

SPAWAR S-100 Testbed Project

1 GENERAL INFORMATION

- **Name of testbed:** SPAWAR S100 Testbed Program
- **Location of testbed:** Norfolk, Virginia
- **Time and duration of testbed:** Ongoing through Phase 6 (Shore Based ECDIS)
- **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:** SPAWAR Systems Center Atlantic
- **Funding program:** NGA
- **Last Edited/Updated:** August 29, 2017

2 EXECUTIVE SUMMARY

The SPAWAR S-100 Testbed Project aims to assist in validation, ingestion and display of S-100 derived data products in the context of a Simple Viewer (Phase 3) and eventual Shore Based ECDIS (Phase 6). In order to support development through Phase 6 (Shore Based ECDIS) various elements of the S-100 Testbed initiatives are exercised by the SPAWAR testbed project. SPAWAR testing areas include Phase 1 (Feature and Portrayal Catalogue use), Phase 2 (validation of S-101 converted data and S-100 based overlays). After Phase 3 completes, additional advanced testing during Phases 4 & 5 will be used to support the Shore Based ECDIS development of Phase 6.

3 TESTBED INFORMATION

The primary users involved 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-100 and S-101. Additional product support based on GML and HDF-5 encodings will follow.

Details of the S-100 testbed solutions considered in the SPAWAR testbed to date were:

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

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

4 TESTBED METHODOLOGY

4.1 METHODOLOGY USED FOR DATA COLLECTION:

Ongoing development efforts for Phase 3 will be presented in this report. As our testbed matures, additional reporting for phases beyond 3 will be included, e.g. Phase 6 (Shore Based ECDIS).

Methodology used for data collection involves sharing our applications with the S-100 WG community via Basecamp. User feedback will be collected and presented in this report at future S-100 WG meetings.

4.2 SUMMARY INFORMATION ON TESTBED RESPONDENTS / PARTICIPANTS:

None to report since S100WG2 (Genoa).

4.3 PROCEDURE USED IN THE TESTBED:

4.3.1 Technical solutions used

SPAWAR S100Viewer application (running on Microsoft Windows 7 and above) via Basecamp distribution to working group community.

4.3.2 Standards

Application specific information and limitations are captured in the version release notes.

5 TESTBED RESULTS

5.1 SUMMARY OF FINDINGS:

This section contains SPAWAR findings regarding our S-100 testbed efforts. When applicable, other working group member's assessments specific to our initiatives will also be included under the subsection "User's Assessment and Experience".

5.1.1 Presentation of data

5.1.1.1 S-100WG2 Action Item 41

1. S-101 Feature Catalogue Edition 0.9.0 does not validate against the S-100 schema due to use of mixed case for valueType – e.g. FC uses "Text" while S-100 FC schema requires "text".

2. The S-100 Viewer was used to verify a modified S-101 Lua portrayal catalogue.

Display Plane	Lua Portrayal		XSLT Portrayal
	RADAR_OVERLAY On	RADAR_OVERLAY Off	
overRadar	Used	Not Used	Used
underRadar	Used	Used	Used

As shown in the table above, the Lua portrayal did not place features in the overRadar display plane when the RADAR_OVERLAY context parameter was set to off. This verifies that the modified S-101 Lua portrayal rules conform to the S-100 sorting requirements; draw instructions should always be sorted by display plane, then by display priority.

The S-101 XSLT portrayal catalogue has not been modified, and currently does not conform to the S-100 sorting rules. Additionally, the XSLT portrayal catalogue does not contain the RADAR_OVERLAY context parameter.

5.1.1.2 GML S-122 (Document NIPWG4-11.1)

1. GML sample data member (gml:id="US.912345B") modified original element

```
<dataAssessment>Unassessed</dataAssessment> to  
<dataAssessment>unassessed</dataAssessment>
```

In order to match feature catalog definition of case.

2. There are ongoing schema problems. Feature catalog changes were made to support backward compatibility with our existing Viewer work. The S-122 provided feature catalog supporting file (S100FD.XSD) has the following note:

2016-07-21: Added value types beginning with upper case to S100_CD_AttributeValueType (temporary fix(?) to bypass case discrepancy between types in the register model and application schema.

Raphael Malyankar indicates the S-100 specification uses lower case literals ("text"). However, the concept entries in the GI registry were made with the first letter in uppercase ("Text"). So feature catalogues created by drawing on the GI registry use the wrong case. Furthermore, he states that the registry database should be updated to conform to S-100 version 3.0.0.

This item was also brought to the S-100 WG attention during TSM4 in Rostock. The referenced paper is here:

http://www.iho.int/mtg_docs/com_wg/S-100WG/TSG4/TSM4_6.1%20AttributeValueTypeUppercase_vs_Lowercase.pdf

3. Information Associations problems (June 5 Raphael Malyankar/SPAWAR email exchange)

Information associations cannot have bindings from information types to feature types.

