INTERNATIONAL HYDROGRAPHIC ORGANIZATION

S-100 NIWC Test Bed Report for S-101PT4

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Version Number	Date	Author	Purpose
1.0.0	2019	J.Powell	Template based on the IALA Guideline 1107 for the planning and reporting of test beds

Contents

1 Contents of the Reporting Template

1.1 General Information

Name of testbed	NIWC S100 Testbed Program
Location of testbed	Virginia Beach, Virginia USA
Time and duration of testbed	Ongoing
Contact person(s)	Robert Greer, Robert.a.greer@navy.mil (Project Manager); Mikan Stamenkovich, mikan.stamenkovich@navy.mil (Technical Lead)
Testbed website	N/A
Organisation(s) involved	NIWC Atlantic (Formerly known as SPAWAR)
Funding programme and budget	Ongoing

1.2 Executive Summary

The NIWC S-100 Testbed Project aims to provide empirical proof of the S-100 design through phased implementation of an ECDIS. The testbed will implement data import and validation, data loading and portrayal of S-100 based products in the context of a Simple Viewer (Phase 3) and Shore Based ECDIS (Phase 6).

In order to support development through Phase 6 various elements of the S-100 Testbed initiative are exercised by the NIWC testbed project. Testing areas include Phase 1 (Feature and Portrayal Catalogue use), Phase 2 (validation of S-101 converted data and S-100 based portrayal). After Phase 3 completes, additional testing during Phases 4 and 5 will be used to support the Shore Based ECDIS development of Phase 6.

1.3 Testbed Information

The type of user group(s) involved in the test:

☐ Shipboard users

☒ Shore-based users

☐ SAR users

Details of e-navigation gap/s considered for the testbed (some examples are given below. For a complete list, please refer to the IMO MSC 91 report)

☐ Information/data management

☐ Effective and robust voice communication and data transfer

☐ Systems and equipment

☐ Ship reporting

☐ Traffic monitoring; and/or

☐ Training and familiarization

The category of e-navigation gap/s considered in the testbed

☐ Technical

☐ Regulatory

☐ Operational: and/or

☐ Training

Details of e-navigation solution/s considered in the testbed (solutions prioritised by IMO are listed below. For a complete list, please refer to the IMO MSC 91 report)

☐ S1: Improved, harmonized and user-friendly bridge design

☐ S2: Means for standardized and automated reporting

☒ S3: Improved reliability, resilience and integrity of bridge equipment and navigation information

☐ S4: Integration and presentation of available information received via communication equipment

☐ S9: Improved Communication of VTS Service Portfolio

Compliance to SOLAS navigation – if the product or testbed will be used as part of SOLAS navigation the system should be able to meet the following:

1.3.1 Expected Functionality per Product (i.e S-101)

Only S-101 is addressed in this report edition within this section.

☒ 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 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

☒ Test datasets and test cases

1.3.2 Expected Functionality per Product (S100Viewer addresses all S100 compliant products)

The primary users are S-100 Working Group members and other interested IHO parties. The testbed aims to identify gaps in utilization of the S-100 family of product specifications with initial focus on S-101. Support for products using GML and HDF-5 encodings is in development.

The S-100 testbed phases implemented to date are:

- Build Catalogues (Phase 1)
- Produce data (Phase 2)
- Ingest and Display Data on ECDIS (Phase 3 Simple Viewer)

The S-100 testbed phases currently in development are:

- Multiple Datasets / Interoperability (Phase 6 Shore ECDIS)

The category of S-100 Testbed solutions considered in the NIWC testbed project were both technical validation of the specifications and operational considerations in the context of ECDIS.

1.4 Testbed Methodology

Methodology used for data collection:

Method	S100Viewer user experience feedback
Validity	
Reliability	

Summary information on testbed respondents / participants:

Number	None, no direct user feedback during reporting period

Background	
Experience	
Demographics	

Procedure used in the testbed:

Testbed setup	Windows 7 or 10 via Basecamp distribution
Technical solutions used	C# application, XML, XSLT, Lua scripting
Standards	IHO S100WG standards support. Application specific information and limitations are available in the release notes of the S100Viewer application.

The contents of this report are the result of using NIWC S100Viewer version 1.6.1.0, released to coincide with S-101PT4. The 1.6.1.0 revision supports modified calling parameters for Lua scripting function *CreateCurve*; see item 1.5.1.2 for details.

