



PROJECT PERIODIC REPORT

Publishable summary

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Publishable summary

IMARINE CONTEXT & OBJECTIVES

Today, scientists need complex models to analyse multidisciplinary data in diverse formats and with wide temporal and spatial scales, highly demanding computing and virtual organisations supporting collaborative work. Biodiversity scientists and policy-focused organisations are no exception. These different specialists need to accelerate discovery and analysis to meet Ecosystem Approach (EA) policy making and management challenges. iMarine (www.i-marine.eu) provides a cutting-edge open e-infrastructure that is user-friendly and fully transparent designed to support a wide variety of specialist communities. By coming together in a single “community of practice” (CoP), sharing data and knowledge within iMarine, they can collectively develop tools and information to advance the adoption of an ecosystem approach for the integrated management of the marine living resources.

The overarching objective of iMarine is to support the application of the principles of the EA to fishery management and conservation of marine living resources through the establishment and operation of a data e-Infrastructure and, in so doing, to facilitate the emergence of a unified EA-CoP. Instrumental in the work of iMarine towards the above goal is the establishment of a rich set of collaborations with other EU and international organizations, initiatives, and projects as well as national centres of excellence. Existing policies, technologies, and e-Infrastructures will be reused and rendered interoperable by iMarine. By leveraging these collaborations and by taking advantage of additional funds that some of these organizations are willing to invest in the project activities, the number of resources available to the entire effort will be maximized, the e-Infrastructure deployment process will be quickened, and the overall cost of building and operating the infrastructure will be reduced.

To achieve its main goal, iMarine has established three main objectives dedicated to the development of the e-Infrastructure and a complementary one addressing the communication and dissemination of the project outcomes.

IMARINE ACTIVITY AND MAJOR RESULTS TO-DATE

POLICY DEVELOPMENT

An important part of the development of a data e-Infrastructure is the definition of its regulating policies. The main instrument put in place to achieve this goal is the iMarine Board, a board comprising info system specialists, managers-“mediators” between users and technologists, and representatives of data-holding institutions involved in EA. This Board is supported by a subsidiary body, called the iMarine Advisory Council, comprising high-level representatives of selected EA initiatives. The primary goal of these Boards is to define the data e-Infrastructure governance model, with a sustainability focus, and to formulate a set of organizational and technological policy recommendations regulating the management and operation of the e-Infrastructure, the development and deployment of its services and the resources sharing and their usage.

Major achievements

The iMarine Board was established at the beginning of the project (Nov 2011) and it consists of a core set of influential partners who collaborate closely with the project for the development of an e-Infrastructure supporting the principles of the Ecosystem Approach. to the Board focuses on three main business cases: “Support to implementation of the EU Common Fishery Policy”, “Support to FAO’s deep seas fisheries programme”, “Support to regional (Africa) LME pelagic EAF community”.

A first version of a Data Access and Sharing policy document was reviewed and commented by the Board. Although this document should converge towards an approved and frozen version at the end of the project, it is of a living nature and it is expected to flexibly evolve to adjust to new identified needs and solutions. These documents, which will be completed by a software sharing policy document, will regulate the EA-CoP provision and usage of resources.

The Board also made preliminary steps toward the definition of a governance model with a sustainability focus, an activity that will be reinforced during the second period / half of the project.

The Board decided to organise the analysis of shared requirements around four clusters: “statistical data”, “biodiversity”, “geospatial”, and “semantics”. In each of the identified clusters an effort was made to identify needs and novel technologies offering harmonization and cross-domain analysis. The result of this activity largely influenced the technological development both in terms of functionality to be provided and standards to be supported. The Board was also instrumental in the establishment of links with other e-Infrastructures in lieu of future closer collaboration, such as AgInfra in the semantic domain, with FAO and EUROSTAT in the statistical domain, and UNESCO and FIN in the biodiversity domain. Under *iMarine Board* guidance, iMarine services now potentially contribute to an entire ecosystem of e-Infrastructures, where iMarine not only contributes data and services, but also offers a platform for data policy development that is difficult to find elsewhere.

DATA E-INFRASTRUCTURE MANAGEMENT AND OPERATION

In order to meet its aim the data e-Infrastructure will be operated, monitored, and maintained as a 24/7 service based on the policies established by the iMarine Board. It will supply services capable of supporting the typical business cases that arise in applying the EA approach. In particular, a selected number of business cases will be supported in the course of the project by deploying appropriate VREs. These range from statistical management of socio-economic data, including data on aquatic ecosystems and monitoring of vessels, fleets, and activities, to management, transformation, and visualization of different types of marine biodiversity data including species data and taxonomies.

CoP members will be able to exploit these facilities on-demand either programmatically or through innovative applications. The e-Infrastructure is expected to provide these services by leveraging services provided by other existing e-Infrastructures.

Major achievements

Detailed planning of resource contributions was performed in the early phases of the project together with the definition of e-Infrastructure regulating policies and procedures. The planning included the definition of the resource contribution from each partner, not only in terms of hardware and software but also in the definition of the appointed resource managers and members of the Infrastructure support team. The e-Infrastructure software was upgraded in order to deploy modifications and enhancements (six releases deployed) and reallocate resources (two VOs dismissed). New e-Infrastructure monitoring and accounting tools were developed and deployed.

