

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

**Nineteenth Session of the IOC Committee on International Oceanographic Data and
Information Exchange (IODE-XIX)**
Trieste, Italy, 12-16 March 2007

**PROJECT DOCUMENT FOR THE ESTABLISHMENT OF THE
OCEAN DATA AND INFORMATION NETWORK FOR THE
BLACK SEA REGION
(ODINBLACKSEA)**

(submitted by Atanas Palazov, Bulgaria and Nick Mikhailov, Russia)

1. INTRODUCTION

The IOC's International Oceanographic Data and Information Exchange (IODE) is established to enhance marine research, exploitation and development by facilitating the exchange of oceanographic data and information between participating Member States and by meeting the needs of users for data and information products. The main objectives of the IODE Programme are: (i) to facilitate and promote the exchange of oceanographic data and information; (ii) to develop standards, formats, and methods for the global exchange of oceanographic data and information; (iii) to assist Member States to acquire the necessary capacity to manage oceanographic data and information and become partners in the IODE network; (iv) to support international scientific and operational oceanographic programmes of IOC and WMO and their sponsor organizations with advice and data management services.

Recognising that the lives of at least 160 Million people are profoundly influenced by the Black Sea and considering that all riparian countries depend to a large extent on marine and coastal resources, the ability to acquire, manage, archive and disseminate data, as well as the capacity to generate products and services in support of decision making and management of the Sea and Coastal Zones is of vital importance. The Ocean Data and Information Network for the Black Sea Region (ODINBLACKSEA) Pilot Project is proposed to respond to these needs through: (i) providing assistance in the development, operation and strengthening of National Oceanographic Data (and Information) Centres and to establish their networking in the region; (ii) providing training and education in marine data and information management, taking into account the requirements of operational oceanography; applying standard formats and methodologies as defined by the IODE; (iii) enhancing national and regional awareness for Marine Data and Information Management; (iv) assisting in the development and maintenance of national and regional marine data, metadata and information databases; (v) assisting in the development and dissemination of marine data and information products and services, meeting the needs of user communities at the national and regional levels, and responding to national and regional priorities; (vi) undertaking the ODINBLACKSEA activities in close collaboration and networking with other relevant organizations, programmes and projects operating in the

Black Sea region; and (vii) undertaking the above activities applying modern technologies for data collecting, processing, storing and disseminating.

In addition, ODINBLACKSEA will satisfy the requirements of the other IOC programmes (e.g. BlackSeaGOOS), as well as other organizations (e.g. Commission on Protection of the Black Sea against Pollution, Black Sea Economic Cooperation), programmes and projects (e.g. BSERP, ASCABOS, SeaDataNet, BlackSeaScene, ECOOP, SESAME, ESONET) active in the region, in terms of capacity building, and management and exchange of oceanographic data and information.

Development and implementation of the ODINBLACKSEA project will be based on the success and lessons learnt from the other IODE ODIN projects, in particular, ODINAFRICA, ODINCARSA (Caribbean and South America region) and ODINCINDIO (Central Indian Ocean region). First the ODIN idea was implemented in the IOCINCWIO region as from 1996 when the IOC, with funding from the Government of Flanders, started the development of the Ocean Data and Information Network for Eastern Africa (ODINEA). The innovative model of these project was the linking of provision of equipment, training and operation support in a regional context. The ODIN projects focus on building capacity at the national level and the development of products and services at the national and regional scale. Training courses are organized at the regional level and follow-up support by a training consultant is provided. It is worth noting that all ODIN networks are now being developed in close collaboration with GOOS (and other programmes). An excellent example is ODINAFRICA III, which has been developed as a cross-cutting project involving data collection (GOOS), data and information management (IODE), and product/service development (GOOS, ICAM).

The ODINBLACKSEA proposal was discussed first in the frame of SIBEMA project. The idea was supported by Dr. Patricio Bernal, Executive Secretary of IOC, and discussed in details through electronic communications with all IODE national coordinators in the Black Sea region. They agreed that ODINBLACKSEA should become a capacity building instrument for further development of NODC structure in the region and will support BlackSeaGOOS and other regional initiatives. All of them expressed their support for the establishment of ODINBLACKSEA (see Appendix 1).

2. CURRENT STATUS

Black Sea is a semi-closed basin with very vulnerable ecosystem, which is recovering during the last years after the big degradation in 70s and 80s of twenty century. Therefore to acquire, manage, archive and disseminate both historical and operational data is of crucial importance for understanding the ecosystem changes and preventing further degradation. A huge amount of oceanographic data for the Black Sea is now stored mainly in riparian countries. To make this data available to both scientific community and general public is a challenge which could generate significant added value.

In other hand the state of regional NODCs is quite unbalanced. The status of data and information management varies significantly from one country to another. On the one pole is Russia with advanced NODC and WODC in Obninsk and on another Georgia and Romania that do not have well established NODCs. In the same time, Bulgaria, Turkey and Ukraine take an intermediate position having comparatively well developed NODC collecting data in organised databases and providing certain products. All riparian countries are represented in the IODE system with national coordinators on data management.

At this stage the following countries and organisations are involved in ODINBLACKSEA initiative (in alphabetical order):

- **Bulgaria** – Bulgarian National Oceanographic Data Centre (BGODC), Institute of Oceanology – Bulgarian Academy of Sciences;
- **Georgia** – Tbilisi State University;
- **Romania** – National Institute for Marine Research and Development "Grigore Antipa";
- **Russia** - All-Russian Research Institute of Hydrometeorological Information – World Data Centre (RIHMI-WDC), Federal Service of Russia for Hydrometeorology and Monitoring of Environment;
- **Turkey** - NODC-Turkey, Office for Navigation, Hydrography and Oceanology;
- **Ukraine** – Marine Hydrophysical Institute, National Academy of Sciences of Ukraine.

3. PROJECT OBJECTIVES

OBJECTIVE 1: Provide assistance in the development, operation and strengthening of National Oceanographic Data (and Information) Centres to advance the level of less experienced data centres and to establish their networking in the region;

OBJECTIVE 2: Provide training and education in *marine data and information management*, taking into account the requirements of operational oceanography; applying standard formats and methodologies as defined by the IODE;

OBJECTIVE 3: Enhance national and regional awareness for Marine Data and Information Management;

OBJECTIVE 4: Assist in the development and maintenance of national and regional marine data, metadata and information databases;

OBJECTIVE 5: Assist in the development and dissemination of marine data, information products and services, meeting the needs of user communities at the national and regional levels, and responding to national and regional priorities;

OBJECTIVE 6: Undertake the activities needed for applying modern technologies for data collection, processing, storing and dissemination to achieve end-to-end data management (E2EDM).

OBJECTIVE 7: Undertake the ODINBLACKSEA activities in close collaboration and networking with other relevant organizations, programmes and projects operating in the region.

4. ACTIVITIES DESCRIPTION

The activity descriptions below are preliminary and can be modified by the Project Steering Committee.

OBJECTIVE 1

1.1 Provision of expert support for improvement of NODCs' structure in the Black Sea region

National experts will work in close collaboration with IODE experts to improve NODCs' structure in the Black Sea region aiming to meet IOC-IODE requirements and best practices.

Expected result: Strengthen the structure of existing NODCs and DNA in the Black Sea region.

1.2 Provision of operational support for newly established NODCs

Provision of startup hardware/software NODC for newly established NODCs. This will be a standard equipment and software package. This should be justified by a relevant document describing the planned use of the hardware/software. Some support may be provided for operational expenses (communication, Internet access, office supplies). It is recommended that the cost be covered by the national sources.

Expected result: Pre-operational NODCs.

1.3 Setting up the Project office

- Project office could be set up in one of the participating countries. The main function of the office will be to support day-to-day activities of the project. Hosting country is expected to support functioning of the office, providing of startup hardware/software, communication, Internet access, office supplies etc. Extra funding will be searched to employ a project technical secretary. It is recommended to set up the office in the project Coordinator's country.

Expected result: Project office set up.

OBJECTIVE 2

2.1 Participation in basic level data management training course

These data management training courses should be attended by the staff of newly established NODCs and low experienced staff of the other ones with the support of IODE.

Expected result: Increased expertise of the NODCs' staff.

2.2 Participation in advanced level data management training course

These training courses will cover advanced oceanographic data management with special emphasis on new technologies and operational oceanography with the support of IODE.

Expected result: Increased expertise of the NODCs' staff.

2.3 Participation in specialized training courses (remote sensing and GIS application)

The IODE experience will be used for implementation of high level advanced training courses;

Expected result: High level expertise transferred to the Black Sea specialists.

2.4 Operational oceanography training, provided by top experts

With the support and collaboration with BlackSeaGOOS and IODE a basic course on Operational Oceanography will be organized for the specialists from regional NODCs (ASCABOS training program).

Expected result: NODCs will obtain expertise on Operational oceanography.

OBJECTIVE 3

3.1 Support to enhance national awareness

To enhance awareness about the importance of oceanographic data and information management, NODCs will develop a number of promotional products such as brochures, posters, newsletters etc in local language. The NODCs will also organize national awareness workshops for data and information users.

