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# NAVAL POSTGRADUATE SCHOOL
## Monterey, California

# THESIS

A SYSTEMATIC APPROACH TO LOCAL AREA NETWORK
ADMINISTRATION

by

Martin E. Buker

March 1989

Thesis Advisor:          N.F. Schneidewind

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A Systematic Approach
to Local Area
Network Administration

by

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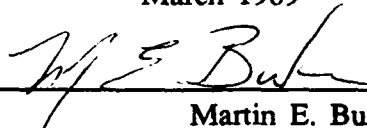Submitted in partial fulfillment
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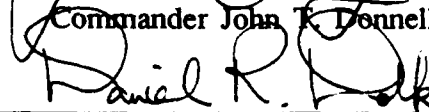NAVAL POSTGRADUATE SCHOOL
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# ABSTRACT

A systematic approach to Local Area Network (LAN) administration was presented to help new Administrative Science Department LAN lab staff members conduct management tasks. A two dimensional matrix was developed using the four LAN functional modules and five management task groups. Detailed task procedures were then prepared using rules developed for the functional modules.

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# I. INTRODUCTION

## A. BACKGROUND

The Administrative Science Department at the Naval Postgraduate School has established three Local Area Networks (LAN) labs for faculty and student support. These LAN have progressed through the design and implementation phases of development and are currently in the operational phase. LAN administration is conducted on a part time basis by a three member faculty staff.

The purpose of this study was to develop a methodology to enable new lab staff members to carry out management tasks. Since it is impractical for new staff members to perform every possible task to gain experience a systematic approach to task management was developed.

LAN management tasks were categorized by the LAN functional modules affected. Task categorization was based on observation and hands on experience working with the LAN lab staff over a four month period. Interviews were conducted with current and former staff members to review procedures and problems during the design and implementation phases of AS labs development. Task categories were then placed in a matrix with the LAN functional modules. Rules were developed for each task category. Accomplishing a task using this approach will take the manager through each module insuring that all critical aspects of the tasks are checked.

## B.   DEFINITION OF TERMS

The area of network management analysis is relatively new.  Most of the terms used to discuss local area networks are taken from related topics like automated data processing management, computer science, and communications networking.  Some of these terms have multiple meanings.  The following definitions are given to clarify their meaning in this study.

The term station will be used to describe a micro computer installed in the network.

The term LAN administration is used to define the overall management functions performed by the lab staff.  Network management is usually associated with those tasks performed by network peripheral equipment or software to locate and record physical LAN problems [Ref. 1:p. 181].  The LAN administrator is responsible for the overall function of the LAN and not just the physical equipment.

The three Administrative Science Department LAN labs will be identified by room number.  When dealing with the labs collectively the term AS lab will be used.

## C.   ORGANIZATION OF THESIS

Chapter II will discuss the physical and functional layouts of the Administrative Science Department labs.  Chapter III will discuss the LAN functional subsystems and chapter four the management task categories.  Chapters IV, V, VI, VII will present examples of the use of the systematic approach within the task categories.  Chapter VIII will present the issues of AS LAN security.

## II. THE ENVIRONMENT

### A.  INTRODUCTION

The Administrative Science labs were established as part of an effort to provide students "the necessary learning experience and the tools to reinforce the academic experience." [Ref. 2:p. 2] The proposal submitted for the labs states that the lab would accomplish this in the following manner:

- Students will learn the fundamentals of local area networks and multi-user systems.

- Provide for enhanced learning through management simulation and gaming.

- Used as a test bed for student research in local area network and distributed systems.

- Ready access by faculty and students to a library of on-line software packages.

- Allow increases in productivity in producing student theses. [Ref. 2:p. 3]

The architecture of each lab was dependent on the expected use. In-250 lab was set up primarily for computer literacy instruction. IN-224 on the other hand, was set up to provide instruction in and demonstrate LAN and computer technologies for AS students. In each case a different network architecture was implemented. In the In-250 lab an IBM PC Network was installed. In the In-224 lab an IBM Token Ring, a 3Com Baseband Ethernet, and an Apple AppleTalk net were installed. Finally in the In-158 lab another IBM Token Ring net was installed.

Each network architecture involves different procedures for management tasks. A description of each lab is provided to help the LAN administrator understand the nature of the differences in task accomplishment procedures.

## B.    AS LAN LABORATORY LAYOUT

### 1.    Administrative Science Lab IN-250

The physical architecture of IN-250 [Figure 2.1] is based on the IEEE 802.3 broadband standard [Ref. 3:pp. 128-129].   Carrier Sensed Multiple Access with Collision Detection (CSMA\CD) is used for control. The net uses CATV broadband communications technology in a physical star topology. [Ref. 4:pp. 1-5]
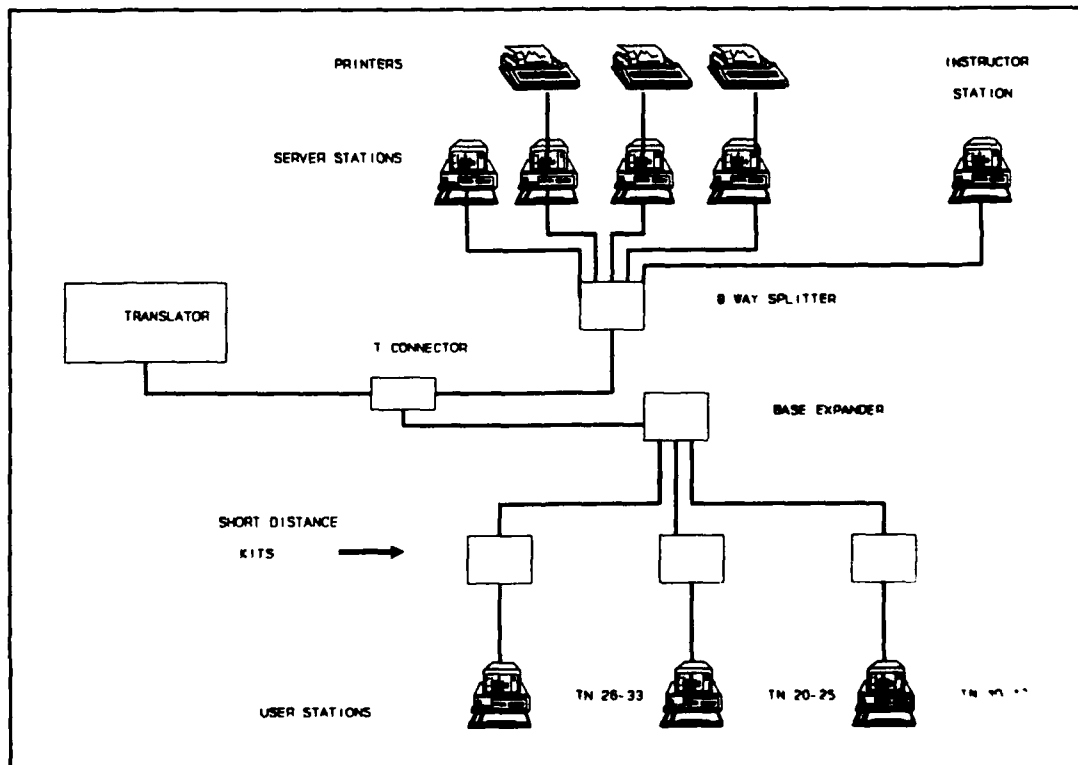


**Figure 2.1    IN-250 IBM PC Network Physical Layout**

The twenty-four user stations are physically linked with short distance kits. The shirt distance kit provide impedance matching for connecting eight IBM PC XT micro computers to a base expander. The base expander in turn provides additional impedance matching for the short distance kits. An eight way splitter connects four server stations and the instructors station. The base expander and the splitter are then connected to the frequency translator making the physical star. [Ref. 5]

The frequency translator is used to shift the transmit frequency (50.75 MHZ) to the receive frequency (219.0 MHZ). Transmit and receive traffic traverse the net through the frequency translator to each attached micro computer creating a functional bus.

The functional lay out of the LAN is shown in Figure 2.2 The network has four server stations. Each server is logically connected to six user stations and three servers have printers. This gives users increased speed in accessing network services and printer functions.

The services provided in the IN-250 lab include message service, software applications, and external network communications. Network message service is provided by the PC LAN Program version 1.10 network operating system. Each user station can send messages to any other on-line station. The network software also has the capability to forward messages from station to station. This message function is limited by the fact that the operating system has no mailbox function. You must be logged on the network to send or receive messages.

