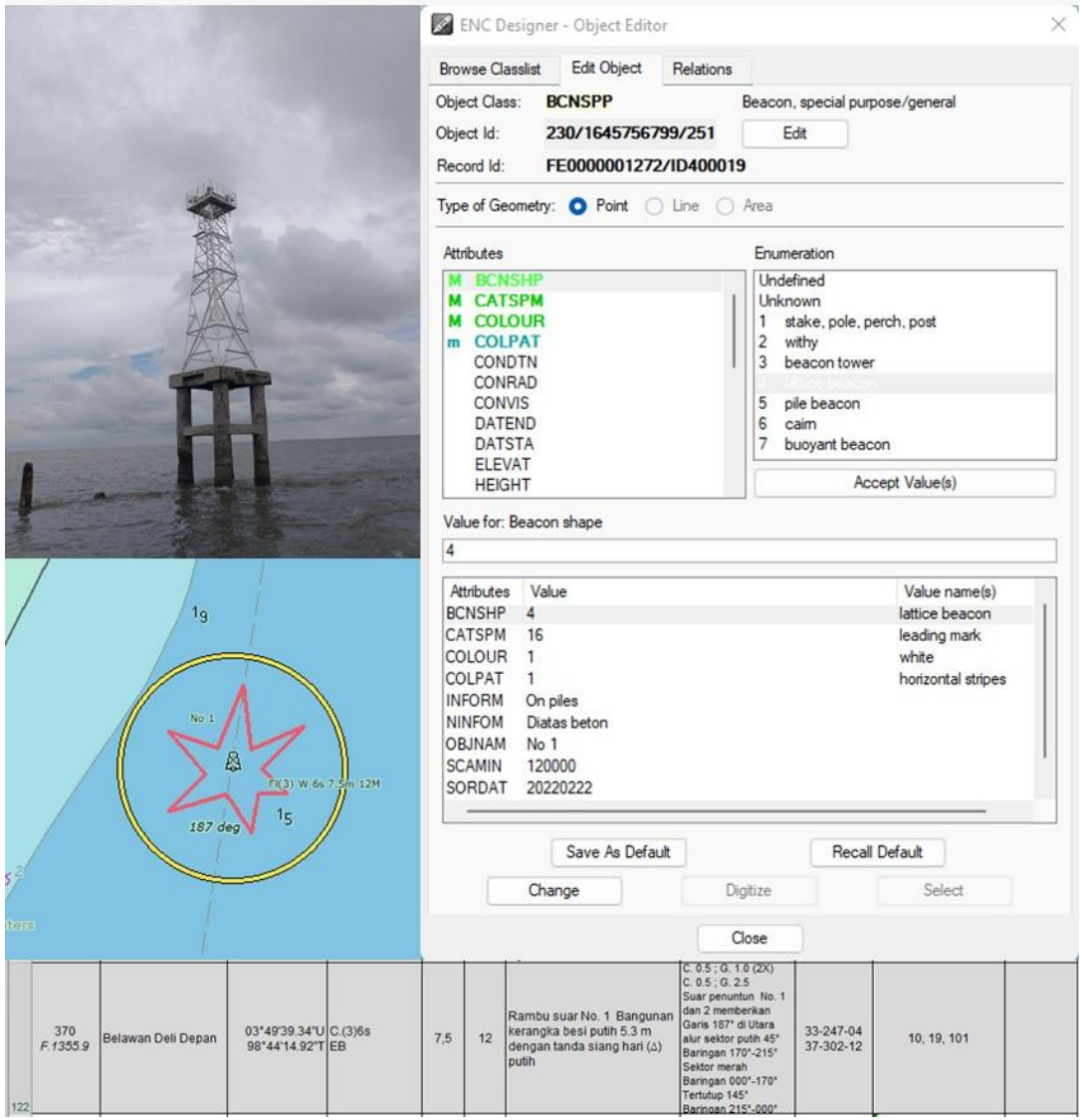

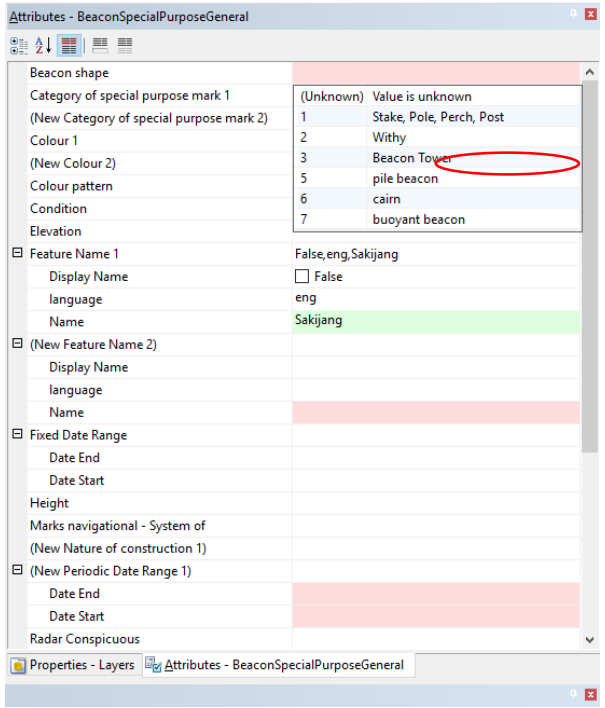

BEACON TOWER?

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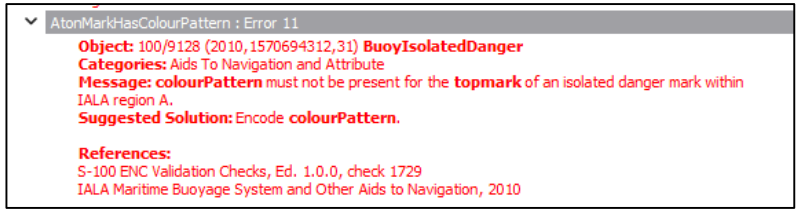
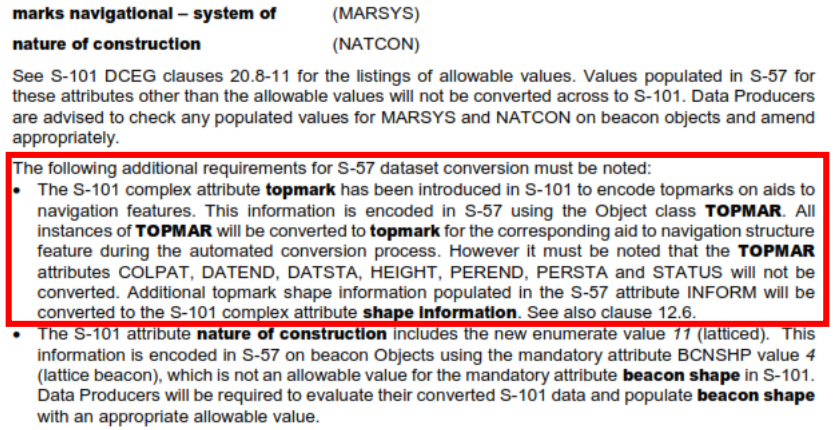
4. error: in the BuoyIsolatedDanger feature. The error occurs because the topmark of a buoy isolated danger has a color pattern. At UOC, it is not recommended