

Paper for Consideration by S-102PT

Grid cell representation as cell area

Submitted by:	Sweden and Finland
Executive Summary:	This is a continuation on Change Proposal presented at S102PT13 (Agenda item 1.2, GitHub issue #29). The paper gives suggestions on how to move the specification from being Node- to Cell area- based. It provides a possible encoding solution and tries to identify what sections in the PS are impacted. Note! Any impact on PC is not included in this paper. There is a sub-group within S-102PT working on this issue currently.
Related Documents:	GitHub issue #29, S-100 part 8-6.2.8 Grid cell structures, S-98 Annex C section C-4-1.2
Related Projects:	None

Introduction / Background

The ongoing GitHub issue (#29) identifies two main questions within the product specification (PS) that needs addressing:

1. The grid cell representation as center node versus cell area.
2. The bounding box versus the data coverage discrepancy and the absence of a definition for how to handle NoData/FillValue.

During S-102PT13 the [Change Proposal](#) was discussed and it was concluded that further discussion/analysis is needed. SMA was tasked to lead this continued work with the intent to show the findings during S-102PT14.

The paper gives an encoding proposal for handling cell areas. All project team members are highly encouraged to contribute and give feedback in GitHub issue #29 once published.

Node-based to Cell area-based product

To change the product specification from being Node- to Cell area- based is possible based on functionality/metadata/attributes currently available in S-102 PS and S-100 ed. 5.0.0. Our suggestion (in dialog with S-100) is changing the encoding in section 10.2.4.Root BathymetryCoverage more specifically the attributes of the BathymetryCoverage feature container group. In detail:

- dataOffsetCode=5 (barycenter)
- interpolationType=nearestNeighbor
- and the case for points on cell boundaries is addressed by commonPointRule=2 (low), for those who use shoalest depth value. *Enumerations: 1: (average) return the mean of the attribute values, 2: (low) use the least of the attribute values 3: (high) use the greatest of the attribute values, 4: (all) return all the attribute values that can be determined for the position.*

Today the dataOffsetCode is not present in S-102 PS, but is in S-100 Part 10C and can easily be added. S-100 also suggests creating a new interpolationType value:

“uniform = Assign the same value as the data point for the cell in which the point is located. Values on cell boundaries determined by commonPointRule.”

The new interpolation type would mean simpler logic for computations, since it would only be necessary to compute the cell to which a point belongs. To create this a S-100 maintenance proposal has to be drafted and submitted and it cannot be added until edition 5.2/6.0 at the earliest. For now, it is recommended that the PS uses what is readily available today i.e. nearestNeighbor. The PT should decide on this at the next PT meeting.

For further clarification regarding cell handling for end users etc. the ISO 19115 discovery metadata attribute MD_cellGeometryCode code could be introduced into the CATALOG.XML. In detail:

Name:	Domain code	Definition
MD_cellGeometryCode	CellGeoCd	Code indicating whether grid data is point or area
Point	001	each cell represents a point
Area	002	each cell represents an area

This metadata attribute is not present in S-100 e.5.0.0. and would require a S-100 maintenance proposal has to be drafted and submitted for S-100 edition 5.2/6.0. Perhaps this action will not be necessary since this information can be described elsewhere in the PS. The PT should decide on this at the next PT meeting.

In addition to making the suggested changes above, some texts edits are required/suggested mainly for clarification purposes:

- Add a clarification regarding cell areas under 4. Data Content and Structure
- In 4.4.1 Introduction: Bathymetric Surface datasets are represented as a discrete array of points contained in a regular grid. The general structure for a regular grid is defined in S-100, Part 8. *Add something on cell areas*
- 7.1 Quality and source metadata are encoded in a raster attribute table that is compliant with HDF-5 and S-100 and will provide valuable information about the bathymetry on a node-by-node basis compared to traditional vector-based metadata files, simplifying the interpretation and implementation by navigation software systems. *Change to cell- by- cell basis.*
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