

LOCAL AREA NETWORK

**ITS SIGNIFICANCE IN INFORMATION
SYSTEM**

P.C. BOSE

Secretary

Society for Information Science

New Delhi

1991

Batra Book Service

NEW DELHI-1

ROLE OF LAN IN OCEANOGRAPHIC INFORMATION MANAGEMENT
- A CASE STUDY OF NATIONAL INSTITUTE OF OCEANOGRAPHY

Pravin D. Kunte and R.M.S. Bhargava

Indian National Oceanographic Data Centre,
National Institute of Oceanography,
Dona Paula, Goa - 403 004.

ABSTRACT

A powerful and efficient computer system is needed for rapid exchange of data and information from scientists of different divisions to accelerate information management activities of Indian National Oceanographic Data Centre (INODC) of National Institute of Oceanography (NIO). In this respect, how significantly the Local Area Networking (LAN) can play a role in oceanographic information management is explained and dealt with in this communication.

Scope of this paper is limited to an overview of 1. LAN and its capabilities 2. information processing infrastructure at NIO, 3. functioning of INODC and 4. suitability of LAN in increasing efficiency in oceanographic information management.

It has been concluded that, LAN can play a very significant role in oceanographic information processing and management activities of NIO.

7

Role of LAN in Oceanographic Information Management

PARVIN D KUNTE and R M S BHARGAVA

Indian National Oceanographic Data Centre, National Institute of Oceanography, Dona Paula, Goa 403 004

Introduction

At the National Institute of Oceanography (NIO), scientists from different disciplines are engaged in collection, processing and interpretation of variety of oceanographic data from different depths and locations with a common aim of doing extensive application-oriented basic research in oceanography. Ocean study is inherently interdisciplinary and therefore calls for a controlled and integrated approach for information generation, processing and decision-making. INODC can act as a central nodal department for co-ordinating multi-disciplinary efforts, if all the departments are brought under the Local Area Networking (LAN).

The Indian National Oceanographic Data Centre (INODC) of NIO, stands as an unique national facility for

oceanographic data/information services. It has a responsibility to acquire, store and disseminate entire spectrum of oceanographic data. The centre is in need of powerful and efficient computer communication system for easy accessing and dissemination of data/information from scientists of different departments of the institute. In this respect, how significantly the LAN can play a role in oceanographic information management is explained and dealt with in this communication.

Scope of this Paper is Limited to an Overview

- (i) LAN and its capabilities,
- (ii) information processing infrastructure at NIO,
- (iii) functioning of INODC and,
- (iv) suitability of LAN in increasing efficiency in information management.

LAN and Its Capabilities

LANs are defined as privately owned networks that offer high speed communication channels which have been optimized for interconnecting information processing equipment in a limited geographic area (1).

In simple words, a local area network is nothing but an interconnection of personal computers (PC) so that a program running on one PC can access files stored on the hard disk or diskette drive of the other, and produce reports on the printer connected to another.

Terminology as used in LAN (1) and their definitions are :

1. *Network*—A network is two or more computers that are connected so that they can transfer data and share resources, such as disk and printer. In a network, each computer runs independently, but can

also communicate with other computers on the network. A network gives communication and space-saving advantages of shared files, and convenience and economy of shared printer.

2. *Server*—It is a powerful computer which runs special software to act as a file server.
3. *Workstation*—The computer that are linked to servers are called as workstations or nodes.
4. *Resources*—Disk, Directories, printers, plotters etc.
5. *WAN*—Wide Area Networking,

Major advantages of having LAN are listed below.

1. Expensive storage devices (disks and tapes) and output devices (high-speed printers, graphic plotters, terminals and digitizers) can be easily shared among users.
2. Communication and exchange of information is, easy, quick and reliable.
3. All specified users can use common software base, files and data simultaneously.
4. Updating, editing and retrieval of information from main database can be done provided access is given.
5. Electronic mail can be used for message communication.
6. PCs can be used as stand alone systems.
7. Manual data transfer is error prone, whereas data transfer through LAN is reliable.
8. It requires minimum of training to already experienced PC users.
9. It is flexible and growth oriented.

LAN's capability is accessed by : (1) their transmission speeds, (2) the distance they span, (3) their operating and performance characteristics, and (4) the capabilities and services they offer. SUPERLAN, Novell network, VIANet, Ethernet, PCnet, LAN link, D-link, Starlan, Pronet are some of LANs amongst many available describes the characteristics of some of the popular LANs.

