Marine Science Information Throughout the World.
(eds) Winn, Burkhart & Burkhart, IAMSLIC. 1988

Ocean Network Information Center (OCEANIC) Developing an Online Ocean Information System

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ABSTRACT

This paper presents a description of an online information system developed at the University of Delaware using NASA's Space Physics Analysis Network (SPAN). The Ocean Network Information Center (OCEANIC) was conceived as part of a plan for data management of the United States component of the World Ocean Experiment (WOCE). The plan describes three components: WOCE Data Centers, National Data Centers, and a WOCE Data Management Unit. In this plan the WOCE Data Management Unit acts as an information center and monitors WOCE data flow. OCEANIC is the mechanism that has evolved for maintaining and disseminating this information. As development progressed, and it became evident that many of the elements contained within OCEANIC had broader applications and that there might be general interest by oceanographers, a policy of making OCEANIC available through a variety of routes followed. It was also noted that while many oceanographic institutions had access to computer networks, little had been done to coordinate these efforts and pass the information on to the research oceanographer.

Since OCEANIC was created as one part of what is planned to be a distributed system of information, data, and analysis centers, testing was begun on this approach by having a parallel effort at the National Oceanographic Data Center (NODC). The Data Center component of the system is called NODC SPAN Information Exchange (NOSIE). NOSIE elements give the user detailed information on data availability and on how to order the data. NOSIE also contains a section on data submission. The paper describes the current status of both OCEANIC and NOSIE, current developmental efforts, and plans for the future.

INTRODUCTION

In recent years we have witnessed the increasing sophistication and automation of the information sciences. Searching for bibliographic information and contents of abstracts from online data bases is common in the United States and many other countries. Information location and retrieval is also becoming an important task for data centers, particularly for the earth sciences.

Data centers storing numerical data are finding that new observational techniques are producing larger and more varied datasets. This presents a growing problem for the scientist: how to locate datasets of interest, and how to evaluate the usefulness of large datasets without having to wade through a sea of numbers. A solution can be found by creating two elements: a directory to datasets and information about data in the form of data product summaries.

As oceanography from space and telecommunicated in-situ systems develop, there is a growing need for metadata (information about data) and data in summarized or analyzed form. As a consequence, there is a need to develop new search techniques by drawing from those that have evolved out of libraries and those developed from numerical data archives.

I would like to describe OCEANIC (Ocean Network Information Center), a first step in developing an on-line data information center. This system has been developed at the University of Delaware as part of a data management system for the World Ocean Circulation Experiment (WOCE).

THE WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

In order to understand why OCEANIC has certain characteristics, it is useful to have some understanding of the WOCE program. WOCE is a coordinated attempt to describe and understand the general circulation of the world ocean, with emphasis on the relation of the ocean to climate on a decadal time scale. It is envisioned primarily as a field program that is designed and analyzed in concert with the use and extension of modern theory and numerical models. It is also a new kind of large-scale study for oceanography, because it involves a coordinated program of satellite measurements, in situ studies, and modeling.

The WOCE data management system had to take into consideration goals that had been set out by the scientific steering groups:

The assessment of the value of existing datasets to WOCE and the assembly of useful subsets of that data for WOCE purposes.

The creation of datasets for the critical assessment theories and models.

The creation of datasets to be used as boundary conditions for ocean models.

Because of the diverse nature of WOCE, a distributed data system was designed. It consists of specialized data assembly centers, analysis centers, and archiving and dissemination centers. These centers will be linked to each other and to a data management unit with responsibility for receiving and distributing information required by program participants and acting as a link to data dissemination centers.

The University of Delaware, operating the WOCE Data Management Unit, has developed an online system, OCEANIC, as a tool for providing information. OCEANIC is designed to

Describe datasets and how get them (directories and catalogs).

Distribute data products required by program scientists.

Provide program information.

Disseminate information about common WOCE standards, algorithms, and programs.

Inform users regarding network services.

The National Oceanographic Data Center (NODC) is developing a complementary prototype online data center system, NOSIE. Its purpose is to support the broad national oceanographic data archiving and dissemination services of NODC.

