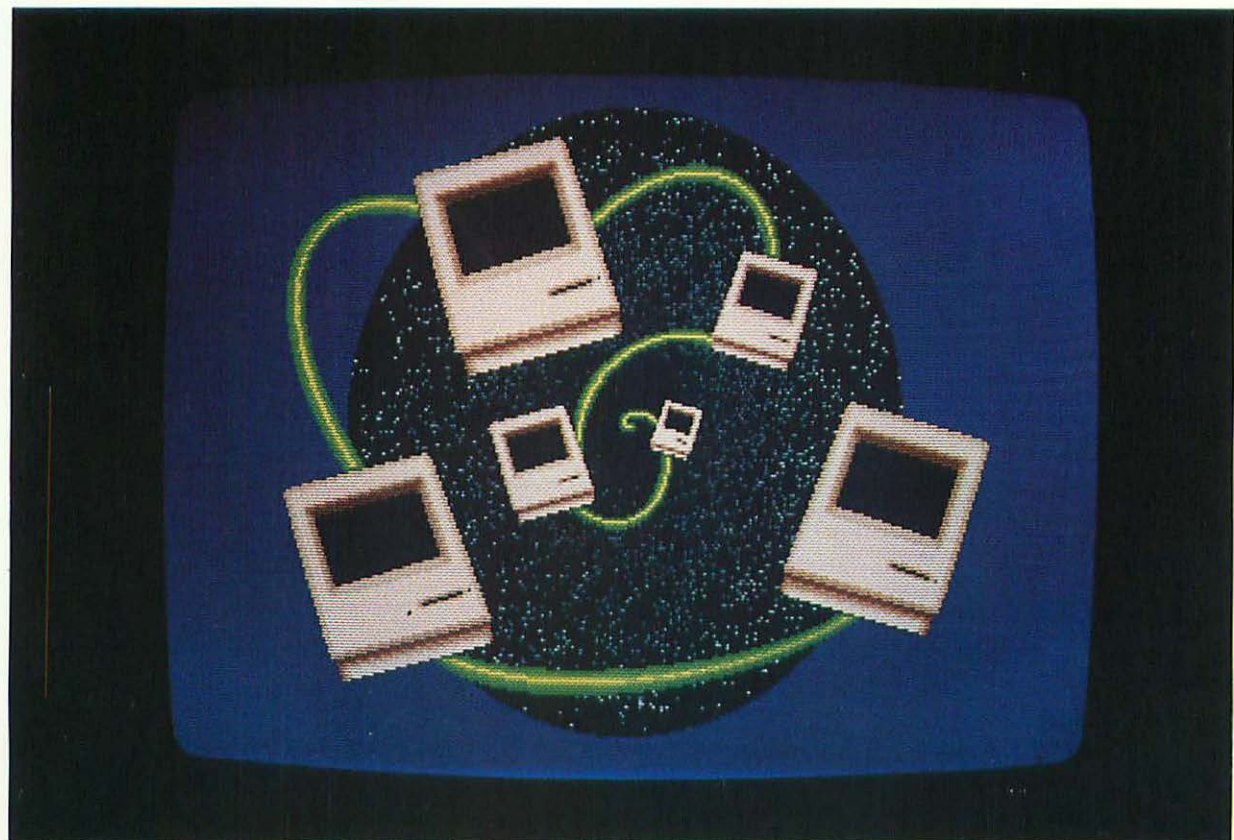


MacLAN's

Local Area Networking with the Macintosh

Mark D. Veljkov



Scott, Foresman and Company Computer Books

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Foreword

Communication is first of all an art. The cave drawings of primitive peoples, the hieroglyphs of the pharaoh's scribes, the rhetoric of Greek philosophers and their successors all conveyed messages in imaginative ways. In our time communication has become a science; consider the studies of attitudes and persuasion, rumor transmission, nonverbal symbols, subliminal cues, and psychological assessment. Now communication has been transformed by technology: fiber-optic and laser processes, digitized multimedia delivery of messages, and computerized networking are available to millions. And there is more to come. The marvelous blend of art, science, and technology created by human talent and intelligence can enhance every facet of human endeavor—education, entertainment, data processing, person-to-person contact.

Who better to lead us to the leading edge of communication than Dr. Mark Veljkov? Whether it's digitized, preprogrammed, sketched, charted, printed, or conveyed as synthetic speech, computerized communication is a purely human activity. Mark's special gift has been building bridges between the human and technical aspects of communication. Maybe a brief description of the man will show how.

