

Title: Gridded data and HDF5 Format - Miscellaneous Updates**S-100 Maintenance - Change Proposal Form (Draft)**

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Change Proposal Type (*Select only one option*)

1. Clarification	2. Correction	3. Extension
		X

Location (*Identify all change proposal locations*)

S-100 Version No.	Part No.	Section No.	Proposal Summary
4.0.0	10c	9.3	Explicitly state which attribute indicates the spatial representation.
	10c	9.7 Tables 10c-11, 10c-12	Clarify that product specifications may restrict which of domainExtent or boundingBox is used in a data product. Add the following sentence to the Remarks cells in corresponding rows in Tables 10c-11 and 10c-12: Product specifications may require use of one or the other of the domainExtent or boundingBox attributes, depending on whether spatial extents of feature instances are definitely known to be rectangular in the coordinate system or definitely known to be of irregular shape.
	10c	9.6 Table 10c-10	Add optional attributes to indicate the location of the sample point within a cell.
	10c	9.7.2	Update Figure 10c-9 to depict dataCodingFormat as an enumeration instead of an integer. New diagram to be developed.
	10c	10.4	New subclause defining literals for dataCodingFormat.
	8	6.2.8 (new)	New clause to clarify cell structure and sample space compared to grid cell.
	8	7	The heading levels and numbering in clause 8-7 make several topics sub-clauses of "8-7 Tiling Scheme" which are not in fact sub-topics of tiling schemes. The following clauses should be renumbered: 8-7.1 Spatial Schema -> 8-8 Spatial Schema 8-7.1.1 S100 Point Set Spatial Model -> 8-8.1 S100 Point Set ... 8-7.1.2 S100 Point Coverage Spatial Model -> 8-8.2 S100 (etc.) 8-7.1.3 S100 TIN Coverage Spatial Model -> 8-8.3 S100 TIN ...

			8-7.14. S100 Grid Coverage Spatial Model -> 8-8.4 S100 Grid ... 8-7.2 Rectified or Georeferencable Grids -> 8-9 or 8-8.4.1 Rectified ... Subsequent clauses should be renumbered accordingly and the whole standard checked for references to renumbered clauses.
	8	8.3 8.4	Clauses 8-8.3 and 8-8.4 relate to topics other than spatial referencing and should not be under clause 8-8 (Data Spatial Referencing) 8-8.3 Imagery and Gridded Data Metadata -> 8-9 Imagery ... 8-8.4 Quality -> 8-8.10 Quality Subsequent clauses should be renumbered accordingly and the standard checked for references to renumbered clauses.

Change Proposal

The change proposal for clause 10c-9.6 and Table 10c-10 extends the HDF5 format with two attributes to indicate the location of the sample point within a grid cell. Bathymetry and potentially other product specifications may need to define grids where the nominal sample data point is located elsewhere than exactly at the grid point at the lower left corner of a cell. The enumeration dataOffsetCode provides an efficient way to indicate whether the sample points are located at corners or centers of grid cells. dataOffsetVector generalizes this to higher-dimensional grids or more complex situations.

The renumbering of clauses in Part 8 in clauses 8-7 and 8-8 rationalizes the arrangement to promote clauses which are actually topics different from the headings under which they are currently placed.

The other changes to Part 10c and the changes to Part 8 add miscellaneous clarifications addressing questions which were discussed by email since Edition 4.0.0 was prepared.

10c-9.3 Generalized dimensions and storage of coordinates and data

[Revise the second paragraph to explicitly mention the attribute which indicates the spatial representation.]

The key idea at the core of the structure is this: the organization of the data is logically the same for each of the various types of data, but the information itself will be interpreted differently depending on the type of spatial representation, (which is indicated by ~~an attribute~~: the metadata attribute dataCodingFormat (defined in Table 10c-10).

10c-9.6 Feature container group

[Add the following attribute to Table 10c-10 in each of the sections for dataCodingFormat = 2 (Regularly-gridded arrays), 3 (Ungeorectified gridded arrays), 5 (Irregular grid), 6 (Variable cell size). Add 10c-9.6.1 to explain the use of the new attributes.]

Name	Camel case	Mult.	Data Type	Remarks and/or units
Offset of data point in cell	dataOffsetCode	0..1	Enumeration	1: XMin, YMin ("Lower left") corner ("Cell origin") 2: XMax, YMax ("Upper right") corner 3: XMax, YMin ("Lower right") corner 4: XMin, YMax ("Upper left") corner 5: Barycenter (centroid) of cell

Offset of data point in cell as vector	dataOffsetVector	0..1	Float	Array (1-D) 0..D-1 where D is the value of the dimension attribute Values must be real numbers in the range [0,1].
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10c-9.6.1 Location of data point within cell

Product specifications may require their data products to indicate the relative location of the data point corresponding to a grid cell in relation to the corners of the cell. The location can be indicated using either the dataOffsetCode or dataOffsetVector attribute. These attributes can be used only with grid-based coverages and not with time series, TIN, or moving platform data. Product specifications may use either dataOffsetCode or dataOffsetVector but not both.

