

OIIP: Oceanographic *in situ* Interoperability Project

“Leveraging available technologies for improved interoperability and visualization of remote sensing and in-situ oceanographic data at the PO.DAAC”

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I. Motivation



- **Need for improved integration & synthesis** of **multivariate datasets** from **diverse observational platforms** for science, mission Cal/Val, decision support applications
- **PO.DAAC** historically NASA archive for satellite physical oceanographic data now needing to increase technical capacity to better support:
 - NASA-funded field campaigns (SPURS, OMG)
 - National & international ocean data infrastructures & initiatives (eg. IOOS, CEOS-COVERAGE)
- **Challenge of *in situ* data:**
 - inherently diverse, complex, heterogeneous (esp. biological)
 - Acute Interoperability issues:
 - *Ad hoc* data file formats/insufficient adoption of self-describing formats (nc, hdf)
 - Paucity of metadata and/or non-standards compliant metadata

II. Goals

- **OIIP:** 2 year, collaborative technology development project funded under NASA/ACCESS15
- **Extend available (higher TRL) technologies** to address key interoperability and data challenges associated with oceanographic *in situ* datasets, focusing on marine animal electronic tagging data as a representative (but also more challenging) use case

OIIP Technology Suite: *NCEI/NODC .nc templates, ROSETTA, THREDDS, CMC, DMAS, Tagbase*

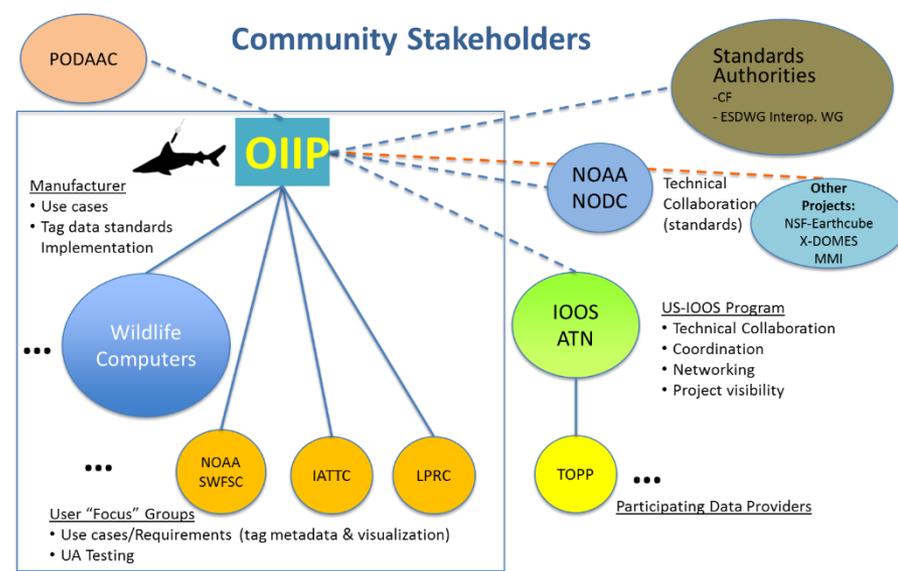
- **Develop improved PO.DAAC capacity to support NASA field campaign data** via the integration of these technology components within system workflows with a view to operational DAAC infusion
- **Illustrate the value-added on satellite-*in situ*/tag data integration** via an enhanced Web-based visualization tool (based on JPL's *Common Mapping Client*)
- Make OIIP software broadly available as **Open Source**



III. Approach



“Community, Data Technologies, Standards, Team”



- Emphasis on **Community Engagement** and **Community Driven** approaches:
 - use case development & bottom-up requirements (external collaborators/focus group)
 - collaboration & coordination with stakeholders: *NCEI/NODC, IOOS-ATN, SPURS, OMG, PODAAC*
- **Work with the leading e-tag instrument manufacturer** (Wildlife Computers -WC) with the aim of ultimately implementing interoperable file/metadata standards recommendations sustainably at source
- *In situ* metadata **standards enhancements in coordination with authorities:** ESDWG Data Interoperability Working Group, CF2, NCEI/NODC

IV. Technology Enhancements



- **NCEI/NODC .nc templates:** Review adequacy for range tagging datasets & provide implementation recommendations regarding representation of *Domain specific metadata*, *Geolocation uncertainty*, *Data summaries*.
- **ROSETTA:** Extend support for .nc templates & community specific metadata framework, implement as a RESTful web service automation interface, integrated with PO.DAAC DMAS
- **THREDDS:** extend support for point, profile, trajectory spatial data types and explore potential integration of TDS-SOS (OGC Sensor Observation Service standard) plug-in
- **CMC Web Visualization** : access/integrate/map *in situ* and satellite-derived datasets, provide synchronized horizontal and vertical views of data and their evolution over time
- **Tagbase:** Port to PostgreSQL & extend stored queries to support CMC-Visualization tool
- **DMAS:** metadata model extensions (CF/ACDD/NODC support), data handler extensions, Rosetta RESTful-Webservice development and Rabbit-MQ middleware enhancement
- **OIIP components Integration in a test-DMAS environment:** demonstrate workflow end-to-end; test also against “conventional” in-situ data holdings at PO.DAAC (eg. SPURS)

