

**Paper for Consideration by S-100WG****Support for Real-Time data**

<b>Submitted by:</b>	NOAA, IIC
<b>Executive Summary:</b>	Support for Real-time data in S-100
<b>Related Documents:</b>	S-100 Edition 5.0.0
<b>Related Projects:</b>	

**Introduction / Background**

S-100 does not currently contain a full implementation of ISO19108 and its treatment of temporal features contains a number of gaps. The proposed additions to a number of S-100's component parts defines more completely how temporality is addressed by the standard. In addition to other proposal submitted to S-100WG these form a foundation for full support for real-time data handling which can be used for a number of use cases.

**Analysis/Discussion**

Under S-100 a number of temporal primitive types are defined, some of which are defined in ISO19108 and some of which (S100\_TruncatedDate, S100\_IndeterminateDate) implement domain specific requirements.

Use cases for temporal data are varied, some pre-existing and some focused on exploiting the different facilities offered by S-100 for implementing product specifications. The definition of "real-time" data is broad but covers data representation for, e.g.

1. Use of observed data from in-situ sensors, such as depth gauges.
2. Support for date-dependent features similar to the existing S-52 Part 1 Section 8.4.1
3. Time series data for water level predictions, used for ECDIS Water Level Adjustment at specific points in time
4. Integration of Multiple datasets representing water movement vertically and horizontally, encapsulated in S-104 and S-111. These could be further integrated with e.g. S-129 at particular datetime(s).
5. Meteorological information such as S-411, S-412 and S-413 AND S-414 where the data is significantly time-sensitive.

Not all these use cases are implemented within this proposal, in particular water level adjustment requires further consideration and has dependencies on other developments in S-100, S-102, S-104 and S-98 Annex C. This paper is restricted to a definitions of temporal concepts on which these client-side features are built.

Although the ISO model has a complete standard for modelling, representing and manipulating temporal data this is not required under S-100. S-100 uses Gregorian Calendar only and prefers the use of UTC with offsets and thus does not require any of ISO19108's Temporal Reference System provisions.

S-100 derives all temporal attributes from thematic attributes and does not define a specific class of attributes representing temporal values. Furthermore, as S-100 has no user defined types, all complex attributes and their sub-attributes are defined in terms of aggregates of primitive types or other complex attributes. Therefore no ambiguity over temporal types is possible and temporal attributes can always be identified in datasets by referring to feature catalogues and metadata.

In order to clarify the S-100 approach, the ISO19108 definitions for primitives "instant" and "period" as temporal primitives are included, as is the ISO19108 language for defining relationships between such primitives.

## **Recommendations**

This paper proposes a small number of additions to S-100 to strengthen support for temporal data in a number of forms to support different use cases. These proposed additions are:

1. Clarifications to Part 1 for temporal types.
2. Glossary entries defining “instant” and “period”. Definition in Part 1 of S100\_TM\_Instant and S100\_TM\_Period, compatible with the ISO19108 definitions.
3. An addition to the General Feature Model clarifying the relationship between ISO19108 and S-100. This clarifies how S-100 defines attributes with a temporal characteristic, and how relationships with them are described. It also clarifies edge cases for definition of “midnight”

## **Justification and Impacts**

S-100 is a framework for representing marine geospatial data and the domain is inherently temporal in nature. Strengthening the temporal implementation is in the long term interests of the IHO community.

A number of emerging product specifications define data which can be used in real-time application, for delivery of data to end users with specific effective dates (e.g. system “now”) and for enhanced planning (data with effective dates between date<sub>1</sub> and date<sub>2</sub>). Integration of real-time sensors as well as predicted values for e.g. Water Level must be defined against a rigorous framework for representing time instants and periods as an attribute. S-100’s existing framework can be enhanced with selected sections of ISO19108 to enable better modelling, representation and search/retrieval of real-time data with the proposed additions.

The introduction of multiple product specifications to S-100 ECDIS requires an update of the IMO requirement for support of date dependent features and a methodology is therefore required for representing such data which minimises any tailoring of implementations.

## **Action Required of S-100WG**

The S-100 working group is asked to:

1. Approve the additions to the parts of S-100 defined in the attached Annex (redline for Part 1 has been supplied)s
2. Note the proposed modifications to S-98 Annex C to implement date dependent features for Water Level Adjustment and inclusion of all product specifications.
3. Note the importance of firm temporal representation of data content for the definition of Water Level Adjustment in S-100 ECDIS and the potential for interoperability between S-100 ECDIS, API based request/response data interchange and real-time sensor feeds in the future.
4. Note the additions to S-98 Annex C in respect of Water Level Adjustment and separate proposals for Temporal Extent in Catalogue metadata.