to fill in COLPAT at TOPMAR, but if it is not filled in or the contents are different from the body, an error will occur.





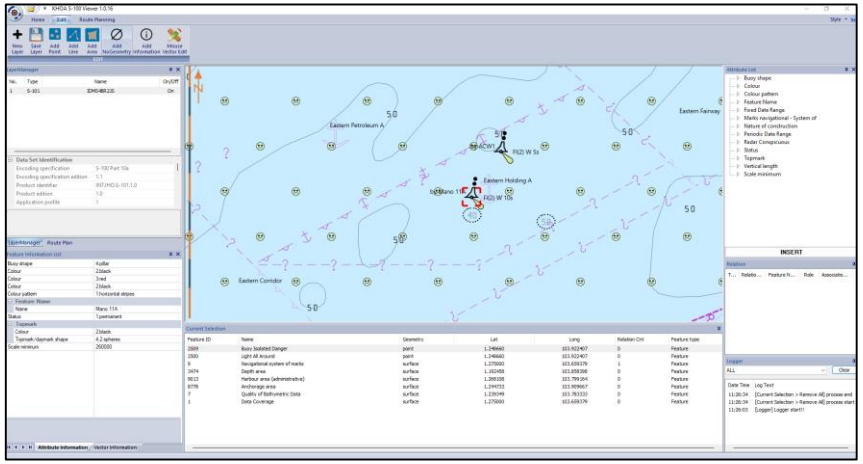
marks navigational – system of (MARSYS)

nature of construction (NATCON)

See S-101 DCEG clauses 20.8-11 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for MARSYS and NATCON on beacon objects and amend appropriately.

