SeaDataNet NetCDF (CF) data transport model for Marine and Oceanographic Datasets

A joint proposal by SeaDataNet and ODIP projects

March 2015

Document type: Standard

Current status: Proposal

Submitted by:

Dick M.A. Schaap
Technical Coordinator SeaDataNet
MARIS
The Netherlands

Roy Lowry, Justin Buck
BODC
UK

Michele Fichaut
Coordinator SeaDataNet
IFREMER
France

Helen Glaves
Coordinator ODIP
BGS
UK
**Title:** SeaDataNet NetCDF (CF) data transport model for Marine and Oceanographic Datasets- A joint Proposal by SeaDataNet and ODIP projects.

**Scope:** Proposal to acknowledge SeaDataNet NetCDF (CF) data transport format, a profile of CF 1.6, as a standard for processing and sharing data files. Particularly, this proposal aims to promote SeaDataNet NetCDF (CF) as a regional (i.e. European) standard.

SeaDataNet NetCDF (CF) has been based upon Version 1.6 of the CF Metadata Conventions, published by the CF community in December 2011 and published as data transport format by SeaDataNet, the leading infrastructure in Europe for marine & ocean data management. The format for profiles, time series and trajectories has been defined by bringing together a community comprising NetCDF and CF experts (such as from NCAR and UNIDATA), and many users of CF NetCDF for oceanographic point data from MyOcean, IMOS, Australian Navy and USNODC.

The acknowledgement of SeaDataNet NetCDF (CF) as a standard data model by IODE/JCOMM will further favour interoperability and data management in the Marine and Oceanographic community.

**Envisaged publication type:** The proposal target audience includes all the European bodies, programs, and projects that manage and exchange marine and oceanographic data. Besides, the proposed document informs all the international community dealing with marine and oceanographic data about the SeaDataNet NetCDF (CF) data transport model.

**Purpose and Justification:** Provide details based wherever practicable.

1. Describe the specific aims and reason for this Proposal, with particular emphasis on the aspects of standardization covered, the problems it is expected to solve or the difficulties it is intended to overcome.

By acknowledging SeaDataNet NetCDF (CF) as a standard data transport model for Marine and Oceanographic datasets, multiple objectives are sought:

- Wider adoption of SeaDataNet NetCDF (CF) by additional marine data centres around European waters. The process will favour further harmonisation and standardisation of European ocean and marine CF metadata as well as interoperability by reducing the existing metadata heterogeneity. Organizations adopting this standard will be able to share their datasets according to a well-known and well specified marine data file format model, therefore the data management and exchange of marine and oceanographic information will be eased in many ways (see following point 2).

- Ease interoperability and outreach towards international communities and initiatives. The existence of a recognized standard at European level will favour its understanding also at a broader level. Example given, international marine and oceanographic communities will be able to correctly understand the information carried by SeaDataNet NetCDF(CF) model.

2. Describe how this proposed standard supports data management, exchange or interoperability. When applicable include mention of what data management functions (e.g. date transport, quality control, archive) the proposal supports.

SeaDataNet NetCDF (CF) enhances interoperability by providing more mandatory attributes on data encoding, such as data quality flags, than the vanilla CF 1.6
standard. Its format supports interaction with other SeaDataNet standards for data management:

- **Vocabularies**
- **Quality Flag Scale**

It is designed to be used for profiles time series, trajectories, time series profile (e.g. moored ADCP) and trajectory profile (e.g. shipborn ADCP) and is fully integrated with the SeaDataNet Common Data Index (CDI) portal, an online data discovery and access service of the pan-European data management infrastructure.

It is designed to be compatible with SeaDataNet analysis (data products services) & presentation tools (**ODV, DIVA**). Example given, the Regional SeaDataNet products can be accessed through the SeaDataNet OceanBrowser web interface and downloaded as a whole in NetCDF, or as a subset using OPeNDAP.

3. **Describe the main interests benefitting from or affected by the proposed standard, such as industry, consumers, governments, distributors. Identify any relationships and/or dependencies.**

Adoption by IODE/JCOMM of SeaDataNet NetCDF (CF) as a data transport standard will give extra momentum to European marine and ocean data centres adopting SeaDataNet. This will also benefit users from all over the world from various sectors as SeaDataNet plans to use it as the transport protocol for other types of data that are difficult to handle in the ASCII formats (ODV, Medatlas) due to their large volume or structural complexity. Moreover, it will benefit efforts for global interoperability (such as ODIP project activities) because that process can focus on a limited set of marine data transport formats, whereby SeaDataNet NetCDF (CF) represents European input.

4. **Describe the feasibility of implementing the proposed standard. Include any factors that could hinder the successful establishment or global application of the proposed standard. Are there any associated issues? Identify resource implications resulting from the recommendations.**

The feasibility and practicality of implementing the SeaDataNet NetCDF (CF) can be, and has already been successfully accomplished in the co-operation of SeaDataNet with several Projects managing their data in NetCDF format as well as in EMODNet activities.

