TSMAD 25-4.5.3 rev 1

Paper for Consideration by TSMAD

S-101 Test Case Statement of Objectives

Submitted by:	TSMAD
Executive Summary:	IHO TR 2/2007 outlines the IHO standards development lifecycle process. In order to complete this process for S-101 there is a requirement for testing to be conducted prior to S-101 being voted on by the IHO Member States. In order to complete this process HSSC approved funding for a contract to document the functional requirements needed for testing of S-101 and the creation of positive and negative test cases.
Related Documents:	N/A
Related Projects:	S-101 Development and Approval

Introduction / Background

S-101 is a major work item under the Hydrographic Services and Standards Committee. While work has progressed on the development of the standard, it has been a completely voluntary activity on the parts of the Member States and expert contributors. However, the development process has come to a juncture where contract support is needed to progress S-101 in order for it to become an accepted IHO standard and to fulfil the requirements of TR 2/2007. HSSC4 subsequently approved funding for TSMAD to tender the development of an S-101 Test Plan and Test Cases.

Analysis/Discussion

One of the requirements of TR 2/2007 – Principles and Procedures for making changes to IHO Technical Standards and Specifications is that there must be a testing phase; therefore the first step in accomplishing this phase is developing a test plan for S-101. TSMAD has prepared a draft test plan for S-101, which includes all the necessary components that are required for successful testing and loosely follows the IEEE 829 test plan structure.

In order to complete the S-101 test plan the following activities must be accomplished:

1. Update the S-101 Test Plan
2. Create a separate S-101 Software Requirements document – based on the latest draft of S-101
3. Create a Positive and Negative Unit Test for each requirement

While TSMAD has the technical expertise to draft an initial test plan, it does not have the same expertise to draft formal test cases in order to conduct an S-101 test bed. Formal test cases include both a positive test and a negative test for each requirement that is to be tested. In addition, it is a time consuming process if done on a part-time basis.

Conclusions

TSMAD prepared an independent cost estimate regarding the completion of the above activities and estimates that it should take $30,000.00 and three months to complete.

In order to move to the tendering phase it is requested that TSMAD approve the draft Statement of Objectives that are located in Annex A.

It should also be noted that the recipient of this contract must be a subject matter expert in S-101 and have experience writing both requirements and test cases.

Justification and Impacts

The development of S-101 has been progressing and it is nearing the point where it will need to undergo thorough testing prior to becoming an official IHO standard. Without the support of an IHO contract to develop the S-101 Test Cases and Test Plan, progress will be slowed significantly, as TSMAD does not have the resources to develop a proper test plan and test cases that can be used in an S-101 test bed.

In utilizing a contract, TSMAD will be able to reach out to industry to get the correct technical expertise needed to create a test plan and test cases to conform to TR 02/2007.

Action Required of HSSC
TSMAD is invited to:

a. agree to the Statement of Objectives for the S-101 test case funding in Annex A
b. Ask the IHO to seek a tender for this contract.

STATEMENT OF OBJECTIVES

S-100/101 Test Plan, Requirements, and test cases

October 1, 2012

1 Goals and Objectives

The International Hydrographic Organization (IHO) is an intergovernmental consultative and technical organization established in 1921 to support the safety of navigational, and to contribute to the protection of the marine environment.

S-101 is a new Product Specification for the Electronic Navigational Chart. It is currently under development by the IHO Transfer Standards and Maintenance Applications Development Working Group (TSMAD). S-101 ENCs will remain, fundamentally, the basic navigation tool for ECDIS and therefore most of the features of the S-57 ENC are retained. However, using the experience and stakeholder feedback gained over a number of years many new concepts and constructs have been developed, aimed at improving the efficiency of the data and improving the user experience. Many of the changes may appear obscure or innocuous, but taken as a whole they will ensure that S-101 is, to a large extent future-proofed, unlike S-57 which is becoming ever more unmanageable.

S-101 draws heavily upon the concepts of S-100 such as exchangeable and dynamic feature and portrayal catalogues, and richer geometric models, information types and complex attributes. The use of these new feature types will allow ENC producers to overcome a number of known encoding shortcomings in S-57-based ENCs, such as the overuse of caution areas. In addition, improved functionality will lead to more efficient data handling and better portrayal definition in ECDIS equipment, by eliminating or reducing the number of conditional symbology procedures.

