

S-101 Metadata Features

Issues and recommended changes

S-101 Feature Types

- S-100 2a-4.2.5 S100_CD_FeatureUseType
 - geographic
 - carries the descriptive characteristics of a real world entity.
 - meta
 - Delineates geographic location where meta information is applicable. Distinct from an Information Type which carries information related to features which are related.
 - cartographic
 - carries information about the cartographic representation (including text) of a real world entity.
 - theme
 - Grouping features thematically.
- S-100 does not describe how feature use type impacts attribution
 - S-101 attribute value inheritance

S-101 Meta Features

- Information about other features
- Overrides default metadata values defined in the ISO-8211 encoding [Sometimes]
 - No formal mapping between encoded defaults and meta feature(s) is defined
 - Not machine readable
 - Affects sounding datum and vertical datum
- Attribution on feature or spatial object(s) overrides attribution “inherited” from a meta feature [Sometimes]
 - S-101 PS 4.3.2.2 Metadata features
 - No formal mapping between meta features and overrides is defined
 - Not machine readable

S-57 Mapping

- ENC PS 3.5.6 Hierarchy of meta data
- Provides formal mapping
- Not machine readable

Field	Subfield	Meta object class	Meta object attribute	Geo or spatial object attribute
DSID	AGEN	The use of M_PROD is prohibited		
DSID	UADT	The use of M_PROD is prohibited		
DSID	ISDT	The use of M_PROD is prohibited		
DSPM	HDAT	The use of M_HDAT is prohibited		The use of HORDAT is prohibited
DSPM	VDAT	M_VDAT	VERDAT	VERDAT
DSPM	SDAT	M_SDAT	VERDAT	VERDAT
DSPM	CSCL	M_CSCL	CSCALE	
DSPM	DUNI	The use of M_UNIT is prohibited		The use of DUNITS is prohibited
DSPM	HUNI	The use of M_UNIT is prohibited		The use of HUNITS is prohibited
DSPM	PUNI	The use of M_UNIT is prohibited		The use of PUNITS is prohibited
		M_ACCY	HORACC	HORACC
		M_ACCY	POSACC	POSACC
		M_ACCY	SOUACC	SOUACC
		M_ACCY	VERACC	VERACC
		M_NSYS	MARSYS	MARSYS
		M_NSYS	ORIENT	Attribute ORIENT of an individual object does not supersede the meta object attribute.
		M_QUAL	CATZOC	POSACC,SOUACC and TECSOU
		M_QUAL	SOUACC	SOUACC
		M_QUAL	POSACC	POSACC
		M_SREL	SURATH	SORIND
		M_SREL	SUREND	SORDAT
		M_SREL	SURSTA	SORDAT
		M_SREL	TECSOU	TECSOU

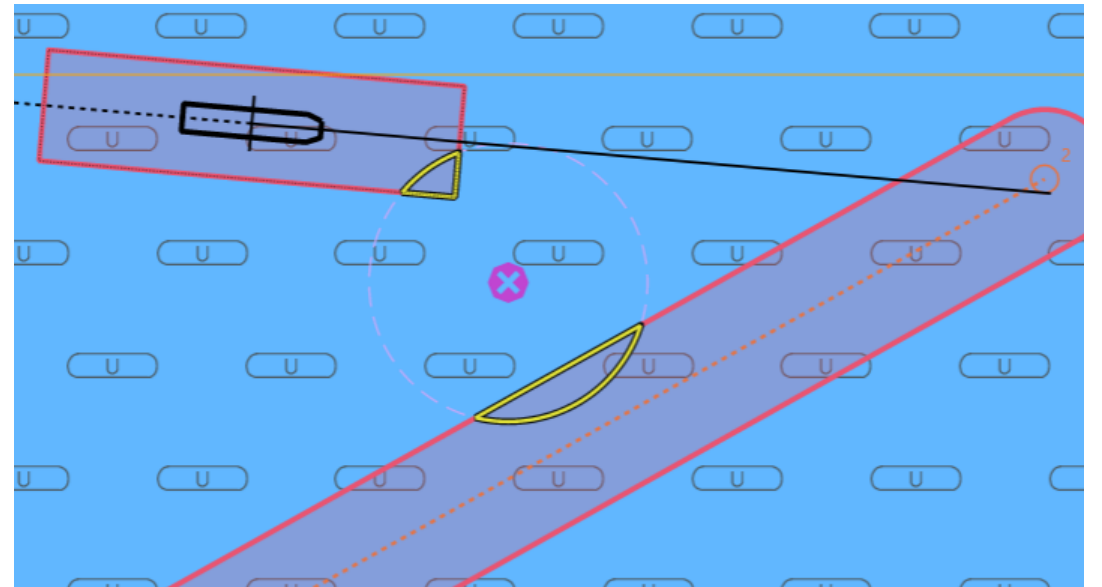
Why does S-101 have meta features?

