

Paper for Consideration by DIPWG & TSMAD

Updated Look-up Tables to be Used to Build the S-101 Portrayal Catalogue

Submitted by:	DIPWG Chair & US Navy (SPAWAR)
Executive Summary:	Information is provided about the updated look-up tables that will support development of the S-101 portrayal catalogue. This paper updates progress that was reported first reported in TSMAD27-4.4.6.
Related Documents:	S-52 S-101 TSMAD26/DIPWG5-9.1B TSMAD26 Action 6 TSMAD27-4.4.6
Related Projects:	S-100 Portrayal Catalogue Builder

Introduction / Background

The portrayal rules in the look-up tables in S-52 will be the primary basis for creating portrayal rules for S-101. A majority of the features and attributes implemented in the old ENC specification (S-57) were carried forward into the new (S-101) ENC specification. However there are also many new or modified features, attributes and enumeration combinations that are implemented in S-101 for which no corresponding look-up table portrayal rule exists in S-52.

At TSMAD26/DIPWG5 it was determined that the Data Classification and Encoding Guide (DCEG) was stable enough to be used as a baseline to develop S-101 portrayal rules for new or modified features, attributes and enumeration combinations that have been developed for S-101. TSMAD26 action #6 called for the creation of a DIPWG S-101 portrayal rules sub-working group, "to develop revised rules for changes to the lookup tables that have occurred as a result of changes in the S-101 DCEG." The U.S. Navy's Space and Naval Warfare Systems Center Atlantic (SPAWAR), which develops, delivers and sustains communications and information capabilities, including Navigation, for the U.S. Navy took the lead in developing the new rules. Their initial draft of the new rules was presented at TSMAD27. This paper and the accompanying look-up tables is the second iteration of this effort.

Even though look-up tables will not be used in S-101, it was decided that the existing format for look-up tables used in S-52 would be a convenient and familiar way to organize all of the portrayal information needed for the new or modified features, attributes and enumeration combinations being developed for S-101. These new look-up tables, along with the existing look-up tables in S-52 will be used as input to the S-100 Portrayal Catalogue Builder tool that is being developed by Caris under an IHO contract, which will produce to first S-101 Portrayal Catalogue. This catalogue will provide the first test of "machine readable" portrayal rules for an S-100 based product.

Analysis/Discussion

The methodology used to develop the new look-up tables is described below.

New Feature Types – AISaidToNavigation example

S-52 does not have an existing symbol defined for AISaidToNavigation, so SPAWAR looked to what existed in INT1 and used the INT 1 symbol name (e.g. INT117.1 refers to the AIS transmitter symbol). In cases where there are multiple symbols defined for a single INT 1 symbol name, they indicate the symbol by appending its position in the list (e.g. INT1Q9-3 refers to an east cardinal mark). So in order to symbolize a physical AIS aid to navigation of type north cardinal, the symbology instruction would be: SY(INT1S17.1);SY(INT1Q9-1).

For the viewing group, they picked the next unused number (mod 10) based on the INT 1 section of the symbol. So for AISaidToNavigation, they selected the viewing group table section "P, Q, R, S BUOYS & BEACONS, LIGHTS, FOG SIGNALS, RADAR" and added ten to the last entry to get 27240.

For the display priority, over-radar, and display category, they looked for items in the same viewing group section for items with similar navigational purposes and chose the value from there. In this case, buoys and beacons had the closest match so they chose display priority of 8, display over-radar, and standard display category.

Since all combinations of AISAidToNavigationType and CategoryOfAISAidToNavigation are valid, there would need to be 36 lookup table entries. Since this this would quickly get out of hand, they adopted the “sub lookup table” technique proposed by Thomas Richardson (UKHO). See the “AIS Aid To Navigation Lookup Tables.doc” file for an example of this.

The sub lookup table syntax has been expanded to allow the lookup of combinations for multi-value attributes. See “Restriction Sub Lookup Tables.doc” for an example.

Modification of Existing Feature Types

For modifications of existing feature types, what is actually needed for the LUT needed to be determined. For instance, S-101 adds the daymark shape attribute to the BCNCAR feature. This allows for symbolization without needing the TOPMARnn CSP. Similarly to the AISAidToNavigation above beacons are encoded using the sub lookup tables as above. Each sub lookup table corresponds to the floating/fixed branch described in the TOPMARnn CSP.

Text Output Changes

In most cases, the formatted text output command (TE) could be replace with the TX command to draw the featureName.displayName directly.

Unknown and Unconverted Entries

Some LUT entries were not converted, these are listed in “Unconverted LUTs.txt” document. These fall under the following categories:

- Non-finalized symbolization such as lights.
- Features relying on CSPs that can change the display category, display priority, over-radar or viewing group based on the mariner defined safety depth. The UDWHAZ04 CSP which is called by OBSTRN and WRECKS CSPs is an example. The DEPARE CSP is another example.
- Features relying on CSPs that use attributes of the spatial components themselves as opposed attributes of the feature itself. SLCONS is an example.
- The Restricted Area feature type CSP has a fairly complex mix of multi-value attributes that’s more complicated than the Restrictions Sub Lookup Tables described above. Mainly due to the fact that more than one attribute is involved in the lookup.
- Other. See details in table below.

