

Complex Portrayals and Pick Reports

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Executive Summary:	Considerations and solutions for complex information display and entry.
Related Documents:	--
Related Projects:	All S-100-based Product Specifications

Introduction / Background

This paper continues and updates previous work on concepts for user interfaces related to associations and complex portrayal which was described at the March 2023 NIPWG VTC.

A presentation (06.0A) at the March 2023 NIPWG VTC, S-98 Edition 1.0, and various Product Specifications, including but not limited to NIPWG-produced specifications, describe presentations of “pick report-type information” that are more structured and complex than the simple object-attribute tree or list layout frequently used in current GIS and ECDIS. Since this type of complex presentation is not based on graphical symbols it cannot be implemented by the current portrayal functionality in S-100, which is focused mainly on graphic symbology using a subset of SVG (Scalable Vector Graphics) format¹ with accompanying text string labels.

This paper outlines potential solutions and paths to addressing the problem of complex presentations in S-100.

References

NIPWG 2023 VTC01 06.0A Concepts for Associations URL: <https://iho.int/en/nipwg-vtc-2023> (VTC01 06.0A). See also “Additional Information” (NIPWG-VTC03-(2022)-09.1A Rev1) and Recommendations for Product Specifications, DCEGs, and S-100 Clauses, linked at the same URL.

S-131 Ed. 1.0.0, Marine Harbour Infrastructure. April 2023.

S-98 Ed. 1.0.0, Annex C: Harmonised User Experience for ECDIS and INS. May 2022.

Nature of problem

Current S-100 portrayal is based largely on portrayal of features using symbols labeled with text strings. “Formatted” text is largely supposed to be in support files which are expected to be displayed according to the formatting in the support file. While this worked for nearly all of S-57’s object-attribute features (or feature collections), S-100 introduced complex attributes, information types, and feature and information associations. These additions have resulted in more complex model structure and relationships than S-57’s collections, and naïve portrayals of such complex structure produce results that are difficult for mariners to understand. Product specifications (especially S-131 Ed. 1.0.0) and S-98 therefore describe structured layouts for text derived from some information types and features, including layouts for combinations of information types/features linked by information/feature associations. Figure 1 depicts an example from S-131. Other products, not limited to NPUB Product Specifications, also require structured portrayal or pick reports, which are not necessarily tabular in form.

A VTC with OEMs was held on July 6. The main outcomes of this meeting were:

- A comprehensive solution to implementation of such complex structured layouts is beyond the scope of portrayal as specified in S-100 Edition 5.0.0 or 5.1.0 and an extension to S-100 portrayal would be required to enable a structured pick report of the kind shown in Figure 1 (from S-131). S-131 also provides for a purely text-based display (Figure 2).
- Encoded information should be in machine-processable form in preference to narrative text, in order to facilitate data queries and more intelligent application software.

¹ S-100 portrayal uses a subset of “SVG Tiny 1.2” which is itself a subset of SVG (see S-100 5.0.0 Part 9 Appendix 9-B).

Table 11.2 - General layout of schedules display

Operations	Days	Times	Notes
(Table sub-header, from <i>featureName</i> if present - omit this row if <i>featureName</i> is not present) Links to other unusual attributes like source and graphic can be included here.			
Normal, Closed, Unmanned OR other: abcde ³ Attribute <i>categoryOfSchedule</i> From <i>ServiceHours</i> Date ranges <i>fixedDataRange</i> , <i>periodicDateRange</i>	(Day(s) of week) DoW (single day) OR DoW - DoW (if <i>dayOfWeeksRange</i> = true) OR DoW, DoW (if <i>dayOfWeeksRange</i> = false)	(Times of day) hh:mm-hh:mm hh:mm-hh:mm ... <i>timeOfDayStart</i> , <i>timeOfDayEnd</i>	(Additional information) <i>complex attribute information</i>
<i>(repeat according to multiplicity of scheduleByDayOfWeek)</i>			
Exceptions <i>NonStandardWorkingDay</i> Day associated to the above <i>ServiceHours</i>	(fixed and variable date(s) from <i>dateFixed</i> or <i>dateVariable</i>)		(Additional information) <i>complex attribute information</i>
<i>(repeat both rows above, according to multiplicity of ServiceHours associated to the feature or information type)</i>			

Figure 1. Information layout of schedule data from the information types *ServiceHours* and *NonStandardWorkingDay*. From S-131 Ed. 1.0.0.

Since S-100 Edition 5.0.0 portrayal does not provide for specifying templates for text formatting, the implementation of **tabular** forms must be left to implementers for this edition. As a provisional alternative, information may be displayed in text form, with rows of Table 11.2 converted to phrases:

Normal operation: (date range) DoW-DoW, hh:mm-hh:mm, (additional information/link)
 Exceptions: (fixed/variable dates), (additional information/link)

Figure 2. Extract from S-131 Ed. 1.0.0 describing simplified alternative for schedules.

More complex depictions requiring more complex tabulations or data plots are required sometimes, as shown in Figures 3 and 4:

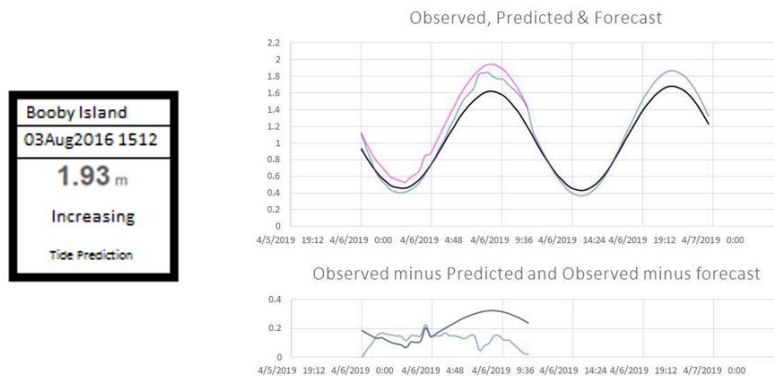


Figure 2. Examples of special formats from S-104: Water level at a station (L) and graphic showing time series of water level data (R). From S-98 Annex C.