NIWC S100Viewer version 1.6.1.0:

- Available on Basecamp
- Supports continued assessment of Lua scripting (S-100 Part 13) and portrayal (S-100 Part 9a)
- Supports review of updates to:
    - ESRI Dataset Converter
    - Feature Catalogue(s)
    - Portrayal Catalogue(s)
- Requires catalogues compliant with S-100 4.0.0 schemas
- Supports NIWC S-101 Portrayal Catalogue 1.0.1
    - previous Lua portrayal catalogues are no longer supported

NIWC S-101 Portrayal Catalogue version 1.0.1 has been released to coincide with this meeting. See item 1.5.1.2 for details.

1.5 Testbed Results

1.5.1 S-101PT Related Items

1.5.1.1 S-100WG4-8.2: Resolve the issues relating to Light Sector Extension

This item is the result of action *S-100WG4-8.2: Resolve the issues relating to Light Sector Extension via recommendations to the S-101PT*. The issue is presented in a separate paper: *S-101PT4-5.4 DCEG Sector Extension Portrayal Attribute*. The paper recommends that DCEG section 30.4 *Sector Extension* is modified as follows:

- Change definition to: *"The distance in screen millimetres (mm) by which a sector is extended beyond the default."*
- Remove 2nd remark: *"The displayed sector must not exceed the nominal range of the light sector on the ECDIS display."*

Rational for these recommendations are presented in the referenced paper.

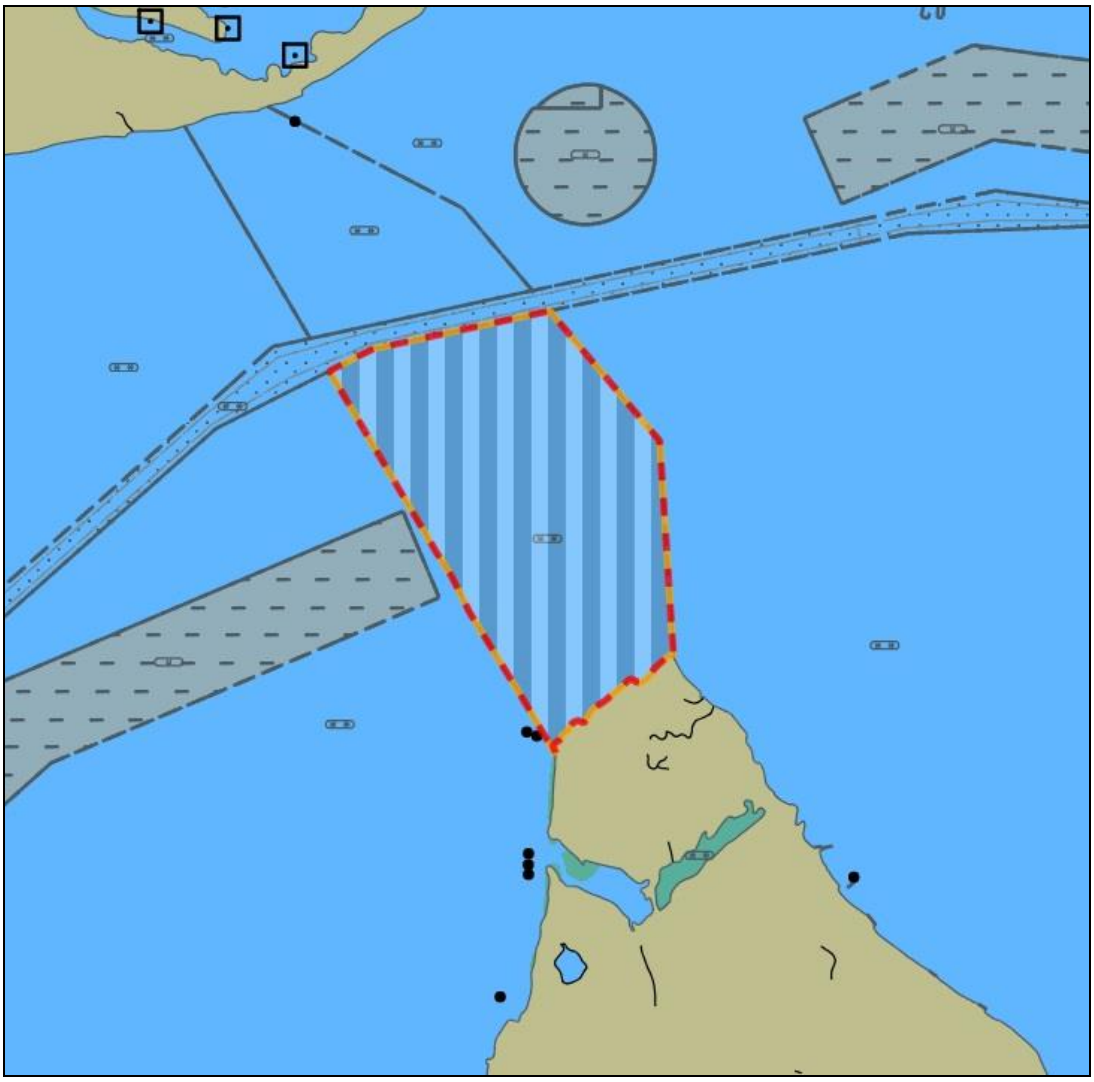
1.5.1.2 NIWC S-101 Portrayal Catalogue 1.0.1