Access points to the infrastructure VREs, the iMarine (<https://portal.i-marine.d4science.org/web/guest>) and D4science.org (<http://www.d4science.org/web/guest>) gateways, were installed. The number of operated VREs was increased during the reporting period by deploying two new VREs (VME-DB and BiodiversityResearchEnvironment) and a number of Apps (publicly accessible VREs)

Major VREs currently available to iMarine visitors are:

- **Biodiversity Research Environment:** Searching for species data (including occurrence points and taxonomic information) seamlessly across heterogeneous data providers and supplying facilities for processing and visualising them.
- **Ecological niche modeling:** Generating distribution maps of marine species that show the potential impact of global climate change on marine biodiversity, using biogeography forecast modelling.
- **Integrated Capture Information System (ICIS):** Integrating regional and global capture and distribution information of aquatic species to improve the quality of worldwide catch statistics.
- **Vessel Transmitted Information Tool (VTI):** Delivering geospatial products that combine information on vessel activity and environmental conditions for scientists working in fisheries, marine resources assessment and marine ecology.

A plan governing the VRE development was defined since the early phases of the project. It led to the operation at the end of the reporting period of 14 of such cooperative environments aiming at serving various scenarios involving more than 350 users.

The Graphical User Interfaces facilitating end-users in exploiting e-Infrastructure facilities were enhanced with respect to those available in gCube at the beginning of the project. In particular, core user interfaces, like the one serving the Workspace usage, were enhanced and new ones, e.g. Species Products Discovery, were developed and released.

All the improved and newly developed software components, which now are part of the new gCube system, were integrated, tested, validated by relying on procedures, quality measures and tools that were defined at the beginning of the project. To support these processes, a new testing e-infrastructure was set-up and updated with latest versions of gCube services. It was used to run deployment tests during integration of the new system releases

At the beginning of the project, the Maven tool was chosen as the best for building and releasing gCube components, All the procedures and tools for gCube component's building were updated to work with this new solution.

Finally, liaisons with other initiatives willing to exploit the gCube technology for deploying and operating Virtual Research Environments were established and as a result it is used to serve the EUBrazilOpenBio project and it has been deployed as enabling system for an infrastructure operated by ISOFT/NAS (Ukraine).

SERVICE ENRICHMENT AND DEPLOYMENT

The extent to which a data e-Infrastructure succeeds as an application platform for a Community of Practice is largely dependent on the tools and services that it makes available to develop and execute the broad class of applications for which it is intended. For the e-infrastructure supporting the iMarine community the target applications are those required to implement the EA, and thus to execute, collate, access, integrate, annotate, transform, search, curate, and publish a variety of data types, including statistics, biological records, environmental observations, and semantic structures. This functionally rich e-Infrastructure will be obtained by integrating and enriching a large number of technologies across the services and tools of gCube, an open software system developed in the framework of other EU funded projects.

Major achievements

The following major technical achievements can be highlighted:

- **The Species Products Discovery service has been designed and developed** to provide users with seamless access to species data across heterogeneous yet fundamental providers including GBIF, OBIS, Catalogue of Life, WoRMS, and ITIS. Via such a service it is possible to discover occurrence records and taxa names along with a comprehensive set of metadata characterising such information objects.
- **Data Storage facilities have been revised.** In particular, a new system has been developed. This system supports the efficient and scalable storage of files by offering a unified interface and by relying on multiple storage facilities including MongoDB.
- **Data Transfer facilities have been enhanced.** A new framework supporting the efficient transfer of files and tree-oriented objects has been designed and developed to support a point-to-point transfer. Transferred objects are exposed through HTTP.
- **The Google-like Data Discovery mechanism has been reinforced** to deal with a comprehensive set of information objects in a seamless way as well as to enhance the results presentation towards dynamic clustering;
- **A new framework offering a comprehensive set of statistic-oriented data crunching facilities has been designed and developed.** Such a framework offers a number of off-the-shelf algorithms and techniques for data mining and for implementing these processes by relying on the distributed computational facilities offered by the infrastructure.
- **The data visualisation facilities have been reinforced.** In particular, a GIS-oriented visualisation service has been developed to simplify the discovery and visualisation of various maps generated by other activities and stored in the infrastructure.

COMMUNICATION, DISSEMINATION AND TRAINING

The whole project is largely based on a cross-disciplinary and community-centric approach. In order to foster interest and cohesion between the members of the CoP appropriate communication, dissemination and training activities will be put in place. These activities will leverage and expand on partner networks by forging strategic alliances in Europe and globally.

Major achievements

Intense activity was performed to set the basis for successful dissemination, communication and training. This activity initially leveraged on the D4Science long tail to stimulate the interest of the public and leverage on the momentum built by D4Science as well as focussing on the promotion of the iMarine Science Gateway and the iMarine applications. Highlights of these activities are the generation and publication of 3 peer-reviewed papers, over 24 articles printed in on-line media promoting iMarine, iMarine actively presented at / contributed to 11 events of which 4 Policy-oriented, 4 ICT-oriented and 3 Community-oriented events, an on-line community counting over 140 members, 5eNewsletters sent to the dissemination & communication database of 360 contacts.

IMARINE INITIATIVE EXPECTED FINAL RESULTS & POTENTIAL IMPACT AND USE

By enabling integration and management of data and software resources across information system administrative boundaries, iMarine allows actors at all Community of Practice levels (from software developers, to data managers, to scientists) and across various disciplines to collaborate in cost effective ways, for the delivery of enhanced science-based data processes which serve ever demanding policy goals of the Ecosystem Approach.

Fundamentally iMarine strives to deploy:

- Dedicated tools for science-based policy making;
- Policy development for a sustainable iMarine future;
- Specialised services for scientific research.

By delivering on its promises iMarine will facilitate policy makers to address the global challenges impacting on the marine ecosystem, the fisheries sector, local economies and communities.

WHO IS BEHIND IMARINE?

iMarine management is jointly carried out by two individuals:

- Philippe Rohou – Administrative and Financial Director, and contact point to the European Commission
- Donatella Castelli - Project Director & Scientific / Technical Coordinator

More information about the project can be found on the project Website: <http://www.i-marine.eu>

Thirteen contractors participate in the project activities:

