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3COM ETHERSERIES LOCAL AREA NETWORK

by

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3COM EtherSeries Local Area Network

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ABSTRACT

The purpose of this thesis is to provide an overview of the requirements and protocols required for the implementation of an Ethernet LAN. The appendix to this thesis is a User's Manual for the 3Com EtherSeries Network version 2.4. The manual is specifically written for use in the Administrative Sciences Department Information Systems lab at the Naval Postgraduate School.

C.1

TABLE OF CONTENTS

I.   BACKGROUND

The Naval Postgraduate School has implemented a 3Com Etherseries baseband Ethernet Local Area Network (LAN). The purpose of this thesis is to explore the requirements and protocols required in the implementation of an Ethernet LAN, discuss the demands of 3Com's Etherseries network as regards hardware and software, and develop a comprehensive student's user manual.

A.   PURPOSE OF A LAN

The purpose of a LAN has evolved from just sharing expensive computer peripherals laser printers, hard disks, and software to reduce costs. Robert Metcalfe, a co-inventor of Ethernet, subscribes to the new view that the purpose of LAN's is to share information creating "workgroup information systems." [Ref. 1:p. 9]

The design of a LAN encompasses a broad set of requirements as cited in The Ethernet Sourcebook: [Ref. 2:p. 13]

- relatively high data rates (typically 1 to 10M bits per second);

- geographic distance spanning about one kilometer (typically within a building or a small set of buildings);

- ability to support several hundred independent devices;

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- simplicity, or the ability to provide the simplest possible mechanisms that have the required functionality and performance;

- good error characteristics, good reliability, and minimal dependence upon any centralized components or control;

- efficient use of shared resources, particularly the communications network itself;

- stability under high load;

- fair access to the system by all devices;

- easy installation of a small system, with graceful growth as the system evolves;

- ease of reconfiguration and maintenance; and

- low cost.

B. BASIC LAN IMPLEMENTATION CONSIDERATIONS

There is a wide variety of available technology to choose from in implementing a LAN. The optimal LAN for a given application is a trade-off between the number of users, their geographical distribution, the data rates required, the applications that must be supported, and user-justifiable costs [Ref. 3:p. 179]. The factors used to sort out the different technologies in making a decision are: hardware configuration, network topology, connectivity, data transmission rate, physical media, interfaces, flow control, and collision detection and avoidance. [Ref. 4:p. 8]

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II.   ETHERNET LOCAL AREA NETWORKS

This chapter provides a brief introduction on the history of Ethernet, basic components, theory of operation, and performance characteristics.

A.   HISTORY OF ETHERNET

The co-inventors of Ethernet, Robert M. Metcalfe and David R. Boggs, created Ethernet at the Xerox Palo Alto Research Center in May of 1972. The name "Ether" was taken from the refuted physical theory of the "luminiferous ether" that was once thought to be the passive medium that served in the propagation of electromagnetic waves through space, such as carrying light from the sun to the earth. [Ref. 2:p. xi] The rationale behind using the term "Ether" was to use a general description of the medium used to carry transmissions through their experimental network.

Ethernet design started with the fundamental idea of packet collision and retransmission developed in the Aloha Network at the University of Hawaii. [Ref. 5:p. 396] The Aloha Network is a star network that uses an outgoing broadcast channel and an incoming multi-access channel. There is no central controller assigning access to the channel, so each radio terminal uses a random access procedure to determine when to transmit. The penalty for the elimination

of any central control is collisions caused by two terminals transmitting at the same time. This required the terminals to wait a random interval of time and then retransmit.

The main difference between Ethernet and the Aloha Network is Ethernet's ability to support many-to-many communication with a single broadcast multi-access channel.

B. EHTERNET BASIC COMPONENTS

An Ethernet uses four basic components: the "Ether," transceivers, interfaces, and controllers.

The "Ether" transmission medium, can be twisted pair wire, thin or wide coaxial cable, or optical fiber cable. Ethernet over unshielded twisted pair wire provides a practical and economical transmission medium. The ability to use a currently installed wiring system within a building reduces the cost of installation by eliminating the costly labor and material expenses of adding the network over coaxial cable. The use of twisted pair wire can support both baseband and broadband data transmission. Network moves, changes, diagnostics, and cable management are simple and flexible in an environment with unshielded twisted pair wire with a centrally located telephone wiring closet. The nodes can be reassigned by moving cross-connect wires on the punch-down block in the telephone wiring closet. When wired in hierarchical star configuration, the network can be segmented into logical subnets to facilitate fault isolation and provide

a control point for troubleshooting. [Ref. 6:p. 102] The major disadvantage of twisted pair wire is the distance limitation of its signal of 360 feet from the workstation to the central telephone wiring closet.

The mechanical properties of coaxial cable makes it possible to tap in at any point without severing the cable or producing excessive RF leakage. It is suitable for transmitting high frequency signals while resistant to electrical interference. It is compatible for both baseband and broadband transmissions. Although coaxial cable costs more than twisted pair wire, the simpler installation and better electrical characteristics have made it the choice for most local area networks [Ref. 7:p. 50].

Optical fiber cables are more expensive than coaxial cable or twisted pair wire due to its construction. It is also difficult to tap due to the high coupling losses that can occur. Its major use is for long distance links or for areas where electrical interference is a problem. Increasingly, it is used for backbone networks and for some LANs because of its high bandwidth.