However, Raphael states:

...This is something we might need to convert to generic invInformationAssociation, which are defined in the GML profile, or escalate to S-100. Reverse links are useful for XSL transform processing and object-based application logic."

4. S-122 Feature Catalog S122FC_20170504.xml <S100FC:S100_FC_InformationType isAbstract="true">

The associated element is incorrectly coded as <S100FC:code>FeatureType</S100FC:code>. This should be coded as: <S100FC:code>InformationType</S100FC:code>

5. GML data architecture may follow the structure as outlined below by Raphael Malyankar, but currently this information is not provided within S-100. If carried forward, the information should be provided within the GML Encoding section (S-100 Part 10b):

GML datasets it can be determined by looking at the path relative to the root of the document. For example:

- *If it is /ROOTELEMENT/member/X1/X2 then X1 is a feature and X2 is an attribute or association role.*
- *If X2 has XML attributes xlink:href and xlink:role and/or xlink:arcrole it is an association role.*
- *If X2 has element content it is a complex or spatial attribute*
- *A spatial attribute will have one of the allowed spatial properties as its content.*
- *If X2 is empty and nilled, or has text or numeric content, it is a simple attribute.*
- *Etc. - for example, if X2 has XML attribute xlink:href but neither of xlink:role/arcrole it's a reference to a spatial object (I'd need to check details for this one, but the principle is the same).*

6. S-122 GML encoding errors that need correction:

<reptForTrafficServ xlink:href="#USSHPREP2".... Should this be: <reptForTrafficService xlink:href="#USSHPREP2" in all cases throughout the dataset file?

There appears to be at least one missing role definition in the feature catalog (filename: USNPI122EX_00001.gml, as modified by us).

```
<S100FC:S100_FC_Role>
<S100FC:name>Service control</S100FC:name>
<S100FC:definition>The controlling authority for a traffic control
service</S100FC:definition>
<S100FC:code>theTrafficControlService</S100FC:code>
</S100FC:S100_FC_Role>
```

7. S-122 Miscellaneous dataset encoding errors (Dataset file USNPI122EX_00001.gml) that require further investigation:

```
_GetAssociatedInformation association lookup failure. MarineProtectedArea id USSEAARE11 info name: responsibleAuthority
_GetAssociatedInformation association lookup failure. MarineProtectedArea id USSEAARE11 info name: responsibleAuthority
_GetAssociatedInformation association lookup failure. MarineProtectedArea id USSEAARE12 info name: responsibleAuthority
_GetAssociatedInformation association lookup failure. MarineProtectedArea id USSEAARE12 info name: responsibleAuthority
_GetAssociatedInformation association lookup failure. MarineProtectedArea id USMPAARE6 info name: responsibleAuthority
_CreateInformation: information type error: Feature id= USMRNSRV1 Information Name: PermissionType error msg: Sequence
contains no matching element
_CreateInformation: information type error: Feature id= USMRNSRV1 Information Name: PermissionType error msg: Sequence
contains no matching element
_GetAssociatedInformation association lookup failure. TrafficControlService id USMRNSRV1 info name: reptForTrafficService
_CreateInformation: information type error: Feature id= USMRNSRV2 Information Name: PermissionType error msg: Sequence
contains no matching element
```

_CreateInformation: information type error: Feature id= USMRNSRV2 Information Name: PermissionType error msg: Sequence contains no matching element

_GetAssociatedInformation association lookup failure. TrafficControlService id USMRNSRV2 info name: reptForTrafficService RestrictedAreaNavigational id= USRESARE1 Invalid geometry encountered, points must form a closed linestring

Attribute enum failed lookup: RestrictedAreaNavigational, id= USRESARE1 value= 14

8. *S100_FC_ListedValue:label* and *S100_FC_ListedValue:code* both uniquely identify a listed value for a corresponding feature attribute. There is no rule or direction for which should be used within a dataset to specify a listed value. The S-123 prototype dataset uses *S100_FC_ListedValue:label* to identify the listed value, while converted S-101 datasets use *S100_FC_ListedValue:code*.

Ideally, a *S100_FC_ListedValue* would always be identified consistently in order to support generic processing of datasets from any product type. At a minimum, we recommend each of the encodings specified in S-100 Part 10 note how *S100_FC_ListedValue* is to be identified.

9. The S-123 and S-101 feature catalogues use opposing definitions for *S100_FC_Role:code* *componentOf* and *consistsOf*.

The S-123 feature catalogue defines *componentOf* as "A pointer to the aggregate in a whole-part relationship", whereas the S-101 feature catalogue uses this definition for *consistsOf*.

The S-123 feature catalogue defines *consistsOf* as "A pointer to a part in a whole-part relationship", whereas the S-101 feature catalogue uses this definition for *componentOf*.

While both catalogues are valid, having opposing *definitions* for a given *code* is confusing at best. We believe that S-123 provides the "correct" *definition*; the S-101 feature catalogue should be updated to match.