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PC NETWORK FUNCTIONAL LAYOUT
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TN 28->33

BARRY

TN 22->27

BEN

TN 16->21

CARYL

TN 9->15

NORMS
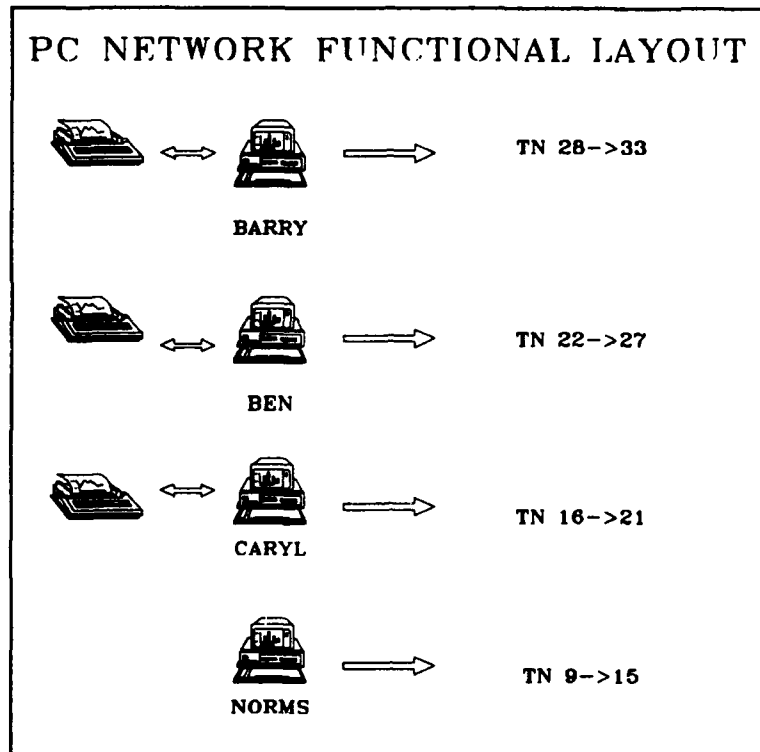
Figure 2.2    IN-250 PC Network Functional Layout.

The IN-250 lab is set up to provide software for instructional purposes and general use. Software applications include Wordperfect 4.2 for word processing, Lotus 123 spreadsheet, and Dbase III+ database management system.

There are two types of communications modules installed in the network: 3270 emulation and 1200 baud modem. The 3270 emulation is provided through a IBM Emulation board and IBM PC 3270 Emulation Program version 3.00. The emulation package is installed in four user stations in the AS lab providing connectivity to the NPS IBM 3033 mainframe.

Modem communications uses Hayes Smartmodem 1200 with SIMPC and Smartcomm software. The number of users able to use modem communication in the

IN-250 lab is limited to seven available phone lines. With the SIMPC package, users can access the NPS IBM 3033 mainframe and the Defense Data Network (DDN) through the NPS terminal access controller (TAC).

There are three IBM Proprinter dot matrix printers available to the network users. To enhance network performance each printer is available to a bank of eight user stations logically connected to that server as LPT1 and to the other user stations as LPT2 and LPT3.

### 2. Information Systems Lab IN-224

The Information Systems lab (IN-224) was designed to be a show case of LAN and computer technology. Installed in this lab are an IBM Token Ring network, a 3Com baseband Ethernet, and a Apple Appletalk network.

#### a. IBM Token Ring

The IBM Token Ring architecture consists of shielded twisted pair cabling connected in a physical star logical ring topology. The 15 user stations and one sever are connected with two wiring concentrators [Figure 2.3]. The concentrators provide the functional ring configuration.

The server station is an IBM PC AT with 1024K RAM memory and a 20 megabyte hard disk. There are 12 Standard 286 (STD 286) IBM AT compatible and three IBM PC XT (XT) users computers. Each STD 286 has 640k ram, a 20MB hard disk, and runs at 10 MHZ. The XT computers have 7.66 MHZ turbo cards and 20MB hard disks installed. [Ref. 5] The services provided by this network include message service provided by the PC LAN Program operating system, applications software, and external LAN communications. The network operating system is the

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**IS LAB
TOKEN RING
LAYOUT**

WIRING
CONCENTRATOR

User stations are
individually attached to
wiring concentrators
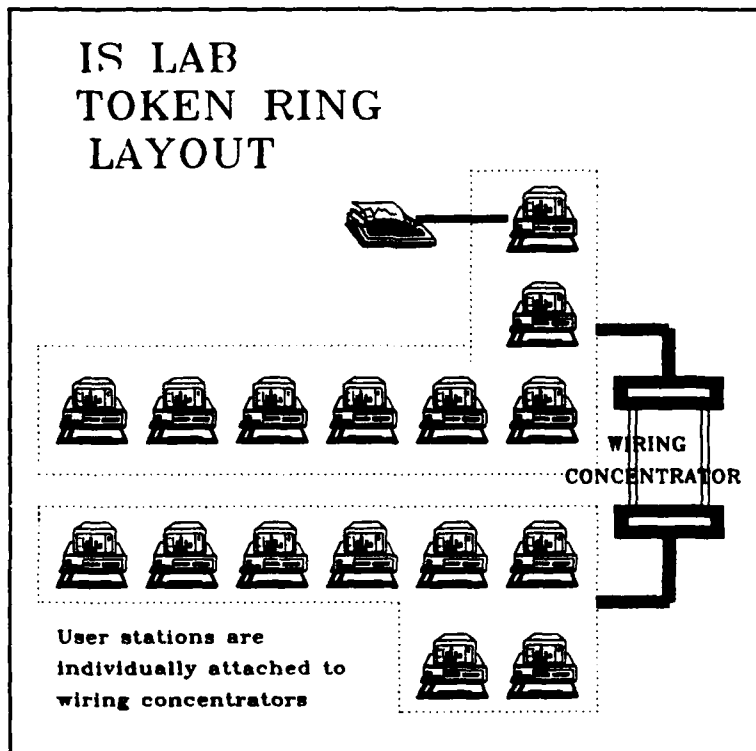
**Figure 2.3   IN-224 IBM Token Ring Network Layout.**

same as the IBM PC Network with two additional programs added to provide token control and netbios.

IBM 3270 emulation is provided through an IBM Emulation board installed in the server.   Using the server as an emulation gateway provides NPS mainframe connectivity for up to five of the 10 configured user stations.   Six user stations have Hayes 2400 baud modems installed.   Modems give mainframe connectivity through SIMPC and Smartcomm.

    *b.   3Com Ethernet*

The 3Com Ethernet installed in IN-224 has three IBM XT and two IBM PC user stations connected to a 3Com 3Server[3] dedicated server. The network

architecture of this system, Figure 2.4, follows the IEEE 802.3 standard [Ref. 3:p.112].

