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Proposal to Divide S-412 to Three Product Specifications

Submitted by:	United States, NOAA National Weather Service Ocean Prediction Center
Executive Summary:	Proposal contains justification for separating S-412 concepts into three separate product specifications.

Introduction / Background

In May of 2012, the 4th session of the Joint World Meteorological Organization (WMO) – Intergovernmental Oceanographic Commission (IOC) Technical Commission for Oceanography and Marine Meteorology (JCOMM) established the need to develop a marine weather overlay for Electronic Chart Display and Information Systems (ECDIS). The US NOAA National Weather Service, Ocean Prediction Center was designated to manage this project on behalf of the JCOMM Expert Team on Maritime Safety Services (ETMSS), now named the Worldwide Met-Ocean Information and Warning Service (WWMIWS) committee. This information overlay is being developed in accordance with the requirements and technical specifications outlined in the S-100 Universal Hydrographic Data Model and aims to standardize weather information for marine navigation systems, including warning and hazard information, marine weather observations, and marine weather environmental conditions.

This weather overlay, titled S-412 Weather Overlay, has evolved and become a product specification for all marine weather concepts. There are growing concerns that an all-inclusive weather product specification will be overly-difficult to manage, implement and/or regulate in the future. Additionally, the development team has technical concerns relating to S-412 allowing for both vector and gridded datasets. Together, the Ocean Prediction Center and the WWMIWS committee have re-evaluated the scope of this product specification and determined that it is appropriate to divide S-412, in its current form, into three separate product specifications. The most important considerations determined in reaching this conclusion were the need for certain data to be in vector format and other data to be in gridded format, the administrative actions needed to maintain an all-inclusive product specification, and the future governance requirements needed to implement and/or regulate future services using S-412 compliant data products.

Feedback on this proposal is sought from the S-100 Working Group, particularly from the electronic chart system (ECS) and ECDIS manufacturer communities.

The three proposed product specifications would be:

(1) S-412 Weather and Wave Hazards

(2) S-4xx Weather and Wave Conditions

(3) S-4xx Weather and Wave Observations

The “S” identifying number would be determined at a later date. The official names of these product specifications may also change at a later date.

Proposal/Analysis/Discussion

This proposal recommends splitting S-412 into three individual product specifications, pending original equipment manufacturer (OEM) feedback. The three proposed product specifications would be (1) S-412 Weather and Wave Hazards; (2) S-4xx Weather and Wave Conditions; and (3) S-4xx Weather and Wave Observations. Reasons for this separation include technical, administrative and future governance considerations.

When S-412 development began, S-412 was scoped to include the traditional information presented on weather charts and focused heavily on meteorological systems. S-412 has evolved to include the concepts of warning services, marine weather observations, and meteorological systems and conditions such as fronts, tropical cyclones, winds and swell. In its current form, S-412 contains 43 concepts modelled as feature types or information types and over 100 attributes to describe the feature and information types. These concepts are modelled in the Data Classification and Encoding Guides found at the following link: https://ocean.weather.gov/s412/.

Technical - Separating GML and HDF5 data products:

In order for an agency to create data files for all 43 concepts, gridded data in HDF5 format and vector data in GML 3.2.1

format would need to be created. These formats are included in the S-100 Universal Hydrographic Data Model as approved data formats. Currently, 15 of these concepts would be encoded by an agency as a gridded coverage; 23 are vector based feature types in point, line, or polygonal geometries; 3 are information types where 1 information type is duplicated for use in a gridded coverage dataset. Because these were modelled under the same parent-child data structure, it's possible that the modelling can be improved and simplified if separated. It's also possible that changes to a feature's model can impact how another, unrelated feature is modelled. For example, the velocity attribute (wind speed and direction concepts) is used in both gridded features Wind and Wind Gust, and the vector features TropicalCyclone and Low. Any changes to velocity would need to be reflected in each of these features instead of only to the gridded or vector features alone. Separating S-412 by the data format of a compliant dataset would allow more flexibility in defining how attributes are used by features.

Governance – Future Services:

Considerations for how S-412 may be implemented and maintained in the future were also considered. The current requirements include modelling concepts consistent with the Joint IMO/IHO/WMO Manual on Maritime Safety Information and, as much as practical, adhere to WMO 471 (Guide to Marine Meteorological Services), WMO 485 (Manual on Global Data-Processing and Forecasting System) and WMO 558 (Manual on Marine Meteorological Services) for standardization. The content, guidelines and requirements outlined in these publications are implemented globally through various mechanisms. One mechanism is the promulgation of weather information, forecast and warning services through the Global Maritime Distress and Safety System (GMDSS).

The content broadcast through the GMDSS is text based and describes real-world point, line and polygonal meteorological features. Because S-412 will enable the visualization of these features for charting systems, these text based descriptions are easily transferable into a GML 3.2.1 format. Grouping these concepts together into a single product specification would likely simplify an authoritative data provider's transition to new S-412 services. This service transition would likely improve the regulatory approval process needed to evolve text based GMDSS weather information into a GMDSS capable of graphical representations of digital products in charting systems.