- *Because S-57 has them...*
- To save space in the encoding?
 - S-57 app. B.1 clause 3.4
 - *The maximum use must be made of meta objects to reduce the attribution on individual objects*
 - Saves an average of 10 to 16 bytes per feature instance
- To provide an area geometry for the legend and/or pick report
 - Attributes of some meta features are never overridden...
 - Data coverage (M_COVR)
 - Local direction of buoyage (ORIENT)
 - Sounding datum (overridden by Vertical CRS on spatial, not by attribution)
 - Some meta features are overridden by feature attributes associated with points
 - Sounding / Vertical Datum (M_SDAT / M_VDAT)
 - Without meta area, would only show in legend if cursor is directly over the point

Update	Published	Buoyage	Magnetic Variation	Sounding Datum	Vertical Datum	Horizontal Datum	Battery Code
0	-	IALA A	-	Approximate Lowest Astronomical Tide	Mean High Water Springs	WGS84	-

Capabilities affected by Meta Feature Issues

- Implementation of S-98 Water Level Adjustment
 - TBD, but meta features complicate evaluation of vertical datums
- Implementation of uncertainty circles (Portrayal / Alarms)
 - Requires spatial evaluation
- Interoperability



Meta Feature Issues

- Meta feature “inheritance”/“override” concepts aren’t supported by S-100
 - Requires applications to add functionality specific to S-101
 - Interoperability is restricted to working with S-100 concepts
 - Update S-100?
- Relationships are not machine readable
 - FC doesn’t relate meta features to geo / spatial features
 - Relationships must be determined by spatial evaluation
 - Applications must hard-code knowledge of the types in DCEG clause 3 when implementing the pick report and legend
 - Inflexible maintenance
- Hierarchy of meta data in S-101 is unclear
 - DCEG should identify relationships if machine readability is not supported

Meta Feature Issues

- Metadata relationships evaluated during portrayal are “expensive” in terms of CPU time (due to spatial evaluation)
 - Currently, overrides are not processed by the S-101 portrayal catalogue
- Unclear how to handle in pick report
 - Show “inherited” attribute values in geo feature(s)/spatial(s)?
- Possible training issue
 - Does the mariner evaluate the meta features?
 - “inheritance” / “overrides”

The screenshot shows a 'Pick Report' window with a table of metadata attributes. The table is organized into sections: Obstruction, Attributes, Symbols, and Geometries. The 'Attributes' section is expanded, showing various data points such as 'Data Assessment', 'Full Seafloor Coverage Achieved', 'Date Start', and 'Date End'.

Attribute	Value	Code
Obstruction		OBSTRN
Navigation System of Marks		M_NSYS
Quality of Data		M_QUAL
Data Coverage		M_COVR
Depth Area		DEPARE
Attributes		
Data Assessment	Unassessed	
Full Seafloor Coverage Achieved	False	
+ Features Detected		
+ Survey Date Range		
Category of Zone of Confidence In Data	Zone of Confidence U	CATZOC, ...
Fixed Date Range		
Date Start	20210101	DATSTA
Date End	20211231	DATEND
Zone of Confidence		
Category of Zone of Confidence In Data	Zone of Confidence U	CATZOC, ...
Fixed Date Range		
Date Start	20220101	DATSTA
Date End	20221231	DATEND
Symbols		
pattern of symbols for a chart with quality not assessed		DQUALU01P
Geometries		
+ Surface		

