

Paper for Consideration by TSMAD28/DIPWG6

Industry Sponsored S-100/S-101 Test Bed Project

Submitted by:	Northrop Grumman Maritime Systems (NGMS)
Executive Summary:	An outline of an industry-sponsored project for testing S-100/S-101 coordinated with the test strategy framework adopted at TSMAD27, proposed by NGMS
Related Documents:	S-100 S-101 TSMAD27-4.4.4 Test Strategy Framework, ISO 15288 Systems and Software Engineering IEC 61174
Related Projects:	TSMAD Work Plan KHOA Test Bed Project SPAWAR Test Bed Project

Introduction / Background

Northrop Grumman Maritime Systems (NGMS) has a long history, well known to those in the industry, of sustained involvement in the development and testing of ECDIS systems based on the S-57 and S-52 standards and their predecessors. Perhaps less generally known is NGMS's active contributions in the development of the VPF-format DNC standard adopted by NGA and achievement as developer of ECDIS-N, deployed on practically every US Navy surface and submarine combatant, and the US Coast Guard VEGA navigation system.

This work has frequently involved debugging chart database issues, customization of bespoke chart engine products, in-house chart rendering tools, migration to new software and hardware platforms and support of commercial and military partners/customers around the world. NGMS has maintained a somewhat unique position by not marketing a proprietary chart distribution system. This independent, multi-fuelled approach has further-contributed to an unusually broad background of experience gained by integrating our products with those of our (equally well-known) partners and working at all levels with them.

The organization and disciplined processes that harness this experience will benefit thorough test of S-100/S-101, recognizing the safety-related importance of its use for shipboard navigation.

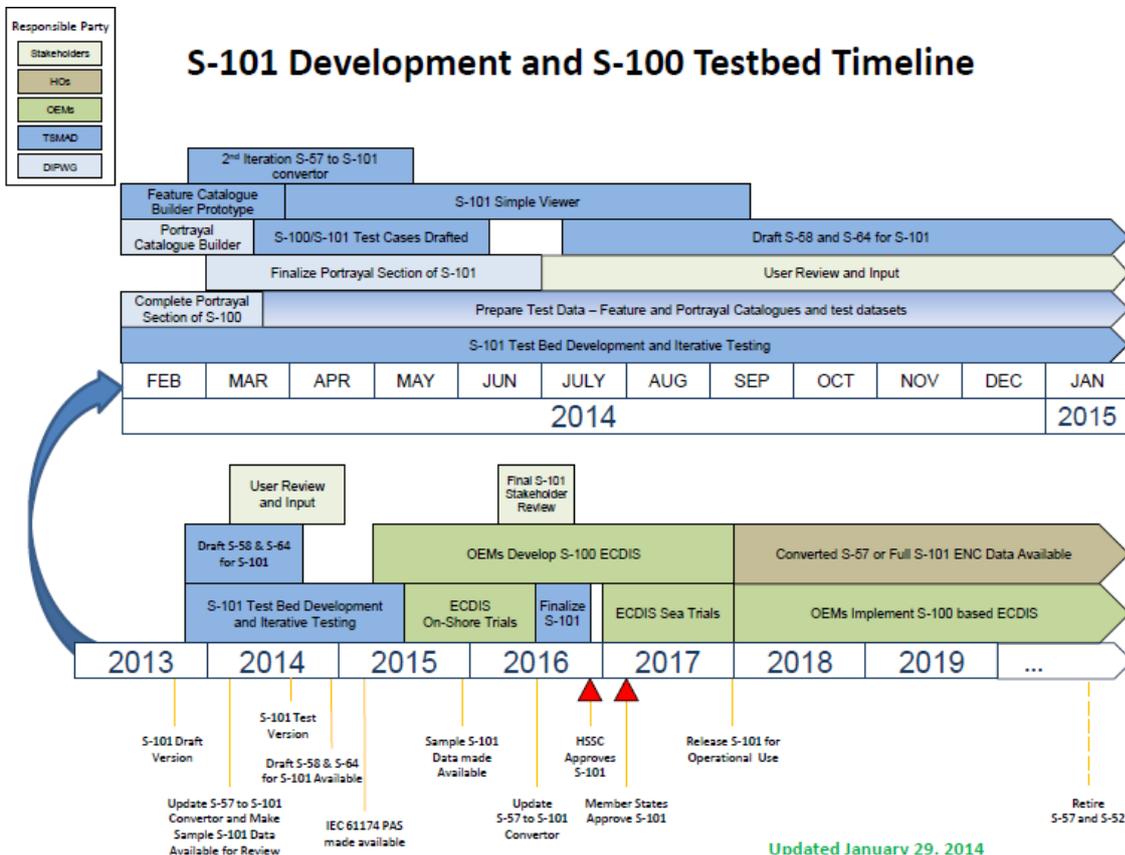
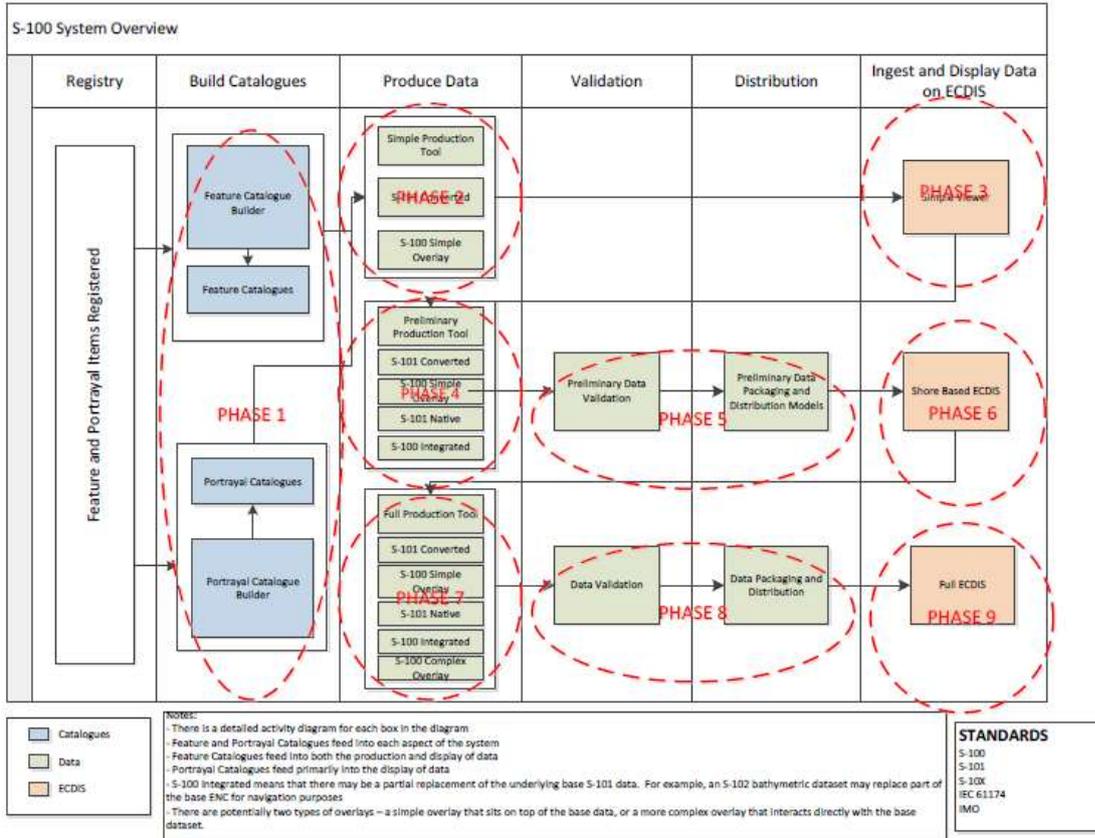
Analysis/Discussion

