Requirements Document
For
Development of

An Oceans Portal Accessing Distributed Bioregionalisation Related Datasets

Through A National Marine Registry

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1.0 Background

Australia's Oceans Policy commits the Australian Government to using an ecosystem-based approach to management of Australia's oceans through regional marine planning. Bioregionalisation defines a spatial framework for regional marine planning by identifying and mapping ecosystem-based units based on information about ecosystem structure, function and process. The current national bioregional planning framework is the Interim Marine and Coastal Regionalisation of Australia (IMCRA), which was endorsed in 1998. Data used to define IMCRA bioregions cover only the coastal and shallow shelf regions of the Australian Marine Jurisdiction. Since 1998, data has become available for deeper shelf and offshore areas. In addition, different States used a range of approaches to collation and analysis of data to define bioregions. In 2002, the National Oceans Office (NOO) initiated a National Bioregionalisation Program. The aim of this Program is to update, extend and refine the current version of IMCRA to produce a comprehensive, integrated spatial framework for management of marine uses in the Australian Marine Jurisdiction.

The National Bioregionalisation will result in two, closely linked outputs: a benthic regionalisation based on geomorphology, sedimentology, demersal fish and sponge biogeography; and a pelagic regionalisation based on biological and physical oceanography. The data inputs to this bioregionalisation arise from a number of projects managed by the National Oceans Office. These projects are listed below and a more detailed description can be found in Appendix A.

- Demersal fish
- Invertebrates
- Sediments
- Bathymetry
- Oceanography

Whilst most of these projects have commenced, two are still at the contract negotiation phase and one is now complete. It is anticipated that all projects will be finalised by December 2004.

Each project is managed by an Officer from NOO and the Office is supported in these tasks by a Bioregionalisation Working Group (Bio WG). The Bio WG is an expert-based forum, convened by NOO and chaired by an independent expert. It meets every 3 months to review program progress. Appendix B lists the membership of the Bio WG.

Each of the projects listed above is required to achieve a number of outcomes in common:

- Delivery of data and products that can be used, in tandem with output from each of the other bioregionalisation projects, to produce a national bioregionalisation extending from the edge of continental shelf to the limits of the exclusive economic zone (EEZ)
- Creation of well described, national fundamental marine datasets
- Data and products that are made public and readily accessible

These outcomes are being used as a starting point to bring all of the disparate projects together under an identified task called the Bioregionalisation Integration Project. This project consists of two linked, but essentially self-contained, sub-tasks:

- Task 1: Integration, combination and analysis of datasets to develop products that can deliver a hierarchically nested spatial framework to support decision-making in planning and management
- Task 2: Development of an Oceans Portal that is the gateway to distributed stores of the datasets and products that have been used in developing the National Bioregionalisation.

It is this latter task that is the subject matter of this requirements document.

In addition to the projects listed above there are also two other NOO-sponsored activities that will need to be brought under the umbrella of Task 2. These are the National Fisheries Uses and Non-fisheries Uses Mapping projects. The former project is being co-sponsored by the NOO and the Fisheries Research & Development Corporation (FRDC) and undertaken by the Bureau of Rural Sciences (BRS) and the latter project is sponsored by NOO and is contracted to Spatial Vision Pty Ltd. Both of these projects are compiling digital dataset snapshots and GIS coverages depicting human uses in our marine jurisdiction (see Appendix C for project descriptions and contacts).

To add an international dimension to Task 2, mainly to maximise the amount of information that can be made available through the Portal at least cost, it is also proposed to link development of the Oceans Portal to the establishment of an Australian Regional Node for the global Census of Marine Life (CoML) Program (see http://www.coml.org). A proposal for funding the establishment of such a Node was recently submitted by Finney & Poiner (2003) to the US based philanthropic fund, the Sloan Foundation. Anticipating that the proposal may be successful in its bid for funding, the requirements for the Node portion of the Portal will also be covered in this requirements document.

2.0 Overview of the Oceans Portal & Registry Concept

The Oceans Portal will be a cyber-site featuring a range of web-based services, initially calling upon geo-processing services. It will act as a gateway to internet accessible marine data and information managed in-house primarily by Australian organisations, particularly those resources related to marine planning, marine biodiversity, human uses and their impacts. The Portal site and its associated “back-end” architecture and protocols will need to comply with international standards characteristic of emerging national spatial data infrastructures. Initial population of the Portal will be through the content associated with all of the projects previously mentioned in section 1.

Although the Portal is the most visible component of what is essentially a distributed network of linked information stores, it is the behind-the-scenes infrastructure that will require the most effort in terms of development activity. In keeping with national strategies and policies, this distributed network must be based on a web services architectural model (ANZLIC, 2003a) and may include a connection to the

information management arm of the global Census of Marine Life (CoML) Program called the Ocean Biogeographic Information System (OBIS, see http://www.iobis.org/).