Information Processing Infrastructure at N.I.O.

Following are the major departments which are actually involved in data/information collection and processing.

1. **Geological Oceanographic Division (GOD)**—Geological, Geophysical study and Polymetallic Nodule study.
2. **Physical Oceanographic Division (POD)**—Physical and meteorological study.
3. **Biological Oceanographic Division (BOD)**—Marine zoological and botanical study.
4. **Chemical Oceanographic Division (COD)**—Chemical and pollution study.
5. **Ocean Engineering Division (OED)**—Oceanographic engineering study.
6. **Marine Instrumentation and Computer Division (MICD)**—Marine Instrumentation study and Computer facility.
7. **Data and Information Division (DID)**—Data and information processing and archiving.

Scientists from different disciplines collect data on-board research vessels with semi-automatic instruments. Large quantum of data collected, are brought to the respective departments and are processed individually. Each department has its own computer infrastructure for data processing, which

is, in addition to the centralised computer infrastructure (Table 2) facility.

Most of the departments have IBM compatible PCs and additionally, some departments are equipped with plotters and digitizers (Table 3). In general, processing of collected data involves storing, formatting, statistical and mathematical computations, production of maps, plots and its interpretation. After utilisation, scientists are transferring data/information to the INODC manually.

Functioning of INODC

Expenditure on oceanographic data collection is very high. Data are valuable not only to the primary users responsible for its original collection but also to a wide range of secondary users. Thus, development of a centralised national data storage and dissemination facility, not only improves the availability of data to end-users but also ensures that the data is protected for long-term use. INODC's functions are defined to satisfy this.

INODC functions are :

1. Acquisition of data
2. Processing (coding and quality checking)
3. Storage (database management)
4. Preparation of data products
5. Dissemination of data

INODC has designed, discipline-wise and parameter-wise data formats for systematic acquisition and dissemination of data. This centre acquires data and information from generators in prescribed formats.

This centre also sorts out inventory level information and assigns INODC numbers to each station and each cruise.

92 *Local Area Network*

Processing of data involves preliminary checks for quality of data and parameters coding.

Inventory level information is stored in Station Inventory Information System (SIIS) developed using 'dBASE III Plus' database package available on PS/386 microcomputer working under MS DOS environment. Actual data level information is stored in Norsk Data (ND) 520, 570 computer system adopting Index File Structure.

Inventories, atlases, charts, data reports, directories, etc., are various data products that the INODC publishes. The processed archived data is available for dissemination to end-users.

When INODC's functions, information processing infrastructure (Table 3) and division-wise distribution of PCs and peripherals (Table 4) are considered together, it is felt that :

1. The resources are not evenly distributed within different departments (Table 4), if manpower, workload, and needs of the departments are considered.
2. Data transfer from generator to INODC or vice-versa, being manual, is not error free.
3. Within developments, same (almost) basic data is being used by the scientists for research work.
4. Scientist of one department requires data/information from the scientist of other department.
5. Within departments, similar pre-processing procedures are being adopted by scientists and hence some pre-processing software base can be shared by scientists.

Under such circumstances, it is felt that LAN may be of great in integrating information processing activities of NIO.

Suitability of LAN

INODC, with its computer infrastructural facility, will act as central node or file server and all other PCs and PC compatible, stretched around the institute can be connected to it using LAN (Fig. 1). LAN resources will reside on PS system of INODC, whereas each work station or node will have ring type of network, where one particular PC causing the trouble will be disconnected from the LAN rather than the whole network becoming standstill.

Central node at INODC will have managerial capabilities. It will allow sharing of resources available in the network. It will have password protection and file locking facility so that only authorized users will be allowed to use authorized resources software and files. The following general facilities can be made available at each workstation of node though central node.

1. Data acquisition formats and software,
2. On-line, user-friendly inventory information system for query handling and retrieval of inventory information,
3. General graphics packages,
4. Software base for quality control checks and statistical and mathematical computations,
5. Processed data reports,
6. Basic data files,
7. Help files,
8. Message files.

Central node will have latest status of network and will have proper documentation of entire network. Each workstation will utilize general facilities provided by central node and in addition to it, it will act as a standalone PC.