The transceiver links the workstation to the cable using a pressure tap. The pressure tap connects to the cable without cutting it to insert a connector and avoids the need to interrupt network service while installing a new workstation. An alternate method of connecting the transceiver to the cable is to use a T-connector which will

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disrupt network service during installation. The two connector ends attach to the break in the cable and the t-adaptor end connects to the workstation's transceiver. The transceiver performs four essential functions: [Ref. 2:p. 20]

- transfers transmit data from the controller to the transmission system;

- transfers receive data from the transmission system to the controller;

- indicates to the controller that a collision is taking place; and

- provides power to the transmission system.

An interface serializes and deserializes the parallel data used by the workstation. Each interface contains the hardware necessary to compute a 16-bit cyclic redundancy checksum (CRC) on serial data while transmitting and receiving. [Ref. 5:p. 399] The checksum protects only against errors in the transmission medium and not for errors in the parallel portions of the interface hardware or workstation. It is possible to use higher-level software checksums for applications requiring a higher degree of reliability.

The transmitting interface uses a packet buffer address to serialize the word count and phase encode the variable number of 16-bit words taken from the workstation's memory which pass to the transceiver. A start bit precedes the 16-bit words and the CRC follows the 16-bit words. The receiving interface will detect a carrier signal on the transmission medium and will use the start bit to acquire bit phase. If the carrier

stays on the transmission medium, the interface will decode and deserialize the incoming bits depositing 16-bit words in a packet buffer in the workstation's memory.

When the interface detects the absence of a carrier signal a check of the integral number of 16-bit words received against the CRC verifies capture of a complete error free packet. The last 16-bit word received is assumed to be the CRC and after checking for a complete packet the CRC is discarded by not being copied into the packet buffer. The interface will contain hardware to check the address of the packet to identify packets addressed to that workstation for packet processing. A destination address of zero is a broadcast packet and will be received by all the workstations.

The controller is the workstation's low-level firmware or software for getting packets onto and out of the transmission medium [Ref. 5:p. 400]. It is the responsibility of the source workstation to detect a collision of its packet on the transmission medium and to generate a new random retransmission interval based on the updated collision count to resend its packet. The Binary Exponential Backoff algorithm is successful in reducing collisions during a heavy load on the network by increasing the retransmission interval causing retransmission traffic to back off to sustain channel efficiency [Ref. 5:p. 400].

C. ETHERNET THEORY OF OPERATION

The IEEE and the American National Standards Institute (ANSI) officially adopted Ethernet as ANSI/IEEE Standard 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specification in June of 1984 [Ref. 2:p. xv]. The United States federal government adopted Ethernet in FIPS PUB 107 as a standard for federal government use in 1984.

1. Network Topology

The network topology of Ethernet is that of an uprooted tree composed of separate bus segments. The significance of this arrangement is one of simplicity by providing only one path through the transmission medium between any source and destination. The benefit of having this arrangement eliminates the possibility of a transmission packet interfering with itself by the packet repeatedly arriving at the intended destination by paths of different lengths. This arrangement prevents redundant connections and provides potential of the convenient addition of workstations to the net with minimal network interruption. The maximum length of the transmission medium for 3Com's EtherSeries baseband network is 1000 feet for each cable segment and allows a maximum of two repeaters between two workstations.

2. CSMA/CD

CSMA/CD (IEEE 802.3) provides straightforward control and can be characterized as "every user for itself" [Ref. 8:p.

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64]. Ethernet CSMA/CD does not use a central controller for transmission medium access control or transmission medium access control management frames. A workstation desiring to transmit data is required to "contend" for the transmission medium. The workstation contending for the transmission medium checks for a carrier on the medium. When a carrier is detected the workstation waits until the medium is quiet and then begins to transmit. The workstation controls the net until all its data is transmitted or until a collision is detected. The "collision window" is the short interval between when a workstation begins transmitting data and a second workstation attempts its own transmission. The "collision window" is a function of the end-to-end propagation delay which is a function of the time required to transmit the data-frame at the transmission medium bit rate and the propagation delay of the transmission medium. [Ref. 9:p. 52]

When a collision occurs the workstation transmitting data will abort the transmission and begin jamming the transmission medium to alert all other workstations of the collision. This invokes the exponential backoff algorithm that determines a delay interval before a workstation can attempt to transmit data. [Ref. 8:p. 65] Each workstation computes a different interval to minimize repeated collisions. The randomness of the waiting period for retransmission and unpredictable workstation control of the transmission medium makes the network availability fair for all workstations.

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3. Broadband vs. Baseband

Ethernet LAN's can use either broadband or baseband data transmissions. The decision of which method to use depends on the requirements of the network, cost of implementation, network expansion, and network maintenance.

Broadband networks are more costly due to the hardware requirements needed to support the transmission of analog data. All workstations require RF modems to modulate and demodulate data transmitted over the network. The advantage of analog transmissions is the ability to transmit video, data, and voice data over one transmission medium.

The key elements of a broadband system are the headend and distribution network. The headend is a hardware device that all data must pass through and there is only one path from a workstation to the headend. The distribution network consists of the cabling, branches to the bus, and cable drops between the branches and individual workstations and shared peripheral devices. Data transmissions are unidirectional which requires a separate frequency channel on the cable or a second cable to accomplish 2-way communication. The inbound channel carries data transmissions from the modem to the headend and the outbound channel carries data transmissions from the headend to the modems. Amplifiers increase the possible distance of the network and reduce signal attenuation.