NIWC S-101 Portrayal Catalogue version 1.0.1 is available on Basecamp. This revision is an update to the S-101PC 1.0.0 provided at S-100WG4. The changes in S-101PC 1.0.0 are detailed in the S-100WG4 testbed report, major changes include:

- Provides all viewing groups
- Implements results of Portrayal Catalogue Builder project, including testPCB symbol
- Features with associated *NauticalInformation* are portrayed using an INFORM01 symbol
    - Example:

The NIWC S-101 Portrayal Catalogue 1.0.1 incorporates the following changes:

- *CreateAttributeConstraints*: new Standard Catalogue Function
    - Referenced in S-100 13-8.1.2.9 but not currently documented in S-100 Part 13
- *QualityOfBathymetricData*: Portrayal modified per HSSC11-05.5B
    - Centred point symbol replaces pattern fill
    - Point symbol scaled to 5mm per HSSC guidance
    - Example:



- Implemented portrayal of *LocalDirectionOfBuoyage*
    - Note: when *marksNavigationalSystemOf* equals 11 (CEVNI) the testPCB symbol is output
- Modified to correctly handle surfaces without interior rings
    - Implementation error resulted in portrayal using default symbology
- *CreateCurve*: changed *startPoint* and *endPoint* from direct points to point references. This change aligns with the spatial model of S-100 Part 7, and the portrayal input schema for a curve defined in S-100 Part 9.
- *AdditionalInformation*: fixed capitalization (was *additionalInformation*)
- *CreateAttributeBinding*: removed duplicate function definition
- Role *informationProvidedFor* changed to *providesInformation*

The following changes will be proposed to the S-100WG as a result of feedback and experience gained while implementing / testing the updates to the S-101 Portrayal Catalogue:

- S-100 Part 13

- Add documentation for *CreateAttributeConstraints*.
- Update 13-8.1.1.5 *CreateCurve* to show *startPoint* and *endPoint* as spatial references instead of direct points

1.5.2 Update on recommendations from S-101PT3-4.5 Test Bed Report section 7.2

1. Complete: DCEG: Add *marksNavigationalSystemOf* attribute to *LocalDirectionOfBuoyage*

   DCEG / Feature Catalogue / Portrayal Catalogue / ESRI converter have been updated.
2. Complete: Update S-101 Feature Catalogue 0.9.3 for S-101 1.0
   a. Complete: Fix validation issues
   b. Complete: Add missing information associations
   c. Complete: Add missing / fix incorrect *alias* elements
   d. Complete: Add *marksNavigationalSystemOf* attribute to *LocalDirectionOfBuoyage*
3. Complete: Update S-101 dataset converter for S-101 1.0
   a. Complete: Support changes to the DCEG / feature catalogue
   b. Disapproved: Convert S-57 catalogue file to S-101 exchange set
4. Ongoing: Update S-101 portrayal catalogue for S-101 1.0
   a. Complete: Align with changes to the DCEG / feature catalogue
   b. Complete: Update SAFCON5X symbols

      KHOA provided updated SAFCON5X symbols which are provided in the NIWC S-101 Portrayal Catalogue.
   c. Ongoing: Update portrayal to emit all instructions for *LocalDirectionOfBuoyage*

      As noted in 1.5.1.2, S-52 equivalent portrayal has been implemented in NIWC S-101 Portrayal Catalogue 1.0.1.