When ALL conditions satisfied	<i>Vessel type: other: all types including tug and tow</i>		
	<i>Dimension</i>	<i>compared to</i>	<i>Limiting value</i>
	length overall	greater than or equal to	50 metre
	length overall	less than	90 metre
	draught	greater than or equal to	6 metre
When ALL conditions satisfied	<i>Vessel type: other: all types including tug and tow</i>		
	<i>Dimension</i>	<i>compared to</i>	<i>Limiting value</i>
	length overall	greater than or equal to	50 metre
	draught	greater than or equal to	4 metre
<i>Miscellaneous conditions: When restricted visibility exists</i>			

Figure 3. Structured pick reports for two instances of the NPUB *Applicability* information type, without and with a miscellaneous condition related to visibility. S-131 says “The information type *Applicability* may be displayed in either text or tabular form.”

Solution Approaches

Support files instead of data-driven pick report or portrayal

The simplest solution is to encode the structured information in an HTML support file which has been previously created by the cartographer. This approach:-

- Cannot handle dynamic information.
- Will find it difficult to handle data products with short production cycles or streamed data, because of the extra time and/or custom programming needed to prepare the support file(s).
- Cannot be used for programmed queries (is not “machine readable”), at least not without defining a complex format and query API which would complicate matters significantly for both implementers and encoders (and require an extension to S-100).
- Relegates core information such as vessel types and dimensions for *Applicability* to a support file; since the concept for support files is “additional information”, retraining will be required so that mariners know when to look for significant information in support files instead of a pick report or on-screen. This will result in confusion about the roles and significance of support files – something to be avoided if at all possible.
- Requires an extension to S-100 portrayal as currently specified in order to replace pick-report display with support-file-based display for designated features.

Generation by portrayal rule

Another approach is to write portrayal rules (in the language used by the portrayal catalogue, which S-100 specifies as either XSLT or Lua) capable of generating the entire portrayal or pick report dynamically, that is, creating the display content for the specific features and information type instances, including all of the tabular, structured text, and or graphical components (data plots as well as pictures). Presumably this would produce a result in a well-known format or combination of formats, such as HTML for layout and text and SVG for graphical components. This approach:-

- Requires significantly complex programming logic to implement.
- Needs custom implementation for each such situation (combination of features/information types, i.e., one rule for schedules, another rule for *Applicability*, etc.).
- Requires an extension to S-100 portrayal to allow the generated file to take the place of the on-screen or pick-report display.
- Would be easier with XSLT rules than Lua rules (or any procedural language like C++, Java, or C#), but still requires that the subject features and information types be converted to a suitable input format. For GML formats, this would be easier if the original GML for feature/information type instances can be retrieved by a simple query, but this in turn would require implementations to include such a retrieval interface (or a conversion API, for non-GML formats).

Templates

A third approach is to define templates describing the display structure, which are populated by portrayal rules when the feature/information type group is selected for a pick report or portrayal. This approach:-

- Also requires more programming logic to implement, though simpler than generating the entire pick report for the feature/information group as in the previous approach.
- Requires a custom template for each situation, i.e., one template for schedules, another for Applicability, etc.
- Requires an extension to S-100 portrayal to define the template language, provide for including template files in portrayal catalogues, and define the processing model for instantiating templates and displaying instantiated templates.
- Should be more compatible with Lua rules (or any other procedural language like C++, Java, or C#) than the previous approach.
- Should also be compatible with an XSLT based approach that is also convenient for programmers.

The templates would be defined as a part of the Portrayal Catalogue for the Product Specification and prepared during work on the portrayal catalogue.

Common points

Points of note about the approaches described above:

- All the approaches described do away with portrayal or pick reports that are purely object-based, i.e., display individual instances as separate display units (tables, list or individual attributes, tree sections, etc.) that are distinguished from display units for other instances, in favor of integrated portrayals/pick reports (that combine different elements of the data into ways that make sense to the mariner. This is already common practice for symbology – the concept should be extended to pick reports as well. Such an integrated display approach makes displays of text or string information easier for mariners to comprehend, since layout characteristics such as spacing, alignment, font, colors, background, etc., can be used to provide visual cues.
- All the approaches require some kind of extension to S-100 portrayal as defined in S-100 5.0.0/5.1.0.

Recommendations

1. In the longer term, meaning a future edition of S-100 (Edition 6.0?) a revision/extension to portrayal will be needed.
2. The “templates” approach appears to be the most promising and work should focus on this approach.
3. As an interim solution, Product Specifications should be encouraged to describe simplified text portrayals similar to Figure 2 in this paper and clause 11.5 in S-131 Edition 1.0.0 (which describes a simplified structured narrative form for the Applicability information type).

Actions Requested

The Nautical Information Processing WG is invited to:

- Discuss the approaches described in this paper especially as they might affect cartographer and editor work on data product preparation.
- Endorse an S-100 task to define structured portrayals and pick reports in the next edition of S-100.