Expected result: Enhanced national awareness and increased institutional and public support.

3.2 Development and maintenance of project web site

In order to assist the coordination of project activities, as well as to create awareness and to promote the project, an ODINBLACKSEA project website will be developed. It will be hosted and maintained by the Project Office.

Expected result: ODINBLACKSEA web site set up. Spotlighting the project activities.

3.3 Development of electronic newsletter

In order to promote project activities and raise awareness amongst users for the achievement of the project an electronic newsletter will be prepared and issued at least twice a year. It will contain user oriented information. This product will be issued by the Project Office.

Expected result: Keep the users informed on ODINBLACKSEA activities.

3.4 Development of regional awareness tools

In order to create awareness in the participating countries and international bodies for the ODINBLACKSEA projects a number of promoting products will be developed and distributed. These will include brochures and posters. They will be prepared by the Project Office and distributed through the participating NODCs and by Project office to international organization.

Expected result: Promoting ODINBLACKSEA activities.

OBJECTIVE 4

4.1 Repatriation of data collected by other countries

A number of research cruises and/or research activities have been carried out in the EEZs of participating countries by foreign research vessels and scientists. Often these data have not been provided to the countries where the data were collected. The project will organize the digitization (as necessary) and repatriation of such data to the region. This will be done through the different project. The task will be implemented jointly by the WDCs Oceanography.

Expected result: Completing the national data collections.

4.2 Data archeology and recovery

A significant volume of oceanographic data in Black Sea countries are still on hard copy. The project will organize digitization, quality control and proper description of these data in order to include them in national collections. For implementing this task corresponding funds should be acquired.

Expected result: Recovered data from hard copies.

4.3 Development and updating of national metadatabases (NODC)

In order to ensure the best possible knowledge on data sets available within the region, cooperating institutions will be requested to develop national oceanographic metadata bases. Where they exist cooperating countries will be requested to ensure that they comply with the agreed upon international standard for metadata bases. It is recommended that the cost be covered by the country.

Expected result: Updated national metadatabases.

4.4 Development of national oceanographic databases

In order to ensure the best possible preservation and utilization of the oceanographic data available within the region, cooperating institutions will be requested to develop national oceanographic data bases, where they do not exist. Advanced NODCs will assist less experienced in creation of national databases. Related cost will be covered mainly by the country. Additional financing will be sought from other sources.

Expected result: Set up of national oceanographic databases.

4.5 Development of national experts database

In order to ensure awareness at the national level of the expertise available at the national level it is recommended to develop national experts database. This information will be valuable for all stakeholders to identify relevant experts to deal with specific issues and avoid continued reliance on external experts when local expertise is available. IOC-IODE is providing such tool (OceanExpert).

Expected result: Increased visibility of national expertise. Database containing information of national experts in oceanography.

OBJECTIVE 5

5.1 Support for elaboration of concept of data products

To enhance utilization of the existing oceanographic data it is recommended NODCs to prepare concept for information products and services corresponding to the end user needs. To this end, users' requirements in each country should be investigated. It is recommended that the cost be covered by the country. ODINBLACKSEA jointly with IODE and GOOS will organize workshop on this issue.

Expected result: Concept of data products.

5.2 Development of user oriented data and information products

The most important activity of NODCs and NOICs is the development of user products and services: data and information centres cannot be isolated data or information archives but must operate in a continuum that responds to issues and to short-term or long-term environmental/climate problems. As such research needs to respond to issues defined by decision makers and other stakeholders. The research implemented will generate data and information that will be managed by the NODCs and NOICs. They, in close cooperation with the research community, will develop products and services that can be provided to the decision makers and stakeholders to respond to the original issue/problem. It is recommended that the cost be covered by the country.

Expected result: End-user oriented products and services.

OBJECTIVE 6

6.1 Setting E2EDM technology as a basis of ODINBLACSEA

The “end to end” data management (E2EDM) system is considered as the coordinated and inter-connected combination of the following basic components: the ocean and marine meteorological data management systems (local data system systems) which are operated and being developed under various ocean study programs and services; the integration technology as an “umbrella” that comprises local data systems and provides communication and “transparent” interaction between metadata, data and products resulted from these local data systems and also an end-user access to any data and information generated by systems.

The goal of this E2EDM technology is to integrate the non-homogenous local data systems into unified distributed marine data system, that will provide the transparent exchange between these local systems and a end-user access to numerous data flows/sets/bases in a “single stop shopping” manner. The E2EDM technology should provide the real-time access to, and fusion of distributed marine data:

(For more detailed information see **Appendix 2**)

Expected result: E2EDM products and services available for the Black Sea region.

OBJECTIVE 7

7.1 Promoting project activities among possible collaborators in the Black Sea region

Communication will be set up to promote ODINBLACKSEA activities among other relevant organizations, programmes and projects operating in the region.

Expected result: Setting up regional relations

7.2 Preparation and signing of formal documents for collaboration

Relevant documents for collaboration will be signed between ODINBLACKSEA and other relevant organizations, programmes and projects operating in the region.

Expected result: Signed documents for collaboration

7.3 Collaboration and coordination

Activities of the ODINBLACKSEA will be coordinated and performed in collaboration with all other relevant organizations, programmes and projects operating in the region.

Expected result: Coordinated project activities

5. ORGANISATION AND MANAGEMENT

The project will be directed, monitored and supervised by the Project Steering Committee. Members of the Project Steering Committee are IODE national coordinators from Black Sea countries. It is recommended that the Steering Committee will meet once a year. Project Coordinator will be elected by the Steering Committee and will manage day-to-day activity of the project.

It is recommended to set up project office equipped with all needed communication tools to support everyday activities.

6. FUNDING

The activities of ODINBLACKSEA project will be funded by:

- participating countries;
- IOC – 5000\$ to support Project Steering Committee meeting;
- projects;
- donors.

7. Requested Actions from the Committee

The Committee is requested to:

- Comment on the PROJECT DOCUMENT FOR THE ESTABLISHMENT OF THE OCEAN DATA AND INFORMATION NETWORK FOR THE BLACK SEA REGION (ODINBLACKSEA)
- Adopt the Recommendation IODE-XIX/??

Recommendation IODE-XIX

OCEAN DATA AND INFORMATION NETWORK FOR THE BLACK SEA REGION (ODINBLACKSEA)

The IOC Committee on International Oceanographic Data and Information Exchange,

Noting with satisfaction the submission of the ODIN Black Sea project document supported by all Black Sea countries,

Noting further the existence of the Black Sea GOOS regional alliance for which ODIN Black Sea can serve as the regional data management service

Further noting the interest of all Black Sea riparian countries to join the ODIN Black Sea,

Taking into account the existence of several international regional projects operational recently in the region that are interesting in the distributed regional data management system and that can provide in kind support for the ODIN Black Sea,

Recognising the role of ocean data and information management capacity building in the region,

Recommends that an Ocean Data and Information Network Pilot Project for the Black Sea region be established;

Requests the IOC Executive Secretary to implement, as a priority, the following actions:

- (i) to coordinate the necessary actions with the Black Sea GOOS Secretariat, and Black Sea Commission to obtain donor support for ODIN Black Sea;
- (ii) to provide funding for the implementation of the ODIN Black Sea work plan (2008-2009);

- (iii) to strengthen links with JCOMM and GOOS in terms of capacity building and oceanographic data and information management in the Black Sea participating Member States

Urges Member States and donors to support this project by providing financial resources and/or in-kind support to enable the implementation of the ODIN Black Sea.

Appendix 1
Letters of support for establishing ODINBLACKSEA

**To: Intergovernmental Oceanographic Commission
International Oceanographic Data and Information Exchange Committee**

21 March 2006

Subject: Establishment of the ODIN BlackSea
Dear Dr. Bernal,

The IOC Assembly, during its 23rd Session (21-30 June 2005) as well as the 18th Session of IODE Committee, appreciated the continuing success of the ODINAFRICA and ODINCARSA projects. The Assembly also welcomed the fact that the ODIN projects are being developed to serve all ocean science and observation programmes of IOC at the regional level through relevant capacity building, as well as development of products and services. It was recognized that ODIN projects had been playing a catalytic role in starting up new alliances between NODCs. It is obvious that ODIN approach has proved its efficacy.

Therefore, in the frameworks of the SIBEMA and ASCABOS projects, the Bulgarian National Oceanographic Data Centre (BGODC – Institute of Oceanology - Bulgarian Academy of Science) and Russian National Oceanographic Data Centre (RNODC - All-Russian Institute for Hydrometeorological Information – World Data Centre) have launched the initiative for establishment of the ODIN BlackSea (ODINBS). Historically, there exists a sound base for such an initiative created through fruitful collaboration between the Black Sea countries in the framework of a number of programmes and projects like NATO ODBMS, Black Sea GOOS, ARENA, Sea-Search, ASCABOS, etc. Assessments indicate that a huge amount of marine data is stored in the riparian NODSs. One of the WDCs is located in the Black Sea country. Nevertheless, there are not substantial and permanent connections between Black Sea NODCs established by now and data exchange is rather irregular.

Establishment of the ODINBS will promote and facilitate oceanographic data and information exchange in the region under IODE programmes and can serve as a basic infrastructure for the various GOOS, EU and other marine data management projects for the Black Sea. Among other purposes like fostering the regional research, monitoring and observing programmes that are relevant to issues such as climate change, ecosystem dynamics and biodiversity, it can serve as a capacity building and data management tool for the Black Sea GOOS.

If realized, the ODIN Black Sea would be a suitable platform to test, further improvement and using of the E2EDM system, developed by JCOMM/IODE ETDMP, thus sustaining the distributed NODC data system approach, proposed by IODE.

Given the above set motivation we would like to ask IOC to support establishment of ODIN BlackSea.

Sincerely yours,

Atanas Palazov



IODE national coordinator for Bulgaria

Nicolay Mikhailov



IODE national coordinator for
Russian Federation



**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
COMMISSION OCEANOGRAPHIQUE INTERGOUVERNEMENTALE
COMISION OCEANOGRAFICA INTERGUBERNAMENTAL**

الدولية الحكومية لعلوم المحيطات
政府间海洋学委员会

UNESCO - 1, rue Miollis - 75732 Paris Cedex 15
Cable address: UNESCO Paris - telex: 204461 Paris- Fax: (33) 1 45 68 58 12 – Contact phone: (33) (0) 1 45 68 39 83/84
E-mail: p.bernal@unesco.org

Paris, 4 April 2006

Ref. No. 137 PB/pp

Dear Dr. Mikhailov,

Subject: **ESTABLISHMENT OF THE ODIN BLACKSEA**

I thank you for your letter of 30 March 2006 with regard to the possible establishment of an ODIN for the Black Sea area. I share your appreciation for the success of the ODIN projects in Africa and the Caribbean/South America, and welcome the initiatives in other regions to establish similar networks. The existing networks have already demonstrated their effectiveness in fostering regional collaboration in data and information sharing, and in providing data and information services at the national, as well as regional level, including other IOC programmes, such as GOOS and JCOMM. I therefore welcome very much the proposal by the Russian Federation and Bulgaria to establish an ODIN for the Black Sea.

In order to facilitate the establishment of this ODIN and to ensure its full adoption and active participation by the relevant IOC Member States, I would recommend the following preparatory actions that you could undertake: (i) to contact IOC Member States in the Black Sea region through their IOC Action Addresses and IODE National Coordinators for Data Management (if existing); (ii) through e-mail discussions, draft a detailed project proposal for the establishment of an ODINBS; (iii) submit the proposal to the IODE-XIX Session (planned to take place in 2007) where a relevant Recommendation should be prepared (including financial implications); (iv) adoption of the IODE Recommendation by the Twenty-fourth Session of the IOC Assembly (2007).

Dr. Nicolay MIKHAILOV
IODE National Coordinator for the Russian Federation
RIHMI-WDC
6 Korolyov Street
Obninsk, Kaluga Region 249035
Russian Federation
Fax: +95 255 22 25

cc: Mr Atanas Palazov, IODE National Coordinator for Bulgaria

/...

Chairman

Prof. David T. Pugh
National Oceanographic Centre, Southampton
Empress Dock
Southampton SO14 3ZH
UNITED KINGDOM

Executive Secretary

Dr. Patricio Bernal
Intergovernmental Oceanographic
Commission - UNESCO
1, rue Miollis
75732 Paris Cedex 15
FRANCE

Vice-Chairmen

Prof. Mario Ruivo
Chairman, Portuguese Committee for IOC
Av. Infante Santo – 42/4th Floor
Lisbon 1350
PORTUGAL

Dr. Alexander Frolov

Deputy Head, Russian Federal Service
for Hydrometeorology & Environmental
Monitoring (ROSGIDROMET)
12, Novovagan'kovsky Pereulok
123242 Moscow
RUSSIAN FEDERATION

Capt. de Navío Javier A. Valladares
Jefe Departamento Asuntos Maritimos
Armada Argentina
Comodoro Py 2055
Piso 12° - Ofic. 103
(C1104BEA) Buenos Aires
ARGENTINA

Dr. Neville Smith
Acting Chief of Division
Bureau of Meteorology Research Centre
G.P.O. Box 1289
Melbourne, VIC, 3001
700, Collins St., Docklands VIC
AUSTRALIA

Dr. Alfonse M. Dubi
Director, Senior Research Fellow
University of Dar es Salaam
Institute of Marine Sciences
P.O. Box 668
Zanzibar
UNITED REP. OF TANZANIA

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I would like to urge you to take into consideration both data and information management, and in this regard, I also refer to recent discussions held at the IODE Training Course on Marine Information Management for European Countries in Economic Transition (ECET) where it was proposed to establish an ODIN for ECET.

I would like to invite you to contact Mr. Peter Pissierssens, IODE Programme Coordinator, for further assistance with the preparatory process.

In looking forward to the establishment of an ODIN for the Black Sea region I remain, yours sincerely,

Patricio Bernal
Executive Secretary
IOC
Assistant Director-
General of UNESCO

Dear Dr. A. Palazov,

Subject: ESTABLISHMENT OF THE ODIN BLACKSEA

An establishment of the ODIN BlackSea is timely and extremely desirable action, that will accelerate the development of the national data centers, upgrade capacity building and encourage young scientists and specialists to be involved in the data and information management.

We fully support an establishment of this programme and ensure its full adoption and active participation of local data holders.

Sincerely yours,

Dr.K.Bilashvili

IODE National Coordinator, Georgia

Dear Dr. Palazov,

Thanks for your kind message.

Regarding your suggestion to establish ODIN BLACK SEA we think it is a good idea that scientist from the Black Sea countries are going work together for a better information service for the Black Sea oceanography. Even if they are were different projects aiming at that we consider that scientists directly involved in managing their data should be assigned for this purpose. As you are informed we started the preparation for a future National Oceanographic Data Center and primarily we are working for the Terms of Reference. In so far your suggestion in this respect would be highly appreciated.

Again we support your initiative to establish ODIN BLACK SEA.

Yours sincerely

Viorel Malciu

NIMRD "Grigore Antipa"

Tel : 0090 216 322 25 80
Fax : 0090 216 331 05 25



**OFFICE OF NAVIGATION
HYDROGRAPHY AND OCEANOGRAPHY
34805 Çubuklu/ISTANBUL-TURKEY**

TECH.DEP. : 3600-210-06/OCN.

31 AUGUST 2006

SUBJ. : Establishment of the ODIN Blacksea

Dr. Atanas PALAZOV
IODE National Coordinator for Bulgaria

Dear Dr. Palazov

I would like to express my great pleasure of being informed about establishment of possible Oceanographic Data Information Network for Blacksea (ODINBS). I beleive that ODINBS will improve the collaboration of managing and sharing oceanographic data/information among the IOC Member States in the Blacksea region.

We are intending to have an active role in establishing ODINBS at this stage. However, it is strongly advised to start the formal paperwork to prepare a detailed project proposal which all the possible participants from IODE Member States in the region will agree on before submitting it to IODE-XIX Session.

Best regards.

**Mustafa İPTEŞ
Rear Admiral
Director**

Dear Dr. Palazov,

I offer an apology for taking so long to answer your letter. The reason is that I was on holiday out of Sevastopol. Now I am ready to go on with our work. As I know, the ODIN projects in Africa and the Caribbean/South America were successful and the existing networks have already demonstrated their effectiveness in fostering regional collaboration in data and information sharing, and in providing data and information services at the national, as well as regional level, including other IOC programmes, such as GOOS and JCOMM.

So, I appreciate your idea to put all data managers in the Black Sea region to work together for better information service for Black Sea and I support the establishment of ODIN BLACKSEA in a full measure. With great respect

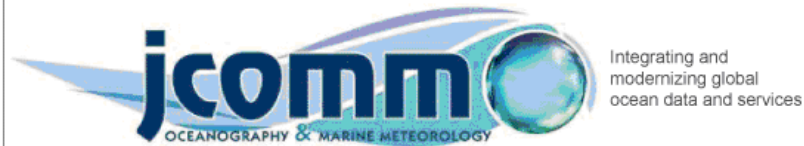
Dr. Alexey Khaliulin
IODE National Coordinator for data management for Ukraine



World
Meteorological
Organization



Intergovernmental
Oceanographic
Commission
of UNESCO



Joint WMO-IOC Technical Commission
for Oceanography and Marine Meteorology

JCOMM/IODE Expert Team for Data Management Practices ODIN BLAC SEA BASED ON E2EDM TECHNOLOGY

(Nicolay Mikhailov, JCOMM/IODE ETDMP Chair, Russian Federation)

1. CURRENT E2EDM TECHNOLOGY STATUS

1.1. Short overview

The “end to end” data management (E2EDM) system is considered as the coordinated and inter-connected combination of the following basic components:

- the ocean and marine meteorological data management systems (local data system systems) which are operated and being developed under various ocean study programs and services;
- the integration technology as an “umbrella” that comprises local data systems and provides communication and “transparent” interaction between metadata, data and products resulted from these local data systems and also an end-user access to any data and information generated by systems.