Welcome to NODC

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NOAA Satellite and Information Service

You are here: [Home](#) > [Formats and Codes](#) > NetCDF Templates v1.1

NCEI NetCDF Templates v2.0

<https://www.nodc.noaa.gov/data/formats/netcdf/v2.0/>

- NCEI/NODC netCDF “spatial feature class” templates (8)
- Represent discrete sampling geometries:
eg. point, profile, trajectory, time series etc.
- Standard Self-Describing file format (netCDF)
- CF & ACDD compliant metadata implementations
- Well documented with good examples but some templates still under development

NetCDF Templates

www.nodc.noaa.gov/data/formats/netcdf/v1.1/Templateexamples

Feature Type Templates and Examples

The table below lists the 8 feature types and provides templates for 13 of the 14 most common combinations of feature type (point, profile, etc.) and array representation (orthogonal, incomplete) expected for oceanographic or CF-satellite group before publishing a swath template and examples. The table provides the templates themselves in the “CDL Template” column. For many of the templates, we have one or more real-world examples as well. It is listed in the “Specific CDL Examples” column, and links to the corresponding netCDF files on the NODC THREDDS Data Server (TDS) are in the last column on the right. Following those links, you can explore the numerous services

Feature Type	Description	General Ocean Data Examples	CDL Template	Specific CDL Examples
point	A single data point (having no implied coordinate relationship to other points).	One or more recorded observations that have no temporal or spatial relationship (where each observation equals one point in time and space).	Point	Kachemak Bay, NE Arctic Bioeffects Program Data
timeSeries	A series of data points at the same spatial location with monotonically increasing times.	Sea Surface Temperature from one or more fixed platforms with the exact same increasing time intervals. Multiple platforms collecting observations at different time intervals.	Orthogonal Incomplete	Bodeqa Marine Lab Data Bodeqa Marine Lab Data Combined
trajectory	A series of data points along a path through space with monotonically increasing times.	One or more events where an underway platform collected data from a thermosalinograph.	Incomplete	1. Oceanus Explorer; 40M4_TSG; 3. Jason3 Data
profile	An ordered set of data points along a vertical line at a fixed horizontal position and fixed time.	One or more CTD or XBT casts that have the exact same depth (z) values (do not need to have the same number of depth levels). Multiple CTD or XBT casts that do not have the exact same depth (z) values.	Orthogonal Incomplete	World Ocean Database Level Data World Ocean Database Level Data
timeSeriesProfile	A series of profile features at the same horizontal position with monotonically increasing times.	Single or multiple mooring lines with stationary instruments at the same depths across all the mooring lines and all the instruments measuring at the same points in time. Multiple mooring lines with stationary instruments at different depths across the mooring lines but all the instruments measuring at the same points in time. Multiple mooring lines with stationary instruments at the same depth	Orthogonal Time and Depth Orthogonal Time and Incomplete Depth Incomplete Time and Orthogonal Depth	USOP Internal Wave Data No example CDL avail No example CDL avail