Central to this infrastructure will be development of a national marine data services registry which will provide a standardised mechanism for cataloguing on-line marine-based business service locations and descriptions. In the case of this particular implementation, most of the business services envisaged will involve web-based mapping.

The Oceans Portal and its linked data and services would primarily be a collaboration amongst a "community(s) of practice" focussed around the use and provision of marine data and information. The infrastructure required to support this would ultimately need to entail:

- **Institutional arrangements:** intellectual property (IP), pricing, access & licensing arrangements, policies, protocols, standards and coordination;
- **Technical:** discovery, access and transfer facilities – including a registry or catalog of services and providers; and
- **Products, Services, Solutions:** data service providers, value-added resellers, information brokers, product integrators and modellers.

The initial implementation will need to be well-bounded in its function and scope but should be designed so as not to preclude any future enhancements, particularly additional services and features.

Given the importance of this project as a case study for what would essentially be the first marine components of an Australian Spatial Data Infrastructure, it is likely that the project will be nominated for inclusion in the ASDI Action Plan (ANZLIC, 2003b).

Because this task will require a high degree of co-operation amongst a number of stakeholder institutions it is envisaged that the scope of the project will need to be agreed collaboratively, prior to development of a full specification. The first step towards developing a committed "community of practice" and a consensus on the project's scope amongst potential key players, will be a NOO-sponsored workshop facilitated by a technical consultant. The outcome from the workshop and the consultant's endeavours will be a project specification that must meet, as a minimum, the criteria outlined in this Requirements Document.

Once the project specification is complete it will be used to contract further technical consultancy services for:

- the establishment of a Marine Data Registry; and
- development of the Oceans Portal application.

But most importantly the specification will be used by NOO to scope the project in terms of the necessary stakeholder contributions, level of input, commitment and additional resources required by agencies to successfully deliver the project. Once this process is complete NOO will move to establish partnership arrangements with agencies to formalise project arrangements.

3.0 Project Benefits

From a NOO perspective, this project offers a solution to tasks such as collaborative mapping, geo-processing and modeling services that are important to the conduct of regional marine planning. The implementation of a distributed network of shared data stores, with both spatial and non-spatial internet accessible applications provides a mechanism for multi-agency (or whole of government) participation in oceans management. Under this architecture various layers of data could be queried in real-time and integrated according to the needs of the day, whilst the data custodians are able to focus on managing their data in a distributed computing environment.

This type of infrastructure would allow NOO to tap into expertise already resident within both government and industry, without having to harvest data, procure technology or develop specific analytical skills in-house. Instead the specialised technology, expertise and data stay where they are best managed and NOO simply accesses services when required.

In terms of efficiencies, distributed web services encompassing distributed GIS, offers stakeholders (government and industry) a streamlined means of leveraging each other's expertise. Significantly it also provides mutual access to considerable investments that have been made by individual agencies in software development and in technology, by allowing selected pieces of an agency's business activity to be exposed over an interoperable network. Today, most government agencies lock their content and business software behind walls (physical and technological). This means that agencies that share similar business needs for specific content, and for certain types of content manipulation and portrayal software, generally develop these solutions independently and redundantly at significant cost to the taxpayer.

The distributed web services architecture calls for conformance to standards and protocols, but it does not require standardisation of in-house technology. A stakeholder agency remains free to choose its own business solutions and continues to control its internal technological environment but exposes selected content and services to the network for others to use and build upon. This not only fosters greater collaboration amongst stakeholder agencies but also creates opportunities for the business community through exploiting government-sourced content and in developing services. This is of particular importance given the Australian Government's commitment to the Spatial Information Industry Action Agenda (DISR, 2001). The Action Agenda identifies the changes that will be required to capture future opportunities for growth in the industry.

4.0 Project Requirements

4.1 Oceans Portal Functionality

The Oceans Portal application will reside on a server, hosted and administered by the NOO. The front page of the Portal will explain the purpose of the site, which is to provide access to marine-based data, information and services offered over the internet by national and international organisations. The data, information and services available through the Portal will be clearly explained in the opening window or initial interface display. As far as is practical the application should be developed from commercial off-the-shelf components or open source software.

4.1.1 Page Components

A number of standard features should be included in the Portal page structure:

- A horizontal navigation bar, perhaps containing the list of services offered by the Portal
- A logo and customised banner
- A full text search form or tool to search site contents and services that should be present on every page
- A vertical left-hand navigation panel that will allow a categorisation of certain elements of the content. Could be a place to jump off to the OBIS Regional Node pages
- Pages need to contain links to contact information, feedback, help, login and printable page
- A breadcrumb trail, to facilitate navigation in the Portal hierarchy
- A section for headlines of the latest news, articles, events and services
- A disclaimer message in the lower part of the page
- A section containing a Calendar of events which links to relevant published meetings and events in calendar form
- If not the home page, there should be a main window displaying content.

