LOCAL AREA NETWORKS (LANS) AND THEIR APPLICATION IN LIBRARIES

Pradeepa Wijuntunga

The Central Library
University of Colombo
Colombo 3, Sri Lanka

Keywords: Local Area Network, LAN, Network, WAN, Wide Area Network, MAN, Metropolitan Area Network, Developing Country, Communications, Communication Media.

Abstract: Networks can be defined as a collection of independent computers and other devices interconnected by a communication medium, such as coaxial cables, twisted pairs of optical fibers. Local Area Network (LAN) can be defined as a collection of computers and peripherals interconnected within a limited geographical area. This area may be one building or one campus within a few kilometers. Out of different types of Networks, LANs can be distinguished by its private ownership, its high speed, and its low error rate.

The advantages of LANs can be pointed out as

• resource sharing
• central control of equipment and data
• easy connection of equipment from different vendors

LANs have been used in developing countries to improve the library facilities in an effi-cient manner. Using these applications as examples, we can apply the LAN technology in our libraries to enhance the services in the following manner.

Application of LANs in Libraries:

• Housekeeping applications - acquisition, cataloguing, circulation control.
• Educational programmes - user education from distance and other study programmes.
• Office administration - connection to administration offices for easy access of necessary files.
• Connection with other libraries - inter library loans and electronic journals.
This paper intends to address this topic in greater length.

1. INTRODUCTION

This paper initially gives a basic introduction of Local Area Networks (LANs). The author does not provide a detailed discussion of this section since it is not the scope of the paper and also because a detailed description could have taken a highly technical nature. Secondly, the paper deals with the application of LANs in libraries with some examples from the applications in developed countries. Finally, the barriers which we, the developing countries, encounter in the application of LANs in our libraries are outlined.

2. WHAT ARE LOCAL AREA NETWORKS

Although the term "Networks" can be interpreted in a number of ways, in our context we can interpret it as a collection of computers and peripheral devices interconnected by a communication medium such as, coaxial cables, twisted pair wires and optical fibers. Three major categories of networks can be identified, based on their geographical coverage, as follows:

• Wide Area Networks (WANs): Computers and peripherals which are interconnected over a geographical area of 10 or

more kilometers belong to this category. Usually they cover the entire country.

• Metropolitan Area Networks (MANs): This is the type which covers a single metropo-litan area.

• Local Area Networks (LANs): "...are concerned with the interconnection of items of computing equipment (office workstations, intelligent instruments etc.) which are distributed over a localized area such as a university campus or process plant. They are referred to, therefore as Local Area Networks". (Halsall, 1988).

LANs can be distinguished from other networks because of their short distance. The total coverage may be from 1 km to 10 kms. The data transmission speed of LANs is much higher than in other types of networks. When a WANs works at a speed of 1 mbps, LANs can transmit data at a speed of 1 - 10 mbps. The error rate in data transmission is slow because of the shorter distance between the equipment. Since LANs are within a single building or a smaller area, they are owned by the specific organization. This localized control provides greater flexibility in LANs than other types of networks.

2.1. Evolution of LANs

In the 1960s, the computers predominantly used were mainframes and only a few organizations were able to afford them because of their high cost. The concept of time sharing was popular during this period. Harnessing a dumb terminal to the mainframe by using a telephone line and leasing or sharing the computer time was the common practice. The major problem was the slowness of the computing process.

With the advent of minicomputers in the 1970s, a solution for this problem was found. It could accommodate several terminals and more and more people were able to afford mini computers. Proliferation of minis led to the necessity of a communication between them in order to share the data stored in them.

Computer resources in the organizations further increased with the arrival of microprocessors and the advanges of integrated circuit technology. (Halsall, 1988). It soon became common to find a multiplicity of products by different manufacturers physically located within the same building. Although they could act as autonomous computers, it was often required to establish a communica-tion with each other. As microcomputers became more and more powerful and less and less expensive, more people were using them and having their own databases and exchanging data. The communication facility provided is referred to as a private Local Area Data Network. Therefore, it is clear that only with the arrival of microcomputers that implementation of LANs were possible and necessary. (Schatt, 1987).

2.2. Components of a LAN

Each workstation of the LAN, which can be a microcomputer, a barcode reader or a word processor can work as an autonomous equipment, but they are connected to a central controlling unit, through which they can communicate (exchange data, share software or hardware) with other workstations of the network. Though each workstation can act independently, they are not capable of controlling the activities of other stations of the network. To avoid corruption or collision of data during communication, several techniques like Career Sense Multiple Access/Collision Detection (CSMA/CD) and Career Sense Multiple Access/Collision Avoidance are used to control the transmission of data. Further information on these techniques will not be given here since it lies outside the scope of this paper. Figure 1 shows the basic components of a LAN (Collier, 1988).

