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Pilot Project Proposal Implementing a Data Model with Exchange Formats for Maritime Limits and Boundaries

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Abstract

S-121 is a standard that establishes a data model for Maritime Limits and Boundaries (MLBs) to support the content (digital data structure) and exchange formats to be the carrier of the information. MLBs are constructs used to define maritime zones for nations around the world. The United Nations Convention of the Law of the Sea (UNCLOS) is the international legal foundation of MLBs. S-121 represents an essential extension of the International Hydrographic Organisation S-100 for the administration of the marine domain.

In December 2016, the International Hydrographic Organisation (IHO) distributed the initial document describing the standard at the United Nations headquarters in New York. This meeting began the international effort to define the core features of the S-121 standard.

The Pilot presented in this document will help to advance the two goals of the S-121 standard: 1) to have an open, international, coordinate-based, representation of maritime boundaries and their associated rights, restrictions, and responsibilities (RRRs) that are authoritative and easy to interpret; and 2) to facilitate parties to UNCLOS in fulfilling their deposit obligations in a spatial coordinate-based format.

Background

The Maritime Limits and Boundaries standard - S-121

Our planet's oceans are subdivided by international and national laws into many areas and zones. Certainty over the locations of these zones and the rights, restrictions and responsibilities that apply to them facilitates the development of the world's ocean resources while providing for the protection of the marine environment and safety of navigation.

Maritime Limits and Boundaries (MLBs) are the constructs used to delineate maritime zones and form the legal foundation of the marine domain. These maritime zones are established in national legislation by their geographic limits and where such limit is delimiting two neighbouring States, this limit is described as a maritime boundary, hence the term Maritime Limits and Boundaries (MLBs).

To effectively distribute MLBs for the due publicity obligations under the United Nations Convention on the Law of the Sea and for operational purposes, there needs to be a standard framework which ensures compatibility between users of the MLBs.

In January 2010, by adopting the S-100 Universal Hydrographic Data Model, the International Hydrographic Organisation (IHO) embarked on the development of a versatile standard framework aligned with the International Organization for Standardization (ISO) 19100 Geographic Information / Geomatics series of standards. The IHO S-100 standard aims to support a wide range of users by developing digital products and transfer standards for the marine community beyond the core hydrographic applications of the IHO. The standard opens the possibility of better marine administration by facilitating the integration of Hydrographic, Scientific and Legislative information.

The Maritime Limits and Boundaries standard - S-121 represents an essential extension of S-100 for the administration of the marine domain. It enables MLBs to be described in terms of what they are, what they embody and what they are used for. S-121 establishes a framework for communicating in a digital form the geographic extents of marine areas and the associated rights, responsibilities and restrictions that apply to them. The framework has been developed in line with applicable provisions of the United Nations Convention of the Law of the Sea.

The primary purpose of S-121 is to allow States to communicate official digital representations of their maritime limits and boundaries to the public and international community. S-121 is established to enable users to depict, describe and communicate national maritime limit or boundary positions. The S-121

secondary purpose is to provide a flexible and expandable framework able to support other maritime delimitation requirements such as defining areas of overlapping jurisdiction and Joint Development Areas, or any other management areas.

The current vision for this standard is to leverage the capabilities of the ISO-19152 Land Administration Domain Model. ISO-19152 supports the legal description of associated rights, restriction and responsibilities along with providing proper referencing through sourcing and versioning. This additional capability aligns the standard with legal practices of trace-ability. The use of the ISO-19152 standard leverages the significant community investment made in land administration, with which the management of maritime boundaries and limits has much in common. The use of ISO-19152 provides a foundation to extend S-121 into the management of other regulated boundaries, such as marine reserves and fisheries. Alignment with the land domain model will facilitate consistent administration of the littoral zone for those states that adopt S-121 for their marine spaces and ISO-19152 for their land jurisdiction.

The S-121 standard is designed to provide a flexible management and communication solution that can support any type of MLBs for the broadest range of users including the Owner State, other States, the international community, government organizations, private industry, academic institutions, and the general public. By construction, the standard also remains compatible with S-101 (Electronic Nautical Chart Product Specification) to allow for the depiction of the MLBs information encoded by the standard to be displayed in electronic navigation charts.

The S-121 takes a practical step toward achieving the vision of S-100 as it was established: to expand the user base and better accommodate the requirements of our digital world. By building on ISO-19152, the S-121 framework provides the capacity to more efficiently and consistently administer across the land and maritime domains. It is essential that current best practices are evolved to provide a foundation for sustainable administration of the world's blue economy. Use of the S-121 standard will reduce costs of enforcement and compliance, and will support the extension of the digital economy into the offshore.