4.1.2 Customising or Updating the Portal

In developing the Portal, the application should be structured so that the dynamic presentation of content is programmatically separate from the business logic of the application. It should be relatively simple and straightforward for an administrator to modify the application. This implies the need for good within code documentation and a programmers manual.

If some functions or features within the Portal require regular updates (e.g. by running scripts once per day), this should be automated.

4.1.3 Portal Security

Security will control how users use the site and how it can be maintained and administered. It is therefore important that:

- There are some features or resources that have controlled or restricted access privileges
- A user should be prompted for authentication (via password) if he/she tries to access resources for which they do not have access privileges
- The Portal should be capable of assigning roles (users or groups of users) and permissions (access controls on specific objects)
- There should be at least four types of user: “anonymous” users who have basic permissions which would allow them to view public pages, make searches, and use some services; an “administrator” would have permission to use all facets of the Portal; a “contributor” who could execute some specific functions such as submit files, folders, HTML pages and URLs, plus have all the privileges of an anonymous user and “trusted” users who have all anonymous user privileges, plus additional permissions to specific objects
- All security features should be able to be administered by an administrator’s security console.

4.1.4 Multimedia Support

The Portal should be capable of publishing small videos from local or remote file objects in a portal page, using an appropriate multimedia player plug-in installed on the client computer. Supported formats should include Windows Media Player, Quick Time Player and Real Player.

4.1.5 Checking Remote Links

There should be a facility that allows the administrator to quickly verify if links to remote sources of information published in the Portal are still valid, without having to manually trawl all links on the Portal.

4.1.6 Automatic Notification of New Data, Features & Services

A facility should exist to allow registered users of the Portal to receive automatic email updates when new Data, Features and Services are added to the Portal. In registering, the user should be able to review and update their profile details in order to maintain currency of their contact details.

4.1.7 Portal Content & Publishing

The Portal should offer support for content to be published in folders; URLs to remote sources, HTML pages and files.

It should be possible for authorised contributors to make submissions to the site, therefore a specific set of form interfaces needs to be available to support submission of the various content types to specific locations on the site. The contributor should be able to preview his or her submission. All submissions should remain unapproved until authenticated by an administrator.

The administrator should receive notification of all pending submissions and be capable of reviewing the content and either approving or deleting the submission.

In terms of content the Portal should provide:

- access to data and products derived from the NOO-sponsored projects listed in section 1, utilising web mapping services through a web map viewer (see section 4.2.1). The functionality required of the web map viewer will be an important part of the project scoping exercise;
- links to agency-level, marine related spatial metadata systems and the Australian Spatial Data Directory; and
- dedicated pages to support the work and output of Oceans related working groups (e.g. Oceans Policy Science Advisory Group -OPSAG; Ecosystem-Based Management - EBM Working Group; National Oceans Advisory Group - NOAG).

4.2 Included Services

Web mapping services are a mandatory component of the Oceans Portal and related infrastructure development. OBIS services may be required, pending the outcome of a funding submission. Other business related services such as a one-stop-shop for maintaining and sharing marine regulatory information will be an optional future feature.

4.2.1 Web Mapping Services

Initially included geo-spatial services will be a selection of those that currently fall within the framework described by the Open GIS Consortium (OGC) as Open Web Services (OWS). OWS refers to an open standards-based online geospatial services framework that will enable seamless integration of online geoprocessing and location services. Ultimately OGC hopes that OWS will provide a vendor-neutral interoperability framework for web-based discovery, access, integration, analysis, exploitation and visualisation of geodata sources, sensor-derived information, location information, and geoprocessing capabilities (OGC, 2001).

In this project we will confine our initial implementation to what the OGC refers to as web mapping, where the Oceans Portal and potentially other clients that can access the marine registry, will be able to use content from remote Web Map Servers, Web Feature Servers, and Web Coverage Servers for the display, interaction and integration of raster, vector and image data respectively. The content to be manipulated will be data and products associated with the NOO sponsored projects listed in section 1. The Portal will also support non-mapped data delivery services where data can be acquired through the portal in a variety of specified formats (e.g. asciii text files, XML, HDF-EOS, netCDF). Other geospatial services (e.g. specific types of data filtering or modeling) will be added over time.

The Portal will treat the OWSs that it accesses as “black boxes” or operations that each perform a task, for example the task of providing a map. Since these services should have their tasks described in “metadata”, it should be possible for the Portal software to search the web for URL-addressable services and understand what tasks

those services can perform. This allows multiple services to be connected, whilst the Portal application remains independent of services' internal logic.

Figure 1 shows the relationship between the Portal application and the other necessary elements of the infrastructure.