1.1.1. The E2EDM technology goal

The goal of this E2EDM technology is to integrate the non-homogenous local data systems into unified distributed marine data system, that will provide the transparent exchange between these local systems and a end-user access to numerous data flows/sets/bases in a “single stop shopping” manner.

The E2EDM technology should provide the real-time access to, and fusion of distributed marine data:

- at operational and delay-mode time scale;
- across oceanographic and marine meteorological disciplines;
- of a various data categories – observation, climate, forecast, analysis;
- from multiple local data formats and data storage types;
- from multiple data providers in different geographic regions.

1.1.2. Overall solutions

The basis of the E2EDM technology is the model of distributed information resources on the concept of the E2EDM technology objects - any entities producing or using data (metadata) under the framework of the E2EDM system: local data system, data source, information resource, transport data file, E2EDM services and end-users.

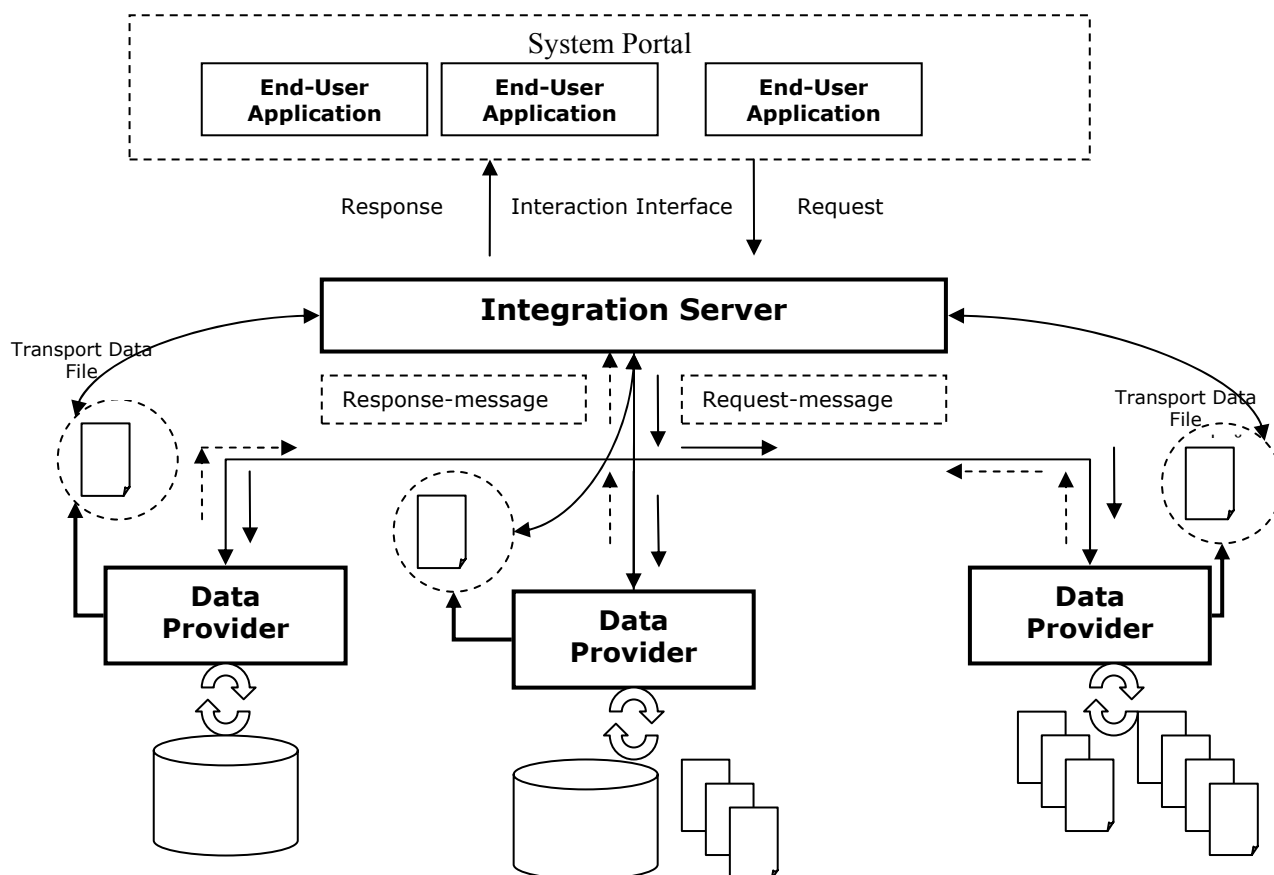


Fig.1. The overall model of E2EDM system

The architecture of the E2EDM technology is based on the widespread the “client-server with mediator and wrappers” concept for the integration of the non-homogeneous distributed data systems that is sometimes named as “virtual data holdings or virtual organizations” (fig.1.):

- wrapper (Data Provider in terms of E2EDM) provides access to data or metadata of the local data system (DBMS, structure or formatted data files, object data files – html, jpeg etc). As soon as the wrapper is installed in the local data system, the latter becomes a data source for the distributed data system;
- mediator (Integration Server) integrates data from various local data systems interacting with wrappers (Data Providers) and with other mediators (Integration Servers). This makes it possible to construct a complex network of interacting mediators creating various combinations (or federations) of integrated data sources to meet the needs of various projects and applications.

The E2EDM technology is based on HTTP, XML, EJB middleware. After the analysis of currently existing systems and technologies it has been decided to use the following existing systems and tools: DiGIR Portal and Provider software and Protocol, NetCDF/OPeNDAP Protocol and Java-utilities. The data model and metadata/data structures was developed taking account WMO Core metadata, ESIMO (Russian system) data model and metadata structures and NERC DataGrid models.

1.2. E2EDM components

The E2EDM Technology is based on the following components (fig.2):

- Technical specifications for data exchange between non-homogeneous distributed local data systems;
- Software components for management, access to and use of distributed data sources.

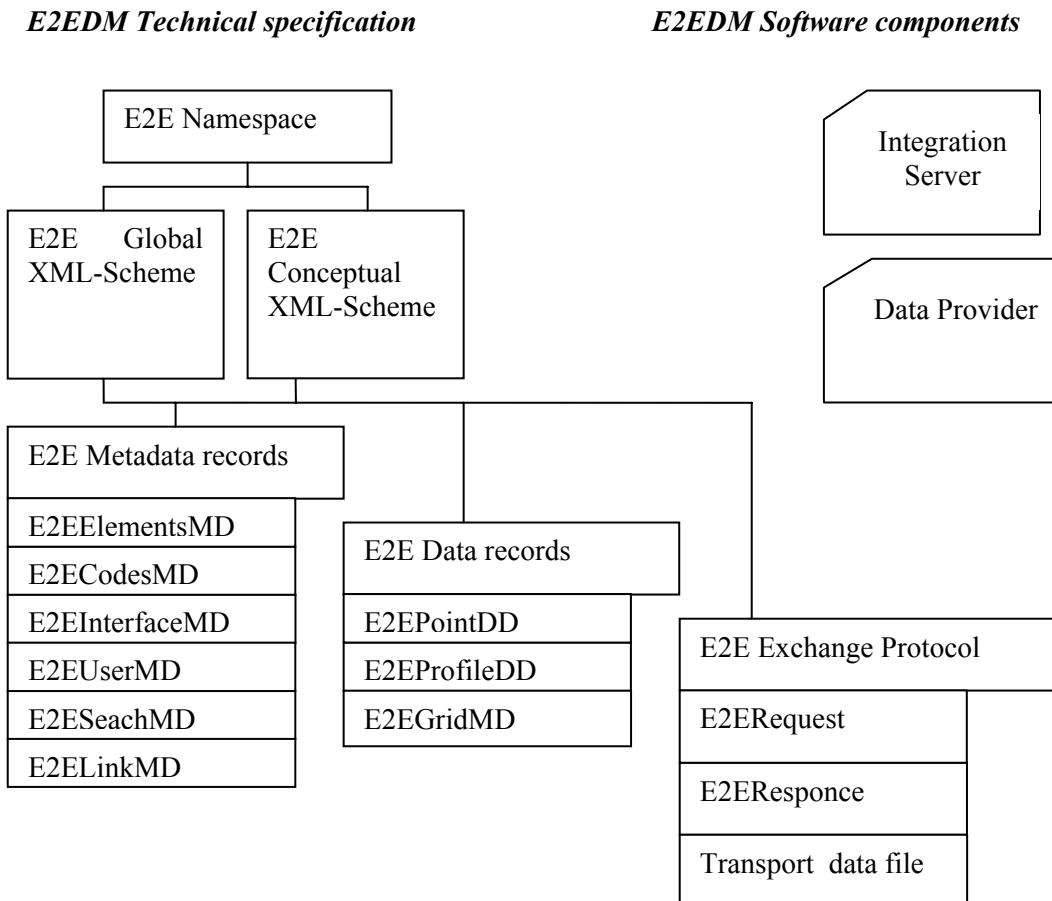


Fig.2. E2EDM Technology components

1.2.1. Technical specifications (current version- v.1.0., 15.05.2006) are based on a single data model and include:

- namespace;
- metadata and data records;
- data exchange protocol.