The network layout uses CSMA/CD control and baseband communications medium in

a bus topology [Ref. 6:pp. 215-220].
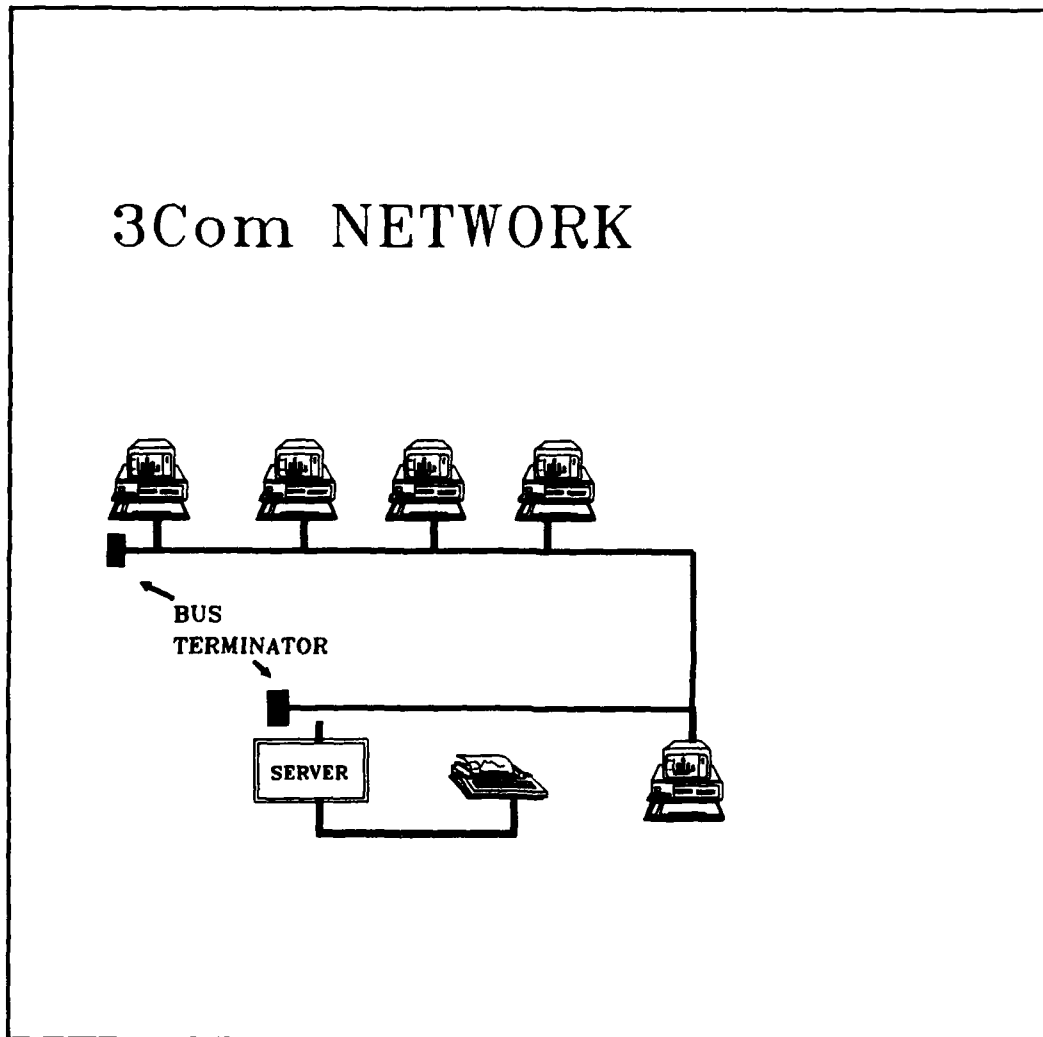


Figure 2.4    IN-224 3Com Ethernet Network

The 3Com LAN has a full range of services provided with the

EtherSeries 2.4 network operating system (NOS). Network services include electronic

mail, commercial and class specific software applications, and one IBM Proprinter.

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Electronic mail (E-mail) is provided through the EtherMail portion of the NOS. EtherMail allows users to conduct message and file transfers via the "post office" located in the server. This is a much better service than the IBM PC LAN operating system message service. The "post office" allows E-mail service to network users even if they are not logged on.

c. *AppleTalk*

The Appletalk network connects five Apple MacIntosh Plus (MAC+) user stations, an Apple Laser printer, and a Mac+ server station. The server station has a 45MB hard disk which is used to share software applications with user stations. The topology is a physical and functional bus system using shielded twisted pair copper wire [Figure 2.5]. The AppleTalk network uses Carrier Sensed Multiple Access with Collision Avoidance (CSMA/CA) for access control [Ref. 7:p. 23].
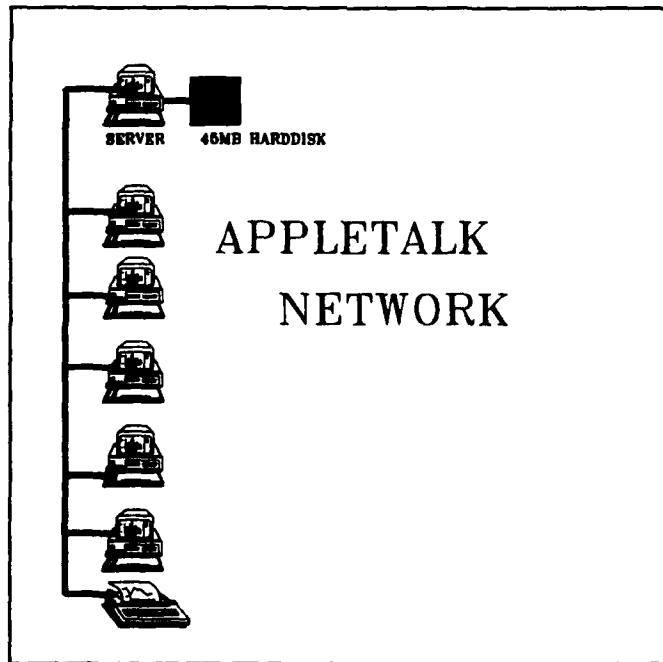


Figure 2.5    IN-224 AppleTalk Network

### 3. Administrative Science Lab IN-158

The initial purpose of In-158 was to provide a laboratory area for a variety of computer lab assignments. The lab has an IBM Token Ring installed using five user stations and two servers. One server is used for applications and the other is a dedicated print server. The print server has an IBM Pageprinter 3812 laser printer and an IBM Personal Graphics printer.

The In-158 lab doesn't have IBM mainfram emulation, but two stations have Hayes 1200 external modems. These modems use SIMPC and Smartcom for mainframe and DDN connectivity.

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# III. LAN FUNCTIONAL MODULES

## A.   INTRODUCTION

The function of a local area network can be broken into four functional modules: hardware, operating system, applications, and security.  After each module is discussed a set of rules is presented that cover the major issues.  These rules will be used when applying the systematic approach.

### 1.   Hardware Module

This module considers two issues: the compatibility of network hardware and the hardware location.  Compatibility issues center around whether all hardware components installed in the LAN can be connected physically.  Hardware location considers the placement of various network components

Compatibility is more than just whether two hardware components can be physically joined.  The network administrator must consider the computer's Basic Input Output System (BIOS), and installed expansion boards incompatibility.  With the abundance of IBM "compatible" machines; the question becomes how compatible is compatible?

The issue of location of LAN components is often overlooked.  The issues considered under location include access to the device for use, access for maintenance, who will do maintenance, and how and where to lay the connecting cable.

*Hardware Module Rules*

The following rules apply to the hardware module:

- Check hardware compatibility.

- What expansion boards are present?

- Check access to electrical receptacle.

- Check access to network cabling.

2. **Operating System Module**

There are three major areas of consideration in the operating system module: the network operating system (NOS), the station operating system (DOS), and the batch files used to manipulate them. The network operating system controls all aspects of the network. With the exception of NOS services, the function of this layer should be transparent to the user. The station disk operating system (DOS) controls the function of the user station.

For all LANs except the Appletalk network, the operating system is PC-DOS. PC-DOS sets the environment for the station-network interface. The batch files, written in DOS, create the connection between a user station and the server. If these files are written properly, the network will be transparent to the user. If however these batch files are written inefficiently, the network will become a burden to the user.

In the PC Network and Token Ring the NOS and DOS use considerable random access memory (RAM). On a user station with a micro computer having 640K RAM, operating system programs use 252K RAM. This leaves only 388K RAM for applications software.

*Operating System Module Rules*

- Check NOS compatibility.

- Check RAM requirements

- Modify network batch file based on requirements.

### 3. The User Interface Module

The user's perception of the network is based on how easily and quickly he can use network applications. The network, described by Freeman, " typically includes everything between himself and the applications program....simply, everything behind the tube" [Ref. 8:p. 91]. The major concern of the user interface module is to make the network transparent to the user.

The user interface module includes the screen menu interface installed on the network and the batch files used to manipulate the NOS and DOS.

### a. Menu Screens

The AS labs use two distinct menu systems. The AppleTalk network uses the MacIntosh icon screen interface. The 3Com and PC LAN networks use the 1DIR menu program. The MacIntosh icon screen interface allows the user to choose commands using either the keyboard or a point and click operation with a mouse.

The 1DIR menu program displays directories and allows the user to select a file to be accessed using the arrow keys. While this operation is easier than manually typing in the requested file, the 1DIR screen is cluttered with every file in the directory. Selecting a program file from the menu screen can be confusing to novice users. To alleviate this problem the network applications batch files are placed in a separate directory. Using this screen the user can select applications without the

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confusing background of auxiliary files.  An example of the 1DIR menu screens is provided in Appendix A.

b.  *Batch Files*

Batch files are used in the PC DOS based networks to make the network transparent to the user.  Batch files setup the stations and access applications without making the user manually type long and complicated commands.  By using batch files the user only needs to be familiar with the application he wishes to use and not with the inner workings of the network.

Network batch files are used to initially setup the network.  These batch files control access to the directories and devices shared by the server station.  At the user station, batch files define shared directories and devices for use.

Application batch files are used to access the applications shared by the network.  These files, written in DOS, step through the directories and configure the user station.  There are several examples of the batch files used to access the network applications on the PC Token Ring and PC Network LANs in Appendix B.  By using batch files, the administrator can configure the user station to use specific default drives and printers that best utilize network assets.  The word processing application Word Perfect batch file for example, sets the Path to the critical directories holding the network and DOS programs, and sets the B drive as the default drive.  The Path ensures the user has access to programs he may need to format data disks or use network peripherals.  Setting the default drive maintains the integrity of the program directory by sending the user's data to his floppy disk. [Ref. 9:pp. 264-272]

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*User Interface Module Rules*

- Check for network batch file modification.

- Check for application batch file modification

### 4. Security Module

The security module consists of all physical and software methods for controlling access to the network. Physical access to the LAN labs is controlled by cipher locks on the doors. The door combination is given out via the lab staff to faculty and students. Physical access to the server is controlled by locking the keyboard on the PC AT servers or removing the keyboard.

Controlling access to the server software is accomplished using the NOS. There are three levels of directory access: read only, read/write, and read/write/create [Ref. 7:p. 43, Ref. 10:p. 10-8]. The lab LAN control access to the server using read only access. This however gives users complete access to applications and limits copyright protection. A copyright warning is issued as part of the startup batch file. However, there is no control mechanism to keep users from copying the software.

*Security Module Rules*

- Check access level required.

- Modify network batch file based on requirements

### B. SUMMARY

Local area networks can be subdivided into four functional modules: hardware, operating systems, user interface, and security. Every management task affect one or more or these modules.

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# IV. THE ROLE OF THE NETWORK ADMINISTRATOR

## A. INTRODUCTION

The role of the LAN administrator has emerged with the acceptance of LAN technology in the work place. Del Jones and David Lee wrote:

> As more and more companies, departments and other organizations discover the productivity gains, cost savings, and other advantages of Local Area Networks (LAN), these networks continue to grow at a rapid rate. However the installation of a LAN is like getting married. After the honeymoon, maintenance becomes a daily task. After installing the LAN someone has to manage it. [Ref. 11:p. 32]

The role of the LAN administrator has become more critical as the AS LAN progressed from the design to the operational phase of their life-cycle. In the design and implementation phases of the lab the staff had the latitude to work on the LAN at any convenient time. Now however the lab staff must insure the lab is fully operational 24 hours a day.

This chapter examine two approaches to defining management tasks: the list approach, which a list of objectives is made for each phase of the LAN life cycle, and the group approach, which groups management tasks into task categories. Finally a systematic approach to conducting management tasks will be presented.

## B. MANAGEMENT TASKS

In previous studies the tasks of the LAN administrator have been compiled either by category or list. The list method, illustrated by Kleeman 1986, listed the tasks of the LAN administrator for each stage of LAN development [Ref. 12:p. 40]. Listing

tasks however, does not give a prospective LAN administrator a feel for the LAN as a system.

The category approach to tasks gives the administrator the first step in developing a systematic approach to administration tasks. By dividing management tasks into groups it helps develop the managers skill for conducting related tasks. An example of task grouping is provided by Del Jones. His study divided management tasks into seven categories:

- Network design and installation.
- User support.
- Data administration.
- Database administrator.
- Systems operation.
- Network development.
- Network maintenance.

Within each category Jones states the major tasks. For instance, Network Design and Installation discusses consultation with network users, LAN configuration, network software and hardware, and operating systems. [Ref. 11:pp. 33-34]

The Jones approach includes tasks from all phases of the development cycle. This thesis will only focus on administration tasks during the operational phase.

Tasks during the operation phase are divided into the following categories: hardware configuration, software configuration, systems management, the user interface, and security management.

1.  **Hardware Configuration Tasks**

The hardware configuration task category consists of any task that involves network or station hardware. Examples of these tasks include adding new stations, repairing or replacing faulty stations, adding network peripherals (printers,modems,etc.), and adding expansion boards.

2.  **Software Configuration Tasks**

The software configuration task category covers installing new applications, upgrading existing applications, and making changes to the network batch files.

3.  **System Management**

The systems management task category consists of the daily administration tasks. Examples of these tasks include system reboot, supply management, problem documentation, and lab cleanliness.

4.  **User Interface Tasks**

The user interface consists of the following subgroups: training, and documentation.

Although it is the goal of network administration to make the network transparent to the user, training users on the network/application interface is crucial to the success of the network. As previously stated the AS labs were established for a myriad of services to the faculty and students of the AS department. To gain the most productivity from the labs users need to know both the benefits and limitations of the LAN.

LAN training and documentation are accomplished on three levels. First, formal and informal, classes teach the use of the applications in the network

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environment. Students and newly arriving faculty learn to access applications and use network services under the guise of departmental staff. On-line and printed documentation is used to help first time users gain access to applications and services. Finally, the faculty is given guidelines for having new programs added to the network for future instructional use.

### 5. Security Management

The security management task category consists of those measures taken by the LAN administrator to maintain the integrity of the network. Tasks in this category include physical security and data security.

## C. THE SYSTEMATIC APPROACH

The systematic approach encompasses three key elements: method, tools and procedures. Method is the technical know-how to accomplish the task. Tools are the manuals, prior documentation, software diagnostics, or mechanical tools used to support methods. Procedures are the glue that holds methods and tools together. Procedures define the sequence of methods used to complete management actions. Without procedures a manager would have to rely on prior experience to accomplish tasks.

This study uses a two dimensional matrix to determine the procedures to accomplish management tasks. This matrix, Figure 4.1, shows the interactions between the functional modules and the LAN administration task categories. A set of rules was developed for each module to aid in determining how each module is effected by the task a detailed procedure can be written.

## MANAGEMENT TASK MATRIX

| LAN FUNCTIONAL MODULES / MANAGEMENT TASKS | HARDWARE MODULE | OPERATING SYSTEMS MODULE | USER INTERFACE MODULE | SECURITY MODULE |
|---|---|---|---|---|
| HARDWARE CONFIGURATION | X | X | X | X |
| SOFTWARE CONFIGURATION | | X | X | X |
| SYSTEMS MANAGEMENT | X | X | X | X |
| SECURITY MANAGEMENT | X | X | X | X |
| SUPPLY MANAGEMENT | X | | X | X |

**Figure 4.1    The Management Matrix**

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1. **Four Phases of LAN Management Tasks**

In this study a four phase approach was use to identify tasks and to complete management actions: TAsk Identification, Management Matrix Check, Preparing Task Procedure, and Conducting the Task.

*a. Task Identification*

What is the task. Problems or actions should be submitted in writing for every task so task maintenance can be scheduled and recurring problems can be documented.

*b. Management Matrix Check*

After the task is identified the methodology matrix is checked to determine what LAN functional modules are effected. Checking the task against the matrix will prevent any module from being over looked.

*c. Preparing Task Procedure*

The first step in preparing any procedure is collecting the documentation provided. This may be manuals for a given application or procedures from a previous installation. Using the modules rules a logical approach to the task is developed. A detailed procedure is developed by answering the rules using the documentation.

*d. Conducting Task*

The task is completed using the detailed procedure. The last step in completing the task is completing the task documentation.

## C.  SUMMARY

This chapter has defined the functional modules and the administrative task categories for the operational phase of a local area network.  By placing the functional modules and the administrative task categories into a two dimensional matrix the affected modules for each task were determined.  A detailed procedure for any task can be developed using the rules for each functional module.

# V. HARDWARE MANAGEMENT TASKS

## A. INTRODUCTION

To demonstrate the use of the management matrix for hardware configuration tasks, the actions taken to install a micro computer as a user station in the IBM Token Ring and the 3Com Ethernet will be reviewed.

## B. PROCEDURE PREPARATION

### 1. Task Identification

The systematic approach begins with a review of the task documentation. A Laboratory Installation Form will be generated for a hardware installation. This form, presented in appendix C, identifies the item to be installed and provides the following information necessary for the installation:

- A description of the item's function.

- Hardware requirements.

- Software requirements.

The hardware requirements for installing a user station in the IBM Token Ring include the micro computer, the network board, shielded twisted pair cabling, and any expansion boards installed in the micro. Software requirements include PC LAN Program NOS, PC DOS, and any software necessary for expansion boards [Ref. 10:p. 1-2]. Of major importance to the LAN manager is the documentation supplied with the hardware and software.

## 2. Management Matrix Check

Phase two of the task is the matrix check. Hardware tasks affect all functional modules. Starting with the Hardware module the procedure for a user station installation is created.

### a. Hardware Module

The subject of compatibility is clouded by the myriad of IBM PC AT Compatible micro computers on the market. The AS department selected the Standard 286 for user stations in the IBM Token Ring. While these computers are highly IBM compatible in stand alone operation, in the network environment compatibility becomes an issue.

The hardware requirements for this installation are a IBM Token Ring network adapter card, a Hayes Smartmodem 2400B internal modem, and IBM Token Ring Network PC adapter cable (P/N 63399098). [Ref. 13:p. 7, Ref. 14:p. 1-3, Ref. 15:p. 1-3, Ref. 16:p. 1-3]

The first check under hardware compatibility is to ensure system compatibility. The Standard 286 unit is a PC DOS based machine fully physically compatible with network hardware.

The next check for hardware compatibility is the system interrupts. System interrupt levels are used by the micro Central Processing Unit (CPU) to determine the order for accessing expansion boards. The interrupt levels for the expansion boards were obtained from the accompanying documentation. The interrupts for the Standard 286 micro however, were not in the accompanying documentation. To obtain these interrupts the manufacturer had to be contacted [Ref. 17]. After

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obtaining the interrupt information for the micro, the following comparison can be made.

The level three interrupt cannot be used as Com2 and by the Emulation board at the same time. This means that the station can be configured with either a modem or 3270 emulation, but not both.

Location is the second issue of the hardware module. The two concerns of location are access to as electrical outlet and access to the network cabling. For electrical connectivity all that is required is a 110 volt outlet. In the IN-224 lab existing electrical outlets are sufficient to add another user computer.

Adding a new station to the existing Token Ring network however, requires additional network cabling. The physical layout of the Token Ring network, Figure 2.3, shows 16 micro computers connected via two concentrators. To add another station, a third concentrator must be added to the network.

*b.    Operating System Module*

The operating system module includes the NOS and DOS. Adding a new station to the Token Ring requires that the PC LAN Program software be installed on the user station. To accomplish this NOS software must be loaded to the hard disk of the micro.

DOS version 3.2 must be installed on the micro to make it compatible to the rest of the network. Startup batch files need DOS version 3.2 with the Append.com DOS program added.

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### c. User Interface Module

The screen menu program 1DIR must be copied to the user station hard disk. This requires a 1DIR data directory and the 1DIR program copied to the user hard disk root directory [Ref. 18:pp. 4-6].

Startup batch files must be modified to include the new station and copied to the station hard disk. A logical station identification must be included to call the network profile batch file which will set the environmental variables for the station. Appendix D lists the files that must be copied to the user station hard disk for network operation.

### d. Security Module

The security module is concerned with physical access to the hardware and software of the user station installation. This unit is to have open access. Anyone with access to the lab will have access to the station. The network files will be copied to the station hard disk using the attrib.com DOS program. This program will limit file access to read only. No users will be able to alter the contents without changing the file attribute to read/write. After installation of the network files the Attrib.com program will be removed from the DOS directory.

### 3. Preparing Task Procedure

After reviewing the matrix a detailed procedure can be written for this task:

- Install all expansion boards into unit.
- Install network board into unit.
- Set interrupt levels to those selected during matrix check.
- Physically install unit in location decided upon during matrix check.

- Connect electrical and network cabling.

- Install network software on unit hard disk.

- Modify network batch file to include unit identification.

- Set file attribute to read only and erase Attrib.com program.

- Test unit by connecting to network and accessing network applications.

- Complete network installation documentation.

### 4. Conducting Task

Complete the installation using the prepared procedure.

## C. SUMMARY

The systematic approach enables the network administrator to use the corporate knowledge of the lab staff. The first installation of a Standard 286 AT compatible computer to the network was hampered by the poor documentation provided with the Standard 286. This led to a time consuming search for the Standard 286 interrupt levels.

By using the systematic approach, the administrator is able to use the module rules to help identify these problems prior to beginning the task. This reduces network down time and saves the administrator valuable time.

# VI. SOFTWARE CONFIGURATION TASKS

## A. INTRODUCTION

Software installation tasks may involve installing a new commercial application, updating an existing application, or installing an instructional application. The procedure for installing two commercial applications was developed to demonstrate the use of the systematic approach for software configuration tasks.

## B. SOFTWARE INSTALLATION PROCEDURE

### 1. Task Identification

Word Perfect Corporation's updated word processing program Word Perfect 5.0 (WP5.0) gives users the ability to import graphics. To give the IBM PC DOS based network users this new capability it was decided to bundle WP5.0 with a graphics package. The graphics program was chosen before continuing to the matrix check.

The first step in choosing the graphics program to bundle with WP5.0 was to review WP5.0 documentation to determine which graphics programs were compatible with WP5.0 [Ref. 19:pp. 443-450]. At the same time a list of which graphics packages were already being used by the department was compiled. It was found that only one IBM PC DOS graphics program, Software Publishing Corporation's Harvard Graphics (HG), was both currently being used by members of the department and compatible with WP5.0. Havard Graphics was then checked against the matrix with WP5.0.

## 2.  Matrix Check

A software installation affects the following network modules: operating systems, user interface, and security.  Since the WP5.0 program will be bundled with the HG program both packages were reviewed simultaneously.

### a.  *Operating Systems Module*

This installation will affect IBM PC DOS compatible machines.  The WP5.0 and HG manuals state that these programs run on any IBM PC, IBM AT, or compatible machine running PC DOS 2.1 or higher [Ref 19:p. 1, Ref. 20:p. 1].  The AS department IBM PC DOS based LAN run DOS version 3.2.

Word Perfect 5.0 requires 384K RAM to operate on an IBM PC. That is below the maximum 389K RAM available under NOS and DOS in the IBM LAN and below the 599k RAM available in the 3Com LAN.  The Harvard Graphics program needs 512K RAM to operate on an IBM PC making it incompatible with the IBM PC LAN, but compatible with the 3Com LAN.

Since the software could not be run on the IBM LAN the systematic approach proceeded to determine if WP5.0 could still be upgraded on the IBM network and both applications could be bundled on the 3Com network.

### b.  *User Interface Module*

The screen menu program 1DIR requires 50K RAM [Ref. 18:p. 5]. This put the available RAM below the 384K needed for WP50 on the IBM LAN. Both applications could still be put on the 3Com LAN.  The total RAM used by the operating systems and the 1DIR program was 110K, which gives a PC on the 3Com

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network 530K of usable RAM. This is above the 384K needed by WP5.0 and the 512k needed by HG.

To install WP5.0 on the Token Ring network, the NOS batch files will need to be changed to share the new program from the server and use the application from user stations. The applications batch file for WP5.0 on the IBM networks will need to be modified to cancel 1DIR prior to starting the WP5.0 program and reinitiated it after the program is exited. [Ref. 9:pp. 265-272]

*c. Security Module.*

The WP5.0 and HG programs were given open access. Anyone having access to the AS labs was given read only access to the programs. Both programs are copyright protected. Warnings must be attached to prevent unauthorized copies from being distributed.

**3. Preparing Task Procedure**

Using the information gained from the matrix check the following procedure was prepared for installing Word Perfect 5.0 and Harvard Graphics on the 3Com network.

- Logon to the 3Com network as network custodian.

- Using the installation procedure in the application software install the applications in the applications directory.

- Set application defaults for the network user stations and printer.

- Write the applications batch files for WP5.0 and HG. Cancel the 1DIR menu program before calling HG.

- Test applications batch files for proper function.

- Complete installation documentation.

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## 4. Conducting Task

The installation was accomplished using the procedures listed above.

## C. SUMMARY

The use of the systematic approach found the memory incompatibility problem between the applications and the IBM LAN before the actual installation. This saved the lab staff the time required to install and test the applications on the network configuration.

## VII. USER INTERFACE TASKS

### A. INTRODUCTION

The User Interface Task category is interwoven with every other task category and every LAN module. Any change to the network requires user interface tasks. To illustrate user interface tasks the previous software application task example will be expanded.

### B. TRAINING AND DOCUMENTATION FOR SOFTWARE INSTALLATION

#### 1. Problem Definition

The installation of the commercial applications Word Perfect and Harvard Graphics on the 3Com network required training and documentation for potential users.

The purpose of the installation was to provide the graphics capability of Word Perfect 5.0 and the Harvard Graphics (HG) bundled together at workstations. Training and documentation therefore must include how to place Harvard Graphics put into Word Perfect. The question for the administrator then is where to place documentation and how will it be presented.

#### 2. Management Matrix Check

A review of the management matrix shows user interface tasks affect every functional module.

*a. Hardware Module*

Training and documentation for the new applications requires users to access the 3Com network and be familiar with the attached IBM Proprinter. User training must also include instruction in what to do if the 3Com network fails. Since WP5.0 can also be used on the IBM network, training might include exporting graphics to that network.

*b. Operating System Module*

Training and documentation for the new applications must include the use of the network EtherPrint program. Users also must be informed of the inordinate amount of time it takes to print on the 3Com network so that users do not misinterpret the length of time necessary for the network to print, even under light load, for a mistake and try to print a second time.

*c. Applications Module*

Training and documentation will include how to access the files, the format for HG graphics output required for insertion into WP5.0, and memory usage of graphics files. Applications batch files written for these programs must be placed in the batch file directory. Users must be informed of which directory will be the default.

*d. Security Module*

The software configuration task required decisions to be made regarding access requirements for these applications. Users must be informed of access requirements for these applications.

### 3.    Preparing Task Procedure

Using the guidelines provided by the matrix check, the following procedure was prepared for training and documenting the use of WP5.0 and HG on the 3Com network:

- Prepare on-line documentation using the Text2com text editor.

- Place on-line documentation in the WP5.0 directory on the server.

- Place pointer to on-line documentation in the WP5.0 batch file.

- Notify users of all networks that WP5.0 and HG are available on the 3Com network.

- Complete task documentation form.

### 4.    Conducting Task

Setting up the user interface for these applications consisted of installing the batch files in the batch files directory D on the 3Com server, developing the on-line and printed documentation explaining access to the programs, and how to export HG graphics in a WP5.0 format.

On-line documentation was provided using the Text2com program and placing a pointer to it in the start up batch file for Word Perfect. The Text2com program allows text to be written in a DOS Com file. This file can then be called from within the application batch file. Unlike a DOS batch file Text2com also allows the user to scroll through multiple pages to reread portions of the documentation. [Ref. 21:p. 1-1] Printed documentation was provided in the form of a printable help file available on the server machine.

## C. SUMMARY

Using the management matrix for user interface tasks allows the administrator to consider all aspects of the LAN in formulating training and documentation.

# VIII.   SYSTEMS MANAGEMENT

## A.   INTRODUCTION

Systems management tasks cover a variety of tasks needed to keep the LAN functioning smoothly. The two major subcategories of systems management are system failure recovery and supply management. For the system failure subcategory LAN recovery procedures for the PC Token Ring and Ethernet, 3Com Ethernet, and the AppleTalk networks will be discussed. Supply management tasks will discuss issues involved with the procurement of funding for the AS labs.

## B.   SYSTEM RECOVERY TASKS

### 1.   Problem Definition

There are numerous reasons for a network to fail. Power outages, user accidents, and malicious acts all can create havoc for the network administrator. The As labs are vulnerable to all of the above. The goal of the network administrator is to make the LAN robust enough to recover from any failure quickly.

### 2.   Management Matrix Check

The systems management task LAN recovery affects the hardware module, the operating system module, and the security module.

#### a.   Hardware Module

In the advent of a power outage, some networks can recover automatically. The 3Com network does this simply by rerunning the Autoexec.bat reboot. The PC LAN Token Ring and PC Network however, can not use this

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procedure because the server keyboard is key locked preventing completion of the auto startup procedure.

### b. Operating System Module

The IBM Token Ring , the IBM PC Network, and the 3Com Ethernet use Autoexec.bat files for network start. The IBM PC Network, with its four servers, allows a user to start his station from any of the three remaining servers if his units server is down. The Token Ring with only one server does not have this option. The 3Com network also requires the server to be restarted in the event of a system failure other than a power loss. The AppleTalk requires the administrator to use the AppleShare NOS software to conduct the reboot.

### c. Security Module

Physical access to the IBM Token Ring and Ethernet network servers is through the AT keyboard key. To reboot the system the administrator must gain access to the keyboard. Access for a reboot of the AppleTalk network requires the administrator to place the AppleShare administrator diskette into the sever.

### 3. Preparing Task Procedure

Using the guidelines provided by the matrix check the LAN recovery procedure is as follows.

- Gain access to network server.

- For the IBM networks restart network using the autoexec.bat batch file.

- For the AppleTalk network restart network using the administrator diskette and reinitialize server access.

- Complete task action form.

### 4. Conducting Task

The restart procedure for the IBM and AppleTalk networks requires the administrator to gain physically access to the server. This means that if the network goes down during nonworking hours rebooting must wait until a staff member returns the next day. If the network fails over a weekend the LAN could be down for 48 hours. This will have a major effect on user perception of the network.

One option would be to physically restrict access to the server by locking the entire unit in a cabinet and not using the keyboard lock. This would allow the unit to recover automatically if the reason for the failure is electrical. Expanding this option a remote rebooting procedure could be initiated using a modem installed in the server so the administrator could check network status during nonworking hours.

Restarting the AppleTalk network requires the administrator to restart the server using the AppleShare administrator diskette. After restarting the server the administrator first must gain access to the program using a password. Next he must go through the menus and reinitialize the application accesses. Finally he removes the administrator diskette and reboots the server.

## C. SUPPLY MANAGEMENT TASKS

There are two basic emphasis areas of LAN supply: reconfiguration and resupply. LAN reconfiguration tasks deal with the procurement of new hardware and software. LAN resupply tasks cover replacement parts and consumables.

The AS department has a specific procedure for ordering LAN supplies. This section will outline those procedures.

1.  **Using The Systematic Approach**

Supply tasks do not begin with a task form. Instead consumable and replacement parts are ordered on an as needed basis. The current system is to order resupply when the stock on hand gets to a predetermined point.

The AS department has developed a Procurement Request Form for ordering supplies [Appendix E]. After the form is completed it is submitted to the department procurement office for auditing and priority assignment.

Each procurement request is checked against available funds to ensure the requestor doesn't go over budget. Procurement funds come rom two sources: research funding and departmental funding. The LAN las funding currently comes from departmental funding.

Priority levels are assigned based on the urgency of the item requested. The highest priority 10 is used for emergency procurements. This priority would be used if the item is needed within 30 days. The second priority level for procurement is 15. This level is used for normal LAN resupply. The expected delivery time for priority 15 is 60 days.

## D. SUMMARY

System management tasks include failure determination, system recovery, management task scheduling, and supply. The systematic approach can be used to determine failures and create system recovery procedures. Supply tasks use the AS department procedure for resupply.

# VIII. SECURITY TASKS

## A. INTRODUCTION

Security tasks concentrate on the physical security equipment and software in the LAN. The security module is concerned only with access to the files on the network servers for use only. The security task group is concerned with physical access to the LAN. The issues involved with the security task category are theft, malicious destruction, as well as unauthorized reproduction of network software.

This chapter will discuss the security issues of the AS labs. No one example of the systematic approach will be used to demonstrate this task group. Instead the physical security measures of the LAN are discussed.

## B. PHYSICAL SECURITY

The AS labs are open to any faculty or student at NPS. Access to the AS labs is controlled on three layers: lab entrance, external station and internal station. Access through the lab entrance is controlled by cipher locks. The combination is changed every NPS quarter. The combination is distributed by one member of the lab staff who records users' name, curriculum, and student mail center (SMC) address. The problem with this system is that it is continuously circumvented by the faculty and students.

The labs are scheduled for classes through the campus scheduling office. Professors who use the labs give the cipher combination out to students prior to their first lab. These users are not recorded in the lab staff records. A solution would be

for each instructor that schedules a lab for class use submit a class roster to the lab staff for their records.

Another area where cipher lock security is circumvented is with the individual users. Users feel no compunction against giving access to the labs to any one who asks. This behavior is an extension getting the combination during a class. Students feel that if they didn't have to sign for the combination, why should they make someone else.

External station physical security is maintained by security cable and combination locks on equipment. While this may deter the casual user from rearranging the lab setup, it will not deter anyone wanting to steal lab equipment.

Internal station physical security for the purpose of preventing software copying cannot be easily controlled. The current security measures only prevent the alteration of files on the server by use of the read only access restriction. These access restrictions cannot prevent a user from copying the applications to floppy disk.