At TSMAD27, the test strategy framework was introduced at plenary. It calls for at least one simple viewer and at least three companies on-board for the 'shore-based' (i.e. partially functional) and fully-functional ECDIS test stages. It states that a consensus of at least three companies is needed to say that the S-100 mechanisms and S-101 are successful before official release of S-101 for implementation in ship board navigation systems.

S-100 Test Bed projects should incorporate good software quality processes. The IMO e-Navigation Strategy Implementation Plan highlights the importance of software quality to navigation safety. The software processes implemented by NGMS are assessed at Level 3 by CMMI. NGMS maintains a quality management system certified to ISO9001 and follows ISO 15288 systems engineering practices.

NGMS will participate with this industry-team, with particular focus on implementing the Validation, Distribution and Ingest/Display phases (phase 5 and onward) as outlined in TSMAD27-4.4.4.

S-100/S101 High Level System Overview, Showing Test Bed Phases



Phase 5:	Preliminary Data Validation and Distribution. This phase will put in place draft data validation rules and test data packaging and distribution models.
Phase 6:	Shore-Based ECDIS. This phase deals with the creation and testing of an interim stage of ECDIS with less-than-fully-compliant capabilities prior to availability of fully-compliant ECDIS software.
Phase 7 – 9:	Full Production Tool, Data Validation, Distribution, and Full ECDIS. These three phases deal with the full system testing and implementation of S-100 and S-101 with shipboard-ready ECDIS systems with simulated sensor inputs and/or shipboard installation.

Table 1. NGMS Test Bed Planned Capabilities

Conclusions

NGMS will prepare a test bed for the purpose of supporting completion of the timeline for S-101 testing, to prepare test tools for S-101 and S10x products integrated with S-101 to insure shipboard implementations can meet requirements for safety of navigation and protection of the environment.

Recommendations

Consideration should be given to the need for continuing update of the test framework based on ISO 15288, as test experience is gained. NGMS supports the plan for a test bed workshop this Fall.

Justification and Impacts

Adding to the number of OEMS using different types of implementations and tools should improve fault detection and decrease the potential for anomalous behavior later on. It should help generate common implementation guidance useful to the wider stakeholder community.

Action Required of [HSSC] [Relevant HSSC WG]

The TSMAD is invited to:

- a. Endorse the development of the NGMS test bed
- b. Include the NGMS test bed project in TSMAD planning