One of the nation's leading writers about microcomputer technology, Mark has lived on both coasts and in the urban, suburban, and rural Midwest. At one time or another he has been a hippie, Yuppie, farmer, and businessman. A former professional photographer and amateur filmmaker, Mark is also a musician and music historian. He is multilingual, versed to some degree

in Spanish, French, Japanese, and even in some foreign computer languages. A teacher, humanist, and cultural observer, Mark excels in human relationships; he reaches people of all ages, conditions, and backgrounds. These relationships have been a fundamental part of both his personal and professional life. Mark loves old Ford pickups and brand-new Volvos. He is as comfortable spending an afternoon with Timothy Leary as a morning with John Sculley of Apple Computer.

The information Mark shares in this work is crucial to the latest advancement in microcomputer communication. This is an age of micros and modems, when reams, indeed Ks, of data and digitized intimacies may be collected from any part of the globe at any home or office. This information may be edited, appended, illustrated, scavenged, printed, held available for others, or sent on immediately by anyone with a couple of thousand dollars' worth of equipment and software. Local Area Networks (LANs) make this power available to a group and link the individual units, geometrically increasing the potential. These microcomputer links have changed the way a corporation, a small company, a bureaucracy, or a service organization does business.

To illustrate the change, let's take the hypothetical case of Ace Acme, Inc. (AAI), of Anytown, U.S.A.

Ace Acme has 1,000 employees working three shifts. There is, of course, a board of directors, a president or CEO, five department directors (often called vice presidents), 15 section or shift chiefs, and numerous data managers. AAI has 40 microcomputers at work, no LANs. Five of the computers have modems. The corporation subscribes to several database services.

At AAI, department heads meet with their shift and section chiefs daily. The meetings are spent evaluating output, anticipating problems, modifying goals, reviewing printouts, and having very little fun. The CEO meets with department heads at least once, and usually twice, a week. These meetings use the results of the daily meetings to review, project, budget, and plan. Again, not much fun. Total person-hours spent in meetings average 80 hours per week. Total fun-time averages 15 minutes.

At these meetings there are usually more than two people. The discussions, however, center between two individuals for periods of time ranging from one minute to half an hour. Granted, others at the meeting *may* benefit from this information exchange, but listening is not producing. Since only one is speaking at a time (barring hostile interchange), most of the meeting is listening time. Individuals must wait their turn to comment on what they heard; they must wait their turn to give their reports; they must wait everyone's turn to leave and return to production.

Of course there is always a computer in the CEO meeting room. Printouts are available and occasionally a section chief or department head will bring a disk or two for sharing data at a gathering. Modifications may be made directly to the data. However, in most cases an individual will take notes back from the meeting, boot up his or her own disk and enter the new information, make a new printout, and send it up the chain of command. The computer saved time, but the follow-up process cost time.

That *was* the AAI method of operation. Now add a LAN and this book.

I went back to AAI today, my first visit in a month. I immediately saw that something was different. Desks were not piled with reams of printouts. Keyboard activity was fast and furious. Many workers were leaning back in their chairs, scrolling their screens, smiling, occasionally editing the contents with the addition of an exclamation point or bold font. I saw printouts on bulletin boards that looked like love letters—to the boss! What had happened here?

The boss had installed a LAN and ordered several copies of this book. The software and hardware links now interconnect every computer in the corporation. Meetings are shorter, less frequent, rarely include more than three people (with the exception of productivity celebrations), and *always* take place in the presence of a large-screen computer projection device and at least two micros.

All the information of the corporation is instantly available to those who use it. Data may be updated, appended,

cross-referenced, applauded, critiqued, transmitted, and printed as required. "Meetings" happen without individuals leaving their desks, their disks, their reference books, their coffee cups. Interoffice mail and memos are instantly transmitted, instantly available, instantly erasable. Technical graphics, charts, photos, production records, quotas, database info, schedules, budgets, costs, money transfer records, *everything* is readily available within the corporation to those who require the access.

Certain records may be blocked to access without the proper codes. Memos may be "circulated" for comment and "signatures" to every micro operator. Filing is automatic. Retrieval is quick and easy. Hard copy is less necessary. Phone lines are rarely used for communication between desks and floors. AAI runs smoothly, more efficiently, more effectively. There is more time for fun communication, fewer boring meetings, and production is *up*.

Now let's think **big** about the future!

