ODIP Best Practice for Data Systems

Best Practices Working Group

Introduction

Ocean observing systems with value and impact rely on robust and stable instruments and platforms integrated into an equally robust data management infrastructure. Such data infrastructures must be capable of supporting the conversion of raw observation data into usable information and knowledge products that can be stored in repositories providing management and access. The methodologies and best practices associated with large-scale observing systems engage all aspects of an elaborate, end-to-end process, which ranges from observatory design and sensor handling, to the deposition of quality data in repositories. Best practices in this domain emerge from time-tested experience, usually gathered within organizations such as universities, private and public research institutions, or through collaborative projects and programs. For example, large programs such as the European FixO3 for fixed mooring observations, IOOS for coastal observations in the USA, or JCOMM networks may document best practices and urge their propagation. These valuable documents are often maintained by international organizations such as the UNESCO IODE or GOOS, which create forums for discussing, recommending and documenting observation and data practices. Despite the quality of these efforts, best practice documentation is still fragmented and their impact is difficult to sustain over time.

Objectives

The long-term objective of this initiative is to provide the ocean observing community with a sustainable compendium of peer-reviewed best practices in data management and interoperability that can be used in training new oceanographers and data scientists, and also in providing references for experts. Where practical, a solution should reach across science communities and networks to support multi-disciplinary applications. Examples include those practices related to ODIP prototypes in areas such as cruise summary reports and implementation of sensor web enablement.

The near-term objectives are to 1) formulate the processes and infrastructure that can form the basis of a longer-term solution and 2) engage the ocean observation community in the evaluation of these processes and infrastructure.

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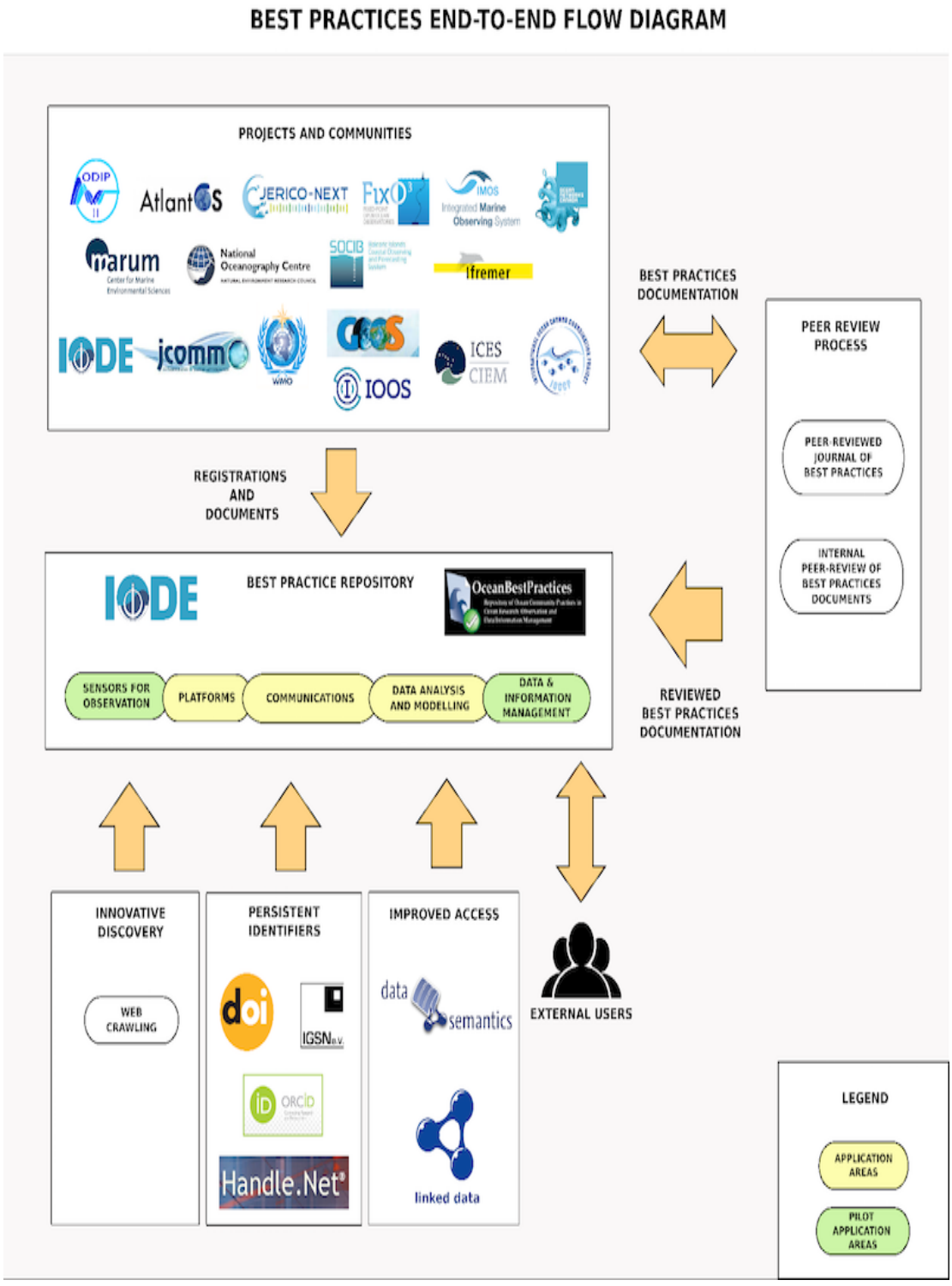
Best Practices Working Group (BPWG) Contact us HERE. The BPWG is participating in ODIP and coordinating activities with other projects, international and national agencies and projects to improve access to documented best practices.