Baseband networks use a bidirectional transmission medium to transmit digital data at a rate of 10Mbps [Ref. 10:p. 10]. Baseband network length is limited to one to two kilometers. The lower cost of baseband networks, their ease of installation, and overall simplicity highlight their advantage.

D.   ETHERNET PERFORMANCE CHARACTERISTICS

The performance characteristics of an Ethernet baseband LAN are measured on: data throughput, attached device connectivity, network response time, error types and error rates, fairness in access, and reliability [Ref. 7:p. 111].

Data throughput depends on the load condition of the Ethernet LAN and data packet size. John Shoch and Jon Hupp in their study on the performance of Ethernet LAN's reported that as the network load approached 90 percent the network's throughput curve leveled out at a level above 96 percent. [Ref. 11:p. 718] When larger packets are compared to the collision interval the network is less susceptible to collisions and the data throughput will remain high. Conversely, the reduction in packet size increases the chances for collisions decreasing throughput as the packet size approaches the collision interval.

The Ethernet LAN provides excellent connectivity. This is due to its passive broadcast medium which allows relative ease in adding or moving peripheral devices on the network.

The results of John Shoch and Jon Hupp in documenting the performance of Ethernet under normal loads indicated that workstations rarely waited for access, error rates were very low and few packets were lost [Ref. 11:p. 720]. As a result of fairness in access and infrequent data collisions workstation response time is negligible.

III.   3COM NETWORK

The 3Com EtherSeries baseband network version 2.4 provides a fast and powerful system for communicating and sharing information with other IBM or IBM-compatible PC's.   Ether-Series utilizes the IEEE 802.3 Ethernet industry standard and MS-DOS.

EtherSeries when using a network server connected to the network allows use of the five EtherSeries products: [Ref. 12:p. 1-1]

- EtherLink;
- EtherShare;
- EtherPrint;
- EtherMail;
- EtherMenu.

In addition, application programs and data files for other computer software can be utilized using DOS commands.

IV. 3COM HARDWARE

The hardware requirements for the 3Com EtherSeries network include: an IBM PC, EtherLink card, coaxial cable, BNC T-Adapter, transceiver cable and terminators.

A. WORKSTATIONS

The workstation requires use of an IBM or IBM-compatible PC with the following requirements:

- one diskette drive;
- 128K of memory or 192K when using EtherMail;
- an 80 character display;
- an available expansion slot;
- PC DOS version 2.0.

B. ETHERLINK

The EtherLink is a printed circuit board that plugs into an expansion slot in the IBM PC. The EtherLink sends and receives information across the network.

C. COAXIAL CABLE

EtherSeries can use either thick or thin coaxial cable. Thin Ethernet coaxial cable uses 50 ohm RG-58 A/U cable (0.2 inch diameter) and uses BNC connectors. The maximum length of a cable segment is 1000 feet and a minimum distance of three feet is required between workstations or transceivers. Thick

Ethernet coaxial cable is 0.4 inch diameter cable that uses N-series connectors. The maximum length of a cable segment is 1640 feet and the minimum distance between workstations or transceivers is 7.5 feet. When using EtherLink with thick cable an external transceiver is required or N-series to BNC-series will be required. [Ref. 12:p. A-2] A repeater allows combining either thick Ethernet of thin Ethernet cable segments. The repeater has the same electrical characteristics of a transceiver. A limit of only two repeaters are allowed between any two workstations and only a combination of 100 workstations and repeaters are allowed per cable segment [Ref. 12:p. B-6].

D. BNC T-ADAPTER

The BNC T-adapter provides the link between the coaxial cable and the transceiver cable to the EtherLink card. The Thin Ethernet coaxial cable is attached to the T-adaptor using the BNC adapters.

E. TERMINATORS

Two terminators are required in the EtherSeries network. The terminators attach to the T-adapters or coaxial connectors on the T-adapter at both ends of the network bus. One of the terminators is grounded to an AC wall plate to ensure the reliability of the network.

V. 3COM SOFTWARE

This chapter provides a general description of each of the software components of the EtherSeries network. It is not intended to provide a detailed presentation, but to describe their major attributes.

A. ETHERSHARE

EtherShare is the software interface of the EtherSeries network. EtherShare allows workstations to share a single hard disk which may be contained in the network server. The network server controls hard disk resources, printers, and electronic mail service.

The hard disk is divided into volumes that can be any size from 64KB to 32MB. The volumes can be viewed as a workstation's own diskettes. The volumes can be accessed after logging on to EtherShare and linking to an EtherShare volume to a drive specifier on your PC. The normal drive specifiers for EtherShare volumes are D:, E:, F:, and G: with C: reserved for PC's that contain their own hard disks.

Security of the volumes is determined by the user when creating EtherShare volumes. The only practical accesses are public and shared. The owner of a private volume can change the access level to either public or shared. A public volume allows read only access to users other than the owner. The

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owner must determine what degree of access others will have to his volume. If the owner generates a password to access the volume only those granted the password can use that volume. If no password is generated anyone can access the volume. Shared volumes allow others to have read-write access if they are granted the password to the volume. Both public and shared volumes can be accessed by multiple users at the same time.

B. ETHERPRINT

EtherPrint permits many users to print programs, data, and text files on a shared printer. When the workstation is linked to the network server print files from the workstation are "spooled" on the network server to be printed on the printer selected in the order they arrive at the server. Three printers can be attached to a server and only one of these may be a serial printer.

The benefit of EtherPrint is its ability to make programs run faster. When using EtherPrint data is sent to the server at the speed of the network not the speed of the printer [Ref. 12:p. 2-1]. The delay in responding to print requests is very slow. Also, after an application is completed and the output file is to be printed the workstation is allowed to do other useful work. The output file is queued onto the server to be printed in order of arrival.

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C. ETHERMAIL

EtherMail allows users to send and receive messages through the network server. The network server acts as a mailbox that distributes mail to their destination when that user is online or saves the message until that user logs on the network. The server will notify users if they have mail waiting for them the next time they log on the network. Also, the server will notify the sender if the message is undeliverable. Networks with multiple servers must have EtherMail software on each of the servers in order to distribute messages to the users of that server.

EtherMail is a screen-oriented message editor. The message editor can be used to create distribution lists, documents, programs, batch files, and other text related files. In addition, DOS files can be attached to an EtherMail message.

D. ETHERMENU

EtherMenu allows users to select the task they wish to perform. The standard EtherSeries menu includes a Main Menu, EtherSeries Utilities Menu, Dos Utilities Menu and Network Volumes and Printers Menu. EtherMenu can be modified to meet the needs of the network users.

VI.   CONCLUSIONS AND RECOMMENDATIONS

Recommendations for the EtherSeries network relate to the LAN's management.

A.   LAN MANAGEMENT

An effective LAN management plan requires good maintenance of the LAN and support from the vendors providing the equipment used.   Prior evaluation of a vendor's products and services to be provided are critical in the life cycle of a LAN.

B.   CONFIGURATION MANAGEMENT

The life cycle of a LAN always includes changes over time. Periodical evaluation and reconfiguration of the LAN are needed.   Configuration management entails optimizing the resources of the LAN and maximizing throughput and data transmission reliability.   A method to provide essential management of the network a database must be kept of the system's configuration, operational problems that have occurred and problems encountered while reconfiguring the network.

C.   OPERATIONS AND MAINTENANCE

A plan must be developed to ensure a maintenance schedule is developed for hardware and software and a history of work

done is compiled for future reference. Included in this area a plan should be developed to determine future growth requirements and a backup system developed to minimize damage caused by network down time.

D. PERFORMANCE MONITORING

Performance monitoring of the network provides information necessary for optimizing the networks configuration. Typical information required concerns LAN loading, traffic information, failure situations, and network choke points.

E. SECURITY

Ethernet systems are not designed for network security. A user management plan is required to provide mechanisms to control physical access and logical access to the network.

APPENDIX

3COM ETHERSERIES LAN USER MANUAL

This appendix is a User Manual for the 3COM EtherSeries Network version 2.4. The manual is specifically written for use in the Administrative Sciences Information Systems lab at the Naval Postgraduate School located in Ingersoll Hall room I-224.

TABLE OF CONTENTS

I. INTRODUCTION

Welcome to the Naval Postgraduate School's 3Com EtherSeries Network. The purpose of this manual is to provide a step-by-step guide in learning the 3Com EtherSeries LAN at the Naval Postgraduate School. The user's manual is adapted from EtherSeries User's Guide Version 2.4 May, 1985.

The EtherSeries Network is located in Ingersoll room 224. This network has 3 IBM XT and 2 IBM PC computers connected to the 3Com EtherSeries Network. The network uses a 70 megabyte 3Com 3Server3 server.

The following outline highlights the topics and features of the EtherSeries LAN

A. GETTING STARTED

The getting started section will define the meanings of key words and letters used within the user's guide to describe user actions.

B. LOGON PROCEDURES

The logon procedure describes the repetitive logon requirements of the EtherSeries network, the setup of logon names, passwords, software and drive specifiers.

C. ETHERMAIL (EMAIL)

The EtherMail section describes the capabilities of EtherSeries electronic mail system. Also, a step by step user guide of each EtherMail option is presented.

D. ETHERMENU (EMENU)

The EtherMenu provides access to the EtherSeries Utilities and DOS Utilities.

1. EtherSeries Utilities

The EtherSeries Utilities provides the following options:

- A Help menu that provides a one screen description of the 3COM EtherSeries network.

- The option, Link Network Volumes and Printers, allows users to:

    a. Link, unlink, create, modify and delete volumes.

    b. Link and unlink printers.

    c. Create, modify and delete users.

    d. No options available for the server selection.

    e. Displays the help screen detailing keyboard options.

- "Tour" the Network provides an abbreviated indoctrination of the EtherShare (ES) and EtherPrint (EP) commands.

2. DOD Utilities

The DOS Utilities provides the following options:

- A Help screen providing a brief description of the DOS Utility option capabilities with EtherMenu.

- Allows users to list the directories of available disk drives (A:, B:, C:, D:, E:, F:, and G:).

- Allows users to make copies of files.

- Allows users to display files on the screen.

- Allows users to format diskettes.

- Allows users to execute a program while logged on the network.

E.   ETHERPRINT (EPRINT)

The EtherPrint option provides a help screen detailing how to print a file.

F.   HELP

The Help option details how to start EMAIL, EPRINT, and application programs. Also, the user is notified that disk drive A: is the default drive for user applications.

G.   ETHERSHARE (ES)

This section details the procedures to follow when executing the following EtherShare commands:

- (ES LOGIN) Logging onto the server.

- (ES LOGOUT) Logging out from the server.

- (ES LINK) Linking to an EtherShare volume.

- (ES UNLINK) Unlinking from an EtherShare volume.

- (ES DIR) List all linked user volumes.

- (ES CREATE) Creating a new volume.

- (ES MOD) Modifying an existing volume.

- (ES DEL) Deleting an existing volume.

- (ES UDIR) Listing all network users.

- (ES UCREATE) Creating new user names.

- **(ES UDEL)**   Deleting user names.

- **(ES UMOD)**   Modifying your user password.

- **(ES SDIR)**   Lists all servers.

- **(ES HELP)**   The Help screen is currently unavailable.

H.   ETHERPRINT (EP)

This section details the procedures to follow when executing the following EtherPrint commands:

- **(EP LINK)**   Linking a printer to a server.

- **(EP UNLINK)**   Unlinking a printer from a server.

- **(EP DIR)**   Lists the printers supported by the server.

- **(EP HELP)**   Provides help information for EP commands.

II. <u>GETTING STARTED</u>

Getting started with the EtherSeries network helps users to understand the methodology used in the user's manual. The following explanations and examples will apply:

- all user commands require the user to hit the enter or return key to execute the command.

- <u>XXXXXX</u> will denote input data to be provided by the user.

- **(CTRL-ALT-DELETE)** is an example of control keys that must be entered at the same time. This example would be used if the user desired to re-boot the PC.

- **(CTRL-BREAK)** is used to cancel EtherShare and EtherPrint commands. The user will be able to return to the 1DIR screen.

- Input data for all user names, passwords, and commands can be entered in either upper or lower case letters. Upper case letters are used in this manual to highlight user input requirements.

III. LOGON PROCEDURES

Logging onto the EtherSeries network is a four step process.

1. Turn on the PC.

2. Enter the corresponding user name that applies to the PC you wish to use. The current legal user names available on the network are: **ENET1, ENET2, ENET3, ENET4, and ENET5.**

3. Enter the current password to access the network server. The current password is **GENERAL.**

4. Enter the current password to access the network user's private volume. The current password is **GENERAL.**

The following example shows the correct procedure for logging on the network:

Your name? **ENET1**

Password? (**GENERAL**

ENET1 logged in to NORMS.

Your EtherShare drives are D: through G:

Password? (**GENERAL**

NORMS.SYS2 linked to D.

NORMS linked to PRN.

In the event of an unsuccessful logon enter (**CTRL-ALT-DEL**) to re-boot the PC and try again. If you are still unsuccessful after correctly entering the proper user name and passwords, notify the network manager.

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You have now entered the EtherSeries network. The network is capable of using drive specifiers D:, E: and G:. Drive D: contains the Server NORMS and drive E: contains the volume INBOX which is used as the mailbox on the server to store electronic mail.

EtherShare volumes can have three kinds of access: private, public, or shared. All EtherShare volumes are created with private access. After files have been loaded, the access may be modified to public or shared.(12:C-1) Each of the INBOX volumes for the 6 workstations are designated private volumes.

Each of the different EtherShare volume types have different access restrictions. Only the owner can log on. Public volumes may be shared by many users at the same time, but have read-only access. Only shared volumes can be accessed by many users at the same time with both read and write capability.

Semaphores are provided for use with shared access volumes and provide a means to protect against the loss of data that may occur when multiple programs update the same file. Three semaphore operations are provided by EtherShare servers: LOCK/WAIT, LOCK/RETURN, and UNLOCK. Any program using shared access volumes must be modified to include semaphores if they will update files in shared volumes. [Refl. 12:p. C-2]

At this point you will looking at the 1DIR screen on drive D: listing the available user options:

- SYS2 the current network server volume.

- APPS the subdirectory containing application programs available on the network server.

- EMAIL the subdirectory containing EMAIL system files.

- EMENU the subdirectory containing EMENU system files.

- EPRINT the subdirectory containing EPRINT system files

- EMAIL.BAT the batch file for starting EMAIL.

- EMENU.BAT the batch file for starting EMENU.

- EPRINT.BAT the batch file for starting EPRINT.

- HELP.BAT the batch file for displaying 1DIR screen help information.

IV. EMAIL

EMAIL allows users to send and receive messages through the network server volume (NORMS). Each workstation has a private volume called INBOX located on server drive E: which contains that workstation's mail.

A. STARTING EMAIL

The EMAIL program can be started after logging on the network. The 1DIR screen will appear and the user starts EMAIL by selecting **EMAIL.BAT** with the down arrow key and pressing the enter key or by typing:

D>EMAIL.BAT

The first EMAIL screen will appear displaying in numerical order received mail in your INBOX volume. If there is no mail the screen will be blank. Immediately upon starting EMAIL the program will check to see if you have any mail waiting for you on the server mailbox. The status line at the bottom of the screen will tell you to press **F8** to receive your mail.

The bottom line on the screen lists the following EMAIL function keys:

- **F1** HELP Displays a description of the function keys.

- **F2** SHOW Displays contents of message/attachment indicated by the cursor.

- **F3** DELETE Will delete the indicated message/attachment from your INBOX folder.

- **F4   PRINT**   Prints a hard copy of the indicated message/attachment.

- **F5   FILE**   Will copy the message/attachment to a DOS file.

- **F6 REPLY** Will create a new message which is a reply to the message indicated by the cursor.

- **F7   FORWARD**   Will forward a copy of the indicated message to someone else.

- **F8   GET**   Will check the mailbox on the server for new messages and will transfer them to your INBOX folder.

- **F9 NEW** Will create a new message.

- **F10 EXIT** Will return the user to the 1DIR screen.

B.   CREATING A MESSAGE

Press **F9** to start the message editor screen.   The message screen contains the message header, message text, the EMAIL status line and function key display.

1.   The Message Header

The message header must be entered first before the status line and the function key line will be displayed at the bottom of the screen.   The message header is divided in the following five fields:

- **FROM:** the from line is automatically generated using the user workstation's name.

- **TO:**   the to line is a required field and must be entered by the user using valid names on the server.   Multiple addresses are allowed.

- **CC:** the carbon copy line is optional and allows the user to send himself and others a copy of the message.

- **SUBJ:** the subject line is optional and only one line of data is allowed for the subject.

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- **ATTACH:** The attachment line is optional and allows the user to attach up to 26 DOS files to a message. In order to attach a DOS file the drive specifier, file name, and file extension is required. If necessary the DOS file's path name will be required.

Example: **B:NAME.EXT**

B:\PATH\NAME.EXT

a. General Rules for Header Information

When sending a message to multiple users separate the names with a comma or semicolon or enter a comma or semicolon and hit enter to start a new line for user names. The same rule applies for multiple CC: user names and DOS file attachments.

When invalid names are used a message will appear on the status line after sending the message notifying the user the server is unable to deliver the message. If multiple addresses are used and at least one user address is invalid a message will appear on the status line asking the user if the message should be sent anyway. The user should enter **Y** to send the message or **N** to leave the message in the user's inbox folder.

The user can erase an entire line of input on the header line data by pressing the **ESC** key once. If the user presses **ESC** key twice the message will be aborted and returns the user to the original EMAIL display.

2. Entering Message Text

Upon completion of the header information the status line will display whether the screen editor is in the insert

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mode or type-over mode and displays EDIT for edit mode. The
editor uses the **INS** key to toggle between the insert and
type-over mode.

The function key line at the bottom of the screen
displays the following information:

- **F1--HELP** displays explanations of the function and
  special editor control keys.

- **F2--FILL** fills edited paragraphs out to the margins.

- **F3--DELW** deletes the word indicated by the cursor
  location.

- **F4--DEL2** deletes text from the cursor position to the
  end of the current line.

- **F5--DELL** deletes the entire line of text.

- **F6--MARK** marks text to be moved, copied or deleted.

- **F10--DONE** exits the editor and returns to the first
  EMAIL screen.

a. Margins and Tabs

The text editor provides for automatic word wrap
so it is unnecessary to hit the return key for each line of
input.   There is no option to alter the margins or tab
settings for the text editor.   Each line is 65 characters
long and the tab key moves over four spaces to the next tab
setting.

Whenever the tab key is used the left margin
will default to that location on each succeeding line until
the return key is used. Also, when using the move function
to move tabular information always start the move location

at the far left margin of the screen to retain the same location after moving the data.

      b.   Special Text Editor Control Keys

      The following special keys on the keyboard perform the following editing and control functions:

- **Arrow Keys** control Up, Down, Left, and Right Cursor control.

- **Home** moves the cursor to the top left corner of the screen.

- **CTRL-Home** moves the cursor to the lower left corner of the screen.

- **END** moves the cursor to the end of the current line.

- **END END** moves the cursor to the end of the paragraph.

- **ENTER** inserts a new line at the current cursor position.

- **CTRL-ENTER** moves the cursor to the beginning of the next line.

- **PGUP** displays the previous screen of text.

- **PGDN** displays the next screen of text.

- **DEL** deletes the current character the cursor is under.

- **INS** toggles between INSERT and TYPE-OVER mode.

- **BACKSPACE** backspaces and deletes the previous character.

- **TAB** moves the cursor to the next word or tab stop.

- **SHIFT-TAB** moves the cursor to the previous word or tab stop. [Ref. 12:pp. 6-7--6-9]

      c.   (F6) Marking Text

      Marking text is used to mark blocks of text which can be moved, copied or deleted. Regardless of whether you want to move, copy or delete, the first step is

always to mark the beginning and end of the block of text. The blocked text will be highlighted and you can then delete the text, or position the cursor anywhere in the document and move or copy the text to that location.   [Ref. 12:p. 6-19]

Example: Deleting Blocked Text

1.   Place the cursor under the beginning of the text you wish to delete.

2.   Press the F6 function key.

3.   Move the cursor under the ending location of text to be deleted and press the F6 function key again.

4.   Press the F9 function key to delete.

5.   Press the F9 function key again to confirm.

Example: Moving Blocked Text

1.   Move the cursor under the beginning of the text you wish to move.

2.   Press the F6 function key.

3.   Move the cursor to the ending location of text to be moved and press the F6 function key again.

4.   Move the cursor to the screen location you wish to have the blocked text moved to and press the F8 function key.

Example: Copying Blocked Text

1.   Move the cursor under the beginning of the text you wish to move.

2.   Press the F6 function key.

3.   Move the cursor to the ending location of text to be copied and press the F6 function key again.

4.   Move the cursor to the screen location you wish to have the blocked text copied to and press the F7 function key.

The **F10** function key will end the MARK mode and allow the user to resume editing. Caution should be used when moving and copying text because no formatting information is maintained which may require reformatting your text after these operations.