The following additional requirements for S-57 dataset conversion must be noted:

- The S-101 complex attribute **topmark** has been introduced in S-101 to encode topmarks on aids to navigation features. This information is encoded in S-57 using the Object class **TOPMAR**. All instances of **TOPMAR** will be converted to **topmark** for the corresponding aid to navigation structure feature during the automated conversion process. However it must be noted that the **TOPMAR** attributes COLPAT, DATEND, DATSTA, HEIGHT, PEREND, PERSTA and STATUS will not be converted. Additional topmark shape information populated in the S-57 attribute INFORM will be converted to the S-101 complex attribute **shape information**. See also clause 12.6.
- The S-101 attribute **nature of construction** includes the new enumerate value *11* (latticed). This information is encoded in S-57 on beacon Objects using the mandatory attribute BCNSHP value *4* (lattice beacon), which is not an allowable value for the mandatory attribute **beacon shape** in S-101. Data Producers will be required to evaluate their converted S-101 data and populate **beacon shape** with an appropriate allowable value.



The TOPMAR feature in S-57 will be converted to a topmark in the Buoy Isolated Danger structure, whereas COLPAT will not be converted to S-101. However, when COLPAT in TOPMAR has different contents from COLPAT in BOYISD on S-57, an error will occur on S-101. So, COLPAT in TOPMARK must have the same attribute as COLPAT in Structure BOYISD, which is not proper way to populate this object.

Suggest to: Not to become an error or other solution?

FINDINGS

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5. 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).

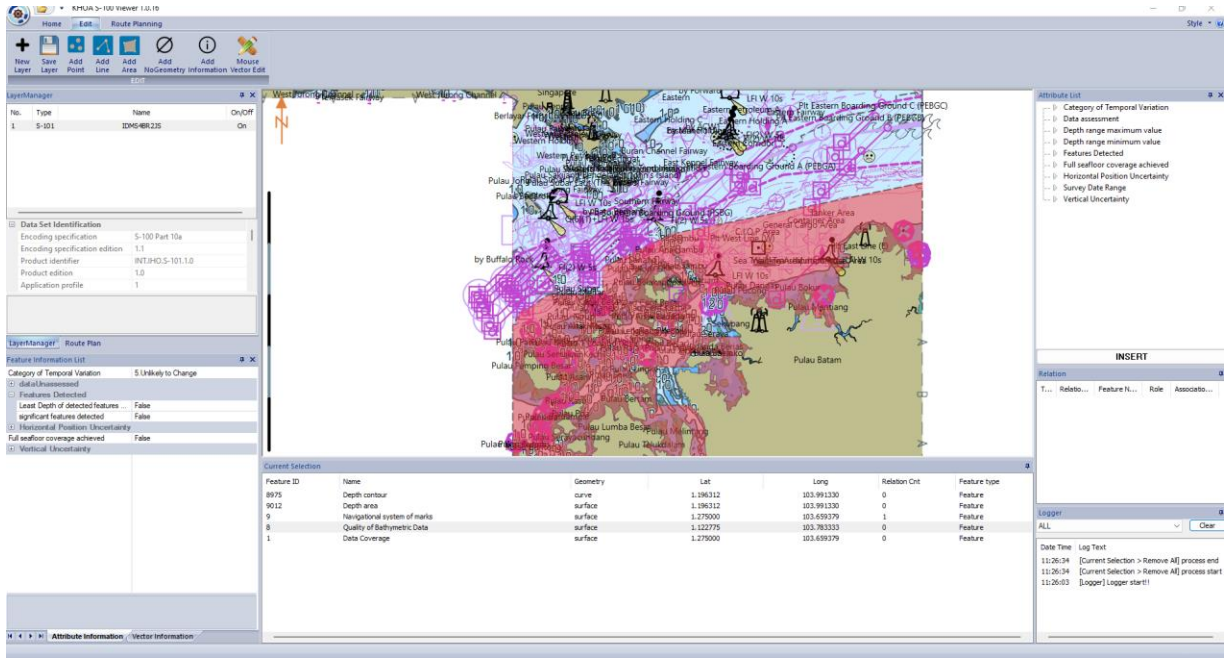
InvalidAttributeValue : Error 3

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



Temporal Variation: The S-101 mandatory attribute **category of temporal variation** introduces the ability for the Data Producer to incorporate the temporal impact on bathymetric data quality in areas where the seabed is likely to change over time, or in the wake of an extreme event such as a hurricane or tsunami. During the automated conversion process, for all **M_QUAL** except those where CATZOC = *6* (zone of confidence U (data not assessed)), the corresponding **Quality of Bathymetric Data** will have **category of temporal variation** populated with value *5* (unlikely to change). For full S-101 functionality, Data Producers will be required to reassess the value of this attribute as required. For CATZOC = *6* (zone of confidence U (data not assessed)), **category of temporal variation** will be populated with value *6* (unassessed).