In summary, the BPWG's objective is to provide a long-term process to sustain best practices. It is not to create best practices, but to work with scientists and technologists in improving access to best practices across disciplines and capabilities.

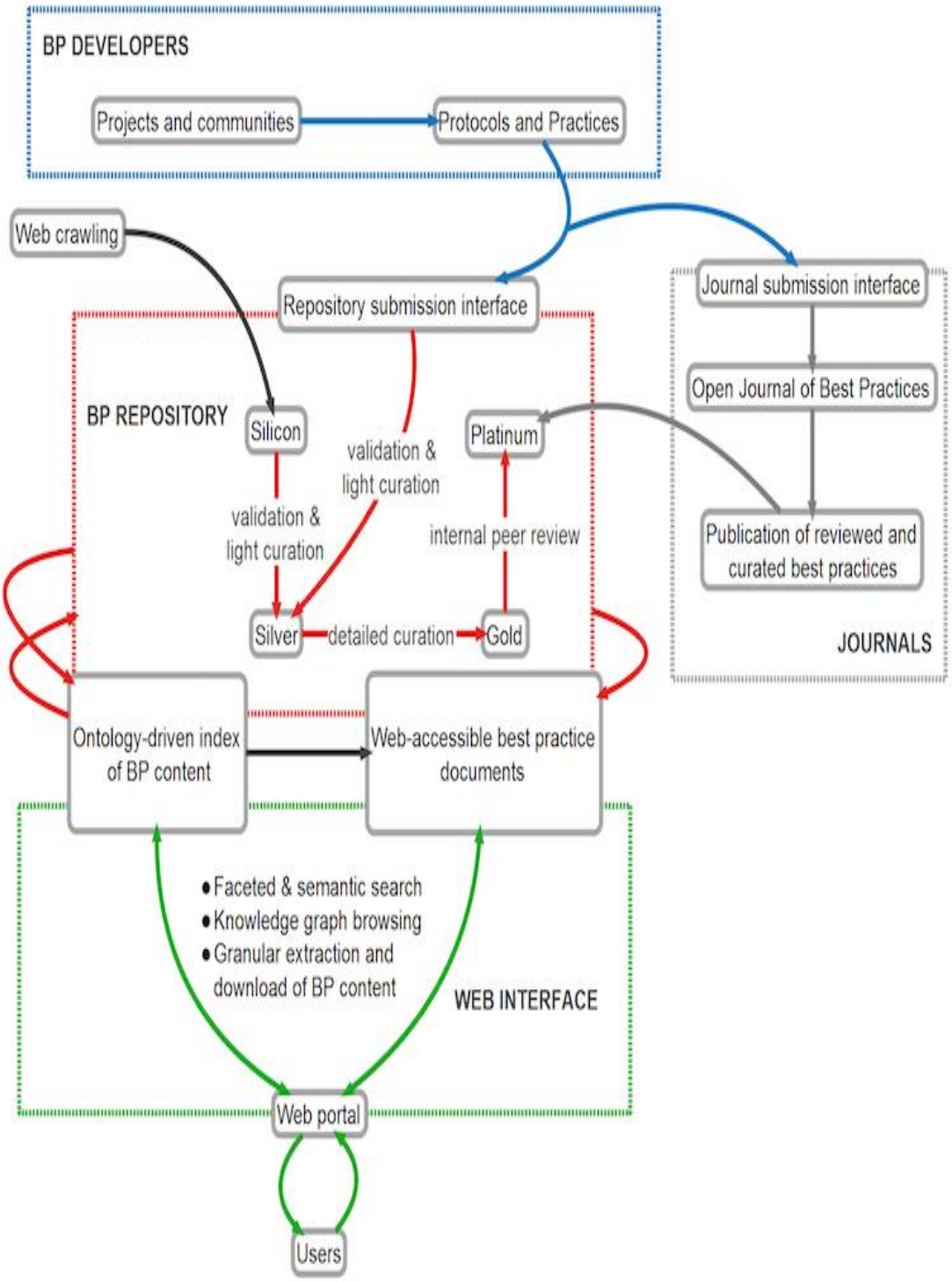
Strategy

The strategy for creating a useful and sustainable repository is to leverage existing capabilities whenever possible, both in the repository infrastructure and its content of best practices. Then expand the infrastructure with new search mechanisms based on ontologies that can service the disciplines of ocean research from physical observation to chemistry to biology and ecosystems. The best practices cover all facets of the information chain from sensors, calibration, platforms and platform integration to communication of observed data, data management and user interfaces. The long-term goal is to provide repository users with the ability to reach across many aspects/elements of observing systems from their own perspective.

While existing best practice documents will be included in their native formats, it may be necessary to add metadata elements to support improved discovery and access. As a strategy, the best practice repository will identify three levels of document processing to indicate the completeness of the best practice metadata and documentation to users. At the highest level, the best practices will have comprehensive metadata and have been peer reviewed by the community or through a repository expert panel. The figure below shows the institutional interfaces.



While the figure above shows the institutional relations in supporting users access to best practices, the flow process is better described in the figure below.



The flow works as follows: documents created by expert groups, agencies, or other stakeholders should be deposited in the OceanBestPractices (OBP) repository where it will be allocated a persistent URI. A methods description of the BP can then be submitted to a companion peer review open access journal. The journal serves as a dissemination platform with the full BP document archived in the Repository. In both

cases, the submitters would include metadata descriptors, sourced from a continually updated ontology, clarifying the content of each section of a BP document (e.g. which parameters, which environments, which sensors, which data processing, etc.). Within the repository, the document may be at one of several levels depending on the levels of metadata, completeness of information and peer review. BP Documents and articles that are already peer reviewed would automatically be assigned the highest level of internal repository review after validation.