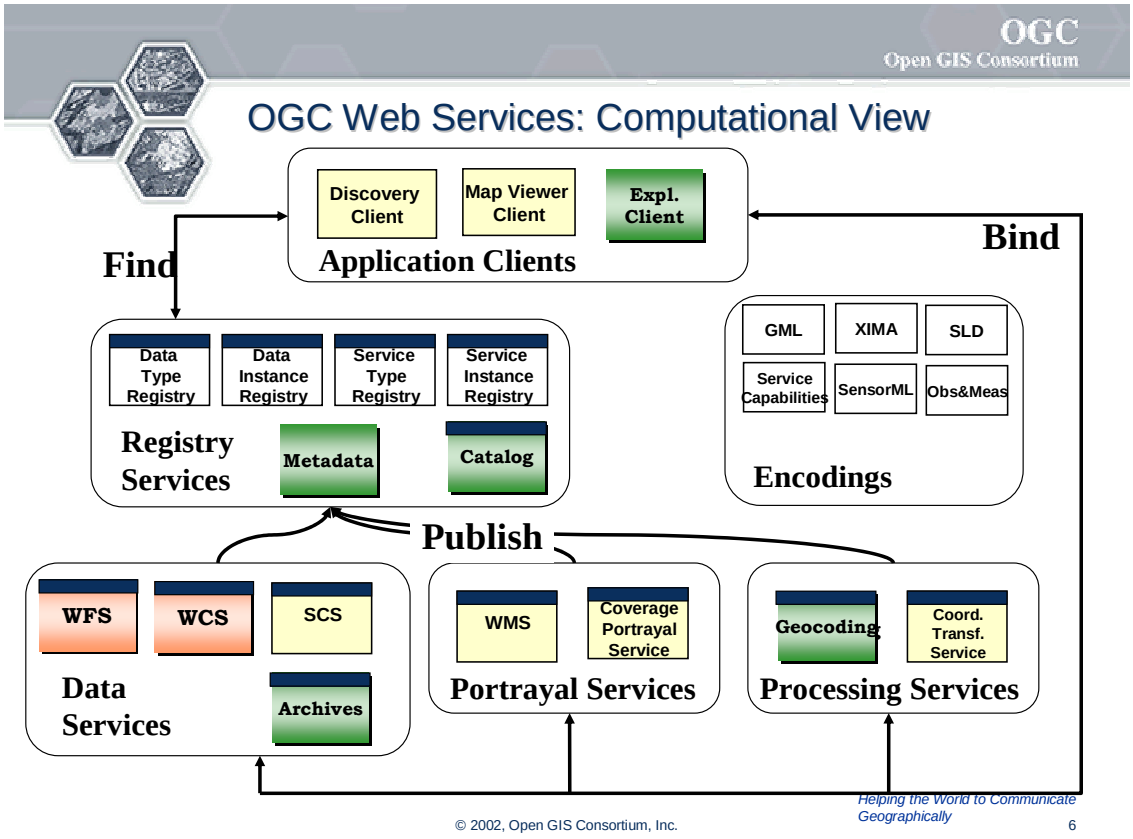

Figure 1 – OGC Web Services (Source: Carl Reed OGC, 2002(a) Presentation)

4.2.2 OBIS Services

The Ocean Biogeographic Information System (OBIS) is a web-based provider of global geo-referenced information on accurately identified marine species. The host application at Rutgers University currently accesses expert species level and habitat level databases and provides a variety of spatial query tools for visualising relationships among species and their environment. With the recent call for Expressions Of Interest for countries to host a Regional OBIS Node, Australia, through the NOO has submitted a bid which uses the Oceans Portal project as the basis for Node development.

Services offered through the Oceans Portal, should the bid be successful, will need to include access to current OBIS services, through a dedicated portion of the Portal that is badged as the Australian Regional OBIS Node. OBIS uses protocols and services such as DiGIR (Wieczorek, 2001).

4.2.3 Regulatory and Legislative Services

Whilst the focus of the initial Portal implementation will be on accessing and portraying ecological data and human use activities in the marine environment, in the longer term the Portal may be used as a gateway to nationally dispersed sources of marine regulatory or legislative information. In this regard there will be obvious links with other national spatial data initiatives such as the Marine Cadastre project (see http://www.sli.unimelb.edu.au/maritime/).

At present the NOO is compiling a comprehensive repository of information pertaining to national marine legislation, regulation and administrative arrangements. To ensure that this information is more than just a snapshot and can be updated on a regular basis, an internet-based “one stop shop” organised around a cross-jurisdictional “marine administration community of practice” may be explored to maintain information currency. The option of developing associated services such as decision-support tools that can be deployed through the Portal may also be investigated as part of future Portal enhancements.