One solution to this problem is hiding application files in other directories. To accomplish this the files can be renamed using the DOS Rename command and stored in a second directory. The Path to these files would then be added to the application batch file to ensure the files can be located. Many commercial applications however make calls to auxiliary files from within the program. If these programs are renamed, the master program will be unable to find them.

The problem of finding renamed files can be solved by using DOS environmental variables. These variables can be assigned in DOS batch files and work like variables

in other programing languages. Once a file name is assigned by a variable the master program call will locate the file assigned by the variable.

Once the program is sufficiently hidden in other directories, copying will become a more difficult task. At the same time upgrading or removing applications becomes a more difficult task for the network administrator. He must ensure that files for other programs are not erased during software configuration changes.

## C.  SUMMARY

Security is difficult to maintain in the AS lab environment. User's consistently circumvent the established access controls to the three AS labs. To prevent unauthorized access to the labs the staff must be constantly vigilant. Software security can be maintained by hiding program files in several directories making it less likely that a user's copy will contain all files necessary to use a pirated application.

# IX. CONCLUSIONS

The LAN is presented as a modular system. Each module describes a series of rules that help the manager develop procedures for conducting management tasks. These modules are hardware, operating system, user interface, and security.

Management tasks were categorized into the following five task groups: hardware configuration, software configuration, user interface tasks, systems management, and security management. These groups allow the manager to see the similarities of individual tasks and prepare procedures that encompass the diverse LAN architectures. A two dimensional matrix was used to determine which modules were affected the management task categories.

As the networks develop new capabilities new modules will become necessary. The lab staff is already planning the connection to the intracampus fiber optic network. A communications module may be needed to emphasize this new capability.

# APPENDIX A  1DIR SCREENS

## A. 3COM NETWORK 1DIR MENU SCREENS

### 1.   MAIN D: DRIVE SCREEN

| Drive D | Name | Ext | Size | | Date | Time | | Toggles |
|---------|------|-----|------|--|------|------|--|---------|
| Select => | SYS2 | | VOLUME | <==> | Mar 21, 1988 | 04:37pm | | Main Menu |
| | APPS | | SUB-DIR | | Dec 15, 1988 | 03:18pm | | |
| | EMAIL | | SUB-DIR | | Mar 21, 1988 | 07:20pm | | Caps / Print |
| | EMENU | | SUB-DIR | | Apr 14, 1988 | 08:03pm | | |
| | EPRINT | | SUB-DIR | | Mar 21, 1988 | 07:29pm | | Batch / Edit |
| | 1 | | 2050 | | Mar 08, 1989 | 09:50am | | |
| | EMAIL | BAT | 128 | | Apr 12, 1988 | 09:36pm | | Set-up |
| | EMENU | BAT | 384 | | Apr 14, 1988 | 10:41pm | | |
| | EPRINT | BAT | 256 | | Apr 12, 1988 | 10:49pm | | Pause / On |
| | HELP | BAT | 1152 | | Apr 19, 1988 | 09:04pm | | |
| | | | | | | | | Sort / Name |
| | | | | | | | | Default / D: |
| | | | | | | | | Display / D: |

D>

| Compose | Copy | Type | Rename | Erase | Date | Mkdir | Options |
|---------|------|------|--------|-------|------|-------|---------|

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### 2.   3COM D:\APPS DIRECTORY 1DIR SCREEN

\APPS

| Drive D | Name | Ext | Size | | Date | Time | | Toggles |
|---------|------|-----|------|--|------|------|--|---------|
| Select=> | PREVIOUS | DIR | | <==> | | | | Main Menu |
| | DBASE3P | | SUB-DIR | | Jan 09, 1989 | 09:25pm | | |
| | JONES | | SUB-DIR | | Jan 04, 1989 | 05:26pm | | Caps / Print |
| | LOTUS | | SUB-DIR | | Jan 09, 1989 | 09:22pm | | |
| | PEACHTXT | | SUB-DIR | | Jan 09, 1989 | 08:59pm | | Batch / Edit |
| | SZYMAN | | SUB-DIR | | Mar 06, 1989 | 01:11pm | | |
| | | | | | | | | Set-up |
| | | | | | | | | Pause / On |
| | | | | | | | | Sort / Name |
| | | | | | | | | Default / D: |
| | | | | | | | | Display / D: |

D>

| Compose | Copy | Type | Rename | Erase | Date | Mkdir | Options |
|---------|------|------|--------|-------|------|-------|---------|

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## 3.   3COM NETWORK D:\APPS\DBASE3P 1DIR SCREEN

\APPS\DBASE3P

| Drive D   | Name     | Ext | Size    |
|-----------|----------|-----|---------|
| Select=>  | PREVIOUS | DIR |         |
|           | SZYMAN   |     | SUB-DIR |
|           | ASSIST   | HLF | 17642   |
|           | BALLAB   | FRM | 1990    |
|           | CHKLIST  | FRM | 1990    |
|           | CONFIG   | BAK | 61      |
|           | CONFIG   | DB  | 87      |
|           | CONFIG   | SYS | 22      |
|           | DBASE    | EXE | 133632  |
|           | DBASE    | MSG | 12420   |
|           | DBASE    | OVL | 266240  |
|           | DBASEINL | OVL | 27648   |
|           | HELP     | DBS | 66560   |

<==>

| Date         | Time    |
|--------------|---------|
| Mar 07, 1989 | 01:21pm |
| Jul 24, 1986 | 12:00pm |
| Dec 08, 1988 | 11:15am |
| Oct 28, 1988 | 03:22pm |
| Mar 07, 1989 | 01:37pm |
| Mar 07, 1989 | 06:12pm |
| Jul 29, 1986 | 12:00pm |
| Aug 13, 1987 | 11:36am |
| Aug 13, 1987 | 11:36am |
| Jul 24, 1986 | 12:00pm |
| Jul 29, 1986 | 12:00pm |
| Jul 24, 1986 | 12:00pm |

| Toggles |  |
|---------|--|
| Main Menu | |
| Caps | Print |
| Batch | Edit |
| Set-up | |
| Pause | On |
| Sort | Name |
| Default | D: |
| Display | D: |

D>

| Compose | Copy | Type | Rename | Erase | Date | Mkdir | Options |
|---------|------|------|--------|-------|------|-------|---------|

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## 4.   TOKEN RING NETWORK BATCH FILE DIRECTORY

| Drive D  | Name     | Ext | Size  |
|----------|----------|-----|-------|
| Select=> | 1DIR     | COM | 49823 |
|          | LOTUS    | BAT | 493   |
|          | MAINFRAM | BAT | 1536  |
|          | PRTSCR   | BAT | 864   |
|          | SHU      | BAT | 641   |
|          | SIMPC    | BAT | 795   |
|          | SMARTCOM | BAT | 729   |
|          | WRD_PRFT | BAT | 256   |

| Statistics |
|------------|
| Disk Usage |
| 8 User files |
| 292864 bytes left |
| 69632 bytes used |
| 362496 bytes total |
| Memory Usage |
| 320208 bytes left |
| 335152 bytes used |
| 655360 bytes total |
| Today Is |
| Saturday the 28th |
| 3:19:28pm |

| Toggles |  |
|---------|--|
| Options | |
| Caps | Print |
| Batch | Edit |
| Set-up | |
| Pause | On |
| Sort | Name |
| Default | D: |
| Display | D: |

D>

| Compose | Copy | Type | Rename | Erase | Date | Mkdir | Options |
|---------|------|------|--------|-------|------|-------|---------|

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# APPENDIX B   APPLICATIONS BATCH FILES

## WORDPERFECT WORD PROCESSING PROGRAM

```
: *** Batch File for WordPerfect Test Token Ring Network ***
path=E:\dos;C:\network;E:\
cd e:\wordproc\wordpfct
B:
E:WP/D-B:/R
cd E:\
D:
path=E:\dos;C:\network;E:\
ldir
```

## SIMPC COMMUNICATIONS PROGRAM

```
: *** Batch File for SIMPC Test Token Ring Network ***
:
:
: *** Make sure machine has a modem.
:
IF NOT %MODEM%==N GOTO :CONT
:
: *** Machine does not have a modem
:
CLS
:
echo off
:
echo  This machine does not have a modem. Please use another machine for SIMPC.
:
:
goto :exit
:
:cont
:
:
```