3. Leaving the Editor

Pressing the **F10** function key causes the current message to be displayed with a new status line and a new set of function keys. The status line will remind the user to press F6 to send the message. The function keys at the bottom of the screen perform the following tasks:

- **F1 HELP** displays an explanation of the function keys.

- **F2 NEXT** will notify the user on the status line that the message was not sent and will ask if you wish to save it. Enter **Y** to save the message or **N** to delete the message. The message will be labeled In Progress and saved in the user's mail folder.

- **F3 DEL** will delete the current message. The status line will ask the user to press F3 again to confirm deletion of the message.

- **F4 PRNT** will print the current message.

- **F6 SEND** will send the message to the addressees of the message. Any addressees that are invalid will cause the server to notify the user of any addresses that can not be located. The user can enter **Y** to send the message anyway or **N** to return to the previous screen.

- **F7 EDIT** will allow the user to re-edit the current message.

- **F9 NEW** will notify the user that the current message was not sent and will ask the user to save enter **Y** or **N** to delete the current message and start a new message. The saved message that was not mailed will be labeled In Progress in the user's mail folder.

- **F10 EXIT** will cause the status line to ask the user to save or delete the current message. Enter **Y** to save the message as In Progress or enter **N** to delete the message.

C. SAVING THE FILE

When editing a large document the file should be saved periodically to protect against an unexpected power failure or system failure. The text editor can edit files as large as 25,000 characters. All changes are kept in computer memory until you save the file on diskette or an EtherShare volume (12:6-25). The following steps outline this operation:

1. Press **F10** to leave the editor.

2. Press **F10** again to get status line request to save the message.

3. Enter **Y** to save the message. The status line will inform you of the file's number.

4. Move the cursor to select the file just save and press F2 to show that file.

5. Press F7 to edit the file you have just saved.

D. CLASSIFYING MESSAGES

Current user messages are labeled in numerical order. An asterisk will indicate a message that has not been read. After the message has been read the asterisk will disappear. Users can classify their messages by entering a one letter symbol to personalize your message file. For example R can be used to signify messages that need to be replied to or a D could be used for messages you wish to delete at some

later time.   The letter used will not be erased if the message is read.

To personalize your messages move the cursor to the message desired and enter your special letter code over the number signifying that message.   The letter will appear to the left of the date you received that message.

V. EMENU

EMENU provides access to the EtherSeries Utilities and DOS utilities. EMENU can be started from the 1DIR screen by moving the down arrow to select **EMENU.BAT** and pressing the enter key or by typing:

D>**EMAIL.BAT**

A. ETHERSERIES UTILITIES

EtherSeries Utilities can be selected by pressing the 1 key or using the arrow keys to highlight EtherSeries Utilities and pressing the enter key. The **ESC** key will allow the user to return to the previous menu. Enter Y to return to the 1DIR screen.

1. HELP

The HELP screen can be selected by pressing the 1 key or by using the up or down arrow keys to highlight HELP and pressing the enter key. The HELP screen provides a one screen description of the 3Com EtherSeries Network.

2. Link Network Volumes and Printers

Users requiring to use this item should contact the network manager for permission to make changes to the volumes, printers, user names, and server.

3. "Tour" the Network

The option "Tour" the Network can be selected by pressing the 3 key or by using the arrow keys to select

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"Tour" the Network and pressing the enter key. The "Tour"
will provide users with descriptive narration of EtherShare
(ES) and EtherPrint (EP) commands.

    4. LOGOUT

       The option **LOGOUT** can be selected by pressing the **4**
key or by using the arrow keys to select **LOGOUT** and pressing
the enter key. The user will now be disconnected from the
EtherSeries Network.

       The user may log back on to the EtherSeries network
by typing **LOGIN** to start the login procedure or by pressing
the **CTRL-ALT-DEL** keys at the same time.

B. DOS UTILITIES

    The DOS Utilities option can be selected by pressing **2**
or by using the arrow keys to highlight DOS Utilities and
pressing the enter key. The six DOS utility options may be
selected by pressing the number of that option or by using
the arrows keys to highlight that option and pressing the
enter key. The ESC key will return the screen to the
previous menu.

    1. HELP

       The HELP screen provides a brief description of the
DOS Utility option capabilities. The user may press any key
to return to the EMENU Main Menu screen.

    2. List File Directory

       The List File Directory will display the directory
of any of the available drive specifiers. The available

drives are: A:, B:, C:, D:, E:, F: and G:. If the directory is over one screen length the listing will automatically list only one screen at a time. The user must strike any key to continue the listing. The ESC key will return the user to the DOS Utilities Menu.

Example: List Directory for what drive? (C:, D:, etc): <u>D:</u>

3. <u>Copy Files</u>

The copy files utility allows users to copy a single file or all the files on a diskette.

Example: Copying a single file.

Enter the drive and name of files to copy: <u>A:Input.Ext</u>

Enter the drive and name of new files: <u>B:Output.Ext</u>

Example: Copying multiple files.

Enter the drive and name of files to copy: <u>A:*.*</u>

Enter the drive and name of new files: <u>C:*.*</u>

4. <u>Display a File on the Screen</u>

The option display a file on the screen will display an ASCII formatted file on the screen. Pressing the ESC key will return the user to the DOS Utilities Menu.

Example: Displaying a file.

Enter the drive letter and filename: <u>C:Name.Ext</u>

5. <u>Format a Diskette</u>

The option format a diskette will format a user's diskette. Pressing the **ESC** key will return the user to the DOS Utilities Menu.