5. **Considering the needs of other fields or organizations, indicate the timeliness, target date(s), or if proposing a series of standards, suggest priorities. List any statutory requirement or other driving factors.**

There are no statutory requirements for adoption of the SeaDataNet NetCDF (CF) standard as one of the data transport format standards. A number of National Oceanographic Data Centres in Europe are bound to implement the standard within their contractual obligations of several EU projects. The NODCs also motivate other data centres in their countries to adopt it. The IOC recommendation will add to this process.

6. **Describe the possible benefits gained by the implementation of the proposed standard. Alternatively, describe the loss or disadvantage(s) if no standard is established within a reasonable time.**
The advantage of using the SeaDataNet NetCDF(CF) standard in Europe is described in (2) and (3). There are no anticipated disadvantages to adopting it.

7. Indicate whether the proposed standard is or may become the subject of regulations or may require the harmonization of existing regulations. Describe any impacts of this activity.

CF conventions NetCDF is already a mature standard used worldwide. Its extension by the SeaDataNet is already used as a de-facto standard in Europe and increasingly prescribed in calls for proposal and contracts by the European Commission.

**Current Operational Implementations:** A number of National Ocean Data Centres (NODC's) and marine data centres within the SeaDataNet partnership have successfully implemented the SeaDataNet NetCDF(CF) standard for profiles, time series and trajectories. The format can be used next to the SeaDataNet ODV 4 ASCII format in the services of the SeaDataNet infrastructure (see [http://www.seadatanet.org](http://www.seadatanet.org)), such as the Data Discovery and Access Services and Regional Products. Implementation is currently based on the reference SeaDataNet XML encoding: a CSW ISO service is available for queries from automatic tools (e.g. this is the interface leveraged by GEOSS), as well as an OAI-PMH service (e.g. leveraged to automatize harvesting by the ODP portal). The results of these activities can be followed at the SeaDataNet portal (see above).

Moreover, different software tools support the SeaDataNet NetCDF(CF) standard, such as [NEMO conversion software](http://www.seadatanet.org) and the [Download Manager software](http://www.seadatanet.org).

**Relevant Documents:**
The following document (attached to the current proposal) is relevant for describing and specifying the SeaDataNet NetCDF (CF):

- SeaDataNet NetCDF data file format-Manual and examples

This document is an excerpt from the SeaDataNet data file formats version 1.16 (deliverable SDN2_D85_WP8_Datafile_formats.pdf)

**Cooperation and liaison:**

1. **Existing Community:** All the organizations listed in the ‘**Current Operational Implementations**’ section are using SeaDataNet NetCDF(CF) in an operational environment and represent the SeaDataNet NetCDF (CF) community. In particular, BODC, CNR-IIA, MARIS and IFREMER have been involved in the drafting and publication of the SeaDataNet NetCDF standard (together with the rest of the SeaDataNet Technical Task Team and with the help of NetCDF and CF experts such as from NCAR and UNIDATA and many participants from MyOcean, IMOS, Australian Navy and USNODC) and are responsible for the current proposal submission.

2. **Expanded Community:** Firstly, other relevant marine and oceanographic data centres in Europe that are not yet engaged in the NODC national networks and/or any of the EU projects and would like to adopt SeaDataNet NetCDF(CF) data transport model for the processing and sharing of their datasets.

Moreover, other marine and oceanographic data centres worldwide eager to use the SeaDataNet NetCDF(CF) at full. SeaDataNet is maintaining active cooperation and exchange on an international scale with data management initiatives and networks outside Europe (such as ODIP) where common standards and interoperability solutions are investigated.
Contact information:
Name: Justin Buck
Organization: British Oceanographic Data Centre
Email Address: juck@bodc.ac.uk
Telephone Number: +44 (0)151 795 4894

Proposal version: Version 1.0 March 2015

List of Acronyms:
- ADCP - Acoustic Doppler Current Profiler
- CDI – Common Data Index metadata format
- CF - Climate and Forecast
- EMODNET – European Marine Observation and Data Network
- EU – European Union
- EuroFleets – EU FP7 project Towards an Alliance of European Research Fleets
- Geo-Seas - EU FP7 project for a Pan-European Infrastructure for Marine Geological and Geophysical Data Management
- IMOS - Australian 's Integrated Marine Observing System
- INSPIRE - Infrastructure for Spatial Information in the Europe Community
- IOC – Intergovernmental Oceanographic Commission
- IODE – International Oceanographic Data and Information Exchange
- ISO – International Organization for Standardization
- MEDATLAS
- MyOcean - Ocean Monitoring
- NCAR - National Centre for Atmospheric Research
- NetCDF – Network Common Data Form
- NODC – National Oceanographic Data Centre
- ODIP - Ocean Data Interoperability Platform
- ODV – Ocean Data View
- OPeNDAP - Open-source Project for a Network Data Access Protocol
- SeaDataNet – EU FP6 project for a Pan-European Infrastructure for Marine and Oceanographic Data Management
- UNIDATA
- Upgrade Black Sea SCENE - EU FP7 project for an Upgrade Black Sea Scientific Network
- USNODC - United States National Oceanographic Data Centre

Other Attachments: No other attachments.