Another important element in the development of the S-101 product specification is the requirement for test beds during the development lifecycle and beyond. TSMAD has begun the process of identifying items needed for the test beds. The main items are as follows:

- S-57 to S-101 open-source convertor
- S-101 open source data editor
- S-101 open source data viewer
- S-100/101 ECDIS reference Test Bed

In recognizing the need for test beds and to help promote the development of the S-101 Product Specification, the National Oceanic and Atmospheric Administration (NOAA) contracted ESRI to develop an S-57 to S-101 open source converter. Once completed, NOAA intends to offer the converter to the IHO to be placed in the public domain. The converter is intended to convert existing S-57 ENC data into S-101 ENC data by utilizing the feature catalogue developed in phase one of the S-101 development project plan. The converter will also utilize the ISO8211 encoding and provide samples of S-101 test data for interested stakeholders. The converter will be validated in consultation with OEMs and other stakeholders to ensure that it is fit for purpose, prior to the IHO adopting S-101 as an international standard.

TSMAD has also recognized the need for an S-101 data editor and an S-101 viewer to enable the creation of S-101 data from first principles. This is required to enable testing and validation of the functionality of the exchangeable feature and portrayal catalogues and the creation of test data that supports new S-101 functionality.

The test bed, when completed will, in effect, be a reference S-100 ECDIS. It will enable TSMAD to test the updateable feature and portrayal catalogues in an environment and a platform that can mimic those systems being submitted for type approval and subsequent use by mariners.

This statement of requirements focuses only on a small, yet crucial portion of the test bed process – the development of the S-101 software requirements to be tested and the corresponding unit test. While it is understood that there are user requirements for the use of the system, for the purpose of this exercise it is considered out of scope.

2 Overview of Activities and Results

The contractor shall provide the following:

4. S-101 Software Requirements document – based on the latest draft of S-101

5. Positive and Negative Unit Test for each requirement

NOTE: For the purpose of the document, the requirements will focus how the system must behave using S-101.

3 Detail of Activities and Results

A. S-101 Requirements Document

The contractor shall review the latest version of S-101 and write a discrete requirement that can be used to write a unit test. Within S-101 the following rules apply:

- "Must" indicates a mandatory requirement.
- "Should" indicates an optional requirement, that is the recommended process to be followed, but is not mandatory.
- "May" means "allowed to" or "could possibly", and is not mandatory.

In an initial analysis of S-101 found that there were at least 292 discrete requirements that were divided into three levels of complexity – high, medium, and low. For the purpose of this tender the contractor shall use the following numbers as a guide for costing.

Requirement Creation:

- **High** – 49 Hours (58 requirements)

- **Medium –** 13 Hours (79 requirements)
- **Low –** 16 Hours (155 requirements)

Performance Standards / Measures

The Contractor shall submit the draft versions of documentation deliverables to the chair of TSMAD for review and comment by the date agreed upon by the Contractor and the chair of TSMAD. The chair will provide written comments within ten workdays. The Contractor shall submit the final copy within five workdays of receipt of the chair of TSMAD's comments.

Deliverable	**Anticipated Due Date**
S-101 Requirements Document	Within one month of award

B. Unit Test Creation

The second phase of this tender is for the creation of unit tests for each requirement documented in section A. This work cannot be started until the requirements have been accepted by the chair of TSMAD.

The contractor shall create both a positive and negative test case for each requirement. This test case will then be used to test the functionality of S-101 as part of the testbed. The test case format should follow the format used in IEC 61174 where it describes what the system or data must do in order to pass the test.

For the purpose of this tender the contractor shall use the following numbers as a guide for costing this phase of the project:

Test Case Creation:

- **High –** 58 Hours (58 Tests)
- **Medium –** 40 Hours (79 Tests)
- **Low –** 39 Hours (155 Tests)

Performance Standards / Measures

The Contractor shall submit the draft versions of documentation deliverables to the chair of TSMAD for review and comment by the date agreed upon by the Contractor and the chair of TSMAD. The chair will provide written comments within ten workdays. The Contractor shall submit the final copy within five workdays of receipt of the chair of TSMAD's comments.

Deliverable	Anticipated Due Date
Test Case Document	Within two months after acceptance of the requirements

4 Method of Contract Deliverables

For activities A and B data files will be transmitted via email.

5 IHO Furnished Information

S-101 Latest Draft
S-101 Feature Catalogue
S-101 Test Data
IEC 61174