THE DEVELOPMENT OF OCEANIC

Although some of the modules of OCEANIC were refined by trial and error, early in the development process some general guidelines were established:

A menu driven system - No book of instructions to read.

Quick response time - Answers in a couple of seconds or less.

Available on the simplest of terminals - no new hardware or software needed (we've had to modify this slightly).

With these guidelines in mind, we created our first version of an online information system. New information was continually being added, and once in a while the structure was reviewed, sometimes found cumbersome, and restructured. This process continued for about a year. As the system evolution took place, we realized that we had to add a graphics capability. That would allow information to be presented in pictorial form to summarize data in the form of information, thereby meeting one of the principal objectives of the system.

However, implementing a graphics system meant that in order to use it, users would need an intelligent terminal (PC) with graphics emulation software. We found that such software was relatively inexpensive (Figure 1) and many users already had what was needed. Thus, in our second year of development we created a version that contained graphic depictions of section lines, inventory descriptions, and data products. When combined with non-graphic information, a world of information was available to the user, with no complicated system to learn, with answers in seconds, from almost any kind of computer terminal.

Figure 1

GRAPHIC PROGRAMS TESTED

EM 4010	PCPLOT	TEKTRONICS 4010

Though OCEANIC began by providing information to the WOCE community, it became apparent that it could also serve a broader audience. It thus now contains some modules that provide information that extends beyond the WOCE project.

NOSIE

At NODC, the problem was a bit different. NODC provides data and data products to requesters. Its mission is to acquire, process, archive, and disseminate. NODC needed to link to the information system so that those first needing to know where to look could be directed to NODC (or another center), without a special hookup. After that, NODC needed to provide the services of a national archive. NODC laid down the following principles for an information system:

Users should be able to search both directory and detailed inventory systems so as to define a data request in some degree of specificity.

Users should be able to get up-to-date information on data acquired by the data center.

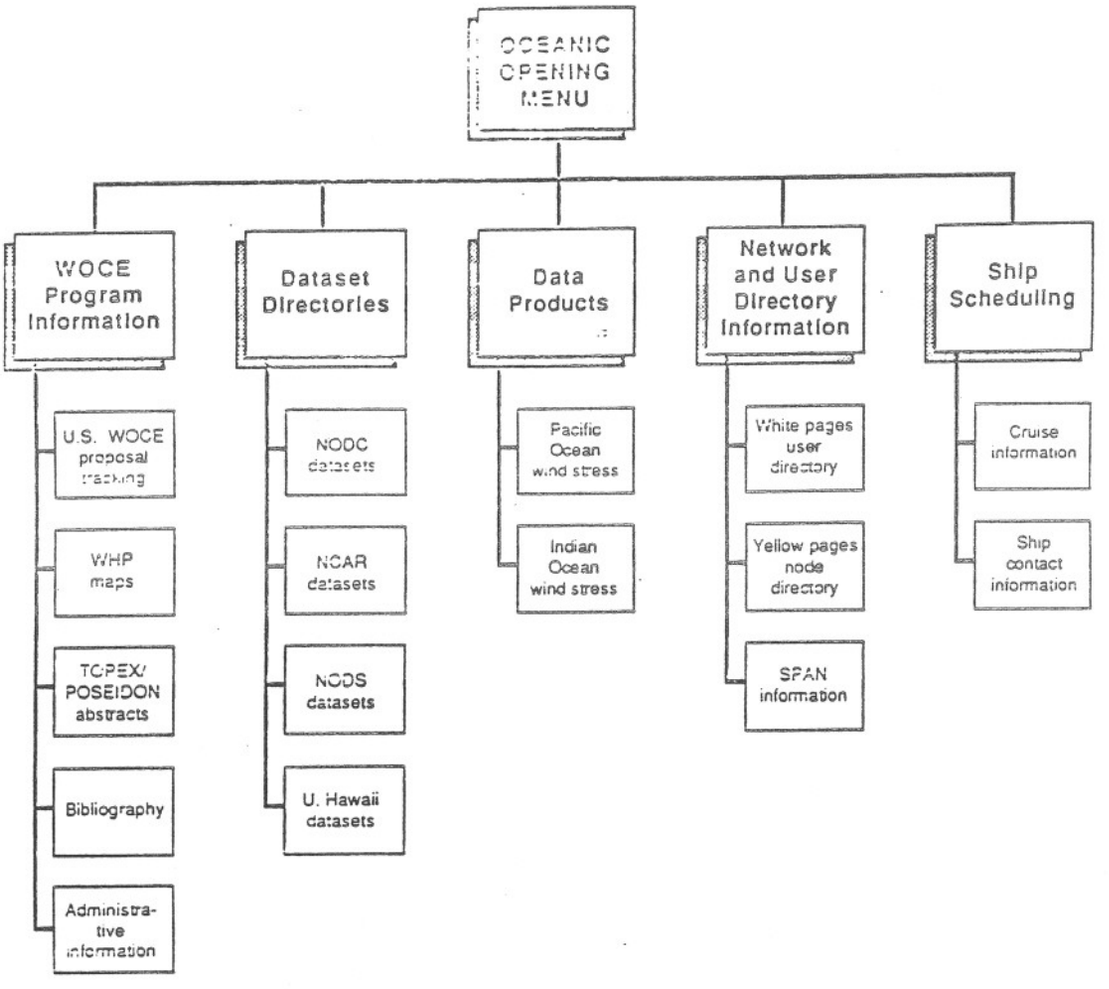
The system should contain data ordering procedures.