Meta Feature Issues

- Storing unreferenced / default values in the encoding or exchange set metadata makes them “invisible” to the pick report and portrayal
 - Default VerticalDatum: CRSH/VDAT, AXTY=11
 - unreferenced by any VerticalDatumOfData feature
 - Default SoundingDatum: CRSH/VDAT, AXTY=12
 - unreferenced by any SoundingDatum feature
- S-100 Part 3 GFM & Part 5 FC model can't reference encoding specifics

Meta Feature Inconsistencies

- **Which meta feature to override?**
 - verticalDatum (on geo feature) – override VerticalDatumOfData or SoundingDatum?
 - uncertaintyFixed – QoNBD or QoBD? (meta features can overlap...)
- **Which meta feature supplies default value?**
 - Gate/verticalDatum, Tunnel/verticalDatum, etc. – VDatumofData or SDatum?
 - X/verticalUncertainty – QoBD or QoNBD or SpatialQuality? (meta features can overlap...)
- **Which meta attributes should not be overridden?**
 - LocalDirectionOfBuoyage/orientationValue, SoundingDatum/verticalDatum
- **How to match attributes when attribute codes don't match?**
 - QualityOfSurvey/surveyDateRange – geo feature/reportedDate

Issue Summary

- Support for meta features must be hard-coded for each S-101 feature type
 - S-101 does not provide clear implementation guidance
 - Attribute inheritance and overrides are not applied consistently
 - Default values “hidden” in the encoding or exchange set are unavailable to portrayal
 - Requires special case handling in the pick-report
- Interoperability does not support meta inheritance / overrides

Possible Improvements

- Option A
 - remove inheritance / override concept
 - store attribute values on each feature
- Option B
 - remove inheritance / override concept
 - store attribute values in separate feature or information types
 - associated with each feature
- Option C
 - Provide a mapping table (via an information type)

Option A

A. Don't use default values

- Require attribute on each feature instance
 - approximately 10 – 16 bytes per simple attribute * number of affected feature instances
- Keep features supporting the ECDIS legend
 - Buoyage system (NavigationalSystemOfMarks)
 - Sounding / Vertical Datum (SoundingDatum / VerticalDatumOfData)
 - Bathy / Non-Bathy Quality (Quality of Bathymetric Data / QoNBD)
- No spatial processing
- No data hierarchy
- Supported by S-100
- Bigger dataset
- Multipoint feature can only include points with shared attribution

Option B

B. Don't use default values

- Remove shared attribute(s) from geo and meta features
- Require association(s) from geo and meta features to feature or information type(s)
 - 11 bytes per association
 - Associated object provides attribute value(s)
- Keep features supporting the ECDIS legend
 - Same as option A, but associated type provides attribute value(s)
- No spatial processing
- No data hierarchy
- Supported by S-100
- Bigger dataset
- Multipoint feature can only include points with shared attribution

Option C

- C. Remove DDR defaults and provide a mapping table (via information type)
 - Machine readable identifier of the attribute override hierarchy
 - Each meta feature has association to a new Information type: AttributeOverrides
 - AttributeOverrides (InformationType)
 - attributeOverrideMap [1..*] – the mapping table (ComplexAttribute)
 - attributeCode [1] – identifies the meta feature attribute to override (SimpleAttribute)
 - overrides [1..*] – identifies the mapping to the override (ComplexAttribute)
 - featureCode [1] – identifies the feature providing the override (SimpleAttribute)
 - attributeCode [1..*] – identifies the path to the attribute providing the override (SimpleAttribute)
 - Supports machine readability
 - Establishes data hierarchy
 - Processing requires expensive spatial evaluation
 - Concept not described in S-100

Recommended Changes

- Implement option A, option B, or combination of A and B
 - Remove unreferenced metadata (defaults) from the encoding
 - CRSH/VDAT, AXTY=11 (Vertical datum)
 - CRSH/VDAT, AXTY=12 (Sounding datum)
- Ensure legend is supported (retain surface geometries)
 - Sounding datum (SoundingDatum/verticalDatum)
 - Vertical datum (VerticalDatumOfData/verticalDatum)
 - Bathy quality (QOBD/.../categoryOfZoneOfConfidenceInData)
 - Non-Bathy quality (QONBD/horizontalPositionUncertainty/uncertaintyFixed)
 - Buoyage system (NavigationalSystemOfMarks/marksNavigationalSystemOf)