The namespace determines a semantic content and structures of elements, supported by the E2EDM technology tools. The namespace is described by the global and conceptual XML-schemes with unified rules of identification and naming for each element and structure.

The global XML-scheme consists of more than 100 elements that are used to describe semantic contents, space-time characteristics, interfaces and other properties of local data

system and other E2EDM objects. The elements are combined into 27 element classes. These classes represent “construction blocks” of 11 records of metadata and data that are used in the current version of the E2EDM technology. If necessary, these classes can be used to construct new records that add to the functionality of the technology.

The conceptual XML-scheme comprises description (names, types, etc.) of data elements (marine environment parameters and derivatives – means, extremes, etc.) and the related metadata (platforms, space-time characteristics, etc.) that are managed by local data systems involved into the E2EDM system.

The conceptual scheme is independent of the Global XML-scheme as Global XML-scheme is only environment to manage the conceptual elements. The several conceptual sub-schemes (based on a single conceptual XML-scheme) can be determined, each of these will contain a description of data/metadata elements of the thematic (specialized) data source federation as virtual fragment of distributed marine data system. It is possible to use a few independent conceptual XML-schemes and in this case a few distributed data system will operate basing on E2EDM technology.

If local data system newly added to system comprises elements which are absent in conceptual scheme, it is sufficient to extend the conceptual XML-scheme and provide readjusting a specifications of Integration Server without changing other components of the E2EDM technology. Global XML-scheme and Conceptual XML-scheme are linked through the E2EElementsMD record (see below).

The E2EDM technology can be adapted to storage structures and data coding systems in the local data sources through the mechanism and tools of translating local formats and codes to the common system codes. These tools (configuration files of local data sources) are based on the conceptual XML-schemes.

The metadata records are:

- E2ESearchMD – description of a local data (or metadata) source as an information resource with the data granulation into instances using specified rules and scheme;
- E2ECodesMD – description of the common (system) code lists and dictionaries used for data unification by mean reformatting the local codes into system codes;
- E2EElementsMD – description of thematic elements (data and related metadata) managed by the E2EDM technology and placed in соответствующей Conceptual XML-scheme;
- E2ETermMD – description of the data classification semantic scheme used in descriptions and end-user screen interfaces;
- E2ELinkMD – description of a data/metadata source to provide access to the local data/metadata system: DBMS, structured data files, object data files;
- E2EInterfaceMD – description of an information interface of the user (e.g. end-user external software application to use the E2EDM resources) who uses distributed data sources;
- E2EUserMD – description of an end-user application (identification, privileges, etc.).

The data records are:

- E2EPointDD – data with fixed spatial (geographical, depth/height) coordinates, “point data” type;
- E2EProfileDD – data with fixed geographical and temporal coordinates, and depth/height coordinates variable, “profile data” type;

- E2EGridDD – data, distributed in the scope by definite geometrical model, “grid data” type;
- E2EObjectDD – representation of object data (e.g. documents, images, GIS shapes, etc.).

The Data Exchange Protocol provides data interaction between the E2EDM Data Provider and Integration Server (or Integration Server and end-user applications) and consists of: request/response messages and transport data file.

The formats and other specifications of request/response messages are based on the DiGIR Protocol. The extension to the DiGIR request/response formats has been developed providing requests/responses for local file-oriented data systems and transferring data using a transport data file.

Depending on the data presentation type in the local data system provision is made for tree types of transport data files:

- structured data file in the transport data format (NetCDF format – binary, ASCII and XML versions) using data records: E2EPointDD, E2EProfileDD, E2EGridDD from data storage types: DMBS, data (structured) file;
- structured data file in local data format from data storage types: data file if this option was defined (E2EInterfaceMD);
- non-structured data file (Jpeg, HTML, pdf, doc and other) used when the local data system produces the information resource in the form of an object file.

1.2.2. Software components consist of Integration Server, Data Provider and typical end-user application software. Their main functions are considered below; the text contains the references to the current development status relative to the design technical specification of software components of version 1.0.

Integration Server (v.0.9., 1.04.2006) provides:

(1) Management Service - interaction with Data Providers, Integration Servers that manage other data source federations and users (end-user external applications), conversion of user requests to the Data Exchange Protocol format (E2ERequest format), server operation management (call of other services, processing of errors)

Ready partly, development of interaction with external applications is in progress. Web-forms (user screen interface) for administrating the Integration Server exists in Russian only. It is required to develop a tools for interaction between Integration Servers of a various data source federations.

– Metadata Service – management of system metadata based on interaction with Data Providers – supporting common and controlled dictionaries and tables of codes (E2ECodesMD, E2EElementsMD), harvesting and storage of descriptions of data sources (E2ELinkMD), resources (E2ESearchMD), users (E2EUserMD) and other E2EDM objects in interaction with Data Providers and end-user application (portal services)

Ready, It is planned (SeaDataNet) to use Web-services for distributed management of system repositories for codes and also provide managing the metadata repositories using DBMS (now - XML files). Also to consider compatibility the E2EDM conceptual XML-scheme (E2EElementsMD) and CF (SeaDataNet)

– Monitoring Service – provides statistics of the status of the distributed marine data system – current data sources availability and history, number of data sources/resources

for countries, regions, data category (observation, climate, forecast, etc.), terms and etc., number of user access and so on.

Under development

– Navigation Service – processing (data selection criteria against resource descriptions) and decomposition of user request from external application for individual data sources and its transmission to Data Access Service for access to required data sources

Ready,

– Data Access Service – check of Data Providers status according to schedule or for request and synchronization of centralized data sources/resources descriptions with Data Provider metadata, management of the user requests execution (connection with Data Providers, time of response, processing of errors, etc.) with using Transport Service

Ready partly, tools is required to improve for check of Data provider status

– Transport Service – reception of response messages from Data Provider (E2EResponse), transmission of response with transport data files address to user (external application)

Ready,

– Security Service - authorization and authentication of users with regard for their roles and privileges (E2EUserMD), management of external application interfaces (E2EInterfaceMD) with Integration Server

Under development

Data Provider (v.0.9., 1.04.2006) provides:

– Management Service – adjustment of Data Provider services with regard for specific character of local data, support of the user screen interfaces for Data Provider administrating, etc., decoding of requests from Integration Server and control of services, responsible for the access to the data source and formation of response

Ready partly, a number of tools are under testing. Web-forms (user screen interface) for administrating the Data Provider are in Russian only.

– Metadata Service – supporting actuality of common dictionaries and tables of codes (E2ECodesMD, E2EElementsMD) at local system side via interaction with Integration Server, preparing (updating) the local resource descriptions according to schedule or request from the Integration Server

Ready, It is planned to use DMBS for storage of metadata repositories (now - XML files).

– Database Access Service (DAS)– connection to the data source of type - DBMS, formulation and implementation of SQL-request, reformatting the local data codes to system codes, and data transmission to Data Format Service

Ready

– File Access Service (FAS) – the same functions as DAS respectively data files. If the local data stored as object data file (Jpeg, htm, doc. etc) or request define to submit data in local format then the access path to this file is provided only

Ready

– Data Format Service – formation of response messages and transport data files (binary NetCDF, ASCII, XML versions, object file, data file in local format in depend on request condition)

Ready, It is planned to move to new version of NetCDF

The end-user application (v.0.9., 15.05.2006) provides:

- enter the system via a web browser and define a sampling criteria using map: region, time period, resource and etc.;
- access to a remote data sources via Integration Server including request status monitoring;
- processing transport data files and tabular-graphic visualization of data , saving requested data on user side.

Ready, but it is required improving. If to build OceanDataPortal it is required to develop the portal services basing on reengineering of ETDMP Web-site and of this application.

The E2EDM documentation and software are at the E2EDM web-site (<http://data.meteo.ru/e2edm/>). The E2EDM Integration Server and end-user web application for demonstration of the E2EDM system operation is available:

VLIZ ((<http://data.meteo.ru:8080/iserv/>)

RIHMI-WDC (<http://data.meteo.ru:8080/iserv/>)

2. THE E2EDM SYSTEM PROTOTYPE

In 2004-2006 the prototype of the E2EDM system was developed under the JCOMM/IODE ETDMP Pilot Project III.

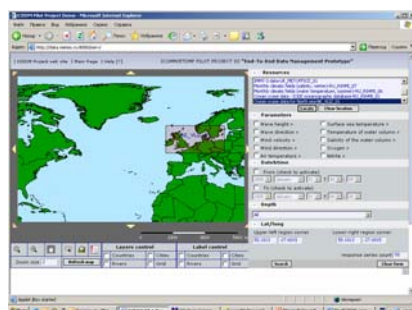
The four data sources (12 information resources) were provided by VLIZ (Belgium), RIHMI-WDC (Russian Federation), Met Office (United Kingdom) and IFREMER (France) for domain covering oceanographic and marine meteorological observation data and product.

The E2EDM system prototype operates with data on the following parameters:

- in-situ data, including marine meteorological data (air temperature, sea surface temperature, pressure, wave height and wave direction, wind speed and wind direction) and oceanographic data (temperature, salinity, oxygen, and nitrates);
- sea temperature and salinity climatic fields;
- synoptic weather charts (imageries).

