



MONITORING OF THE PAN- EUROPEAN MARINE DATA MANAGEMENT INFRASTRUCTURE IN THE FRAMEWORK OF EU/FP7 SEADATANET 2 PROJECT

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WHAT IS SEADATANET

- SeaDataNet (www.seadatanet.org) is the pan-European infrastructure for managing, cataloguing, and providing harmonized access to ocean and marine environmental data sets and products (physical oceanography, chemistry, geology, geophysics, bathymetry and biology) that are collected by research vessels, satellite and in-situ platforms of various marine observing systems and developed, managed and operated by distributed National Oceanographic Data Centres (NODCs) and other marine data centres in countries around the European seas, with co-funding from the European Commission (EC).
- SeaDataNet is now the leading marine data management network in Europe that contributes to build research excellence. The initiative for developing such an infrastructure:
 - Has started as Sea-Search project under FP5 (2002 - 2005) with a focus on metadata.
 - Was succeeded in 2006 with the five-year SeaDataNet project under FP6 with a wider focus including harmonized access to data.
 - Continued under FP7 (2011-2015) as SeaDataNet 2.



PARTNERSHIP



- Started since 90's, MAST Programme
- Today, 59 partners from 35 countries
 - 68 connected data centers and national focal points
- 3 International Bodies: IOC, ICES and EU-JRC
- HCMR-HNODC is the coordinator of the Networking Activities