Advantages of having LAN as a part of information processing infrastructure are :

1. Expensive storage devices and output devices (high-speed printers, graphic plotters, terminals, digitizers) which are not presently evenly distributed within different departments, will be shared among the users.
2. Due to on-line availability of data acquisition formats, data will be made available to INODC.
3. Due to availability of quality control software, correct data will be made available to INODC.
4. A single set of standard software packages like LOTUS, dBASE etc., will be enough for all users.
5. Software base will provide common pre-processing software and statistical and mathematical packages will help users in advanced processing.
6. Scientists will have choice to utilize suitable output device (plotters, printers, digitizers, etc.,) out of devices available in LAN for their plotting and mapping purpose.
7. Users will be able to update, edit, and retrieve information from main data bank (which contains data from different disciplines) provided permission is granted by manager.
8. Scientists will have easy (read only) access to user friendly inventory information system and published data reports.
9. Electronic mail will provide easy way of communication with different departments of NIO.
10. Data integrity and security will be ensured.
11. Scientists will have open opportunity to utilize LAN

facility or otherwise one can be use once's PC as standalone system.

Discussion

LAN offers vastly superior approaches to local communication which greatly facilitates.

1. Information exchange
2. Resources sharing

Fast information exchange will greatly help functioning of INODC by :

1. acquiring data/information from generators,
2. disseminating information to user community,
3. maintaining high standards of data.

LAN will be very useful in speeding information processing activities of NIO due to :

1. resources sharing,
2. easy availability of software base and database.

Thus, it can be concluded that LAN can play a very significant role in oceanographic information processing and management activities of NIO provided proper and constructive co-operation is made available to LAN manager.

Acknowledgement

We express our sincere thanks to Dr. B.N. Desai, Director of the institute, for his initiation and encouragement. We are also thankful to Mr. J.S. Sarupria and other Divisional colleagues, for providing necessary help.

Table 1
Comparison of Some of the Popular LANs

<i>Characteristics</i>	<i>D-Link</i>	<i>VIA net</i>	<i>TEN net</i>	<i>Planet/Comet</i>	<i>MS-Net</i>	<i>Netware</i>	<i>Superlan</i>
1. Hardware & software	Resides on PC	At each work station	Special	Super mini	PC-AT	PC-AT	Distributed architecture reside on PC
2. Transmission speed	1 m bits/sec			Baud rate set by user			High
3. Distance	4000 feet			For long dist. modems/drivers			For long dist modems/drivers
4. Communication port	RS-422 serial	Distribution box	RS-422 serial	RS-232 serial	RS-232 serial	RS-422	RS-232 serial
5. Maximum No. of users	255	255	64	64	64		Large
6. File server	Not required	Not required	Required	Required	Not required	Required	Required more can be attached

7. Security	Moderate	Enough	Perfect	Perfect	Moderate	Perfect log, dir, file
8. Other Characteristic	A file opened & edited locally can be accessed remotely	Needs more space for file server	File transfer is possible but not remote execution	Remotely execution of file is possible	Mass storage disk is partitioned so prior permission is required	Extremely fast, flexible, true multi-tasking, very reliable

Common points

1. Electronic mail available.
2. Passwords, users, resources definitions are made through Manager.
3. PC's can be used as stand alone systems.
4. Individual PC can be log-off, log-on any time.
5. Other operating system can be attached through serial port by emulating terminal mode.

Table 2**Infrastructure of NIO Computer Centre**

Norks Data 520	
Norks Data 570	
Disc storage-units (450 m)	2
Magnetic tape units (800, 1600, 6250 bpi)	3
Printer (speed 1040 lpm)	1
Tektronis terminal	1
Versatac plotter	1
Tandberg terminal	7
Software	
Op. System : Sintran III (k)	Communication : Cosmos
Application packages : Hi Low	Languages : Fortran
(Filter Design)	
Norseis (Seismic)	C
NAG & NAG	
(Graphic)	Assembler

Table 3**Infrastructure of INODC**

1. DCM PS/386 Microcomputer	two
2. 2 MB RAM	two
3. 1.2 MB Floppy Drive	two
4. 40 MB Hard Disk drive	two
5. Color VDU	one
6. Monochrome VDU	one
7. 11" *8" Digitizer	one
8. A3/A4, Colour Plotter	one
9. Epson Dot Matrix Printer	two
10. Line-Drive-Recciver Pair	one
<i>Software</i>	
1. MS DOS 3.21	
2. GW Basic	
3. Kurta Software for Digitizer	

