Revision 2 8 July 2024

S-102 Multiple Vertical Datums Meeting Notes

27 June 2024 1300-1500 CEST (UTC +2) Google Meet

Purpose

The objective of this meeting was to reach consensus on what method or methods for portraying multiple vertical datums (VDs) within a single product were to be allowed in S-102 Ed. 3.0.0. While much robust discussion on the topic had already taken place, the deadline for publishing our first operational edition (3.0.0) was fast approaching. Therefore, we organized this meeting to:

- Hear the BSH proposal raised previously and debated at the last meeting.
- Hear concerns from implementers and other interested stakeholders.
- Reach consensus on what will be allowed in Ed. 3.0.0.

Attendees

S-102PT Leadership

- Lawrence Haselmaier (Chair)
- Lynn Patterson (Vice-chair, CHS)

Special Guests

- Julia Powell (S-100WG Chair)
- Jonathan Pritchard (S-164/S-98 Sub-Group Chair)
- Elizabeth Hahessy (S-100WG Vice-chair)
- Christopher Jones (TWCWG Chair)
- Yong Baek (IHO Secretariat)

Member State Representatives

- Per-Olof Seiron (SMA)
- Laure Avisse (SHOM)
- Topi Filppula (TRAFICOM)
- Daniel Rohde (BSH)
- Mathias Palm (BSH)
- Izzy Kim (BSH)
- Anthony Klemm (NOAA)
- Mikan Stamenkovich (NIWC)
- Dave Grant (NIWC)
- Giuseppe Masetti (GST)
- Stacy Johnson (NAVOCEANO)

Expert Contributors

- Olaf Wentzel (Teledyne)
- Hugh Astle (Teledyne)
- Friedhelm Moggert-Kägeler (Teledyne)
- Hendrick Göhmann (Teledyne)
- Svein Skjæveland (PRIMAR)

- Meredith Payne (Esri)
- Raphael Malyankar (Portolan Sciences)

Other S-104 Guests

- Kurtis Redding (NAVOCEANO)
- Greg Seroka (NOAA)

Summary

1. BSH opened the meeting by presenting their proposal.
2. Raphael's presentation included the following points:

- Externally identified meta features could be a way to encode datum polygons.
    - But the timeline is essentially too short to include these at present.
- Near-term approach:
    - Encoding of multiple VDs may be done using multiple datasets, using fill values to ensure no overlap of data values. This solution is the simplest one for many providers and will be maintained as an option.
    - Encoding of grids with multiple VDs within a single dataset may be done using one feature instance per VD.
        - For each instance, producer populates only the real data for that datum
        - All else receives fill values
    - All instances use the same regular grid geometry.
    - Where an instance's VD differs from that of the root group, it encodes its VD as HDF5 attribute overriding the value in the root group according to S-100.
    - WLA reads each value from one grid cell from all instances; retains the most conservative value as regards safety of navigation.
        - In practice, most nodes will provide either 0 or 1 actual data records because data will only overlap along datum boundaries
    - Domain extent polygons (DEPs) (or other geometry) may be provided but will not be used to access data values.
    - DEPs are not to be portrayed directly.
        - Instead, we should define portrayal rules for S-102 to emphasize datum jumps to the mariner.
    - A Display indication on ECDIS about multiple datums being displayed on the screen.
    - The problem of DEP polygons with holes could be solved by splitting into simple polygons.
        - It was discussed that there are no known practical examples of enclaved VD domains (where they might exist in a single S-102 product).

3. It was discussed generally that the guidelines suggested by Raphael and the BSH proposal were logically compatible.
4. Jonathan agreed with the feasibility of the solution, emphasizing that his prior concerns about complexity were largely allayed by the assertion that ECDIS has no action as regards DEPs in the current edition of S-98 Annex C.
5. There was some discussion regarding (somewhat unrelated) the issues arising when a (geographic) bounding box circumscribes a UTM-projected dataset.
    a. It was confirmed that several producers are already producing UTM products, and UTM production is likely to remain a requirement (for example far north)

   b. Jonathan mentioned that it may be beneficial to limit the projected coordinate reference systems (CRSs) allowed to UTM only.
   c. It was confirmed that UTM and UPS CRSs are the only projected CRSs allowed. Issue 110 was created in GitHub to examine whether UPS CRSs should be removed in a future edition.
6. The Project Team (PT) agreed generally on the following reasoning:
   a. If producers wish to demarcate the exact extents of VDs using DEPs, they can. DEPs in that case will be used to validate any overlaps between data in different feature instance groups and between S-101 and S-102/S-104. In particular, it will be critical to validate boundaries shared by two DEPs (i.e., where an area of real data meets another area of real data). The previous statement is meant to make distinct the case where a DEP abuts a no-data area (e.g., land), which will have a much less stringent requirement for validating precision.
   b. S-100 ECDIS will not be charged to take any action (in portrayal or otherwise).
      i. If this element proves in testing to be a problem, S-98 Annex C may require further revision.
   c. Data producers can mitigate problems by performing due validation and by increasing cell resolution if necessary.
   d. Because of the (limited) overlap allowed at the VD boundary, S-98 Annex C requires revision. Where data overlaps exist in datasets with multiple VDs, S-98 Annex C will resolve by taking the most conservative values. Overlaps will only exist where DEPs split grid cells.
   e. Though this approach adds some complexity, it is believed the PT's choices can significantly keep the complexity growth from reaching the end user.
   f. Furthermore, this approach will allow consistent implementation between S-104 and S-102.
7. The PT adopted the following courses of action:
   a. The BSH proposal is accepted into Ed. 3.0.0. Daniel has action [now completed] to merge his pull request (PR) into the Developing PR.
   b. Upon completion of the merge and associated edits, Lawrence will identify a review period for Ed. 3.0.0 (at the PT level).
   c. After PT review, Lawrence will send the specification to the S-100 WG for review, forwarding, and approval if appropriate.
   d. S-104 Edition 2 will use a structurally similar approach, encoding grids with multiple VDs by using multiple feature instances in the same HDF5 dataset.
   e. S-102 and S-104 will work with the S-98 Annex C group to ensure sufficient clear guidance is contained in S-98 Annex C in respect of multiple datasets (resolving definition of "overlaps") and multiple VDs/DEPs.

Respectfully submitted,

7/8/2024

X Lawrence H. Haselmaier Jr.

Lawrence Haynes Haselmaier, Jr.
IHO S-102 PT Chair
Signed by: hasel