The geographic area of the E2EDM prototype operation covers the North Atlantic, including Norwegian, North and Greenland seas.

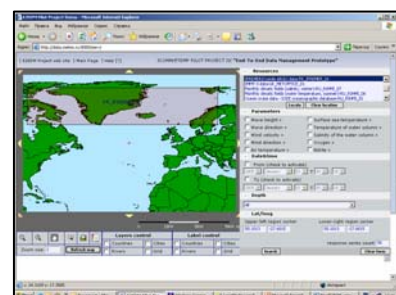
The following data(product) types were involved in the E2EDM prototype operation: historical, delay-mode, real-time, climate data (data geoarea shown on pictures).



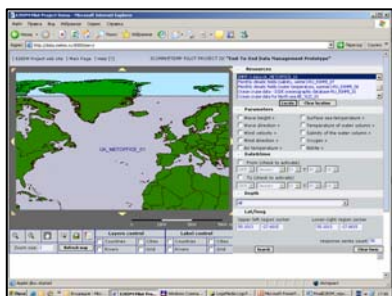
List of parameters – sea temperature, salinity, oxygen, nitrates. Local data system type- DBMS (Oracle).

IFREMER (France) provided the data source with

VLIZ (Belgium) provided the data source based on fragment of the Ocean Data Base (WA2001) for the North

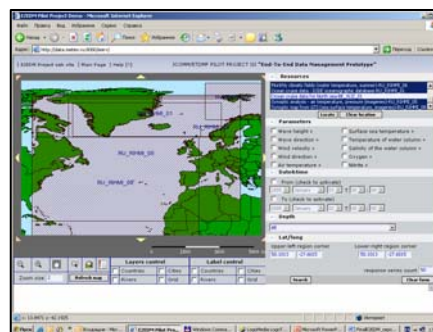


delay-mode Argo data for North Atlantic. List of parameters – sea temperature and salinity. Local data system type- DBMS (Oracle).



Met Office (United Kingdom) provided the historical (for the last 5 years) marine meteorological () data from one of the MCSS project data centers. List of parameters air temperature, sea surface temperature, pressure, wind and wave. Local data system type - data files in IMMT-3 format.

RIHMI-WDC (Russian Federation) provided the 6 data sources: 1)historical (for the last 5-10 years) ocean cruise data (temperature, salinity, oxygen and nitrites); 2) real-time GTS marine meteorological (SHIP) data (air temperature, sea surface temperature, pressure, wave, wind); 3) real-time GTS ocean (BATHY and TESAC) data (temperature, salinity; 4-5) season climatic fields (average temperature and salinity on standard levels); 6) real-time weather chart (images). All local data is managed DBMS (Oracle) excepting weather charts that provided via GTS in for images.



The E2EDM technology prototype began to operate at April 2005. Current E2EDM parameters:

- Integration Server at VLIZ (RIHM_WDC – mirror, It was done more 5 updating);
- Data sources with Data Providers at VLIZ, MetOffice and RIHMI-WDC;
- External end-user application (disposed at Integration Server) at VLIZ (RIHMI-WDC mirror, It was done more 10 updating).

3. E2EDM TECHNOLOGY AND WMO INFORMATION SYSTEM

The E2EDM technology is a one of the WIS prototype components that ensures the operation of the Data Collection and Processing Centre (DCPC) on the basis of RNODC/RIHMI-WDC in Obninsk.

DCPC/Obninsk is based on the E2EDM technology and will provide:

- creation of information resources for the DCPC/Obninsk of the WIS prototype within the E2EDM;
- translation of the E2EDM metadata records to the WMO Metadata ISO profile;
- translation of the E2EDM metadata records to the OAI metadata format;
- publishing metadata by the OAI and WMO Metadata records
- GISC - DCPC/Obninsk interaction.

E2EDM Integration Server will provide the generation of the E2ESearchMD records for these data sources and supporting the actuality of these metadata. Special service will translate on the fly the E2EDM metadata records into WMO metadata records using the scheme: one E2EDM record describing information resource– one WMO metadata record. Each metadata record will have a unique ID based on the E2EDM identification scheme

Similar approach is used to translate the E2EDM metadata records into the OAI metadata records and to provide a standalone metadata catalogue.

The GISC-DCPC/Obninsk interaction will be implemented using the VGISC protocol communication operating through the SIMDAT API (SIMDAT Data Repository) as well as through OAI which provides a standalone metadata harvesting repository. This allows two independent way of the GISC-DCPC interaction to be used.

4 IMPLEMENTATION OF E2EDM THECHNOLOGY – GENERAL ISSIES

4.1. Ocean Data Portal based at E2EDM technology

The moist important task of IODE and JCOM activity is to provide a effective and comprehensive the marine information services for study and exploration of ocean and seas, other marine activity.

The marine information services can be divided in a number of classes: on-line access to metadata about observation systems, data centers and their resources, etc, on-line access to real-time and delay-mode data and product (data summaries, analysis, forecasts) that are supported by data centers, management and access to global ocean data sets, specific services such as climate change monitoring, supporting the hazard warning system and etc.

Each of the above-mentioned (and others) information service requires (or is oriented to) the specific ocean/meteo parameters data or product, delivery time (real-time or delay-mode), access forms (on-line/off-line), representations for users (data copies, the interactive maps/plots/tables) and etc. And each marine information service is implemented through the activities of definite IODE (or WMO, JCOMM) data centres.

Using the E2EDM technology it is possible to establish the IODE/JCOMM distributed marine data system with Ocean Data Portal for improving and make more effective marine information services. Then we will use term “IODE/JCOMM Ocean Data Portal” and we will understand the IODE/JCOMM distributed marine data system based on NODC/DNA data sources and entry point into this system for a various class of end-users. From engineering and implementation points of view the “IODE/JCOMM Ocean Data Portal” is tools based on E2EDM technology - Integration Server/Data Provider software and E2EDM technical specifications, and external end-user software applications (in term E2EDM technology) providing the full range of processes: data discovery, access, delivery, and publishing (visualization, copies of data, etc.) which are placed at portal side.

Evidently what to realize technical line of IODE/JCOMM system with Ocean Data Portal it is necessary to improve/develop a number of software and other E2EDM technology components, for example: portal services and other components about which was spoken in item 1.2.

The overall model of the IODE/JCOMM Ocean Data Portal shown on fig.3.

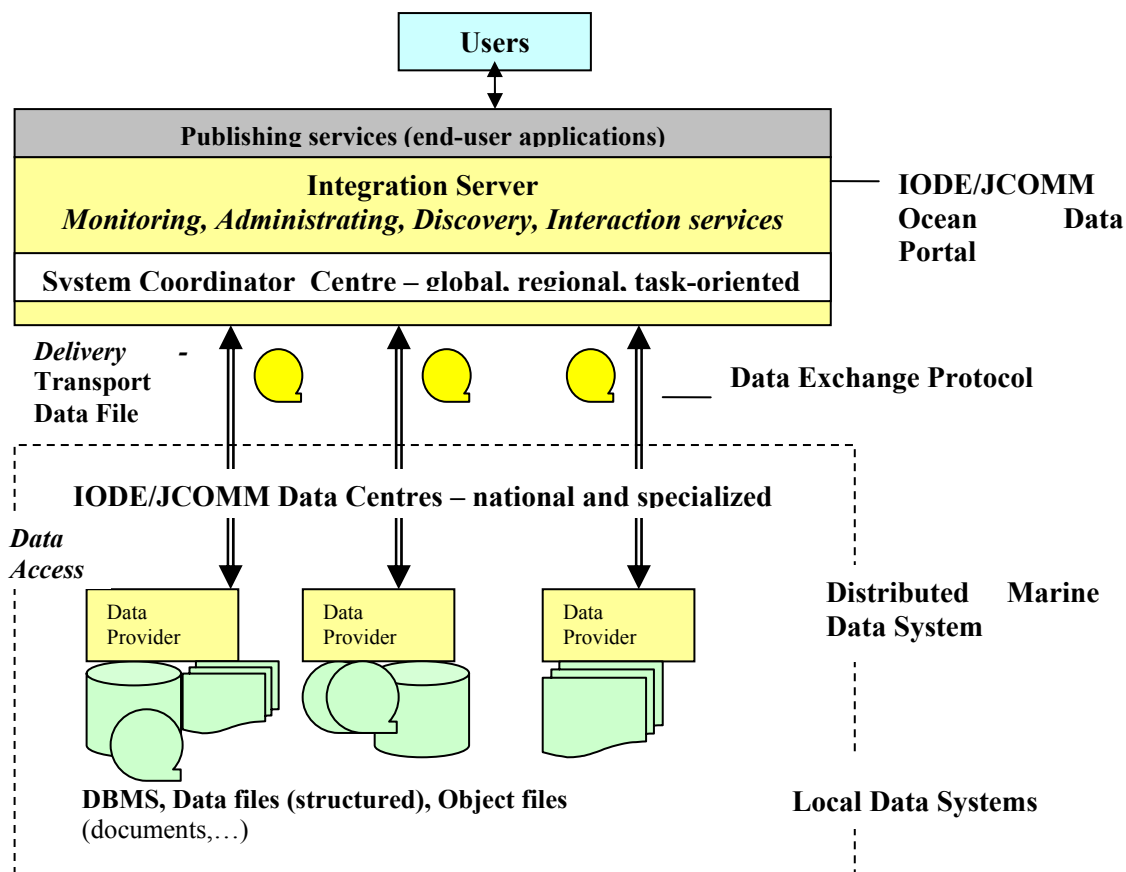


Fig.3 The overall model IODE/JCOMM Ocean Data Portal based on E2EDM technology

In general functional/organizational (enterprise) aspects of IODE/JCOMM Ocean Data Portal model looks as the following