4.3 Use of Technical Standards

The standards used will need to be consistent with the OGC vision for OWS and current OGC and wider IT industry specifications. This therefore requires that the architecture used for infrastructure development satisfies the following criteria:

- Support for many independently developed implementations of the services
- Support for many independently provided instantiations of the services
- Capability to find specific instantiations of the services based on service type, service content
- Provision of service characteristics or quality factors
- Ability to discover what services can be used with specific data holdings
- Ability to deliver services that are tightly bound to data as well as services that have no direct data content
- Capability to enable access control, security, and e-commerce on the services
- Capability to enable ad-hoc chaining of services to satisfy aggregated workflow processes

4.3.1 Architecture

Figure 2 schematically represents the type of service architecture and elements required to support the OWS vision. In this model individual services have interfaces of known types. These interface types are described in service metadata, and the service metadata are available to clients of the service via a "Get Capabilities" request. There are Catalogs or Service Registries that provide query-based access to collections of service metadata. Services provided by these Catalogs/Registries also assist in maintaining the information contained in the catalog, and the interface types form an inheritance tree of interface properties.

The IT industry registry standard for enabling businesses to publish, find and bind their services is called the Universal Description, Discovery and Integration (UDDI) specification. This specification should be used to establish the Marine Registry.

The core building block of Web services is XML, the eXtensible Markup Language. The web service is described using the Web Services Definition Language (WSDL). WSDL describes how a service is evoked and what is returned. This language currently has some deficiencies when applied to geo-processing tasks and may require some embellishment.

The communication between web services is carried out by passing XML messages wrapped in an interoperable container to allow the messages to cross different networks and use different application architectures and systems. The wrapping mechanism is known as SOAP the Simple Object Access Protocol and is best thought of as a standard sized envelope which keeps the contents of the message secure and also guarantees the message will be deliverable through a standard letterbox.

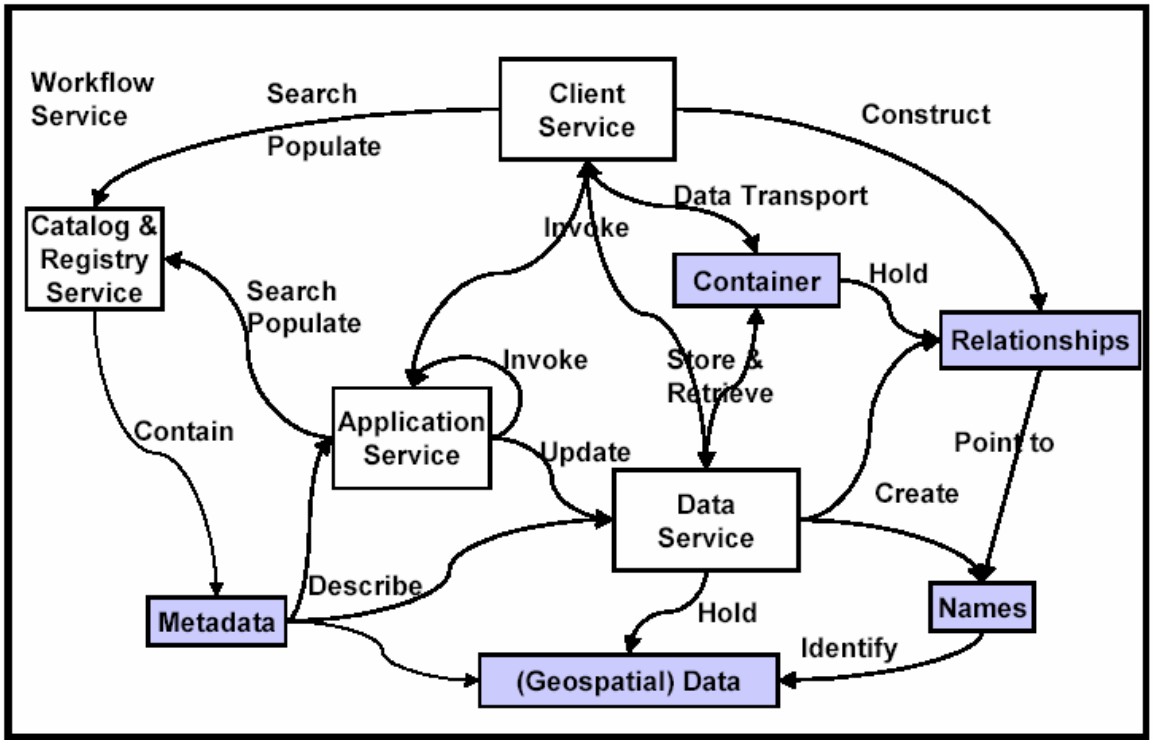

Figure 2 – Service architecture and elements required to support the OWS vision (source Carl Reed OGC, 2002(b) Presentation)

4.3.2 Service Metadata

Service metadata is information that describes a service. There is service *type* metadata and there is service *instance* metadata. In the UDDI (meta)-datamodel (see Figure 3) a *businessEntity* stores information about a service provider and contains *businessServices*. These services contain one or many *bindingTemplates* that again

store information about how to bind to the service. *tModels* have two main purposes: they define a technical fingerprint for the service (when used in binding templates) and an abstract namespace reference (when used in category and identifier bags).