Result of Recommended Changes

- 101GB00GB302045.000
 - 2,354,415 bytes (~2,300KB, 2.24MB)
 - ~5,650 features
 - Estimated size increase = ~32 - 96KB (< 5% prior to compression)
 - Expected size difference post compression < 1%

Backup

Attribute override mappings

- attribute (MetaFeature)
 - Inheriting Features

Attribute override mappings

- **verticalDatum** (SoundingDatum, VerticalDatumOfData)
 - Building, CableOverhead, Conveyor, Crane, Gate, LightAirObstruction, LightAllAround, LightFogDetector, LightSector, PipelineOverhead, SpanFixed, SpanOpening, Tunnel, WindTurbine
- **horizontalDistanceUncertainty** (QualityOfNonBathyData)
 - Canal, DockArea, Gate, LockBasin, ShorelineConstruction, SpanFixed, SpanOpening, Tunnel
- **horizontalPositionUncertainty** (QualityOfBathyData, QualityOfNonBathyData)
 - SpatialQuality (InformationType)

Attribute override mappings

- **verticalUncertainty** (QualityOfBathyData, QualityOfNonBathyData)
 - Berth, Building, CableOverhead, Conveyor, Crane, DeepWaterRouteCentreline, DeepWaterRoutePart, DredgedArea, DryDock, Fairway, FoulGround, Gate, MarineFarmCulture, PipelineOverhead, RecommendedRouteCentreline, RecommendedTrack, SpanFixed, SpanOpening, Tunnel, TwoWayRoutePart, WindTurbine
 - SpatialQuality (InformationType)
- **marksNavigationalSystemOf** (NavigationalSystemOfMarks, LocalDirectionOfBuoyage)
 - BeaconCardinal, BeaconIsolatedDanger, BeaconLateral, BeaconSafeWater, BeaconSpecialPurposeGeneral, BuoyCardinal, BuoyIsolatedDanger, BuoyLateral, BuoyNewDangerMarking, BuoySafeWater, BuoySpecialPurposeGeneral, LightAllAround, LightSector

Attribute override mappings

- categoryOfZoneOfConfidenceInData (QualityOfBathyData)
 - ? (CATZOC)
- M_QUAL/SOUACC (?)
 - ?
- spatialAccuracy? (QualityOfBathyData)
 - M_QUAL/POSACC
 - ?
- surveyAuthority (QualityOfSurvey)
 - ?

Attribute override mappings

- **surveyDateRange** (QualityOfSurvey)

- Overridden by *reportedDate* attribute
- AirportAirfield, BeaconCardinal, BeaconIsolatedDanger, BeaconLateral, BeaconSafeWater, BeaconSpecialPurposeGeneral, Bridge, Building, BuiltUpArea, CableOverhead, Canal, Causeway, CautionArea, Conveyor, DiscolouredWater, Dyke, FenceWall, FishingFacility, FortifiedStructure, FoulGround, HarbourFacility, Hulk, IceArea, InformationArea, Landmark, LocalMagneticAnomaly, MooringWarpingFacility, Obstruction, OffshorePlatform, OffshoreProductionArea, OilBarrier, Pile, PipelineOverhead, PipelineSubmarineOnLand, ProductionStorageArea, PylonBridgeSupport, Railway, Road, Runway, ShorelineConstruction, SiloTank, Sounding, Tunnel, UnderwaterAwashRock, WindTurbine, Wreck

- **techniqueOfVerticalMeasurement** (QualityOfSurvey)

- DeepWaterRouteCentreline, DeepWaterRoutePart, DepthNoBottomFound, DredgedArea, FoulGround, Obstruction, RecommendedRouteCentreline, RecommendedTrack, Sounding, TwoWayRoutePart, UnderwaterAwashRock, Wreck