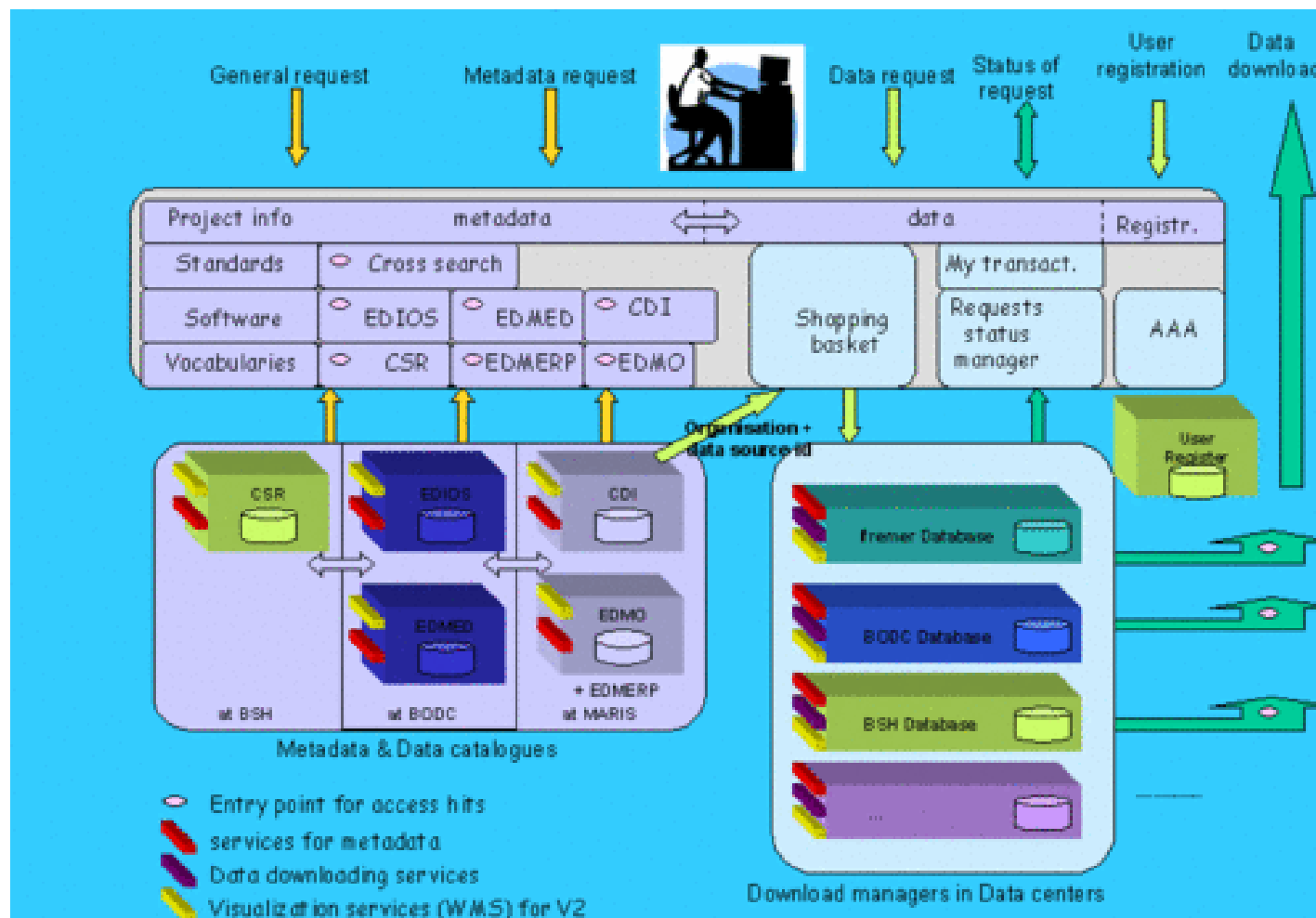


MAIN PRINCIPLES

- SeaDataNet is a **standardized system** for managing the large and diverse data sets collected by the oceanographic fleets and the automatic observation systems.
- It is based on a **semi-distributed system** that incorporates NODCs/partners in a unique virtual data management system and enhances the existing network in order to provide and deliver integrated data, metadata and products of standardized quality on-line through a unique portal.
- SeaDataNet 2 objective is to upgrade the present infrastructure into an operationally robust and state-of-the-art Pan-European infrastructure for providing up-to-date and high quality access to ocean and marine metadata, data and data products.



SEADATANET'S INFRASTRUCTURE COMPONENTS



SDN NETWORK MONITORING SYSTEM

- **Scope:** Upgrade SeaDataNet's infrastructure into an operationally robust and state-of-the-art system.



BENEFITS OF SDN NETWORK MONITORING

- Real time monitoring & alerting.
- Messaging system: a “live” component acting as notification tool for the service administrators to improve the overall availability of the SDN infrastructure.
- Calculation of the overall availability of the SDN provided services.
- Identification and update of critical units is very important in distributed systems such as SDN to improve their robustness.



MONITORED SERVICES

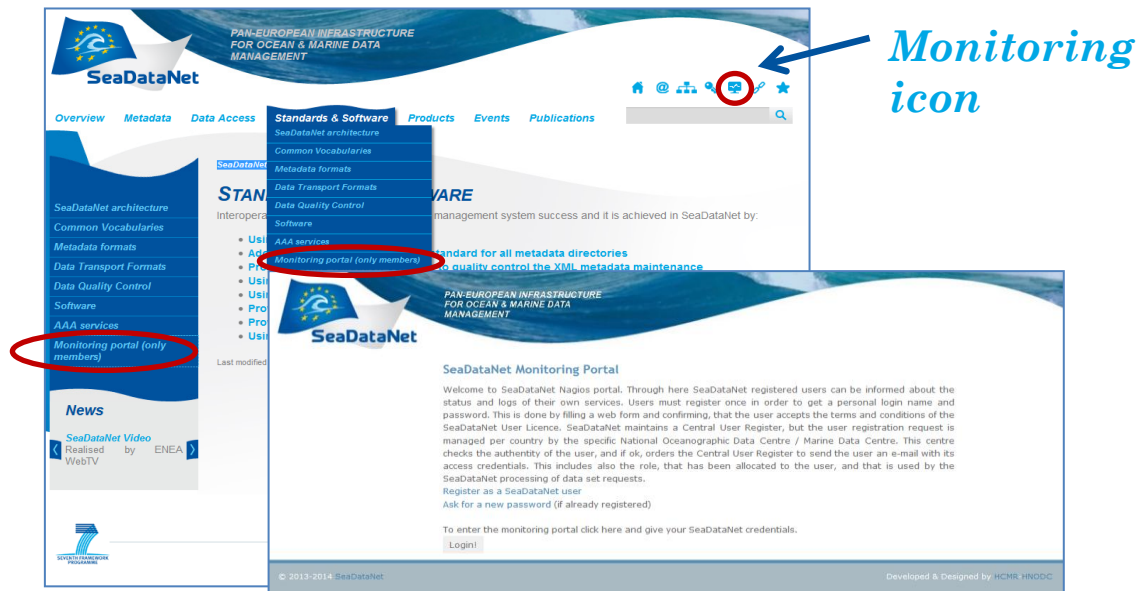
The SeaDataNet components that are monitored are divided into two groups of services:

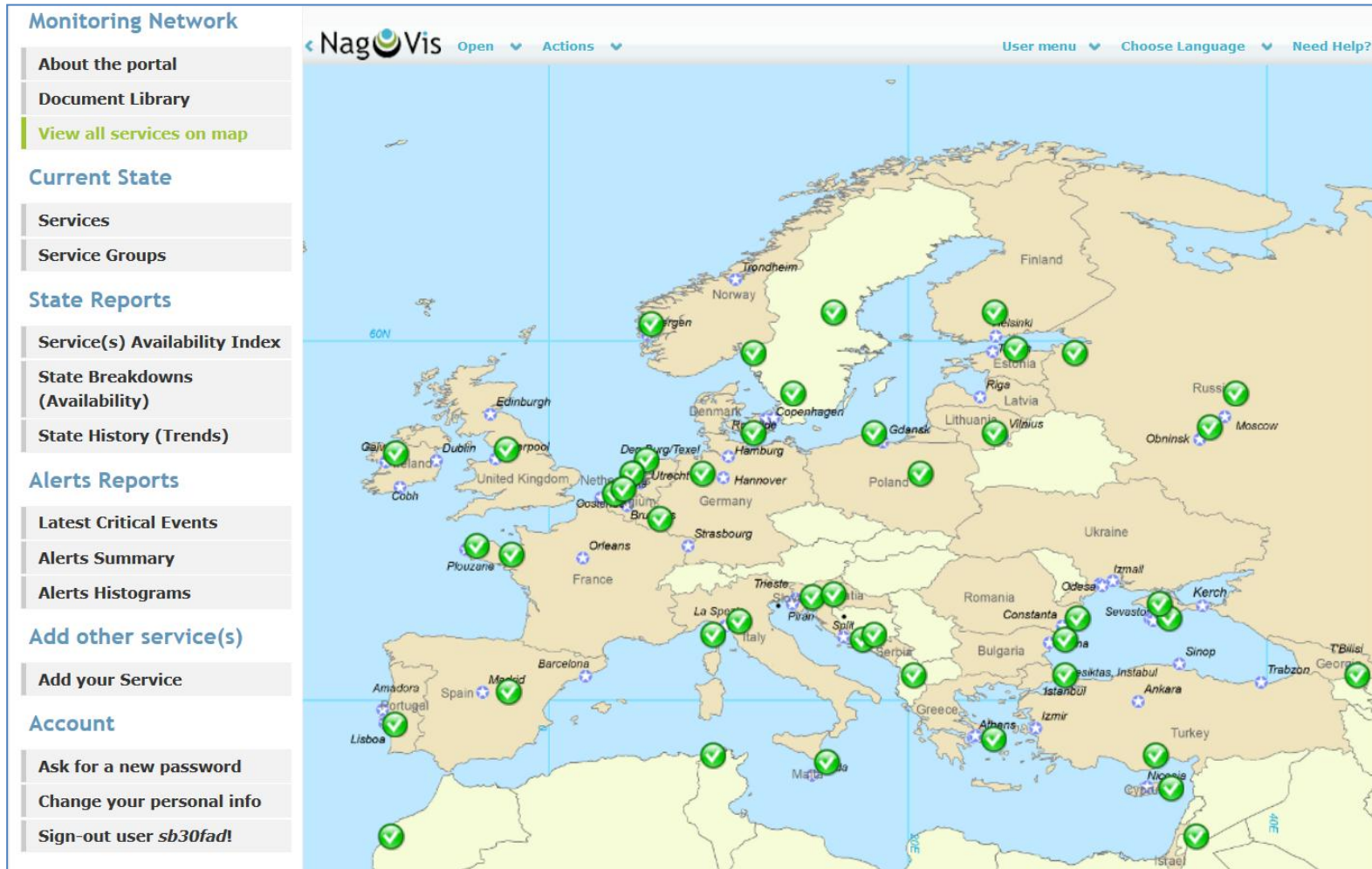
- The **Core services**, which are centrally-based provided services:
 - Common Data Index (CDI) portal
 - European Directory of Marine Organisations (EDMO) portal
 - European Directory of the initial Ocean-observing Systems (EDIOS) portal
 - European Directory of Marine Environmental Research Projects (EDMERP) portal
 - European Directory of Marine Environmental Research Projects (EDMED) portal
 - Cruise Summary Reports (CSR) portal
 - SeaDataNet homepage
 - SDN Central Authentication Service
 - Common Vocabularies Web Services
 - Request Status Manager (RSM)
- The **Local services**, which are services provided by the partners' locally situated infrastructures .
 - 83 Download Managers supporting SeaDataNet, GeoSeas, UBSS and EMODNet-Chemistry-Bathymetry projects



SDN MONITORING PORTAL

- A user-friendly monitoring web portal is developed in order to give access to service administrators (members only) of the SeaDataNet components to view detailed logging information of their own service(s) outages (DOWN status) and report their unit(s) availability (UP status).
- Access via SeaDataNet portal: <http://www.seadatanet.org/>

A screenshot of the SeaDataNet Monitoring Portal. The page has a blue header with the SeaDataNet logo and navigation links: Overview, Metadata, Data Access, Standards & Software, Products, Events, Publications. A blue arrow points to a "Monitoring icon" in the top right corner. The left sidebar contains a list of links, with "Monitoring portal (only members)" circled in red. The main content area is titled "SeaDataNet Monitoring Portal" and contains a welcome message, a registration form, and a login form. The footer includes the copyright notice "© 2013-2014 SeaDataNet" and the text "Developed & Designed by HCNR HRSDG".