A data accessions system should be developed for receipt of data.

NODC should experiment with online data delivery.

Figure 2

OCEANIC MENU STRUCTURE
(Top three levels)



OCEANIC
Ocean Network Information Center
University of Delaware, College of Marine Studies, Lewes, DE

Because NODC deals with large datasets, inventory searches might require a minute or two of searching time and selective data retrieval longer times, plus some knowledge of a query language. The online data search, select, and ship system would almost certainly require a user reference guide and training. As with OCEANIC, the NODC system used SPAN as the test network, but is designing a system to be accessed by a number of electronic systems.

INFORMATION CONTENT OF OCEANIC AND NOSIE

Though they are similar in concept, OCEANIC and NOSIE differ considerably in their contents, as befits their differing service functions.

As presently configured, there are 6 main parts to OCEANIC (Figure 2):

1. **Data Directories** provide a brief description of datasets held by centers. These descriptions usually include the data type, geographic area, period of record, size, and media of storage. Where applicable, principal investigators and project names are provided. Searching may be done by word roots, maps, or simply browsing dataset names of interest. At the moment most entries deal with historical data. As WOCE datasets become available, their descriptions will be added.

2. **WOCE Program Information** contains both administrative and scientific information about the program. Maps portray planned data collection lines and historical data associated with these. Once the program is underway, summaries of data collected and dataset descriptions will be added so that projects and resulting data can be tracked from their inception to data dissemination centers.

3. **Data Products** are provided by analysis centers and contain analytical output (usually in graphic form), derived values, and model output. A short description of the product is included. This description will include a reference to observational data sources when applicable.

4. **User and Network Directories** were created out of a need to find individuals and network services in the oceanographic community. Most networks did not provide this information, nor did any of the traditional sources. Furthermore, things were changing rapidly, but little effort was being made to keep track of these changes.

5. **Research Ship Schedules** contain information on planned voyages for a number of countries. Contents include type of data to be collected, ocean area, and cruise dates. Years for which information is available are 1988-1993. The Intergovernmental Oceanographic Commission (IOC) has partially sponsored this effort as part of its program to disseminate information on planned National Oceanographic Programs.

6. **The Message System** invites all users to leave a message. By telling us what they like, what they would like, and problems they may have encountered, they aid in improving the system.