Alternatively, both catalogues could be updated so that the code for each role does not reflect its purpose; e.g. *A* and *B* instead of *consistsOf* and *componentOf*. The *definition* specifies the purpose.

10. Below is the experimental portrayal of the feature “Marine Protected Area” encoded in the S-122 prototype dataset. The portrayal symbology is notional and intended only to support testing.

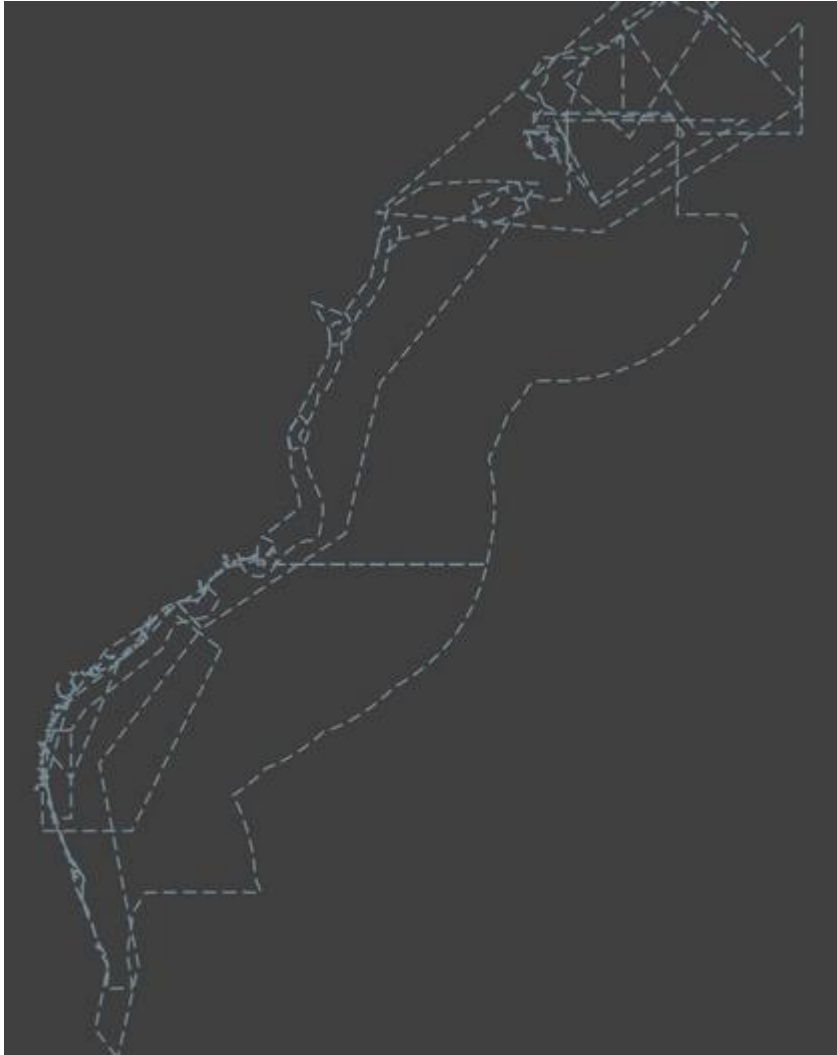


Figure 1. S-122 Marine Protected Area Feature from S-122 prototype dataset

5.1.1.3 HDF-5

No updates for this reporting period.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS:

Additional refinement to GML encoding is needed. It is still unclear if a generic GML encoding processor at the S-100 level will be supportable for the SPAWAR S100Viewer.

6.2 RECOMMENDATIONS:

1. Modify the S-101 XSLT portrayal catalogue to conform with S-100 Part 9 drawing instruction sorting rules via the addition of a RADAR_OVERLAY context parameter and modification of the portrayal rules.
2. Address all issues presented in section 5 specific to product operational use.
3. Specific to GML, additional product experimentation with different GML based products is needed before a final recommendation about the suitability of a GML generic encoding processor can be made.
4. Future releases of GML data prototypes should include a portrayal catalog to facilitate complete evaluation of the product.
5. The need for GML product validation tools is apparent based on experience to date.

7 PUBLICATIONS

N/A

8 REFERENCE MATERIAL

S-100 Edition 3.0.0 Final

S-101 ENC Product Specification Baseline 0.0.2

SPAWAR S-100 Viewer v1.3.0.0

S-101 XSLT Portrayal Catalogue v0.9.1

S-101 Lua Portrayal Catalogue v0.9.1

S-101 Feature Catalogue v0.8.9 (2015-06-29)

S-122 Feature Catalogue (S122FC_20170504.xml), version 1.0.0-20170504 (MODIFIED)

S-122 Sample Data (USNPI122EX_00001.gml) (MODIFIED)

S-122 Portrayal Catalogue (Custom, derived from S-101 XSLT Portrayal Catalogue)

S-123 Feature Catalogue v1.0.0-20170430 (S123FC_20170430.xml)