SERVICE AVAILABILITY INDEX (UPTIME)

- % Uptime for each of the services individually on a defined period of time.

Monitoring Network

About the portal
Document Library
View all services on map

Current State

Services
Service Groups

State Reports

Service(s) Availability Index

State Breakdowns
(Availability)
State History (Trends)

Alerts Reports

Latest Critical Events
Alerts Summary
Alerts Histograms

Add other service(s)

Add your Service

Account

Ask for a new password
Change your personal info
Sign-out user *sb30fad1*

Calculate Availability Index

This form calculates in real-time the availability of a service in a specific period of time on percentage basis.

Select: **All**
From: 2014-02-01
To: 2014-03-07
Calculate

Availability of **Ankara University Download Manager** service for the specified period is **99.11%**
Availability of **BGODC-IOBAS Download Manager** service for the specified period is **100%**
Availability of **BGR Download Manager** service for the specified period is **100%**
Availability of **BGS Download Manager** service for the specified period is **99.11%**
Availability of **BODC Download Manager** service for the specified period is **100%**
Availability of **BRGM Download Manager** service for the specified period is **100%**
Availability of **BSCS Download Manager** service for the specified period is **37.38%**
Availability of **BSH Download Manager** service for the specified period is **100%**
Availability of **BSTU Download Manager** service for the specified period is **100%**
Availability of **CDG-CNRS Download Manager** service for the specified period is **96.69%**
Availability of **CDI homepage 1** service for the specified period is **100%**
Availability of **CDI homepage 2** service for the specified period is **100%**
Availability of **CNR Download Manager** service for the specified period is **99.27%**
Availability of **CSR homepage** service for the specified period is **100%**
Availability of **CYOC Download Manager** service for the specified period is **99.9%**
Availability of **Common Vocabularies** service for the specified period is **99.93%**
Availability of **DEU-IMST Download Manager** service for the specified period is **70.29%**
Availability of **DHMO Download Manager** service for the specified period is **97.44%**
Availability of **EDIOS homepage** service for the specified period is **100%**
Availability of **EDMED homepage** service for the specified period is **100%**
Availability of **EDMERP homepage** service for the specified period is **100%**
Availability of **EDMO homepage** service for the specified period is **100%**
Availability of **EGK Download Manager** service for the specified period is **99.51%**
Availability of **ENEA Download Manager** service for the specified period is **92.32%**
Availability of **EPA Download Manager** service for the specified period is **100%**

DOWNTIME EVENTS (ALERTS)

- Reports services outages on a user defined period of time. (Service Name, When started, When finished if finished during the defined period, Duration and Information about the cause of the downtime.)

Monitoring Network

- About the portal
- Document Library
- View all services on map

Current State

- Services
- Service Groups

State Reports

- Service(s) Availability Index
- State Breakdowns (Availability)
- State History (Trends)

Alerts Reports

- Latest Critical Events
- Alerts Summary
- Alerts Histograms

Add other service(s)

- Add your Service

Account

- Ask for a new password
- Change your personal info
- Sign-out user *sb30fad!*

Contact

Alerts Summary

Select to view the summary of alerts of your host/service.

Select Type: Service Next

Select service from the criteria below:

Select service: All

From: 2014-02-01

To: 2014-03-07

View Alerts

Alerts Details

Number of Alerts: 51

Service	Date Event Started	Date Event Ended	Status Information	Duration
UMG Download Manager	2014-03-06 21:23:23	2014-03-07 00:43:18	CRITICAL - Socket timeout after 10 seconds	03:19:55
ENEA Download Manager	2014-03-05 10:24:10	2014-03-05 12:55:03	CRITICAL - Socket timeout after 10 seconds	02:30:53
NGU Download Manager	2014-03-05 02:00:57	2014-03-05 08:01:02	No route to host	06:00:05
IGS Download Manager	2014-03-04 21:22:56		CRITICAL - Socket timeout after 10 seconds	
IGWE Download Manager	2014-03-04 15:06:08	2014-03-06 08:46:07	No route to host	41:39:59
INSTM Download Manager	2014-03-04 11:05:29	2014-03-06 13:45:22	CRITICAL - Socket timeout after 10 seconds	50:39:53
CYOC Download Manager	2014-03-04 10:54:39	2014-03-04 11:34:38	HTTP CRITICAL: HTTP/1.1 403 Forbidden - string 'OK' not found on 'http://www.oceanography.ucy.ac.cy:80/dm/index.html' - 1602 bytes in 0.229 second response time	00:39:59