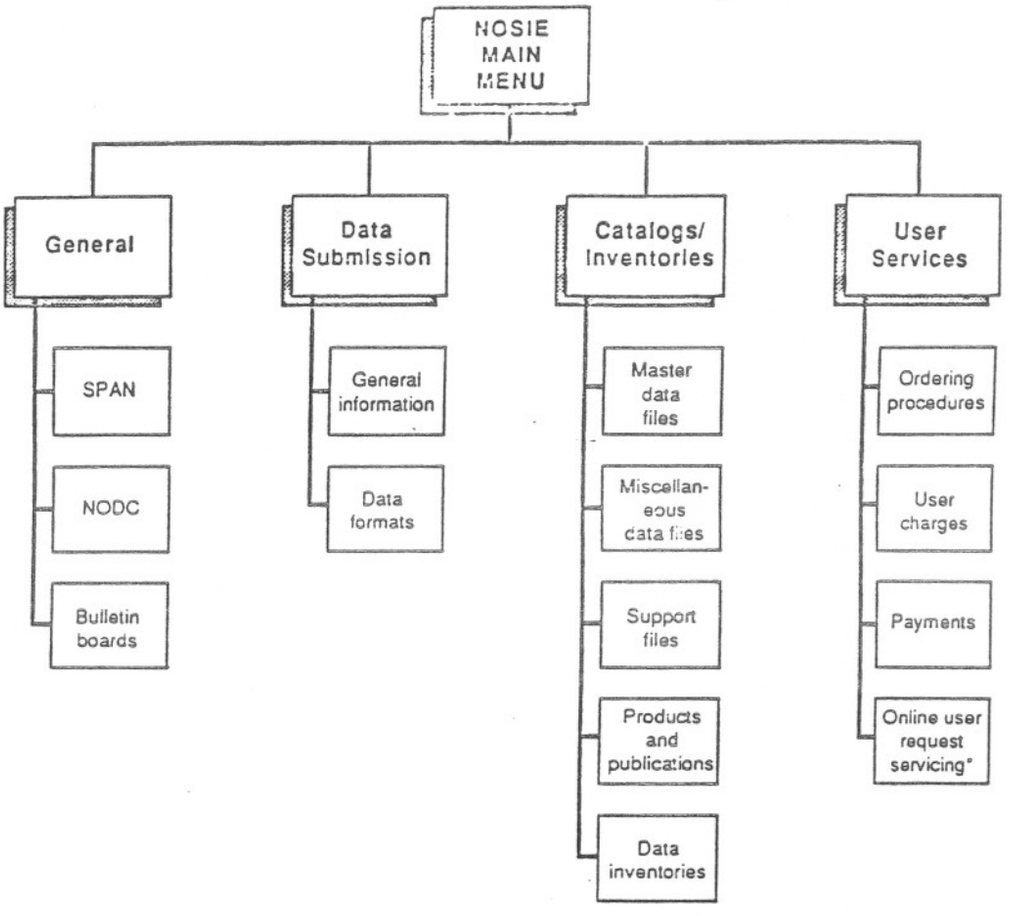
The present configuration of NOSIE (Figure 3) contains four major sections:

1.**Bulletin Boards** provide general information on NODC, how to use the system, and recent news.

2. **Data Submission Guideline and Formats** provide information on the characteristics and formats for common data types. Note that this version

Figure 3

NOSIE MENU STRUCTURE
(Top three levels)



*Not yet available; module under development.

Figure 4

ACCESSING OCEANIC via

SPAN

```
$ SET HOST DELOCN
USERNAME: INFO (No password is required.)
```

Telemail/Omnet (USA)

```
COMMAND? GOTO SONIC
```

(NOTE: In Alaska use Omnet network address: 909014)

Telemail/Kosmos(USA) At the Part B menu, type

```
SONIC
```

Internet Gateway

```
% TELNET LONG.UCAR.EDU (or 128.117.64.6
LOGIN: DELOCN:: (or 6289::)
USERNAME: INFO (No password is required.)
```

International Direct The preferred method is via the international packet-switched network address:

```
311030200612    - if your national system requires a 12-digit address
31103020061200  - if your national system requires a 14-digit address
```

(Some national systems require two zeros in front of the address; you may need to experiment.)