With *tModels*, UDDI provides the functionality to build up classification schemas (taxonomies). Taxonomies allow for organisation of the metadata and enable a user to browse metadata descriptions by category. Particular communities can specify their own taxonomies by providing appropriate *tModels* to an UDDI Operator Node. OGC is developing a taxonomy of service types and an inheritance tree of those service types, therefore reference to this work is important in the context of Marine Registry development.

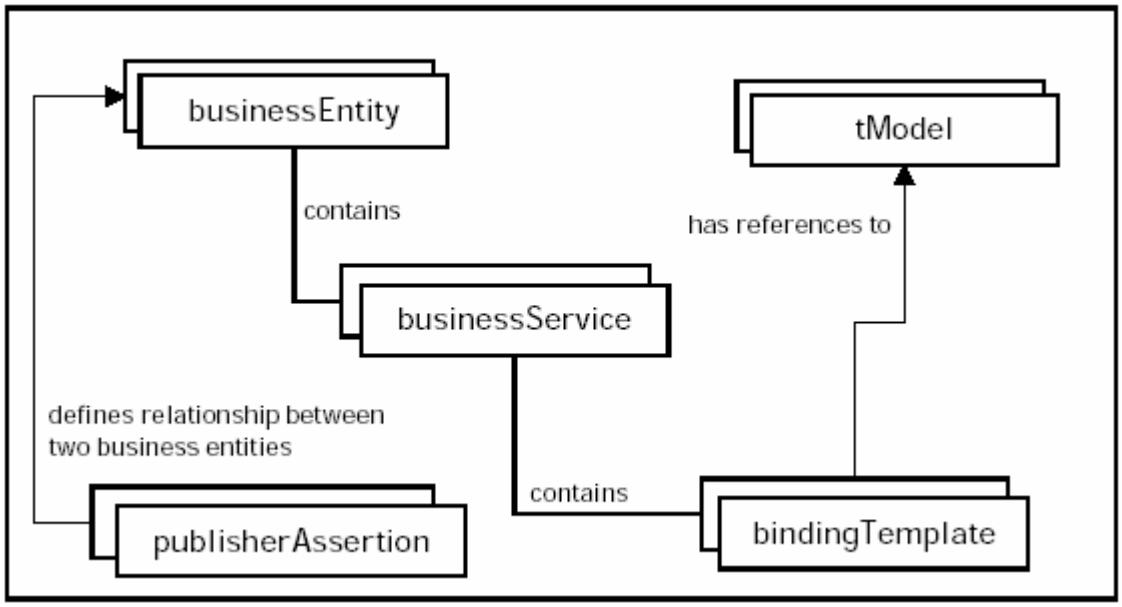

Figure 3 – UDDI (Meta)-Datamodel (source: Fig 3 – Senkler, 2002)

4.3.3 Other Geo-spatial Related Standards

Other standards that should be used in this project include:

- OpenGIS Simple Features Specification For SQL V1.1
- OpenGIS® Catalog Services Implementation Specification V1.1.1
- OpenGIS® Grid Coverages Implementation Specification V1.0
- OpenGIS® Web Map Service Implementation Specification V1.1.1
- OpenGIS® Geography Markup Language (GML) Implementation Specification V3.0
- OpenGIS® Web Feature Service Implementation Specification V1.0
- OpenGIS® Web Map Context Documents Implementation Specification V1.0

4.4 Developing Marine Ontologies

Developing (or using existing) marine-based ontologies will be an important requirement for achieving interoperability and data integration in this project. They must be developed and agreed upon by a community of users. An ontology includes a vocabulary of terms as well as specifications of their meaning. The specifications include definitions and details about how concepts are inter-related. The specifications do two things: 1) they impose a structure on a domain of knowledge and 2) they constrain the interpretation of the terms involved in the domain. An ontology can serve a variety of roles, including:

- Enabling re-use of domain knowledge by formalising concepts and relationships; They provide a shared, common understanding of a domain of knowledge;
- Supporting structured and customised searches – e.g., retrieve a description for a “tidal front” from an ontology and then compare fronts according to the values of the properties in the description;
- Using generalisation/specialisation of information – Search for “microscopic methods” and get too many answers. Instead, a search application should suggest more specific search terms, such as “microscopic methods – electron microscope”
- Consistency checking – checks to ensure that properties, values, etc. are valid;
- Providing completion – a minimal amount of information can be expanded upon by using an underlying ontology; for example, sediment quality is poor due to high PAH or metal concentrations-expect to see low biodiversity of benthic invertebrates;
- Interoperability support – a standardised vocabulary that can be used in different applications

An ontology for a sub-part of physical oceanography, for example, could include the terms “eddy, current, surface temperature, stratification” and definitions of the terms. The ontology could also include specifications of the relationships between terms such as: “current” and “eddy” with the relationship “eddy is a result of current”, with the constraint on the relationship “under conditions current at speed X cm/s, winds from the northeast at X m/s”. Fundamentally, the most important function of an ontology is that it creates a shared understanding of a particular subject area.