GLOBAL AVAILABILITY INDICATOR

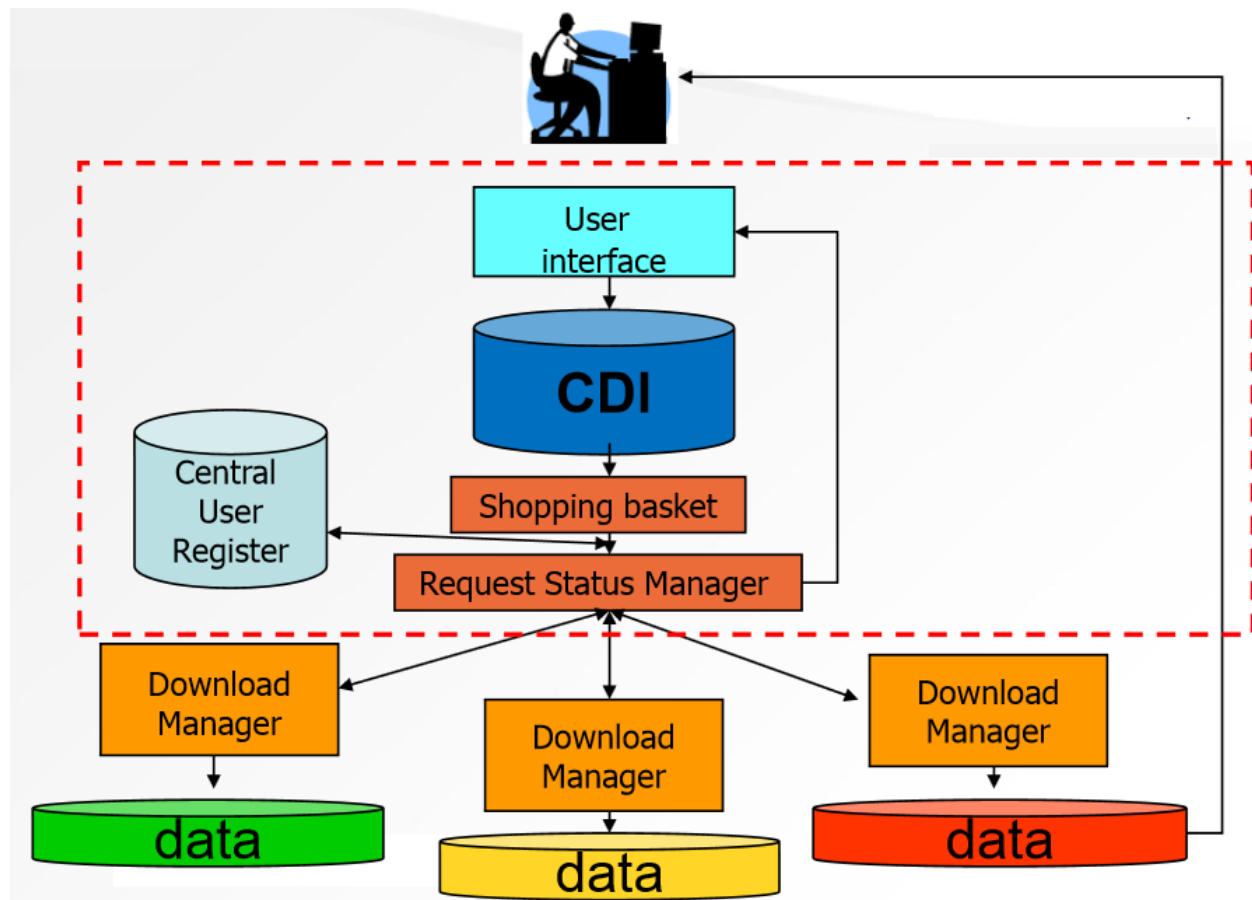
- SDN network is an integrated system of separate services. A critical event (service down) in a system node is possible to isolate other network nodes leading to loss of the availability (uptime) of larger network parts or service types.