Example: Formatting a diskette.

In what drive is the diskette to be formatted? **A:**

6.   Run a Program

The option Run a Program will load and execute a DOS file program.

Example: Run a Program.

What is the name of the program to run? **GAMES**

Enter additional parameters (RETURN to proceed): **A:**

Do not type the drive specifier before the name of the program you wish to run. If a program is located on another drive, typing the drive specifier before the program name allows the menu system to locate only the main program file. It doe not change the current drive. Therefore, do not use this menu option to run a program that consists of multiple files and resides on another drive. EtherMenu will only locate the first file. Also, do not run a DOS command or application that is a .BAT file because the menu system will not be automatically restarted. [Ref. 12:p. 1-8]

VI. EPRINT

The EPRINT.BAT provides a help screen that describes how to print a DOS (ASCII) file. The EPRINT help screen can be selected by using the arrow keys to select EPRINT.BAT and then pressing the enter key or by typing: D>EPRINT.BAT.

A.   PRINTING A FILE

To print a DOS file perform the following steps:

1.   Press any key to clear the HELP screen.

2.   Enter RUNPRINT B:FILENAME.EXT

3.   Press the enter key to return to the previous screen.

VII. <u>HELP</u>

The HELP option provides information on starting EMAIL, EPRINT, and application programs. The help screen can be selected by positioning the cursor at HELP.BAT and pressing the enter key. The user can return to the 1DIR screen by pressing any key to continue.

VIII. <u>ETHERSHARE (ES)</u>

There are 14 EtherShare commands. The EtherShare Command screen can be generated by entering: D>**ES**. The ES command is selected by entering the command's number and pressing enter or by typing **ES** followed by the EtherShare command.

Example: <u>ES DIR</u>

Users that wish to make changes to the network's volumes, server, and user names must receive permission from the network manager prior to making any changes.

A.   ETHERSHARE COMMANDS

1--Login to the server. (LOGIN)

2--Logout from the server. (LOGOUT)

3--Link to an EtherShare volume. (LINK)

4--Unlink from a volume. (UNLINK)

5--List all volumes. (DIR)

6--Create a new volume. (CREATE)

7--Modify an existing volume. (MOD)

8--Delete an existing volume. (DEL)

9--List all users. (UDIR)

10--Create a new user. (UCREATE)

11--Delete an existing user. (UDEL)

12--Modify your user password. (UMOD)

13--List all servers.   (SDIR)

14--Receive help.   (HELP)

Selection 14--Receive help is presently unavailable for selection on the network server.   A server not ready response will be received.   The user should enter a **N** to ignore the message and press any key to return to the 1DIR screen.

Once an ES command is started which will change a user name, volume, or server the user can press the **CTRL-BREAK** keys simultaneously to cancel the operation.

IX. ETHERPRINT (EP)

There are four EtherPrint commands. The EtherPrint command screen will appear after entering **EP**. The EtherPrint command may also be initiated by entering **EP** followed by the command.

Example: **EP DIR**

Users are required to receive permission from the network manager prior to altering printer and server links.

A. ETHERPRINT COMMANDS

1--Link to a print server (LINK).

2--Unlink from a print server (UNLINK).

3--List printers supported by the server (DIR).

4--Receive help (HELP).

B. PRINT SCREEN COMMAND

The EtherSeries network allows users to use the PRTSC key to print the users screen as if the printer is connected to your own workstation. The printout will be spooled out to the server and printed as soon as the printer is available.

X.   GLOSSARY

APPS   the applications subdirectory on the
                    EtherSeries main menu.

CC: EtherMail message header address for users to
                    receive carbon copies of the message.

CTRL-ALT-DELETE   keys used in combination to automatically
                    log out from the EtherSeries server and reload
                    the system's operating system.

CTRL-BREAK   keys used in combination to escape from an
                    EtherSeries operation.

CTRL-ENTER   moves the cursor to the beginning of the next
                    line of text when using the EtherMail editor.

CTRL-HOME   moves the cursor to the lower left corner of
                    the screen when using the EtherMail editor.

DRIVE SPECIFIER   the DOS name used to identify a diskette
                    drive or device with similar data storage
                    capability.

EMAIL.BAT   the batch file that starts EtherMail.

EMENU.BAT   the batch file that starts EtherMenu.

EPRINT.BAT   the batch file that starts the EtherPrint
                    instruction screen.

LINK   the established connection across the
                    EtherSeries network between a DOS drive
                    specifier, printer, or volume.

LOGIN   the procedure performed to access the
                    EtherSeries network.

PASSWORD   the user generated private word assigned to
                    user names and EtherShare volumes.

PRIVATE VOLUME   EtherShare volume access limiting to log
                    on of owner.

PUBLIC VOLUME   EtherShare volume access granting read
                    only access to all users other than the owner

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having read/write access. A public volume without a password may be linked by any user.

SEMAPHORE   a flag that can be unlocked or locked to indicate that a shared resource is available.

SHARED VOLUME   EtherShare volume access granting read/write access to all users at the same time. Shared volumes require semaphores to protect against loss of data caused by many users writing to a file simultaneously. [Ref. 12:p. A-2]

UNLINK   disconnect a link between the EtherSeries network and a DOS drive specifier, printer, or volume.

USER NAME   EtherShare names created by the network manager to identify network users or workstations.

VOLUME   the EtherShare designation use to divide up the hard disk on the server. The volume is assigned a name, access type, password and size.

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