Once developed ontologies can provide the basis for, and improve, web searches. The ontologies are used to develop the semantic “tags” (e.g., <Principal Investigator>Neal Smith</Principal Investigator>) for coding web documents with meaning. Different languages can be used to represent the tags for the web documents. The tags then link back to an ontology (definitions of key terms, relationships between terms, and rules for reasoning about them) that is stored to help interpret the meaning of the tags for the computers and their users. As a result, ontologies can improve web searches, interoperability between databases, the integration of heterogeneous data from multiple sources, and be used for data mining (Gulf of Maine Project, 2002).

4.5 Registry Development & Management

The Marine Registry will need to be hosted and maintained as a stable and central component of the proposed infrastructure. Expressions of interest to host such a service will need to be sought amongst stakeholder agencies. It is anticipated that NOO will fund the Registry development and potentially purchase any required software and a suitable hosting platform. The host agency will, however, need to agree to ongoing maintenance and administration as a service on behalf of stakeholder agencies.

To develop the Registry, NOO will acquire appropriate technical expertise through a tender or select tender process, after the project has been fully scoped.

4.6 Content & Data Access Policies

To be successful, the project will need to have a high degree of co-operation amongst the project participants and agreement must be reached on issues such as data access. Fortunately many of the bioregionalisation outputs that will form the basis of this project, to a large degree have already been agreed upon through contracts with NOO. What is less well defined is how the resultant data and products will be physically managed by the custodial agencies and made publicly accessible.

Whilst all existing contracts specify that NOO must be provided with a copy of the data and the products for archiving purposes, the individual bioregionalisation project contracts have generally tried to encourage custodians to offer the project output for listing on the National Fundamental Data Schedule (http://www.osdm.gov.au/osdm/schedule.html) and to abide by the ANZLIC Data Custodial Guidelines (ANZLIC, 1998). NOO has assumed that in signing the contracts, project proponents have agreed implicitly to manage the data and the products on an ongoing basis after the completion of the project.

The step that is now required, which is beyond the scope of the original bioregionalisation project contracts, is for the custodians to come together to agree on how they could expose (serve) the data and products derived from the bioregionalisation projects, over the web in conformance with the requirements outlined in this document, whilst still utilising their own in-house IT systems. It is understood that each custodian may require some assistance and additional resources to take this step.

4.7 Project Management

It is anticipated that the consultant contracted to develop the technical specification of the Oceans Portal will provide ongoing technical advice for the portal implementation. The Consultant will be managed by the NOO Chief Information Officer.

It will be necessary from time to time to bring technical experts together from the co-operating agencies and this will be managed and resourced by NOO.

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Appendix A: Current Project Providers (Bioregionalisation)

Sediments Project - Geosciences Australia (August 2003 – August 2004)
NOO Contact Officer: Adam Jagla

Key objectives for this project are:

- to identify, as far as possible, sources of marine sediment sample information held by Australian and international research groups and private, corporate entities that are available to be entered into a national seabed sediments database;
- to collate, analyse and map an agreed selection of the identified sediment data held Australia-wide as a key information input to bioregionalisation;
- to collate, analyse and map readily available sediments data for the Northern Regional Management Planning Area as a first priority to provide information for the Northern Region bioregionalisation;
- to populate a National Marine Sediments Database (MARS) with data collated.
- to detail in maps estimates of sediment mobilisation due to waves and tidal currents on the Australian continental shelf to aid bioregionalisation;
- to interact with the National Bioregionalisation Integration project teams to ensure sediments and other seafloor characteristics information is applied correctly in the benthic Bioregionalisation; and
- to strategically analyse the role of sediments and other seafloor characteristic information in marine Bioregionalisation and, based on an assessment of relative benefits, recommend options for further research and data collection.

Listed outputs include:

- A collation of data from various custodial sources to populate a centralised database MARS, housed within GA.
- Map products generated from data in the MARS database including:
    - Coverages of mean grain size and sorting
    - Covergaes of carbonate, mud, gravel, sand
    - Coverages of sediment type
    - Gridded grain size maps for input to GEOMAT (a model)
    - Coverages of all available data with depiction of level of “uncertainty” for all maps
- Estimates of sediment mobility due to tidal currents and swell waves (output from GEOMAT)
- Web accessible information in particular, all maps.