Suggest to: to update the converter.

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6. 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.

NavlneCoincidentRectrcOrient : 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

NAVLNE

orientation			C	1,1
orientation uncertainty			(S) RE	0,1
orientation value	*(ORIENT)*		(S) RE	1,1

10 Recommended tracks and routes

10.1 Leading, clearing and transit lines and recommended tracks

10.1.1 Navigation lines and recommended tracks

S-57 Geo Object: Navigation line (**NAVLNE**) (L)

S-101 Geo Feature: **Navigation Line** (C) (S-101 DCEG Clause 15.4)

All instances of encoding of the S-57 Object class **NAVLNE** and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Navigation Line** during the automated conversion process.

S-57 Geo Object: Recommended track (**RECTRC**) (L,A)

S-101 Geo Feature: **Recommended Track** (C) (S-101 DCEG Clause 15.5)

All instances of encoding of the S-57 Object class **RECTRC** of type line and its binding attributes will be converted automatically to an instance of the S-101 Feature type **Recommended Track** during the automated conversion process. However, Data Producers are advised that the following enumerate type attributes have restricted allowable enumerate values for **Recommended Track** in S-101:

quality of vertical measurement (QUASOU)

technique of vertical measurement (TECSOU)

See S-101 DCEG clause 15.5 for the listings of allowable values. Values populated in S-57 for these attributes other than the allowable values will not be converted across to S-101. Data Producers are advised to check any populated values for QUASOU and TECSOU on **RECTRC** and amend appropriately.

The following additional requirements for S-57 attribution must be noted:

- The S-101 attribute **maximum permitted draught** has been introduced in S-101 to encode the maximum permitted vessel draught at the berth. This information is encoded in S-57 on **RECTRC** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **RECTRC** should be in a standardised format, such as *Maximum draught permitted = [xx.x] metres*, where *[xx.x]* is the value of the maximum permitted vessel draught (decimal part not required if the value is whole metres). For example *Maximum permitted draught = 11.5 metres*.
- The S-101 attribute **measured distance** has been introduced in S-101 to encode the specified measured distance along a track to be followed. This information is encoded in S-57 on **NAVLNE** using the attribute INFORM (see clause 2.3). In order for this information to be converted across to S-101, the text string encoded in INFORM on the **NAVLNE** should be in a standardised format, such as *Measured distance = xxxx metres*, where *xxxx* is the value of the measured distance

Data Producers must note that in S-101 the type surface is not included as an allowable geometric primitive for **Recommended Track**, therefore **RECTRC** of type area will not be converted across to S-101. Where **RECTRC** has been encoded as type area in a S-57 dataset, Data Producers should evaluate their data holdings and re-encode these objects as another appropriate routeing object of type area (for example **FAIRWY**, **TWRTPT**, **DWRTPT**) or as **RECTRC** of type line prior to conversion to S-101.

Suggest to: update S65 Annex B regarding the orientation uncertainty.