All documents will be exposed as web pages, with each section indexed by the assigned metadata descriptors, and assigned its own persistent URI or Handle. Users may access a web portal that would convert their requests (e.g. "Retrieve all BPs that are about measuring nitrate in coastal water") into semantic queries that would be processed using the ontology. The responses to such queries will provide the Handles of all BP sections relevant to the user's search, which will be retrieved and delivered to the user. Access to the documents are provided from the OceanBestPractices repository and will be available in native (the authoritative version) or web-based formats. There is also an ongoing effort to facilitate submission of current and new best practices in formats that are interoperable across ocean observation communities. This may include the availability of templates and recommendations.

Steps forward

The initial challenge is two-part: 1) first, a sufficient quantity of best practice documents must be aggregated to effectively serve the community and 2) an enhanced resource for the efficient archiving of, discovery of, and access to these practices must exist. The AtlantOS-led collaboration is addressing the first challenge by drawing together a range of methodological documents endorsed by communities of ocean observing practitioners. This is being done both by manual submission and machine-assisted web crawling. The collection is then being used as the material with which to address the second challenge: a best practice repository is being created with technologies to persistently archive, systematize, expose, index, version, and cross-link collected best practices. As this is a multidisciplinary and constantly evolving space, technologies that are capable of sustainably yet flexibly linking material across domain-specific terminologies are being deployed, as well as mechanisms for quality management and review. Efforts are being made to ensure even novice ocean observers can use the resource effectively, with little to no training.

BP Document Templates

Is there an ideal Best Practice Document format? It is unlikely that one size will fit all and it could even be argued that there should be a format per platform. Any document format recommendations cannot be over-prescriptive, but it is possible that in addition to a document data sheet, there are core topics that should always be found in a Best Practice document; with additional sections added as the authors see fit. The observation and analyses communities are working with the BPWG to identify what these core sections should be by beta testing using Focus Groups, online discussion forums and a BP Workshop, in the three pilot areas selected for process demonstrations: Applications; Data Management; Sensors.