      Work remaining:
      - Update portrayal for *marksNavigationalSystemOf* equal to 11 (CEVNI)
        - Currently portrayed using the testPCB symbol
        - Completion requires a symbol to be provided via completion of item 7.a
5. Ongoing: Update S-101 specification for S-101 2.0
   a. Ongoing: Note manufacturer portrayal requirements

      Portrayal of the following items cannot be generated by the S-101 Portrayal Catalogue and therefore must be implemented by manufacturers:
      - Chart Updates
      - Chart Scale Boundaries
      - Overscale Data Pattern
      - Non-HO (Non-ENC) Chart Information
      - No Data Areas

      Work remaining:

- Ensure symbols are provided in the Portrayal Catalogue to support manufacturer implementation
- Implement portrayal in Shore Based ECDIS (testbed Phase 6)
- Update S-101 specification to note manufacturer responsibilities
  - Related S-100 issue – S-100 Part 9 should be updated to indicate how product specifications should identify manufacturer responsibilities

6. Ongoing: Update S-100 specification
   a. Ongoing: Provide for portrayal of date dependent features.
   b. OBE: Provide guidance on implementing palette changes for SVG symbols
7. Update the S-101 portrayal catalogue for S-101 2.0
   a. Ongoing: Develop and provide missing symbols

      Results of the Portrayal Catalogue Builder project have been implemented, resulting in portrayal of new features / missing symbols using the testPCB (frown) symbol.

      Work remaining:

      - Nautical Cartography Working Group (NCWG) to develop the symbol concepts
      - NIWC to produce S-100 compliant SVG files from the symbol concepts
      - NIWC to update the S-101 Portrayal Catalogue with new symbols and corresponding portrayal rules

   b. Ongoing: Add support for portrayal of date dependent features
   c. Complete: Emit highlight symbols based on value of *NauticalInformation*

      Features with associated *NauticalInformation* are now portrayed with an associated INFORM01 symbol, ViewingGroup 31030 (no external file) or 31031 (external file).

   d. Complete: Add viewing group layer to toggle highlight info / highlight document

      Viewing group layer 31030 / 31031 are provided.
8. Update testbed viewer for S-101 2.0
   a. Complete: Implement guidance on palette changes for SVG symbols

      Schema changes accepted at S-100WG4 associate each S-100 colour palette with a corresponding SVG stylesheet.
9. Ongoing: Review NIWC S-101 Portrayal Catalogue and provide feedback

1.5.3 S-100 Items relevant to S-101PT

1.5.3.1 Lua Scripting Reference

NIWC has created a C++ Lua Scripting Reference Implementation (LSR) that provides a concrete demonstration of the concepts presented in S-100 parts 9A and 13. The LSR is intended to accelerate development of scripting capabilities within the S-100 Portrayal Catalogue Builder, and to provide a reference for manufacturers implementing scripting capabilities within their applications.

We have released a preliminary version of the LSR to coincide with S-101PT4. A README file included with the LSR provides an introduction and overview, and documents unimplemented functionalities. Feedback is requested for incorporation into a final revision scheduled for release at S-100WG5.

While implementing the LSR a small number of issues were discovered with version 1.0.0 of the S-101 Portrayal Catalogue as well as the S-100 4.0.0 part 9A and part 13 documentation. These issues are raised separately within this report.

1.5.3.2 Interoperability

Performed analysis of required capabilities and began implementation as part of the NIWC Shore Based ECDIS testbed.

1.5.3.3 Date Dependency

A notional implementation will be presented for discussion at TSM7.

1.5.3.4 Alerts and Indications

Updates to the model presented at TSM6 will be presented at TSM7.

1.5.3.5 Symbol / Viewing Group Dependency Issues

A notional solution will be presented for discussion at TSM7.

1.5.4 Presentation of data (e.g. statistics)

Presents issues encountered in data processing.

1.5.5 Users assessment and experience

None reported.

1.5.6 Other comments

None.

1.6 Conclusions and Recommendations

We recommend the user community explore and provide feedback on S-101 Lua portrayal catalogue so that the S100WG and S101PT can fully mature the S-101 standard as soon as possible.

1.6.1 Lessons learnt: N/A

1.6.2 Own plans

1. We invite feedback on the testbed, S-101 Portrayal Catalogue, and C++ reference implementation to advance the maturation of the S-101 standard.

1. Continue S-101 portrayal refinement based on community input.

2. Continue the design of Shore Based ECDIS in support of interoperability.

Suggested further studies: None

1.7 Publications

Not applicable for this reporting period

Peer-reviewed publications

Technical papers

Reports

Communication material

1.8 Reference Material

S-100 Edition 4.0.0 Final

S-101 ENC Product Specification Baseline 1.0.0

S-101 Feature Catalogue S-101FC_1.0.0_20190409.xml

NIWC S-100 Viewer v1.6.1.0

NIWC S-101 Portrayal Catalogue Version 1.0.1