Far Eastern segment of the Unified State System of Information on the World Ocean (ESIMO)

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Motivation

Information management is a necessity for normal maritime activities. So now in the world integrated information systems are widely used, they are linking the various maritime agencies and services. In Russia Unified State Information System on World Ocean was founded (in Russian ESIMO). The system has accumulated a large amount of information. So at the present stage of exploitation ESIMO provides decentralized management and passes to network architectures. The importance of the regional centres increases

World tendency integration

World level

- Global observing system– the GSP, GOOS, GCOS, GEO
- Global Program of studies of the marine environment and services – Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), WCRP, GMA
- Global data-exchange programs – the IODE, JCOMM, WMO future systems, Pogo

Regional level

- Global Monitoring for Environment and Safety (GMES), The European Union
- Sea Data Net, The European Union

At the national level

- EarthTrends-Environmental Information Portal, USA
- An integrated marine observations system (IMOS), Australia
Marine doctrine of the Russian Federation determines

✓ “Information support of the marine activities in the first provides the maintenance and the development of the global information systems... in order to integration and the rational use of the different departmental systems and means...”

✓ “The Information support is the basis for decision-making at all levels of maritime activities”

– information system designed to support marine-related activities in the Russian Federation through provision of the integrated information on the world ocean available from marine-oriented information systems of the Russian Federal Agencies and Russian Academy of Sciences.

ESIMO provides:

• Interaction of the departmental information systems
• Access to information for the study, development, utilization of the oceans
• Data exchange with international information systems
The international experience

- Data management of the WCRP
- The global climate observing system - WMO and IOC
- The global Earth observation system
- The WMO information system
- The monitoring system of the Earth (EU)
Integration of information from different sources: research institutes, departmental subsystems, laboratories

**ESIMO concept** – Integration of the information resources regardless of their departmental affiliation as Unified Space and integrated information management

**Principles:**
- “System of systems”
- Interdisciplinary cooperation
- Unified policy framework for maritime activities
- The priority of the national marine policy
- The use of new technologies and interaction with international information systems
Diagram of the ESIMO operation

- Users

- Portal

- Central server

- Regional Centre

- Specialized Centre

- Data Providers

http://esimo.ru – the current version

http://portal.esimo.ru – the new portal

http://portal.esimo.aari.ru/portal

http://portal.esimo.ferhri.ru/portal
Support of ESIMO operations


Regulatory support
- ESIMO regulation, Operating procedures and rules of ESIMO Centers (21)
- Guidelines and Manuals on ESIMO operation (5 documents)

Information support
- Common codes and classifiers (ISO, GOST, S57, XML, ЕСИМО extensions)
- Metadata formats, request/response messages and data communication protocols (XML, ISO, HTTP)

Technological support
- System-wide information technologies for interaction (4) and provision of services (5)
- Thematic information technologies for data preparation in ESIMO Centers (89)

Technical Support
- Hardware-Software System (HSS) of system-wide technologies – firewalls and Web-servers, Application server, database (DB) server
- HSS of thematic technologies – DB server and software systems of user workstations

Institutional Support
- Organizations of 12 Ministries (Agencies) and RAS – Centres of ESIMO (21)
- Staff in ESIMO Centres to operate ESIMO technologies
Parameters of situation in the World Ocean

Marine environment – natural processes
- Meteo conditions
- Hydro physics
- Pollution
- Ice
- Geocryology
- Geology-Geophysics
- Biology
- Hazardous ocean events

Marine-related activities – marine facilities
- Sea ports
- Ships and shipping
- Exploration of bioresources
- Exploration of mineral resources
- Emergency situations
- Shipbuilding
- Mapmaking and oil-and-gas bearing regions
- Socio-economic conditions

Observations
- Summarizing
- Analysis
- Forecasts

Point, profile, grid, objects files
- DB, structuring files, catalogues of objects files, applications
International systems, which use ESI MO technology

✓ The WMO information system
✓ Ocean Data Portal IOC (IODE)
✓ European Sea Data Net
✓ Information system of oceanographic data (Sea-search)
✓ Black Sea Scene
Unified World Ocean Information System

State customers:
FEDERAL TARGET PROGRAM “World Ocean” – Russian Ministry
Subprogramme - Roshydromet

Lead: RIHMI-WDC Roshydromet, Obninsk

The main stages:
I (1999-2002) – ЕСИМО basis establishment
II (2003-2007) - first ЕСИМО
III (2008-2013) - the full-function ЕСИМО

The main results of the I:
✓ System project ЕСИМО
✓ The basic elements of platform integration ЕСИМО
✓ Web-portal ЕСИМО
✓ The operational module ЕСИМО
✓ Monitoring manuals
11 Components of the first ESIMO

The ESIMO network, centers thematic and cross-cutting technology
First ESIMO

The main disadvantages

- Low control over events in the system
- A high degree of component dependencies -> Low scalability and flexibility
- Limited integration with other systems
The first ESIMO

The full-function Esimo

**The Goal:** *the effective development and improvement of ESIMO*

- Network model
- Componential architecture
- The Central, regional, specialized and departmental sites of ESIMO
Employment  ESIMO SOI in DDSS

5. Sending data to an external user *

6. Interaction of components «Info DB – Info System» *

* - with service bus

Native development based ApacheCXF and AXIS (K. Belova, S. Belov)
Pipes and Filters

Message Router

http://0agr.ru/blog/2012/08/08/enterprise-integration-patterns

Software products that implement the integration patterns

• Mule Enterprise Service Bus (ESB), MuleSoft;
• Fuse ESB, Fuse Source;
• Spring Integration, Spring;
• Apache Camel;
• JBOSS tool (Portlets)
• and a number of other.
Develop of TRANSAS, SPII RAS