Global Availability Indicator Definition: The percentage of time in a specific period that a system composed of several services is up and running.



“DATA ACCESS SERVICES” ARCHITECTURE SCHEMA

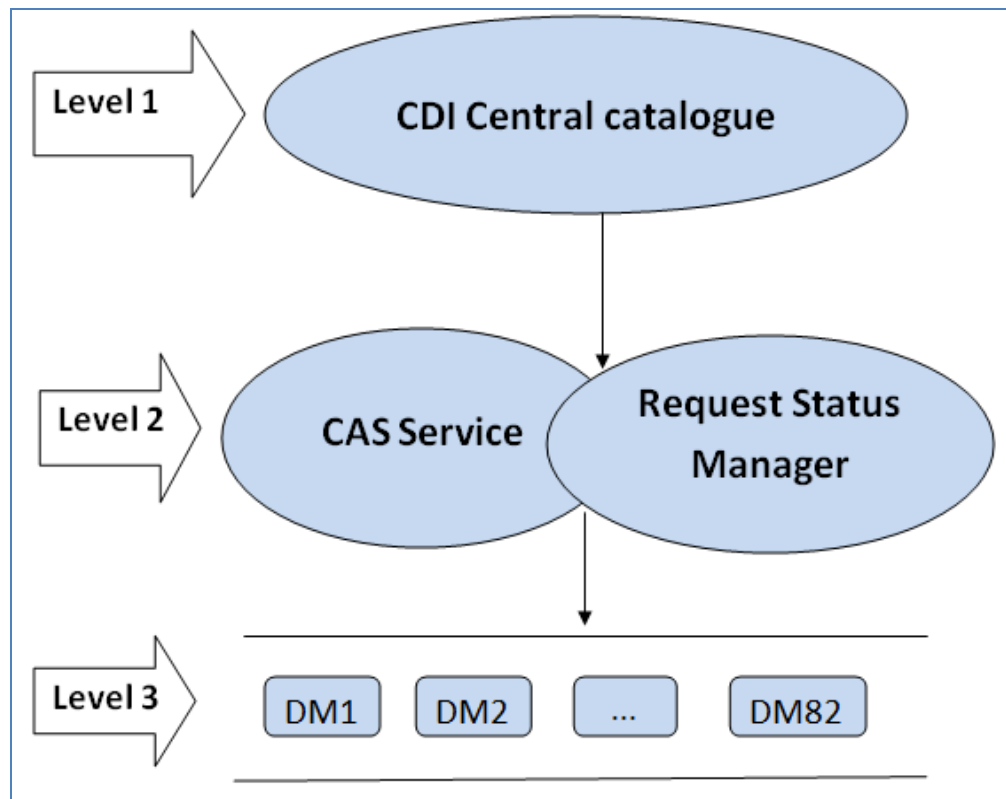


GLOBAL AVAILABILITY: METHOD ANALYSIS

- The method followed to calculate the Global Availability Index in case of SeaDataNet can be described as follows:
 - Division of the whole system in operational modules, single services whose uptime is measured by the monitoring portal.
 - Definition of dependencies between these modules to formulate the influence of each module's availability (uptime) against the whole system.
 - Definition of a weight coefficient for each module indicating its involvement in the total system productivity).



“DATA ACCESS SERVICES” (HIERARCHICAL CHAIN)