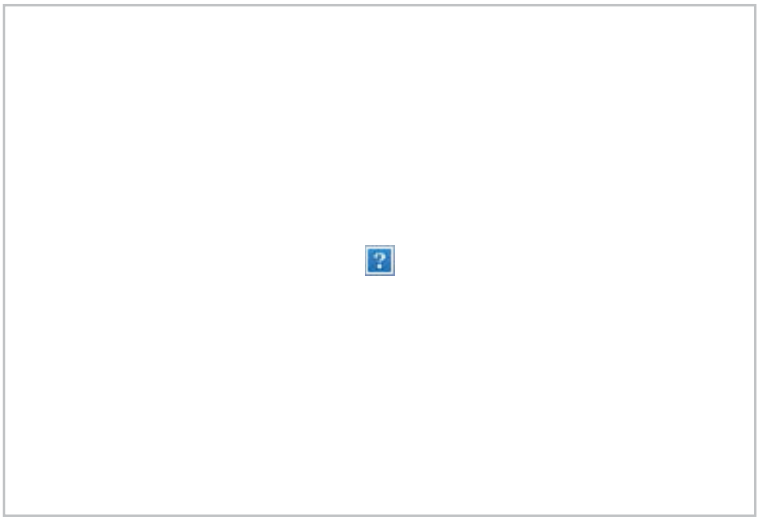
• Communication medium: there is some kind of medium to connect all the workstations and other equipment together.

• File server: a computer dedicated to providing shared access to a main storage device.

• Print server : a computer dedicated to providing shared printing facilities.

• Gateway : a computer providing access to other networks.

• Workstation: a user's computer or any other equipment.



2.6 Types of LANs

LANs can be divided in to two categories based on their topology and communication media. According to topology LANs can take several forms but three core forms can be identified easily as follows:

• Star. Each workstation is connected to the control unit in the form of a star. Communication between two workstations has to be done through this central controller. A particular station which wants to communicate with another station builds up a connection, through the central controlling center, with the destination. Once this connection is established data can be communicated from one to the other station.

• Ring. This category has no central controller but devices are joint together in a form of a ring. Data has to pass some other workstations to reach its destination. " A station wishing to trans-mit waits until its turn and then places a data packet on to the ring. This circulates around until it reaches its destination where the node copies the data into a local buffer. The packet then continues to circulate until arrives back at its source. This then provides a form of acknowledgment." (Winfield, 1984).

• Bus. This takes the form of a data highway connecting all equipment to a linear communica-tion media. A transmission from any station can be received by any other station like in the ring type. Hence there is no sufficient data security in these types. " Obviously if all these devices started transmitting at once there would be chaos, so only one device is allowed to 'talk' at any one time. A form of access control is enforced to determine who can transmit next. The most commonly used medium access control is known as Career Sense Multiple Access with Collision Detection." (Winfield, 1988).

2.7 Communication Media

Based on the type of communication media used to connect the workstations LANs can be divided into three groups.

• Twisted pair wires. This is the most common form of wiring and the cheapest. Consists of two identical insulated wires wrapped together in a double helix. Twisting the wires together reduces the noise - any noise emanating from the environment or the communication medium, which is not a part of the message to be communicated.

• Coaxial cables. This is a copper conductor surrounded by one or more foil or braided wire shields, each separated by the other by some kind of plastic insulator.

• Optical fibers. This is the latest form of communication medium which consists of thin strands of glass enclosed in an insulator. These are light in weight, but the cost is still high. Needs expertise in installation, but the data security is very high, since any tapping of the lines can be detected easily due to the disturbances of the light signals.

2.8 Advantages of LANs

LANs are used mainly for resource sharing. Expensive hardware like laser printers and CD/ROM drives can be shared by several users when they are attached to a network. Further, purchasing a network version of software cuts the costs of purchasing them for each and every computer.

Central control of equipment and data provides easy administration, better data security and more flexibility in changing the system.

Instead of purchasing a multi-user system, the available equipment from different vendors can be connected together using a network.

3. APPLICATION OF LANS IN LIBRARIES

Although Local Area Networks have been in existence for some time, their use is fairly recent in the field of libraries. The initiative steps were taken by the American and British libraries. By taking their applications as examples, we can make an attempt to adopt this interesting technology in our libraries too. The following sections will describe how LANs can be used in a library environment.

3.1 Housekeeping Applications

In several libraries LANs have been used to assist the housekeeping applications or it would be more correct to say that test projects were undertaken to experiment on this aspect. A good example is the University of Aston (UK) LAN installation project where they concentrated on acquisitions, cataloguing and circulation control. (Brindley, 1987).