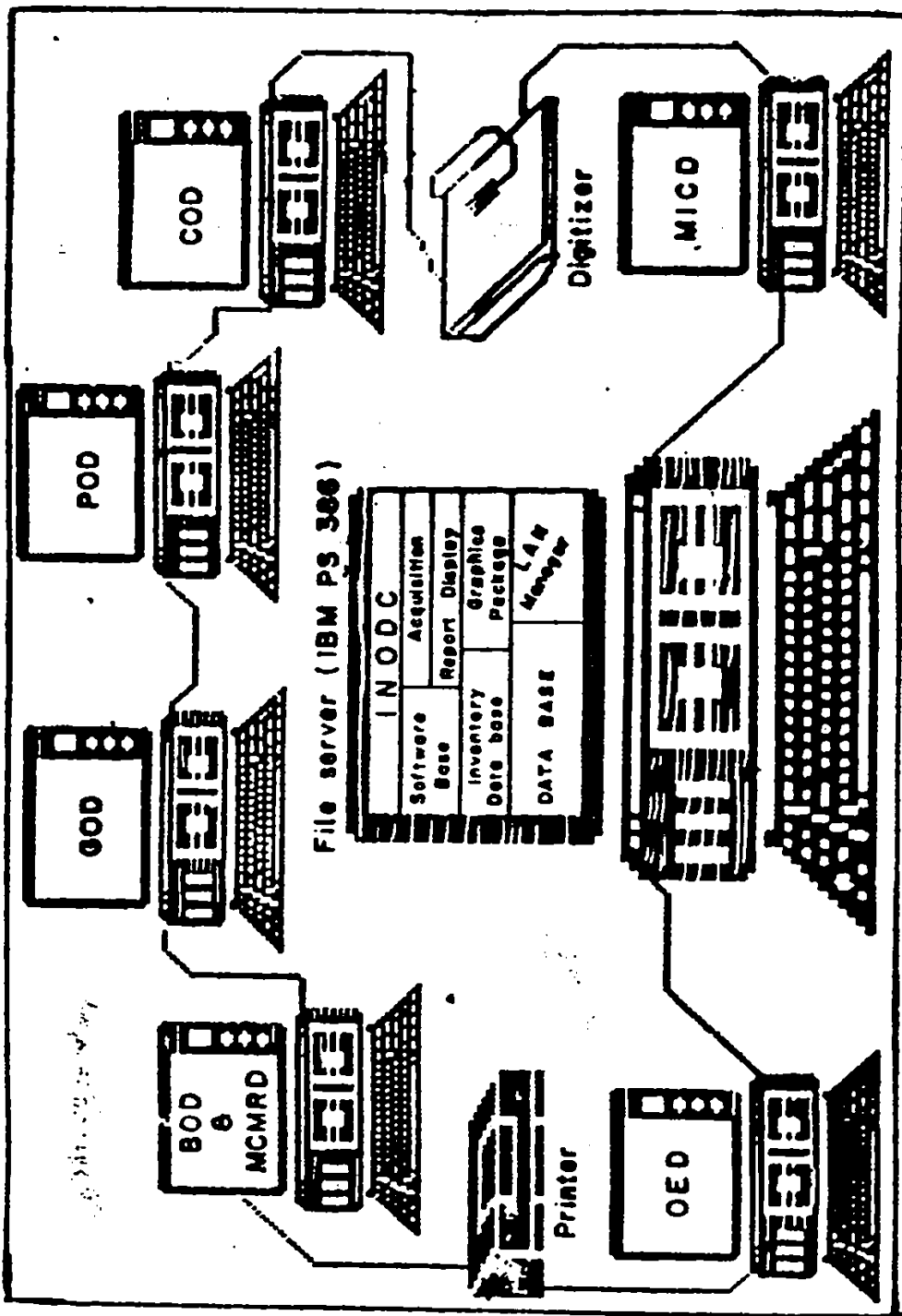


Fig. 2 Sketch Diagram of Sample LAN System in Oceanographic Information Management

Table 4**Divisionwise Distribution of PCs and Peripherals**

<i>Division</i>	<i>No. of IBM PCs</i>	<i>No. of Printers</i>	<i>No. of Plotters</i>	<i>No. of Digitizers</i>
INODC	2	2	1	1
Library	2	2	—	—
POD	8	8	2	—
GOD	7	7	3	1
BOD	2	2	—	—
COD	2	2	—	—
OED	3	4	3	—
MICD	5	2	2	—
Planning	1	1	—	—
Total	32	30	11	2

Additional References

1. *Computerage* January 1987, 5 (4).
2. *Computerage* December 1987, 6 (3).