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```
: *** Set path to ensure it is available when program is entered.
:
PATH E:\DOS;C:\NETWORK;E:\
:
: *** Change to E: drive where SIMPC is located.
:
E:
:
: *** Change to SIMPC sub-directory on E: drive.
:
CD COMM\SIMPC
:
: *** Invoke SIMPC
:
SIMPC
:
: *** Change to root directory on E: drive.
:
CD E:\
:
: *** Set path to ensure it is available when program is exited.
:
PATH E:\DOS;C:\NETWORK;E:\
:
: *** Return to D: as default drive.
:
:exit
:
:
D:
```

SMARTCOM COMMUNICATIONS PROGRAM

```
: *** Batch File for SMARTCOM Test Token Ring Network
:
:
: *** Check for Modem.
:
IF NOT %MODEM%==N GOTO :CONT
echo off
echo This computer does not have a modem. Please use another with a modem.
pause
echo on
goto exit
:
```

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```
:
:cont
: *** Set path to ensure it is available when program is entered.
:
PATH E:\DOS;C:\NETWORK;E:\
:
: *** Change to E: Drive where SMARTCOM is located.
:
E:
:
: *** Change to SMARTCOM sub-directory on E: drive.
:
CD COMM\SMARTCOM
:
: *** Invoke SMARTCOM
:
SCOM
:
: *** Change to root directory on E: drive.
:
CD E:\
:
: *** Set path to ensure it is available when program is exited.
:
PATH E:\DOS;C:\NETWORK;E:\
:
: *** Return to D: as default drive.
:exit
D:
```

LOTUS 123 SPREADSHEET PROGRAM

```
: ****  Lotus Batch File.
: ****  1- Check for monitor type and if B&W issue warning
: ****  2- Start Lotus using environment varaible monitor.
: ****  3- Return to D: drive.
: ****
:
: 1- Check Environment Variable.
if not %MONITOR%==BW goto cont
echo off
cls
echo .
echo .
echo This computer is equipped with a B&W monitor and will
```

```
echo not display graphics. Press any character to continue.
echo .
echo .
pause
:
:
:cont
e:
cd\sprdsht\lotus
lotus %monitor%
cd\
d:
```

# APPENDIX C    LAB STAFF TASK FORMS

## LABORATORY INSTALLATION FORM

| LABORATORY INSTALLATION FORM | |
| --- | --- |
| **Item Installed:** | **Date:** |
| **Name of Person Doing Installation:** | |
| **Describe What the Item Does:** | |
| **Hardware Requirements:**<br>•Memory:<br>•Devices Required:<br><br>•General: | |
| **Software Requirements**<br>•Files Required:<br><br>•Parameters: | |

## LABORATORY SUGGESTION FORM

**User's please fill in items 1–5 below.**

| 1. Date: | 2. Name: | 3. Phone: |
|---|---|---|

**4. Faculty Code or SMC#:**

**5. Program in use when problem occurred:**

**5. SUGGESTION: (Please include the reasons for your suggestion and the benefits that will result from implementing it.)**

### FOR USE OF LAB STAFF ONLY

| 6. Suggestion No.: | 8. Date: |
|---|---|

**9. Action:**

LABORATORY PROBLEM REPORT

| LABORATORY PROBLEM REPORT |
|---|
| User's please fill in items 1—6 below. |

| 1. Date: | 2. Name: | 3. Phone: |
|---|---|---|

**4. Faculty Code or SMC#:**

**5. Program in use when problem occurred:**

**6. PROBLEM DESCRIPTION:** (Please describe in detail the problem you experienced. Include what you were trying to do, what keys were pressed if you can remember, and what went wrong.)

**FOR USE OF LAB STAFF ONLY**

| 7. Problem Report No.: | 8. Date: |
|---|---|

**9. Action:**

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## LABORATORY INFORMATION REPORT

**Name of Person Making Report:**                                                    **Date:**

**Record completion of a task here.**

*Task Number:

*Task Description:

**Record other items of general intrest to the staff here.**

# APPENDIX D   IBM TOKEN RING NETWORK FILE LISTING

The following files must be present on the User station hard drive to start the

Token Ring Network.

## NETWORK OPPERATING SYSTEM FILES

| | | |
|---|---|---|
| INSTALL EXE | MODE COM | NET COM |
| NETBEUI COM | NETBIOS COM | NETWORK PLB |
| NETWORK PIF | NETWORK MSG | NETWORK1 CMD |
| NETWORK1 SCN | NETWORK2 CMD | NETWORK3 CMD |
| NET_IDS NIA | PERMIT COM | PQ SPL |
| PQ OEM | PQ SEP | PSPRINT EXE |
| RCONFIG SYS | RECEIVER COM | REDIR EXE |
| SCONFIG SYS | SHARE EXE | TOKREUI COM |
| TVMSG EXE | TVMSG PIF | TVRDR COM |
| YNPROMPT COM | | |

## DISK OPERATING SYSTEM 3.2 FILES

| | | |
|---|---|---|
| ANSI SYS | ASSIGN COM | APPEND COM |
| ATTRIB COM | BACKUP COM | BASIC COM |
| BASICA COM | CHKDSK COM | COMP COM |
| LIGHT COM | DISKCOMP COM | DISKCOPY COM |
| DRIVER SYS | EDLIN COM | FDISK COM |
| FIND EXE | FORMAT COM | GRAFTABL COM |
| GRAPHICS COM | JOIN EXE | KEYBFR COM |
| KEYBGR COM | KEYBIT COM | KEYBSP COM |
| KEYBUK COM | LABEL COM | MODE COM |
| MORE COM | PRINT COM | RECOVER COM |
| REPLACE EXE | RESTORE COM | SELECT COM |
| SHARE EXE | SORT EXE | SUBST EXE |
| SYS COM | TREE COM | VDISK SYS |
| XCOPY EXE | PATCHFMT EXE | SOUND COM |

## NETWORK BATCH FILES

| COMMAND COM | CONFIG SYS | START BAT |
| USER BAT | AUTOEXEC BAT | |

## SCREEN MENU FILES

| 1DIR COM | OPTIONS EXE | 1DIROPTS OPT |
| ALT MNU | DEFAULT OPT | MAIN MNU |

# APPENDIX E    PROCURMENT REQUEST FORM

PROCUREMENT REQUEST FORM                    Date _____

Approved _____

Approved _____
-------------------------------------------------------------------
*****PLEASE FILL OUT ONE FORM FOR EACH ITEM YOU ORDER.  IF MOST OF THE
INFORMATION IS THE SAME, PLEASE FILL OUT ONLY THE BLANKS THAT ARE
DIFFERENT, AND REFER TO THE FIRST FORM FOR ALL OTHER BLANKS.
IT IS VERY HELPFUL TO HAVE A COPY OF THE PAGE IN THE MAGAZINE OR CATALOG
DESCRIBING THE SPECIFIC ITEM YOU WANT ORDERED.  PLEASE ATTACH A COPY (OR
ORIGINAL) OF THE PAGE TO THE FORM.  IF YOU HAVE ANY QUESTIONS CONTACT
SANDRA x3228.
-------------------------------------------------------------------
TO BE FILLED OUT BY THE REQUESTOR (you!)

1.  Your name:
-------------------------------------------------------------------
2.  VENDOR NAME:
-------------------------------------------------------------------
3.  VENDOR ADDRESS:                         4. PHONE OF VENDOR


-------------------------------------------------------------------
4.  ITEM AND ITEM DESCRIPTION (REMEMBER, ONLY ONE ITEM PER PAGE)


Part Number?  (GSA Contract Number, or ISNB Number if book):
-------------------------------------------------------------------
5.  COST OF ITEM:   $                        QUANTITY NEEDED:
-------------------------------------------------------------------
6.  TOTAL COST OF REQUEST (IF USING MORE THAN ONE PAGE, PLEASE
    ADD ALL UP:  $
-------------------------------------------------------------------
7.  DO YOU NEED THIS FASTER THAN 60 DAYS?? IF YES, I WILL NEED
    AN:

A)  URGENCY OF NEED OF JUSTIFICATION
B)  IMPACT OF OPERATION IF NOT DELIVERED ON TIME STATEMENT

please write this on the back.  If no justifications are written, it will
go in as a priority 15, which will take around 2 months...
-------------------------------------------------------------------
8.  LMC/COST CODE:                          SEGMENT CODE:
-------------------------------------------------------------------
FOR YOUR INFORMATION:  ORDER WAS PLACED ON _____
-------------------------------------------------------------------
JOB ORDER _____  JULIAN DATE/SERIAL # _____

for filing purposes:  Individual accts. _____  PO accts._____


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