• Acquisitions. The users of the library for e.g. the academic staff of the university depart-ments can directly send their book orders to the acquisitions department via the LAN, and also they can keep a track of the books received conveniently through the LAN. These orders could be directed on-line to the book seller if a gateway is available to their network. Blackwell's PC ORDER system caters for this type of book ordering. Once a connection is established between the finance branch of the parent organization and the library, a correct record of expenditure can be obtained without delay, which will enable the proper utilization of funds.

• Cataloguing. The requirement of a union catalogue can be eliminated when a LAN is avai-lable since each branch library can have their own catalogues in site and provide access to other catalogues via the network. This saves the time of the users by eliminating the requirement to visit each branch library in search of books. Further, when cataloguing the material book details can be obtained from the acquisitions department where most of the bibliographic details are available. The cataloguing staff will only have to add what is not there.

• Circulation control. The facility of returning the books at any branch library within the geographical coverage of the LAN could be provided in order to save students time, but of course the books will have to be delivered to the respective library at the end of the day. Checking details of delinquent borrowers could be easily traced when circulation data are attached to a network.

3.2 Educational Services

LANs can be utilized in the library for educational purposes too. Aston University has made plans for two types of services. (Brindley, 1987). They were going to provide an on-line database advisory with trained staff for users engaged in a remote database search and secondly they were having plans to run tutorial classes in on-line searching simultaneously in different locations. In this manner there users will have a better understanding of the electronic media with which they have to interact in the library. Staff time and money will be saved by providing training for a larger

group of students simultaneously. Computer conferencing which uses several remote computers attached to a network to conduct a conference without the actual gathering of participants to a single venue, is another application of LANs which could provide a sophisticated service for the future library users. The LAN installation in the Department of Information, University of Strathclyde has been employed to carry out an experiment on computer conferencing and the author asserts that, despite the ergono-mic and technical problems, computer conferencing and electronic journal production have consi-derable potential and appeal (Baird, 1987).

3.3 Resource Sharing

Installing high cost hardware like CD/ROM drives and readers in a LAN allows sharing of them by a multitude of library users. This in turn will reduce the cost of purchasing several of them for a single library. Thomas P. O'Neil Library of Boston College (USA) has installed Multiplatter which is a CD/ROM Local Area Network designed by Silverplatter to allow multiple users to access the same CD/ROM disc at the same time. (Grant, 1989). Where software is concerned, several copies have to be purchased if several computers are using them. But purchasing a network version of the software, (of course at a higher price than a single version but lesser than several copies)to be installed in the LAN makes things much easier. The principal reason for establishing the LAN at the R.H. Fogler Library of the University of Maine, Ohio was to ease the burden of handling requests for software, which includes Dbase3 Plus, word processors, course specific discs etc. used by the students. (Flower, 1988).

3.4 Office Administration

The library office could be connected to various other offices, for instance personal, finance and welfare branches etc. To avoid wastage of time used to obtain information manually from different branches, LANs can be employed to transfer data, with a certain amount of security, to the library office. Using the concept of electronic mail library staff could be contacted easily instead of calling for meetings, further electronic mail facility could be used to prepare news letters and memos to be circulated among the library and through a gateway among other libraries too. However the ASLIB/BLRDD LAN project says that this function was soon tailed off. (Copeland, 1986). It further says that NCC has established that everybody should have the discipline to check for the incoming mail for this to be a success. (Copeland, 1986).

4. CONSTRAINTS ENCOUNTERED IN APPLYING LANS IN THE LIBRARIES OF DEVELOPING COUNTRIES

We have been unable to reap the full benefits of LAN technology in our libraries, mainly because most of our libraries are not yet automated in its true sense. Automation is still limited to one or several microcomputers and a limited number of applications. Predominantly the application auto-mated is the library catalogue. In that also, a fully automated On-Line Public Access Catalogue is rare. Until computerization is in the full swing, or at least several of our library procedures are automated we cannot actually feel the necessity of communication between the different workstations in the library.

Secondly, the absence of qualified professionals in the field of library automation, has contribu-ted immensely to this issue. It should be emphasized here the problems we encounter in training our librarians, especially providing them with a training, so that they could be on par with their counter-parts from the developing countries. Hence the information of availability of technology does not reach our libraries adequately.

Thirdly, as a core cause of the two reasons shown above, the scarcity of financial resources could be pointed out. Procuring of electronic data processing equipment, suitable software and establishing sophisticated communication links which is essential for LAN applications, is impaired by the direction of national resources towards more basic need satisfaction.

5. SUMMARY

LANs can be defined as the interconnection of computers and peripherals within a limited geographical area, and they can be distinguished, based on their topology and the communication media used to interconnect the equipment. Application of LANs in libraries were initiated in American and British libraries. Housekeeping applications,

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.