Legal References

Coastal States, under articles 16, 47, 75, 76 and 84 of the United Nations Convention on the Law of the Sea, are required to deposit with the Secretary-General of the United Nations charts showing: straight baselines, including closing lines of mouths of rivers and bays, and archipelagic baselines; the outer limits, as well as lines of delimitation between States with adjacent or opposite coasts, of the territorial sea (including roadsteads, article 12); the contiguous zone; the exclusive economic zone and the continental shelf. Alternatively, the lists of geographical coordinates of points, specifying the geodetic datum, may be substituted.

In its resolutions 49/28 of 6 December 1994 and 52/26 of 26 November 1997, the General Assembly requested the Secretary-General to establish appropriate facilities, as required by the Convention, for the deposit by States of maps, charts and geographic coordinates concerning national maritime zones and establish a system for their recording and publicity and to develop and maintain [such] facilities for the deposit by States of charts and geographical coordinates concerning maritime zones, including lines of delimitation, and to give due publicity thereto, as required by article 16, paragraph 2, article 47, paragraph 9, article 75, paragraph 2, article 76, paragraph 9 and article 84, paragraph 2, of the Convention. The Division for Ocean Affairs and the Law of the Sea (the Division), Office of Legal Affairs of the United Nations is the unit which performs these depositary functions on behalf of the Secretary-General, as part of an integrated program on the law of the sea and ocean affairs, distinct from the usual depositary functions of the Secretary-General in respect to multilateral treaties.

Subsequently, in its resolution 59/24 of 17 November 2004, the General Assembly requested the Secretary-General to improve the existing geographic information system for the deposit by States of charts and geographical coordinates concerning maritime zones, including lines of delimitation in particular by implementing, in cooperation with relevant international organizations technical standards for the

collection, storage and dissemination of the information deposited, in order to ensure compatibility among the Geographic Information System, electronic nautical charts, and other systems developed by these organizations. Recent General Assembly resolutions have noted ongoing efforts in this regard.

In addition, the General Assembly, in its annual resolutions on Oceans and the law of the sea, calls upon States Parties to the Convention to fulfil their deposit obligations. Most recently, General Assembly resolution 71/257 calls upon States Parties to the Convention that have not yet done so to deposit with the Secretary-General charts or lists of geographical coordinates, as provided for in the Convention, preferably using the generally accepted and most recent geodetic datums (para. 6).

To facilitate the implementation of the Secretary-General's depositary functions, coastal States are encouraged to deposit the following information, as a minimum:

- Geographic coordinates of points in decimal degrees on the straight baselines and archipelagic baselines in common global geodetic datum such as WGS 84, accompanied, as appropriate, by the relevant national legislation;
- Geographic coordinates of points in decimal degrees on the outer limits as well as lines of delimitation between States with adjacent or opposite coasts for the following maritime zones: territorial sea (including roadsteads); contiguous zone; exclusive economic zone and continental shelf, in common global geodetic datum such as WGS 84, accompanied, as appropriate, by the relevant national legislation. Ideally the points defining the outer limits should be close enough to each other to ensure that the line formed by connecting the points with geodesic lines accurately reflects the outer limit of the maritime zone(s). States Parties are also encouraged to identify in the deposit the points that are part of an international boundary. States Parties are further encouraged to accompany such deposits with the relevant national legislation and/or with references to relevant international treaties.

Accordingly, the Division approached the International Hydrographic Organization with a request to identifying appropriate technical standards. After consultations, the S-121 project team was formed by Member States of the International Hydrographic Organization.

Proposal Objective

This proposal proposes to run a pilot, under the OGC Innovation Program, to advance the two goals of the S-121 standard: first: to have an open, international, coordinate-based, representation of maritime boundaries and their associated rights, restrictions, and responsibilities (RRRs) that are authoritative and easy to interpret; and second to facilitate the deposit of maritime boundary claims with the Division for Ocean Affairs and the Law of the Sea (DOALOS) in a spatial coordinate-based format that fulfils legal requirements under UNCLOS.

The primary purpose of OGC's Innovation Program is to bring sponsors and technology implementers to come together in a collaborative agile process to solve geospatial challenges. Since 1999 more than 100 initiatives have been taking place from in-kind interoperability experiments run by a working group to multi-million dollar testbeds with hundreds of participants.