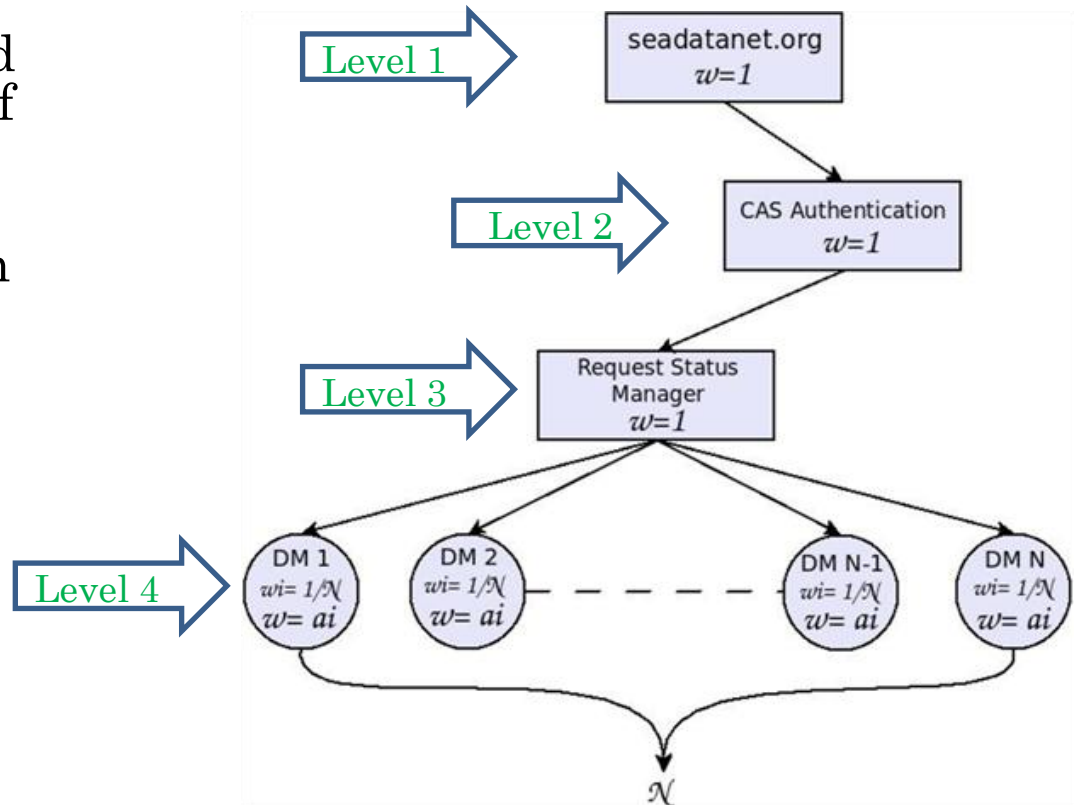
“DATA ACCESS SERVICES”:MATHEMATICAL FORMULA

- The seadatanet.org, CAS authentication and Request Status Manager services play a critical role to the overall data availability of the network.
 - If they are not functioning (**OFF**) then the availability is **NULL**.
 - When seadatanet.org, CAS authentication and Request Status Manager are actually functioning properly (**ON**) then the Availability is calculated based on the equation below that consists of the following factors:
 - s_j value: the uptime of each of the above three services
 - evaluation coefficient (w_i): estimated delivered CDIs for each local service (Download Manager),
 - s_i value: uptime of each local service.

$$Availability = \begin{cases} 0, & \text{seadatanet.org/CAS authentication/Request Status Manager OFF} \\ \sum_{j=0}^3 s_j \sum_{i=0}^n w_i s_i, & \text{seadatanet.org/CAS authentication/Request Status Manager ON} \end{cases}$$

“DATA ACCESS SERVICES”: COEFFICIENT W

- The coefficient w is the weight of each node and describes significance of each node.
- The **sum of w of each level must be 1**, which is the maximum value of w and describes the full service availability.
- In the forth level, the coefficients w are the **monthly analysis of the statistics of each Download Manager (DM)**.
Coefficient $w=a_i$, where a_i is the percentage of delivered CDIs, which are divided by 100.



FALSE ALARMS DETECTION SYSTEM

- **False Alarms:** The Monitoring System gives status CRITICAL (downtime) to services that are not in reality DOWN (e.g. the monitoring system is DOWN).
- **False Alarms Detection System scenario:** to cross check the critical events provided by the two Monitoring Systems (installed in different premises) in order to detect and avoid false alarms.
- **Prompts:**
 - establishment of a more reliable SDN Monitoring system,
 - no false notifications to the partners,
 - more reliable statistics.
- **Three solutions:** two add-ons by Nagios (*Nagira - Nagios RESTful API & status-json*) and one own development => Implementation of the most suitable case.



FUTURE PLANS

- In the framework of another project the network performance will be monitored, also.

Network Performance Monitoring consists of measuring, modeling, planning, and optimizing networks to ensure that they carry traffic with the speed, reliability, and capacity that is appropriate for the nature of the application and the cost constraints of the organization.