- IODE NODC/DNA and JCOMM data centres (*national data provider centre or NDPC, specialized data provider centre or SDPC, short names are conventional, in order do not repeat long title*) which are intended to be data providers under system use the E2EDM Data Provider, so that the local (national or prepared under IODE/JCOMM project – see below) data or product can serve as a data source for the Integration Server and Ocean Data Portal services;

- nominated IODE NODC/DNA data centre (*global system coordinator centre or GSCC, regional system coordinator centre or RSCC, task-oriented system coordinator centre or TSCC, short names are conventional*) use the E2EDM Integration Server/Ocean Data Portal software and provides the monitoring distributed data system status, management of system metadata, users administrating and other functions on global, regional or task-oriented levels;

- a users communicate with the system via Ocean Data Portal to start end-user applications to request data from distributed data sources specifying parameters, space, time and other criteria. The appropriate data, on user's request, are automatically sourced from wherever they reside and returned to the requesting application providing value-added services or delivering data to user computer.

4.2. Approaches for IODE/JCOMM Ocean Data Portal establishing

This model takes into account of global, regional and thematic (or project-oriented) activity of IODE and JCOMM.

Global approach bases on scheme when one portal provides the monitoring and user access to all Data Providers involved into distributed marine data system (fig.4).

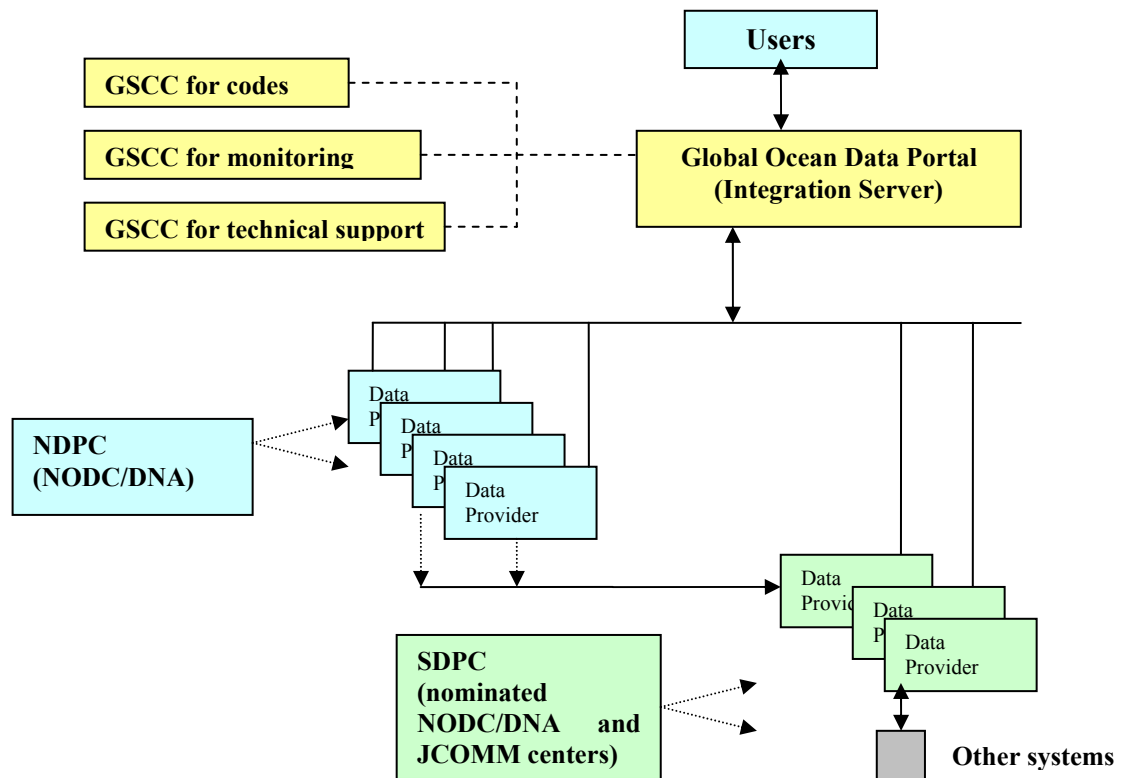


Fig.4 The Ocean Data Portal scheme for global approach

The functions of the GSCC can be distributed (better it should be distributed) among several IODE/JCOMM data centers. The most optimal scheme of the functions distribution looks in the following way:

- GSCC for codes – supporting the common codes and dictionaries (this function can provide by a several centers: for codes, for marine platforms, etc.);
- GSCC for monitoring distributed data system and providing the Integration Server and Ocean Portal operation;
- GSCC for technical support and developments.

For the data provider category it is determined the two types of centers: national and specialized centres.

The NDPC is IODE NODC/DNA providing the national data and product inputs into distributed marine data system. These centers interact with national institutes (laboratories) and operate according to rules and commitments of IOC IODE system and IOC data policy.

The SDPC is centre nominated by IODE or JCOMM to fulfill project (or programme) activity as rule. Such centre prepares the integrated metadata (cruises, coastal stations, buys, etc.), global data (GLOSS, GTSP, GODAR, GOSUD centers) and specific product (climate, forecast. analysis, it is same as SOC - specialized oceanographic centre) and submits these new data and products into distributed data system

These centers provide their functions in interacting with NDPC. In technological sense SDPC is a specific user of distributed marine data system connected with NDPC's and SDPC's needed to produce new data. The special option of E2EDM technology will be used for scheduled delivery data(metadata) from a several Data providers to given URI address of SDPC.

It is distinguished the separate category of specialized SDPC which is responsible for connection and data exchange with other information systems, for example with WIS.

The regional and task-oriented approaches (fig. 5) - when there are a few portals integrating the regional or problem-oriented Data Providers and the integrity of IODE/JCOMM distributed data system on the whole is provided via central system portal operations. In this case it is applied the E2EDM solution as to building of the data source federations.

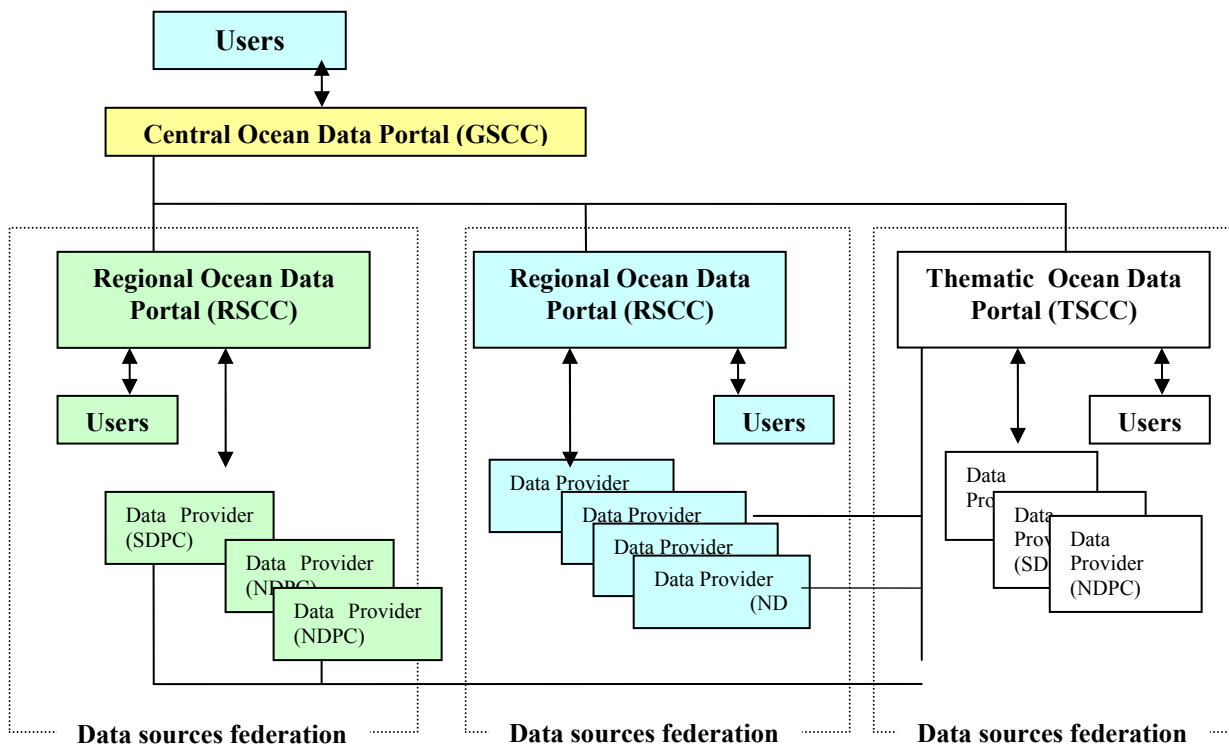


Fig.5 The Ocean Data Portal scheme for regional/thematic approach

The above-considered approaches have its advantages and blemishes. Global approach more is simple in implementations and requires less expenditure for support. But regional (or thematic) approach is more flexible and efficient for users. The regional approach for IODE/JCOMM Ocean Data Portal can be implemented on IODE ODIN concept and realization - ODINAFRICA, ODINCARSA, ODINCINDIO, ODINWESTPAC, ODINBS. The thematic approach can be used for integration of data and realization of data management tasks under IODE/JCOMM project/programme activity.