Demersal Fish Project – CSIRO Marine Research (May 2002 – May 2004)
NOO Project Manager: Miranda Carver

Key objectives for this project are:
- Validate national datasets for demersal fishes on the continental shelf and the slope from 40 m depth to the edge of the Australian EEZ, including critical information on geographic and depth distributions of species
- Use these data to produce provincial and biomic (Level 1 & 2) regionalisations of the Australian EEZ beyond the coastal zone

Listed outputs include:

- Taxonomic validation of species data held in various agencies (mainly museums)
- Collated data including geographic and depth distributions of species and an estimate of data reliability
- Working towards distributed species databases in line with related national data management initiatives by May 2004
- Web-based distribution maps
- Constructing a database of demersal shelf and slope species
- Metadata compilation – cruise, survey track, gear-type, location of data and whether or not it has been digitised

Bathymetry Project – Geoscience Australia (Completed)
NOO Project Manager: Miranda Carver

Objectives
- To add new bathymetry data points generated by the RAN Hydrographic Office to the GA bathymetry database for the continental shelf area to supplement data already entered from shelf, slope and rise to develop a consistent, high quality bathymetric data grid in the Australian marine region.
- To prepare the bathymetry data so that it is available to be integrated into computer sediment model (GEOMAT).
- To prepare the bathymetric data grid so that it is available to be used in the bioregionalisation of the Australian marine region.
- To define geomorphic units on the basis of expert interpretation of morphology and geological origins.
- To prepare the geomorphic units and associated descriptions so that they are available to be used in the bioregionalisation of the Australian marine region.

Listed outputs include:

- High resolution (250m cell) bathymetric grid (in BIL format) which can be imported into ARCINFO, plus an ARCINFO coverage that can be imported into ARCVIEW.
- Text file of grid, 1 record per line (comma separated)
- Coloured images and fly-throughs– generated from Bathymetric Grid

- Map of bathymetry coverage and type of bathymetry data for Northern Regional Marine Plan area
- Geomorphic units as ARCINFO polygons
- Slope, aspect and drainage maps in ARCINFO format

Oceanography Project – Yet To Be Negotiated

NOO Contact: Miranda Carver

Possible outputs include:

- Data types expected include: salinity; temperature, plankton biomass, nutrient levels and current patterns. Could be static maps and moving pictures.
- Anticipate interpreted GIS layers, possibly static maps but these will need to depict areas of high temporal variability.

Invertebrate Project(s) – Yet To Be Negotiated

NOO Contact: Vicki Nelson

Possible outputs include:

- Compiled data on cephalopods, decapods (prawns, lobsters, crabs, stomotapods and anomurans) and sponges
- Data from museums and other catalogues from continental shelf and slop > 40m. Cephalopods and decapods will be described for whole Australian Marine Jurisdiction, sponges for Northern Regional Marine Planning Area only
- Data from state agencies will be made publicly available as a range of products and may be used for updating the Australian Biodiversity Information Facility (ABIF)

Appendix B – Membership of Bioregionalisation Working Group

- Mr Colin Creighton, Director, CSIRO – Healthy Countries (Chair)
- Mr Peter Bosworth, Senior Investigative Officer, Department of Primary Industry, Water and Environment, TAS
- Ms Patricia vonBaumgarten, Marine Advisor, Department of Environment and Heritage, SA
- Dr Rob Coles, Senior Research Scientist, QLD Fisheries Service
- Dr Bob Creese, Principal Conservation Scientist NSW Fisheries
- Mr Ian Cresswell, Assistant Secretary, Marine Branch, Marine and Water Division, Environment Australia
- Mr Jon Day, Director of Biodiversity Conservation and World Heritage, Great Barrier Reef Marine Park Authority
- Dr Peter Doherty, Senior Research Scientist, Australian Institute of Marine Science
- Mr Don Hough, Manager, Marine Strategy Section, Department of Natural Resources and Environment, VIC
- Dr Sam Nelson, Research Manager, Australian Fisheries Management Authority
- Mr Chris Simpson, Manager, Marine Research, Department Conservation and Land Management, WA
- Dr Rob Taylor, Senior Conservation Management Officer, Parks and Wildlife Service Department of Infrastructure, Planning and Environment, NT

Appendix C – Project descriptions

Mapping of Non-fisheries uses

This project will involve collecting and collating marine datasets of various standards and formats into a set of products for the National Oceans Office. These products will be made accessible to other users of the marine environment. The datasets that will form the main basis for this project currently reside with State and Commonwealth agencies and possibly with some private organisations and scientific research agencies. Outcomes from this project will include digital as well as paper maps. This project is being completed by Spatial Vision Pty Ltd.

NOO Project Manager: Alicja Mosbauer

Mapping of fisheries uses

The mapping of fisheries uses is being completed by the BRS and is being partially sponsored by the FRDC. This project has two streams.

Stream 1: Strategic National Marine Fisheries and Aquaculture Data. This stream involves the development of the strategic plan (but not the implementation of that plan). This Stream will also include a single national fisheries data collection exercise.

Stream 2: Fisheries and Coastal Communities Assessment. Analysis of fisheries adjacent coastal communities and the links between.

NOO Project Manager: Alicja Mosbauer