Sources

File Edit View Bookmarks Plot Window Help

Create Plot Combine Plot Open Dataset

Datasets	Catalogs	Bookmarks
Name	Long Name	Type
SPURS_Sarmiento.ct...	SPURS_Sarmiento_ctd.nc	Local File
beam_tran	beam transmission WET Lab ...	---
conductivity	conductivity2	---
depth	depth	---
flag	flag	---
fluorescence	seapoint fluorescence	---
latitude	latitude	---
longitude	longitude	---
nbites	byte count	---
oxygen	oxygen sbe43	---
oxygen_raw	oxygen raw sbe43	---
pressure	pressure	---
salinity	salinity2	---
scan	scan count	---
sound_vel	sound velocity 2	---
temperature	temperature2	---
time	time	---
turbidity	seapoint turbidity	---

```

:units = "psu";
:FillValue = NaN; // double
:platform = "MIDAS-SARMIENTO";
double flag(CTD_cast=22, CTD_data_point=2033);
:long_name = "flag";
:standard_name = "flag";
:FillValue = NaN; // double
:platform = "MIDAS-SARMIENTO";

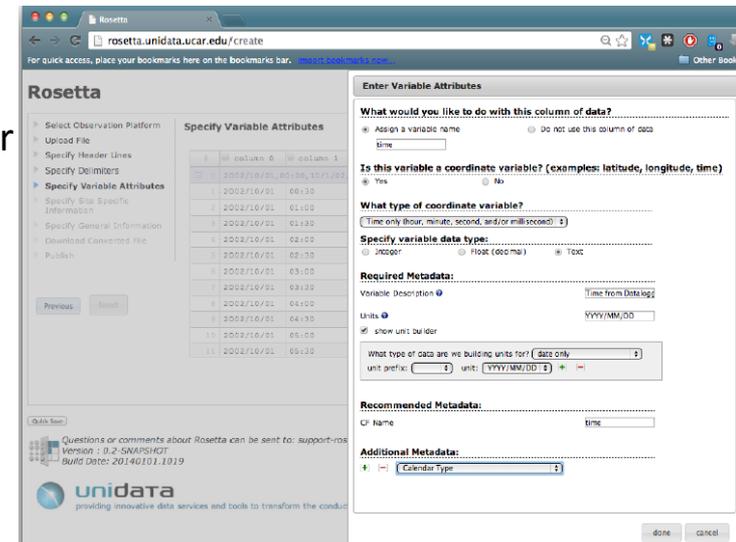
;Conventions = "CF-1.6";
;Metadata_Conventions = "Unidata Dataset Discovery v1.0";
;featureType = "profile";
;nodc_template_version = "NODC_NetCDF_Profile_Incomplete_Template_v1.0";
;standard_name_vocabulary = "CF-1.6";
:title = "CTD data from SPURS Cruise MIDAS - Ship Sarmiento";
:summary = "This includes CTD data (conductivity, salinity, temperature, ...";
:source = "spurs.jpl.noaa.gov";
:instrument = "Sarmiento on-board sea-bird SBE 9/11 CTD.";
:sea_name = "Atlantic";
:instrument_authority = "https://spurs.jpl.noaa.gov";
:time_coverage_start = "17-Mar-2013 12:29:13";
:time_coverage_end = "11-Apr-2013 12:51:56";
:time_coverage_resolution = "point";
:geospatial_lat_min = 23.52274; // double
  
```

Application to OIIP & Related Tasks:

- Review adequacy for range tagging datasets & provide recommendations
- Develop framework for representing: *Community specific metadata, Geolocation uncertainty, Data summaries*
- Define set of tag-related metadata attributes/standards via Community consultation
- Implement support in OIIP components: ROSETTA, DMAS
- Coordinate & support WC to facilitate implementation in tag processing software

Rosetta: general purpose web-based format converter

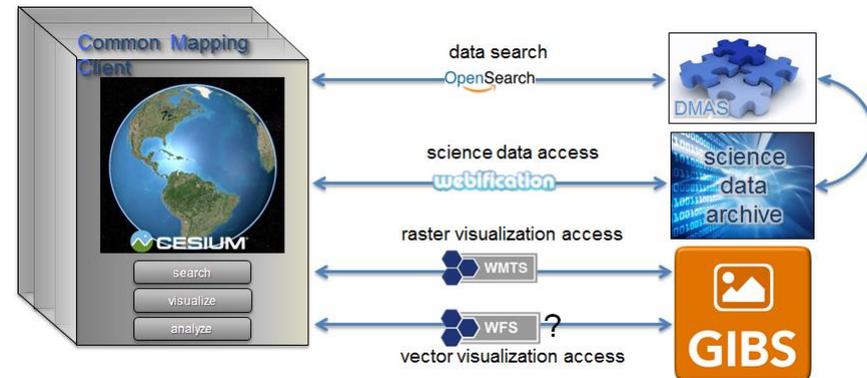
- Generalized web-based tool for conversion of arbitrary, unstructured ASCII data files to CF/ACDD compliant netCDF files
- GUI wizard – guided, step-wise process for conversion & augmentation of file metadata by user
- Burden of conversion mechanics removed from data producer
- Comprehensive, Robust, Consistent translation framework
- Java Web-App Tech. Stack: Java, JS, Spring, Tomcat
- **Enhancements for OIIP:**
 - extend support for NODC .nc templates & community specific metadata framework
 - implement as a RESTful web service interface enabling automated/programmatic data transformation
 - integration within PO.DAAC DMAS



<http://rosetta.unidata.ucar.edu>

OIIP Common Mapping Client (CMC) Web-Visualization

- **Goals:** Develop a web interface that allows users to efficiently and intuitively:
 - Seamlessly access/integrate relevant raster and vector-based *in situ* and satellite-derived datasets
 - Visualize search results within a spatiotemporal mapping domain for the purposes of exploration & discovery
 - Provide synchronous/synchronized horizontal and vertical views of data and its evolution over time



- **Technologies**

- Front end: JPL-CMC, 2D/3D visualization libraries/APIs (Cesium/WebVR*)
- Back end: WFS, WMS/WMTS, DMAS, THREDDS, w10n, Tagbase, Nexus*

- **Approach**

- Identify users & collect use cases/user scenarios
- Generate functional requirements
- Generate design specifications
- Development (rapid prototyping & user review)