5 THE ODIN BLACK SEA ESTABLISHING

5.1. General scheme

Evidently that It should be used regional approach for ODINBS establishing which was considered above. Below it is given the proposals as to the realization of this approach. In this case it will be applied the E2EDM solution for building of the Black Sea data source federation under IODE/JCOMM Ocean Data Portal.

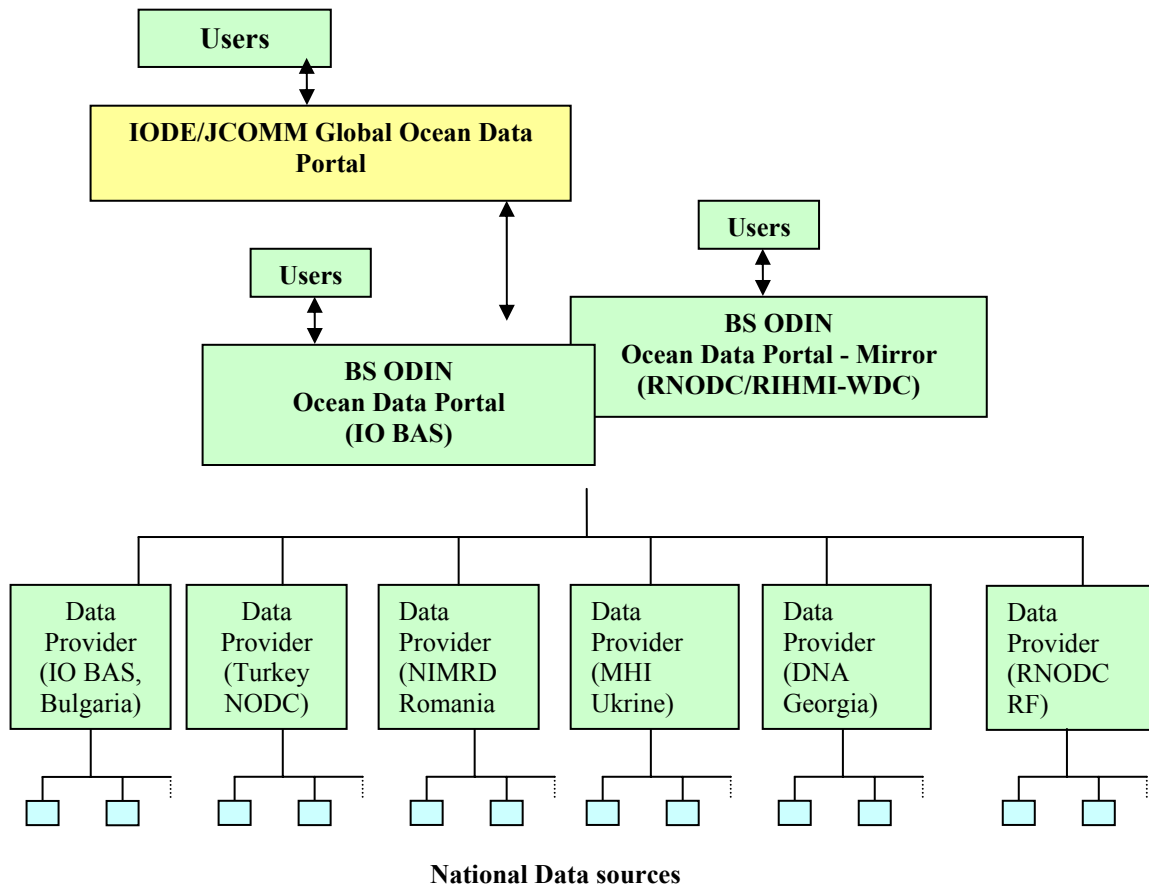


Fig.5 The general framework of ODIN BS

In general functional/organizational (enterprise) aspects of ODIN BS establishing as the following

- IODE NODC/DNA's for Black sea (IO BAS, Navigation Hydrography and Oceanography Office of Turkey, NIMRD Romania , MHI Ukraine, DNA Georgia, Russian NODC/ RIHMI-WDC) define and agree the national operational, delay-mode and historical data/product which will create the ODIN BS data infrastructure;
- these IODE Data centers will provide communications with national data sources (organizations, laboratories) for involving agreed data/product into ODIN BS;
- these IODE Data centers will install and support the E2EDM Data Provider software, so that the local data or product can serve as a data source for the Integration Server and Ocean Data Portal services;
- IO BAS will provide the installation and the E2EDM Integration Server/Ocean Data Portal software and provides the monitoring distributed data system and other functions. The mirror of this ODIN BS technological block will be placed at Russian NODC with the replications of system metadata. Russian NODC will provide the technical support of the ODIN BS operations and interactions with IODE Global Ocean Data Portal including common codes, elements, metadata and etc. exchange.
- a users communicate with the system via ODIN BS Ocean Data Portal (or portal mirror and global IODE portal) to start end-user applications to request data from ODIN BS data sources. The appropriate data, on user's request, are automatically sourced from data sources and returned to the requesting applications for visualization and other operations.

5.2. Proposed actions

1. The definition the agreed common list of data/product types as information basis of the ODIN BS operations;

IODE NODC/DNA participants

2. The providing the collection (or preparing) of these data/product from national organizations/laboratories and forming the national data sources for ODIN BS.

IODE NODC/DNA participants in cooperation with national organizations

3. The improving the Ocean Data Portal services to meet the requirements from the Black sea users.

RNODC in cooperation with other centers

4. The installations of E2EDM Data Provider software at IODE NODC/DNA's.

IODE NODC/DNA participants, RNODC - coordinator

5. The installation of the Integration Server at IO BAS and providing the testing the ODIBN BS operations (connection with data providers, portal functions, interactions with portal mirror and etc.).

IO BAS, RNODC and other centers

6. The providing the ODIN BS operations.

IODE NODC/DNA participants

Annex

General requirements for IODE/JCOMM Data Centers to establish the distributed marine data system

The Role of Data Provider Center and Technical Requirements

Data centers that agree to provide a data sources for the E2EDM system should provide:

- the appropriate middleware for communications: Web server and application server;
- installation of the E2EDM Data Provider software to connect IODE/JCOMM Ocean Data Portal with the local data system (s);
- registration of data sources and generated resources;
- support the actuality of a local data system according to the agreed data obligation.

Below are requirements on software and hardware to install and use E2EDM Data Provider software.

The hardware. To install and operate Data Provider, it is recommended that a computer with the following minimum characteristics: Pentium III 500 MHz or compatible, 256 RAM, 100 Mb hard disk space. At this stage of the E2EDM prototype implementation it was recommended to use a dedicated computer for Data Provider installation.

The middleware. The following is required to install and operate E2EDM Data Provider:

- Operational System – Windows or Unix-based (Windows server is preferred).

- Web Server. this can be any web server that supports PHP. Apache or Microsoft's IIS (there are preferable to Apache 2.x).
- PHP is a cross-platform web scripting language. Centres providing data should have a PHP interpreter (version 4.2.3 or later).
- Domain Name for Server. It is recommended that the machine running the Data Provider service should have a fully qualified domain name (FQDN). One of free services that have proven to be particularly stable is DynDNS.

The Role of System Coordinator Centre and Technical Requirements

Data center that agree to provide the coordination role of E2EDM implementation should provide:

- installation of the E2EDM Integration Server software to provide the connection with data sources of the distributed data system.
- the appropriate middleware for communications: Web server and application server;
- support the centralized metadata sets (CodesMD, ElementsMD, SearchMD and other) providing the actuality and operationally of these system metadata;

Below are requirements on software and hardware to install and use E2EDM Integration Server software.

The hardware. To install and operate Integration Server software, a computer should have the characteristics as follows: Pentium III 500 MHz or compatible, RAM 256 Mb (512 Mb is more preferable) .

The following middleware. tools are required to operate the Integration Server:

- Operational System – Windows or Unix (it is preferable to Windows).
- Web Server. Apache Tomcat (4.03 or more recent) or integrated Tomcat server used in JBoss (www.jboss.org) application server (release 3.2.3 or later);
- Java 2 programming language for implementation of the Integration Server services. JDK (Java Development Kit) 1.4 or later is needed for the Integration Server operation.

The Support Requirements.

To test and operate Data Providers and Integration Server software It was recommended to nominate a person who will be responsible for the E2EDM

[end]