Repository (oceanbestpractices.net)

The central and permanent archive, OceanBestPractices (OBP), is considered as the repository of choice for this initiative. This archive supports open access. OBP is hosted and managed by the IODE/IOC for its partners, JCOMM, WMO and ICES. Any ocean-related Best Practice can be deposited by the community and the upgraded infrastructure will support all attributes of the flow process discussed above

Wiki Interface

To provide greater visibility and discoverability of BP content, the contents of BPs uploaded to the OBP system will be made web accessible via a 'Wiki-style" interface. Similar to other wiki solutions, the OBP wiki will expose the contents of each BP to search and web indexing services, allowing users to find material more easily. Further, each section of a given BP will have a stable URL assigned to it, allowing clear and granular referencing of a BP's contents. This technology will form the basis for extensions such as community commenting and discussion around BPs and their parts, offering users the opportunity to alert the community of new developments or potential issues with BPs in the OBP, facilitating harmonization of ocean observing practices across communities.

Semantic Search Capabilities

The content of the OBP wiki (see above) will be indexed using semantic technologies: technologies which represent the meaning of each BP's content to machine agents in a knowledge graph, known as an ontology. This will allow users to discover and retrieve results which are not necessarily syntactic or verbatim matches to a given search term, but which are known to be related to it through links in the ontology. The BPs and their sections in the OBP will be "tagged" or annotated with ontology classes (e.g. nodes in the knowledge graph which represent the environments relevant to the method, sensors used, or chemicals measured), allowing granular and flexible searches across the OBP collection, guided by the knowledge captured in the ontologies used. Importantly, we will leverage and reuse existing and mature ontologies adopted by other communities in the life and Earth sciences to promote interoperability. Furthermore, we will express the needs of the OBP community to these ontologies, shaping them for improved performance in ocean science.

Communication and Outreach

This activity will focus on engaging the community by using a variety of communication channels.

Upcoming events:

1. Presentation of Best Practices process and infrastructure, Oceans 2017 Conference Anchorage AK, USA 18-22 Sep 2017
2. Evolving and Sustaining Ocean Best Practices Workshop, Paris France 15-17 Nov 2017
3. Best Practices Town Hall, AGU Ocean Sciences Meeting, Portland OR, Feb 2018

OceanBestPractices Community Listserv

Our discussions have already brought us into contact with many in the BP Community. To maintain momentum and provide a central discussion forum for the whole community, an oceanbestpracticescommunity listserv will be created.

ACRONYMS	
AGU	American Geophysical Union
ATLANT0S	Optimizing and Enhancing the Integrated Atlantic Ocean Observing Systems
AWI	Alfred-Wegener-Institute
BP	Best Practices
EMSO	European Multidisciplinary Seafloor and water-column Observatory
EuroGOOS	European Global Ocean Observing System

FIX03	Fixed point Open Ocean Observatory network
GEOMAR	GEOMAR Helmholtz Centre for Ocean Research
GOOS	Global Ocean Observing System
GROOM	Gliders for Research Ocean Observation and Management
ICES	International Council for the Exploration of the Sea
IEEE	Institute of Electrical and Electronics Engineers
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IMOS	Integrated Marine Observing System
IO PAS	Institute of Oceanology, Polish Academy of Sciences
IOC	Intergovernmental Oceanographic Commission of UNESCO
IODE	International Oceanographic Data and Information Exchange of IOC
IOOS	U.S. Integrated Ocean Observing System
JCOMM	Joint Committee on Oceanography and Marine Meteorology
JERICO	Joint European Research Infrastructure Network for Coastal Observatories
MARUM	MARUM Zentrum für Marine Umweltwissenschaften Universität Bremen
OBP	OceanBestPractices (Repository)
ODIP	Ocean Data Interoperability Platform
ONC	Ocean Networks Canada
PML	Plymouth Marine Laboratory
SAEON	South African Environmental Observation Network
SOCIB	Sistema d'observació i predicció costaner de les Illes Balears
UPMC	Université Pierre et Marie Curie
UNESCO	United Nations Educational, Scientific and Cultural Organization
URI	Universal Resource Identifier
WMO	World Meteorological Organization