For some LUT entries, specific elements such as display category, priority, etc. could not be determined. In these cases, question marks (?) are put in place of the actual values.

Feature Type	Reason for not Coverting
New Object	No guidance on methodology for encoding symbolization instructions.
Hulk	Not sure what display category it belongs to.
Depth Area Dredged Area Obstruction Underwater Awash Rock Wreck	CSP Depends on safety depth.

Coastline Depth Contour Shoreline Construction	Uses spatial component attributes.
Light Soundings	Symbolization not finalized.
Restricted Area	Complicated multi-attribute multi-value interactions.
Tunnel	Required attribute BURDEP removed.

Current Draft Status

So far SPAWAR has completed draft LUT for the following features that are new or have had changes:

Status* (U)nchanged (N)ew (M)odified	Lookup Tables	Comment
U	AIS Aids to Navigation	Note: The two LT commands should be interpreted as the Cartesian product of the associated attributes and as such will cover all 36 attribute combinations.
N	Anchorage Area	
U	Beacon	
N	Bridge Aggregation	
N	Building	
U	Buoy	
U	Buoy Emergency Wreck Marking	
N	Cable Area	
U	Collision Regulations	
U	Conveyor	Note: Assuming CONRAD attribute type in S-101 Data Classification and Encoding Guide is supposed to be BO, not C.
N	Current Non Gravitational	
N	Deep Water Route Part	
U	Depth No Bottom Found	Note: It is assumed a depth command will be created to display depths. DD(<i>hjust</i> , <i>vjust</i>) – Displays the Z value for the given feature's spatial component. <ul style="list-style-type: none"> • <i>hjust</i>, <i>vjust</i> – Specifies the justification relative to the point. Uses same values as TX command.
U	Discoloured Water	Note: The area symbology procedures assume the areas are colored by the DEPARE symbology.
N	Dumping Ground	
N	Dyke	
N	Fairway	
U	Ferry Route	
N	Incineration Area	
N	Inshore Traffic Zone	
U	Floating Dock	Note: The FloatingDock (FLODOC) type exists in S-57 as a line and area spatial type. S-101 adds a point representation. Note: The S-52 LUTs specify over radar for lines and suppressed by radar for areas. I chose over radar here.
U	Foul Ground	Note: Unsure how to symbolize curves since the S-52 version requires conditional symbology
U	Gate	Note: Symbolized using navigable lock gate symbol.
M	Landmark	
N	Marine Farm Culture	

N	Military Practice Area	
N	Miscellaneous	
N	Navigational System of Marks	
M	Obstruction	
N	Offshore Production Area	
U	Offshore Wind Turbine	
N	Overhead Cable	
U	Pile	Note: The PILPNT02 complex linestyles and area fill commands are high density repetitions of the PILPNT02 symbol.
U	Pontoon	Note: Not sure at what orientation a point pontoon should be drawn.
N	Precautionary Area	
U	Production Area	Note: The two LT commands should be interpreted as the Cartesian product of the associated attributes and as such will cover all 36 attribute combinations.
N	Recommended Traffic Lane Part	
N	Seabed Area	
N	Seaplane Landing Area	
M	Slope Topline	Note: Unsure if a complex linestyle is wanted or different line colors.
N	Sloping Ground	
N	Submarine Pipeline Area	
N	Submarine Transit Lane	
U	Text	Note: All of the entries that were changed exclusively to use the displayName attribute are all collected here.
U	Text Placement	Note: It is assumed that text placement will defer to a custom procedure. That custom procedure will be responsible for setting the text viewing group, display priority, display category and over radar settings. Note: The TextPlacement feature type described in the S-101 Data Classification and Encoding Guide will need some way to specify a text viewing group. This could be an attribute on the TextPlacement feature or possibly an information association.
N	Territorial Sea Area	
N	Traffic Separation Scheme Crossing	
N	Traffic Separation Scheme Lane Part	
N	Traffic Separation Scheme Roundabout	
N	Two-Way Route Part	
	Other Informative Tables	
M	Lookup Tables/How the lookup tables were generated	
M	Unconverted LUTs	

* Status since TSMAD-27 (Monaco, Dec 2013)

Recommendations

Move forward with the final refinement of the new look-up tables presented at TSMA28/DIPWG6.

Action Required of TSMAD/DIPWG

TSMAD and DIPWG are invited to:

- a. reconstitute a small DIPWG S-101 portrayal rules sub-working group to assist SPAWAR in specifying any portrayal elements (display category, priority, etc.) that could not be determined.

- b. endorse the use of the new S-101 portrayal rule look-up tables for the creation of the first S-101 Portrayal Catalogue that will subsequently be used as part of the S-100/S-101 testbed.
- c. Finalize the portrayal rules for lights and soundings.
- d. Determine a method for creating portrayal rule look-up tables that depend on mariner selected depth values.
- e. Determine a method for creating portrayal rule look-up tables that depend on spatial component attributes.
- f. Determine a method for creating portrayal rule look-up tables that can result in a change to the default display category, viewing group, display priority or over-radar settings for features.
- g. Determine a method for expressing more complex attribute value relationships in the lookup tables. This might involve creating a syntax that allows for Boolean expressions, inequalities or ranges. This could be helpful for mariner selected depth values listed above.