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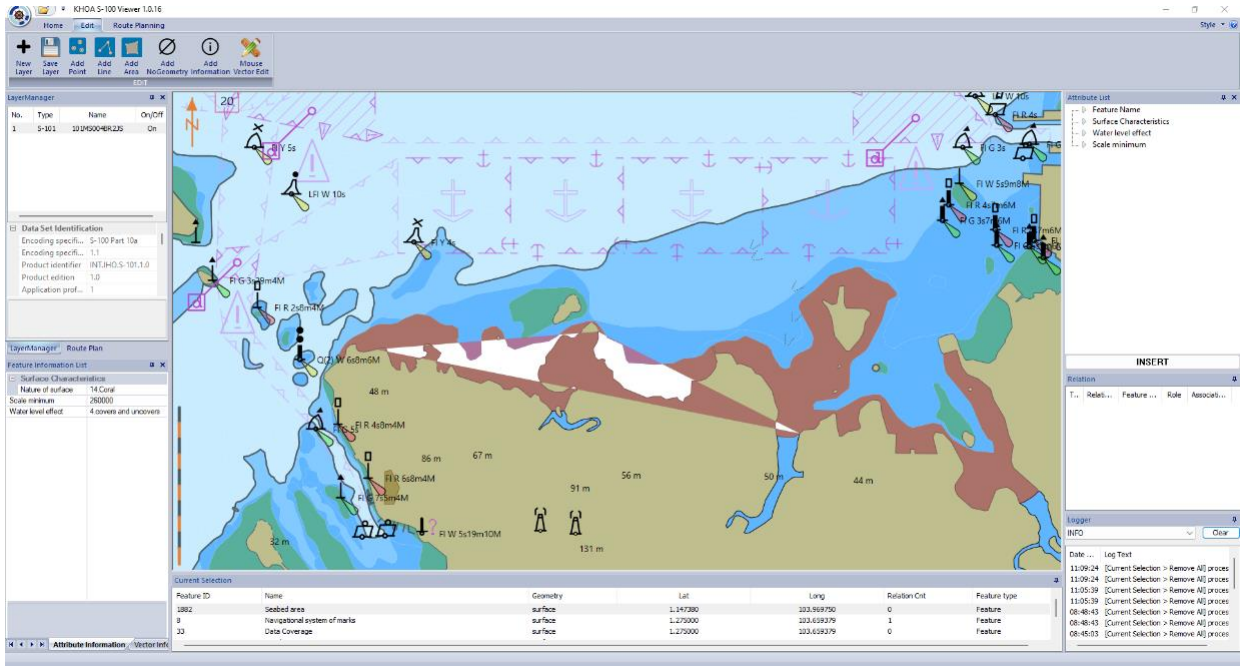
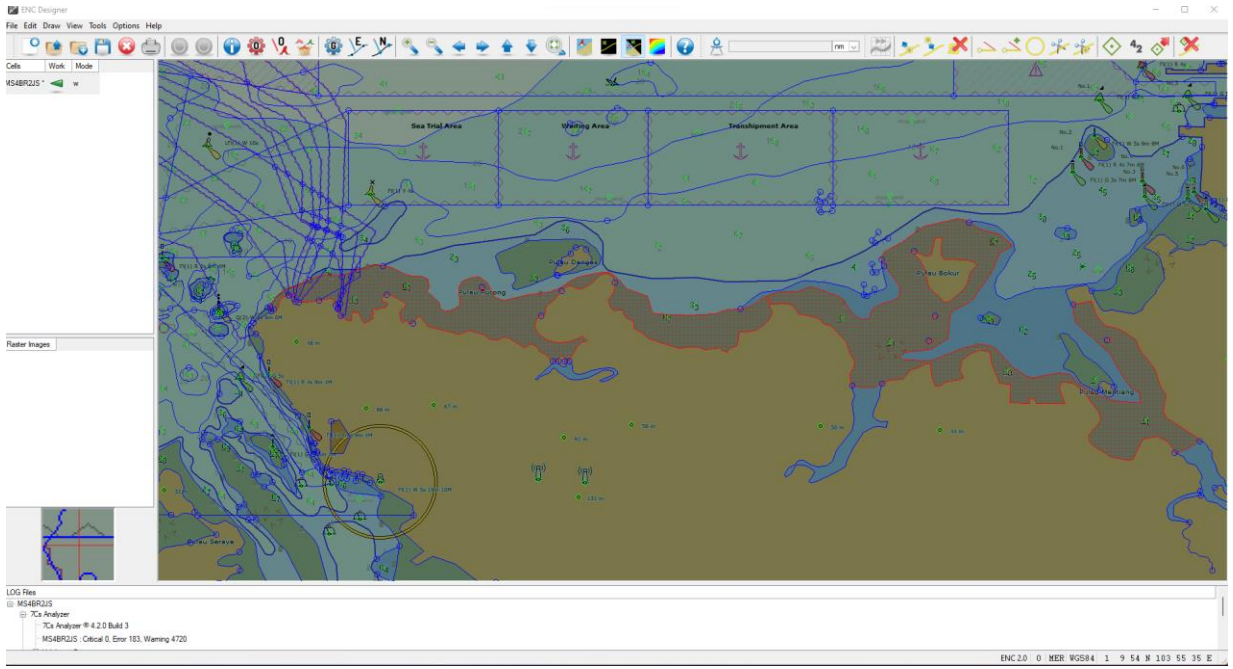
7. There are also some **topology gaps** on the KHOA Viewer with no explanation as this was not occur on the S57 editor.



101MS004BR2JS KHOA S-100 VIEWER 1.0.16



MS4BR2JS IN ENC DESIGNER 4.7.0.14

CONCLUSION AND RECOMMENDATIONS

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From the results of the S-57 to S-101 ENC MS4BR2JS conversion,

1. it was found that there were several critical errors and errors that had not been accommodated in S-65, Annex B;
2. Therefore, some improvements are needed specially to reduce more works on the S-57 (ready conversion);
3. 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.

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THANK YOU