International Telemail/Omnet You may connect via Telemail/Omnet at one of these addresses:

```
311090900003    - if your local network requires a 12-digit address
31109090000300  - if your local network requires a 14-digit address.
```

(NOTE: In Canada use Datapac network address: 1311090900014)

After you get the Telenet prompt "@", continue the following sequence of prompts and responses:

```
@ MAIL
USERNAME? Your Username
PASSWORD? Your Password
```

Once you are signed on to Telemail:

```
COMMAND? GOTO SONIC
```

To return to Omnet from OCEANIC:

```
SELECTION→ GOTO MAIL
```

When you are finished with your Telemail session, enter:

```
COMMAND? BYE
@ HANG (this disconnects Telenet)
```

Telenet Pad OCEANIC is accessible by pre-paid accounts over packet-switched systems via Telenet Pad# 302612. At the Telenet "@" prompt:

```
@ C 302612
USERNAME: INFO (No password is required.)
```

Direct Dial-up To access OCEANIC by modem (at 300, 1200, or 2400 baud), dial (302) 645-4204. When the connection is established, hit a carriage return, <cr>, then respond with:

```
USERNAME: INFO (No password is required.)
```

of the system requires special arrangements for direct network data shipments.

3. **Catalogs and Inventories** contain information similar to the directory information in OCEANIC and additional information on data content. In addition, there is a rudimentary inventory program that allows searching for data by geographic area and time period. Data found in these directories may be added to a "shopping list" and ordered prior to leaving the system.

4. **User Services** allow the placing of orders online. While online data delivery is not fully functional, it is planned to add it in the coming year.

COMMUNICATIONS

By definition, an online information system must have connections to users, data and information sources, and other information repositories. What is now OCEANIC was able to develop by using the Space Physics Analysis Network (SPAN), a NASA sponsored computer network. SPAN was originally put together to serve the needs of the space physics research community. The Ocean Processes Branch of NASA supported the installation of a number of network nodes at oceanographic centers to create SPAN:OCEAN. SPAN was thus timely and available as a test network to try out an information system.

The system at Delaware began as a SPAN:OCEAN network service and was called SONIC (SPAN:Ocean Network Information Center). As WOCE information increased, as the connectivity went beyond SPAN, and as graphical data products became numerous, the Delaware system grew to what is now called OCEANIC. (SONIC, that is the SPAN:OCEAN network service, continues as a component of OCEANIC.)

To be effective, an information systems should be accessible to scientists nationwide (if not globally) and should provide the means for access through a variety of links. Thus, today OCEANIC has several modes of access available in addition to SPAN. It may also be reached via NSFnet, INTERNET, OMNET/telemail, KOSMOS/telemail, Telenet, and by direct dial-up of the host computer (Figure 4). OCEANIC is currently averaging approximately 1000 sign-ons per year, with no single means of access predominating.

NOSIE may be queried over SPAN or by direct dial-up of the NODC computer (Figure 5). Although OCEANIC and NOSIE have been linked experimentally; automatic switching between these systems is not yet operational.

Figure 5

NOISE can be accessed over SPAN or via dial-up modem (at 300 or 1200 baud.)

Over SPAN, type: Set Host NODC (carriage return)
Username: INFO (carriage return)

By modem, dial: (202) 673-5657 (300 baud)
or (202) 6730-5665 (1200 baud)

When the connection is established, hit a carriage return, then respond to the prompts as follows:

XT-Command: C NODC (carriage return)

Username: INFO (carriage return)

In the future it is planned that NOSIE will also be accessible via OMNET/Sciencenet on the TELEMAIL electronic mail system.

FUTURE DEVELOPMENTS

A number of enhancements to OCEANIC are presently underway or planned. These include

- Additional data directory information.
- New data products.
- Improved national and international connections
- Automatic switching to NODC and other archive centers.
- Cruise summaries and other data-tracking modules.
- Improved search capability.
- Additional network directory information.

NODC plans to augment NOSIE by

- Terminal-independent access.
- Access by other networks.
- Improved inventory searching.
- Prototype online data retrieval system.

CONCLUSIONS

The information systems under development at the University of Delaware and NODC are testing the feasibility and usefulness of such systems to the oceanographer of the 1990's. These systems are intended to use the tools of digital computers and high-speed networks to cope with the data generated by satellites, telemetry, and new instrumentation. They are prototypes of more advanced systems that will surely follow. As more sophisticated systems are developed, they will combine data bases containing information on publications with information derived from data dissemination centers into unified marine information systems.

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