1 level
Main Servers, Obninsk, Moscow

2 level
Regional Servers, (as Vladivostok)

3 level
Theme Centers

System metadata, Data management, backup service

Data integration, exchange, service

Data integration, exchange, service

Data integration

Metadata and Data

Data providers
ESIMO subsystem of information safety

<table>
<thead>
<tr>
<th>№</th>
<th>Protection</th>
<th>Option implementations</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Protection against unauthorized access</td>
<td>Dallas Lock</td>
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<td>SecretNet</td>
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<td>Anti-virus protection</td>
<td>Kaspersky Open Space Security</td>
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<tr>
<td>3</td>
<td>Ensuring secure Internetworking</td>
<td>StoneGate FW</td>
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<td>Cisco ASA</td>
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<td>4</td>
<td>Cryptographic information protection</td>
<td>ViPNet Custom</td>
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<td>Kontinent</td>
</tr>
<tr>
<td>5</td>
<td>Resources intrusion detection and prevention</td>
<td>StoneGate IPS</td>
</tr>
</tbody>
</table>

For services:
- Privacy
- Accessibility
- Integrity

For resources:
- Preservation of authorship
- The use accountability
The new elements of the full-function ESI MO

« GIS-Server» prepares operational and statistical electronic cards, provides the joint reflection and analysis of spatial data

«Analytic Tool» allows you to prepare analytical materials in the tabulated-graphic and cartographic form
Data normalization and storage, the creation of OLAP cube

Forecasting in the changes

Create publications based on analyses and forecasts

Visualization and configuration of reports

Ensure the smooth operation of all modules of AT

Download/update parameters from external sources

Interaction with the ESIMO portal
General scheme of GIS in ESIMO

- Data 1
  - Converter 1
  - Store
- Data 2
  - Converter 2
- Data N
  - Converter N
- Catalogue
- GIS server
- Client Visualizer 1
- Client Visualizer 2
- Client Visualizer M
Electronic marine Atlas (EMA)

• Thematic marine Info
• Many sources of information (ESIMO sites, Data providers)
• The ability to maintain relevance and to make changes
• The dynamic nature - monitoring and operational update
• Category

Selection of technical tools for GIS ESIMO

The system is based on OpenSource software:

• PostgreSQL – data storage and processing
• PostGIS – Spatial Extender
• GeoServer – creating and displaying geoservices
• GDAL – spatial data converter
• Web-based application framework OpenLayers
OceanViewer (under construction)

- Access to geo data
- The ability to upload their own geo data with automatic creation of the OGC geo services
ESIMO as "System of the systems"

Methodology - the formation of the unified information space in the sphere of marine activities and integration ready information systems and procedures for the management of maritime activities

Directions:

✓ Network Infrastructure
✓ Functional
✓ Regional

The tasks of the regional directions

✓ interoperability and integration with regional and municipal information systems of RF marine subjects
✓ providing target data and services of the authorities of RF marine subjects
✓ information support of regional marine-related activities programs and major projects
✓ information support of development and implementation of integrated development of coastal areas and coastal waters
Need to create new ways of working with data
Generalized functional structure of Far East segment of ESIMO

Main Server

FERHRI

Regional Server

Departments

Primorsky HM Agency
Sakhalin Agency
Khabarovsk Agency
Kamchatka Agency

POI

PIG
Природопользование, состояние и тенденции изменений морской среды прибрежных и сопредельных районов Дальневосточных морей России
CIS Infobase

Беринговоморский район

Охотоморский район

Япономорский район

Физико-географические и гидрометеорологические условия
- морфометрическая характеристика и донные ландшафты
- участков акватории и заливов
- климат и его изменения
- гидрометеорологический режим
- опасные и особо опасные явления

Гидрологические и ледовые условия
- Физические процессы
- распределение температуры и солености
- структура воды: водные массы
- гидрохимические характеристики
- колебания уровня и приливные явления

Дальневосточный регион как объект КУПЗ
- Прибрежная зона как объект управления
- Тенденции развития контактных прибрежно-морских структур
- Природопользование в концепции КУПЗ
- Районирование дальневосточного побережья России с точки зрения геополитических интересов
- Природно-ресурсный потенциал Дальневосточного региона
- Экологические проблемы

Биоразнообразие
- общая характеристика
- промысловые морские беспозвоночные, водоросли и травы
- тенденции изменений в популяциях
- бионивазии

Состояние морской среды
- загрязнение морских вод из различных источников
- экологические последствия и угрозы
- эколого-экономическая оценка антропогенных воздействий

Природопользование
- социально-экономические условия
- контактные прибрежно-морские структуры
- приоритетные и допустимые типы природопользования
- алгоритмы интегрального управления
- марикультура
- заповедные территории
- безопасность мореплавания и эксплуатации морских объектов

Данные наблюдений
- Архивные
- Мониторинговые
Portlet application
Analytic Tool presentation
POI Cruises tracking
International Portal DINRAC/NOWPAP/UNEP - access to thematic resources on the condition and pollution of the marine environment of the North-Western Pacific - http://portal.pacificinfo.ru
Web-GIS of Russia coastal marine zone in the Japan/East Sea -
http://pacificinfo.ru/icam/
ESIMO is a real system of information systems created in different areas of maritime activities of the Russian Federation on the basis of end-to-end data integration.

Strategic objective development of ESIMO is improved information management activities of research, development and use of the oceans and coastal areas through the establishment of the unified information space in the field of maritime activities.