A Pilot is a collaborative effort that applies technology elements from the OGC Technical Baseline and other (non-OGC) technologies to Sponsor scenarios. In practice, a Pilot is where OGC and other industry standards can be "stress tested" based on real-world application and experience. Pilot are an opportunity for users to understand how to best address their requirements using standards-based architectures.

Tasks (Requirements and Deliverables)

R1: Independently Operable exchange format conformance test suite

Develop a stand-alone or integrated toolset to ensure all encodings are valid and compliant. Conformance test sets are based on the mandatory components of the S-121 schema.

Deliverables:

- D11: S-121 Conformance Test Suite

R2: Develop GIS Implementation:

Implement, verify and test the S-121 model in several GIS systems allowing producers to create and edit S-121 data including all of the direct attributes and information objects (Rights, Restrictions, Responsibilities, Parties, and Governance) and associated S-100 defined metadata. The implementation must support all of the capabilities of the standard, including display, editing, export, import, and conversion of the data between formats.

Deliverables:

- D21: S-121-Production Toolkit

R3: Develop Universal Exchange Format:

Develop a GML based exchange format to allow for the complete exchange of S-121 data within nations and between nations including all of the S-121 model elements. This should use an appropriate GML profile and should consider use of the IHO S-100 GML profile (GML 3.2.1). The Universal Exchange Format developed needs to fully implement the S-121 schema.

Deliverables:

- D31: GML Application Schema – Universal Format of S-121 UML model
- D32: GML Application Schema Conformance Tests, for validity of format as well as completeness; including valid population of all required attributes

R4: Implement Legal Dissemination Format:

Implement a legal dissemination format that is human readable, in accordance with the S-121 specification and which is suitable for deposit to DOALOS to satisfy the deposit requirement for Maritime Limits and Boundaries. This output format should encode features and attributes already defined within the S-121 feature model. This human readable output format shall also be machine-readable so that it can also be imported into a GIS system.

Deliverables:

- D41: XSLT converter from GML to plain text including tabular data.

R5: Develop Additional Administrative Layer Format:

Develop a GML based exchange format to allow for the overlay of MLBs information over an E-NAV chart or base chart in alignment with S-100 Universal Hydrographic Data Model, Part 10a and Part 10b: ISO/IEC 8211 Encoding, and GML Data Format. This format should support the S-121 schema. This format is intended to be displayed on top of ECDIS systems and other navigation systems.

Deliverables:

- D51: GML Administrative Layer Application Schema
- D52: XSLT converter from Universal Format to the GML Administrative Layer

R6: Develop Data Display Format:

Show how portrayal of data can be achieved from different countries with a common set of symbols. The pilot project should define an architecture following Spatial Data Infrastructure principles to discover access and merge data from web services that support the S-121 data model. This should allow the navigation and display of all key component of the model being (Party, RightsRestrictionResponsibilities, BasicAdministrativeUnit, FeatureUnit/Spatial Attribute, and the Sources and Governance features). In particular, the portrayal should consider how the challenge of multiple CRSs can be overcome in the creation of a map across multiple countries within a web services environment.

Deliverables:

- D61: Portrayal Registry with common set of symbols and associated style sheets
- D21: S-121-Production Toolkit

R7: Support The Extension of S-121 to Generic Objects:

Support the extension of the standard to accommodate state specific objects and extension objects such as UNCLOS Article 74.3 (Joint Development Areas), UNCLOS Article 51 (Traditional Fishing Rights) and UNCLOS Article 76 (Extended Continental Shelf). Examples of these state specific objects and attributes can be found in section 3.6 of the S-121 Feature Model.

Deliverables:

- D71: GML Application Schema for Generic Objects
- D21: S-121-Production Toolkit

R8: Provide Engineering Report

Provide an engineering report, to be published by the OGC in order to inform the S-121 community about best practices, proposed solutions and guidance on the best way forward in implementing the data model, and comprehensive guidance on generating the exchange formats.

Deliverables:

- D81: Engineering Report

Summary requirements & deliverables provided by Participants

Deliverables	Requirements							
	R1	R2	R3	R4	R5	R6	R7	R8
D11: S-121 Conformance Test Suite								
D21: S-121-Production Toolkit								
D31: GML Application Schema								
D32: GML Application Schema Conformance Tests								
D41: XSLT converter from GML to plain text including tabular data.								
D51: GML Administrative Layer Application Schema								
D52: XSLT converter								
D61: Portrayal Registry								
D71: GML Application Schema for Generic Objects								
D81: Engineering Report								

Schedule of the Pilot

The schedule is available at the pilot project web page:

<http://www.opengeospatial.org/projects/initiatives/mlbp>