Additionally, information contained in GMDSS text type broadcasts cannot represent real-world conditions to the same resolution of gridded data due to text character limitations. Because of this current reality, the Ocean Prediction Center believes gridded data for electronic charting systems is more akin to a data of opportunity for agencies to create and when compared to current requirements, exceeds the minimum level of detail needed for a mariner to navigate safely to avoid hazardous weather. Using S-412, this realization would be particularly true if an agency issues polygonal warning services in GML 3.2.1 format.

Administrative – Work flow and project management:

Recent changes to the content and concepts included in S-412 included simplifying and reusing concepts throughout S-412. When changes are needed, this quickly becomes a tedious administrative exercise to track and effect all needed changes. Separating S-412 in accordance with the concepts proposed here, would allow for a natural concept driven development approach and reduce this overhead.

Additionally, articulating project goals, updates and content would be greatly simplified if developmental workflows were concept-driven. This is particularly important for implementing future services.

S-4xx Weather and Wave Observations:

The Ocean Prediction Center envisions a mariner selecting an observation layer or platform (buoy, another vessel, or a coastal land-based platform) in their charting system and visualizing the most recent weather observations. This vision would be best realized with a streaming data mechanism, allowing a mariner access to real or near-real time observations similar to how AIS information is currently displayed. Because the potential exists for this concept to be delivered to a vessel differently from regularly broadcasted or downloadable content, the Ocean Prediction Center believes this concept should be its own product specification to enable the best data modelling methodology to achieve the necessary content with the smallest data format.

Proposed Scopes and Initial Requirements for each Product Specification

S-412: Weather and Wave Hazards

A vector-based S-100 compliant product specification designed for electronic charting systems, to include ECDIS, for warning services and weather systems, as outlined by the WMO, with the flexibility to include authorative regional and local

messaging services, designated such by an appropriate National Meteorological Service. This includes the identification of and information on weather systems that impact the safety of life and property at sea. Temporally, features outlined in this product specification may be in the present or near future, on weather and long range time scales.

Initial Requirements:

(1) Within the confines of the S-100 Universal Hydrographic Data Model, model significant atmospheric systems and messages (warnings, watches, advisories, synopsis, forecast statements, etc) in vector format that is, as much as practical, compliant with the Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI).

(2) S-412 should, as much as practical, adhere to warning requirements defined in WMO 558.

(3) Visuals and terminology of traditional meteorological features shall, as much as practical, match the standardization outlined in WMO 471, WMO 485 and WMO 558.

(4) Particular emphasis should be given to polygonal warnings, envisioned with a user selecting a polygon for warning information.

S-4xx: Weather and Wave Conditions:

A gridded-based S-100 compliant product specification designed for use in electronic charting systems, to include ECDIS, which indicate marine weather conditions present or forecast across a region. Temporally, features outlined in this product specification may be in the present or near-future, on weather and long range time scales.

Initial Requirements:

(1) Within the confines of the S-100 Universal Hydrographic Data Model, model significant characteristics of the sea-surface conditions in gridded format that is, as much as practical, compliant with the Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI). Particularly, conditions and occurrence probabilities of atmospheric pressure, sustained wind and wind gusts, air and sea-surface temperature, swell and significant waves, freezing spray, precipitation, and reduced visibility should be considered.

(2) Existing standardized terminology and symbolization shall, as much as practical, match the standardization outlined in WMO 471, WMO 485 and WMO 558.

(3) Where possible, this S-4xx product specification should harmonize with other S-100 based product specifications.

S-4xx: Weather and Wave Observations:

An S-100 compliant product specification designed for use in electronic charting systems, to include ECDIS, for meteorological and oceanographic parameters observed in near real-time and/or real-time from, or within close proximity to navigable waters, that may improve situational awareness of meteorological conditions along a route.

Initial Requirements:

(1) Within the confines of the S-100 Universal Hydrographic Data Model, model coastal and marine weather observations. Observation features should be modelled, as much as practical, to include wind, waves, pressure, temperature and visibility.

(2) Consideration should be given for the ability to interoperate S-4xx Weather and Wave Observations data with buoy, bridge, pier, or other similar features defined in other product specifications.

(3) A mechanism should be established to prevent old, non-relevant, or inaccurate observations from being displayed within the charting system.

(4) Where possible, the S-4xx product specification should harmonize with other S-100 based product specifications.

Conclusions

The development team tasked to develop a weather overlay for future S-100 compliant navigation systems has proposed separating S-412 into three product specifications. Feedback on this proposal is needed in order to fully realize its impacts.

Impacts

Additional work will be needed for three product specifications, including separate schema, feature catalogue and portrayal catalogue files. Because consensus on a majority of these concepts has been reached and initial modeling has been

completed, significant changes to developmental timelines are not anticipated.

In order to fully realize the impacts of this proposal, original equipment manufacturer (OEM) feedback is requested.

Action required of S-100 Working Group

S-100 Working Group is invited to:

a. Note this proposal.

b. Provide recommendations and or comments regarding this proposal that may be helpful in developing S-412; and

c. Support JCOMM/WWMIWS S-412 activities