Product specifications in which the data point is located at the (XMin, YMin) grid point need not use either dataOffsetCode or dataOffsetVector.

The attribute dataOffsetCode can be used only with two-dimensional grids. It indicates whether the data point is one of the four cell corners or the centre of the cell. Note that the definitions of the codes indicating the corners are in terms of X and Y grid coordinates relative to the grid origin. (This means that in a grid with its X axis directed from east to west and Y axis from north to south the "lower left" corner is different from the "lower left" corner in a grid with X axis directed west to east and Y axis south to north.)

The attribute dataOffsetVector is intended for use with higher-dimension grids or in cases where the data point location is not at one of the corners or the centre of the cell. The values in this array indicate the relative offset along each axis of the data point from the grid point whose grid coordinates are closest to those of the grid origin. In a two-dimensional grid, this will be the point with smallest X and Y grid coordinates. Again, it should be noted that the direction of the axes and the location of the grid origin determines which corner is the cell origin. Each offset is relative to the dimension of the cell along the corresponding axis. The order of values in dataOffsetVector must correspond to the order of axes in the axisNames array (Table 10c-9).

[New clause formally listing the values of data coding format.]

10c-10.4 Data coding format

Item	Name	Description	Code	Remarks
Enumeration	S100_HDF_DataCodingFormat	Data coding formats for S-100 HDF5 data		
Literal	fixedStations	Data at multiple discrete fixed point locations.	1	
Literal	regularGrid	Data at grid points forming a regular grid with constant cell spacing.	2	Regular grids are commonly composed of perpendicularly crossing lines of equal spacing on each dimension, creating square or rectangular cells.
Literal	ungeorectifiedGrid	Data that does not include any information that can be used to determine a cell's geographic coordinate values, or in which cell spacing is variable, and there is no predefined association between one cell's location and that of another.	3	For example, a digital perspective aerial photograph without georectification information included
Literal	movingPlatform	Data at sequential discrete point locations of a moving sensor platform.	4	

Literal	irregularGrid	Data distributed over a grid with uniform cell spacing but irregular overall shape.	5	The irregularity of shape may consist of non-rectangular coverage area or relatively large regions which are not populated with data.
Literal	variableCellSize	Variable-density grid containing one or more regions with cell spacing that is a whole multiple of a common minimum uniform cell spacing.	6	The shape of the overall grid may be non-rectangular.
Literal	TIN	Triangulated irregular network.	7	A TIN is a representation of a continuous surface consisting entirely of triangular facets. The vertices at the corners of each triangle are shared with the adjacent triangle. These vertices form the control points of the coverage function.

Part 8 Imagery and Gridded Data

8-6.2 Point Sets, Grids, and TINs

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8-6.2.8 Grid cell structure

S-100 utilizes the same view of grid cell structure as Section 8.2.2 of ISO 19123. The grid data in S-100 grid coverages are nominally situated exactly at the grid points defined by the grid coordinates. The grid points are therefore the “sample points.” Data values at a sample point represent measurements over a neighbourhood of the sample point. This neighbourhood is assumed to extend a half-cell in each dimension. The effect is that the sample space corresponding to each grid point is a cell centred at the grid point.

Note that applying interpolation methods to a coverage means that the value of a data characteristic at a location between grid points may be different from that at any or all of the grid points which are its nearest neighbours.

Some data products may find it convenient to use nominal locations of data measurements that do not coincide with grid points as outlined above. Part 10c provides a method for encoding such data products by selecting one of the corners of the cell or by defining a standard offset to be applied to the default grid point locations in order to determine the nominal locations of the data values.

Change Proposal Justification

This proposal:

- 1) provides additional functionality requested by product specification teams (the attributes defining where the sample points are placed in a cell);
- 2) addresses requests for clarifications which were brought up by project teams since Edition 4.0.0 was prepared;
- 3) rationalizes the arrangement of certain clauses in Part 8.

What parts of the S-100 Infrastructure will this proposal affect?

- S-100 Feature Concept Dictionary Interface or Database
- S-100 Portrayal Register
- S-100 Feature Catalogue Builder
- S-100 Portrayal Catalogue Builder
- S-100 UML Models

Please send completed forms and supporting documentation to the secretary S-100WG.