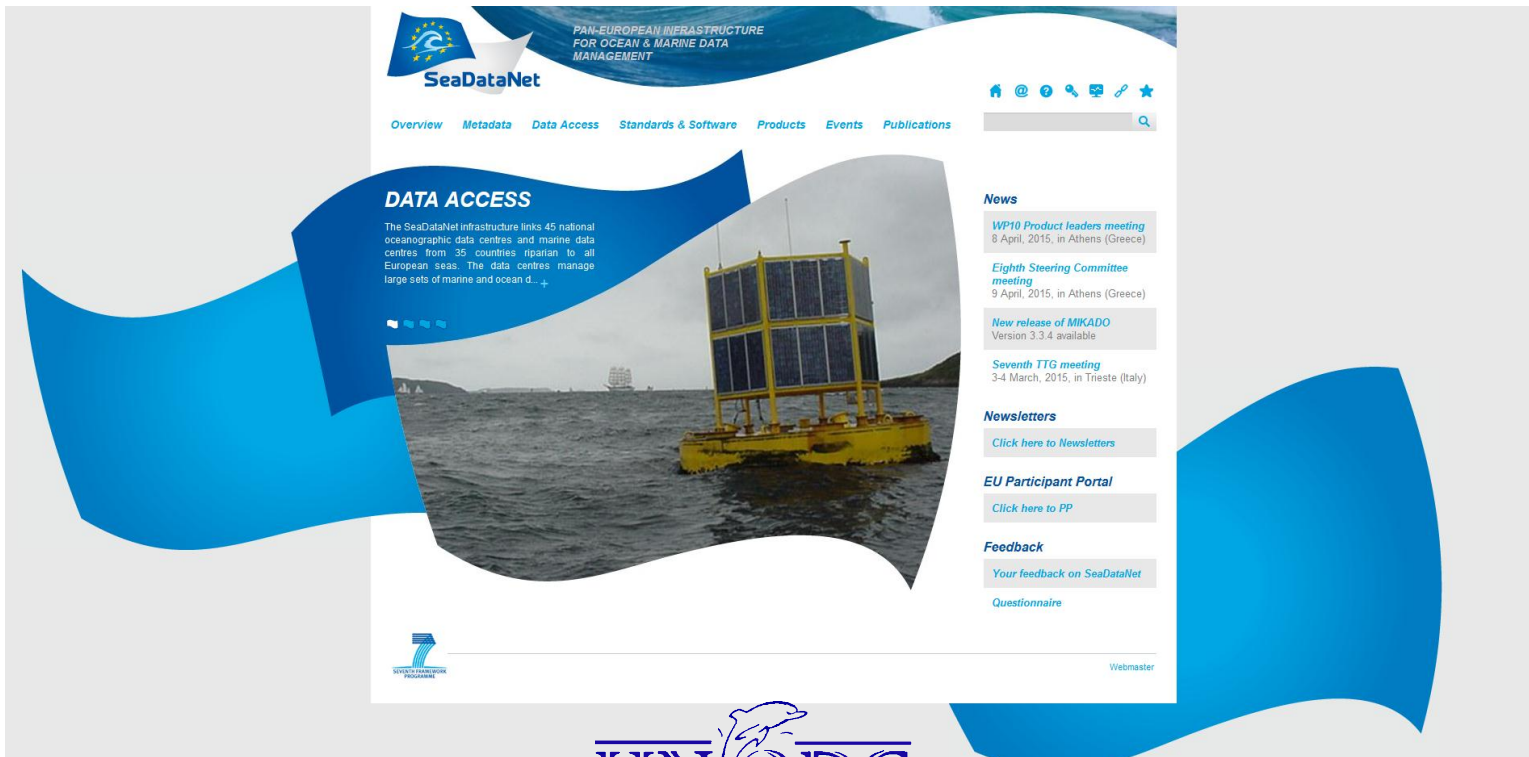


- Performance monitoring is vital for service networks based on heavy consumption of computer and network resources, such as Web Processing Services (WPS).



THANK YOU!

Visit the seadatanet portal at: <http://www.seadatanet.org>



The screenshot shows the SeaDataNet portal homepage. At the top, there is a banner with the SeaDataNet logo and the text "PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT". Below the banner is a navigation menu with links: Overview, Metadata, Data Access, Standards & Software, Products, Events, and Publications. A search bar is located on the right side of the menu.

The main content area is divided into two columns. The left column features a large blue wave graphic and a section titled "DATA ACCESS". The text in this section reads: "The SeaDataNet infrastructure links 45 national oceanographic data centres and marine data centres from 35 countries riparian to all European seas. The data centres manage large sets of marine and ocean data." Below this text is a small image of a yellow buoy with solar panels on the water.

The right column contains a "News" section with three items: "WP10 Product leaders meeting" (8 April, 2015, in Athens (Greece)), "Eighth Steering Committee meeting" (9 April, 2015, in Athens (Greece)), and "New release of MIKADO" (Version 3.3.4 available). Below the news section is a "Newsletters" section with a link "Click here to Newsletters". Further down is an "EU Participant Portal" section with a link "Click here to PP". At the bottom of the right column is a "Feedback" section with a link "Your feedback on SeaDataNet Questionnaire".

At the bottom left of the page, there is a logo for the "7th Framework Programme". At the bottom right, there is a "Webmaster" link.