Adding the increased communication capability of LANs to every sizable company, corporation, government agency, service organization, and database *worldwide*, we can see a wonderful potential. When a LAN includes micromini-, mini-, and supercomputer links, various large units are interconnected with other larger units. Let's add permanent fiber-optic cable hookups, satellite microwave connections, audiovisual, digitized color, and sophisticated, cross-indexed, coded-access file-server capabilities.

Now distribution companies are linked to manufacturing and transportation facilities. Corporations are interconnected with regulating agencies. Auditing and accountability are continuous. Populations can vote and register comments instantly and continuously on issues or people. Experts, teachers, preachers, helpers can be "on-screen," live or prerecorded for instant replay as needed. When information is updated at one point, the changes may automatically ripple through the system according to any preprogrammed requirement. The news is *now*!

Of course, every solution creates problems; each new system has its bottlenecks, breakdowns, and bad guys. Greed, corruption, and fraud will play on every new playing field. Ignorance,

error, and deception replicate themselves, expanding until they are discovered and corrected. At any level, however, problems of this nature can be more readily rectified in an environment of instant availability of information.

Clearly, in an era of expanding LAN capability, issues of privacy, database sabotage, illegal access, copyright violations, and outright theft become important. A technology of security software will grow along with the advancement in LANs.

There will be new books by Mark and others to promote the new technologies. Many of these publications will be part of any LAN database. I fully expect the current work to be the first of its kind—and a future classic. This book, like the Macintosh itself, invites you to explore. If you don't want to go through it chapter by chapter, then skip around. Find what you want. Communication is not linear. It circles and spirals. The more information obtained, the larger the spiral grows. The more information you get from this book, the more doors that will be opened.

MICHAEL GRAY

Preface

Like a good roadmap, a resource book should contain a structure that is accessible and helpful to the reader. *Local Area Networking with the Macintosh* has been broken into an Introduction and seven chapters:

- Chapter 1 LAN Tips, Suggestions, and Installation
- Chapter 2 Cable, Topographies, and Terms
- Chapter 3 LAN Companies
- Chapter 4 LAN Peripherals
- Chapter 5 More Peripherals: Utilities and Software
- Chapter 6 Troubleshooting Guide
- Chapter 7 Wrap-up

The Introduction provides a philosophical framework and some LANs history. If you are unfamiliar with the LANs concept, this section should get your thinking geared in the right direction. A famous manager once said that half of the success of a LAN depends on the planning and training that goes ahead of the actual installation.

Chapters 3, 4, and 5 are really the heart of the book. Chapter 3 describes various Macintosh LANs from such companies as 3Com, Centram Systems West, and Infosphere. These products are the actual LANs that are available. Some are hardware-only solutions, some are software-only, and others offer a combination of hardware and software solutions. The structure of Chapter 3 was designed to provide you with practical and useful information. It looks like this:

Product

Company name:

Address:

Telephone no.:

Product name(s):

Type of LAN:

Computers supported:

Network wiring supported:

Maximum length of network:

Maximum number of users:

Network speed:

DESCRIPTION

SETUP AND INSTALLATION

CONFIGURATION/TOPOGRAPHY

NETWORK MANAGEMENT

Hardware provided

Software provided

Product Pros

Product Cons

PRODUCT PRICES

Chapter 5 names the peripheral LAN products that are add-ons to LANs. These include modem servers, hard disks, optical disks, add-on cards, and internetwork bridges. An important set of peripheral products serve to connect the Mac to mainframes, minis, and alternate networks. The descriptive format is similar to that in Chapter 4 and looks like this:

LAN Support Companies

Company name:

Product names(s):

LAN quality:

Computers supported:

Description of the product:

Product price(s):

Chapter 5 lists some of the network “usable” software. The term “usable” refers to multiuser and single-user materials. There is still very little multiuser software available for the Macintosh. However, some single-user applications lend themselves well to the multiuser environment of a LAN. This chapter also covers desktop publishing software and file conversion software.

Chapter 6 is a short troubleshooting guide. There are a number of dos and don'ts when configuring LANs, and this chapter should help you deal with some of these.

Chapter 7 wraps everything up. It provides a glossary of LAN terms and some final words of wisdom(?).

This represents the first book about Macintosh LANs. Many exciting products are described in these pages. Many more are on the way. Let this book be your guide, reference source, and companion. Sit back, relax, and happy LANdings!

 **ACKNOWLEDGMENTS**

I would like very much to thank the folks at Apple Computer, not only for creating the Mac, but for providing me with technical assistance. Thanks also to the many companies that responded to my requests for their products and technical specs to review and play with. Without their help this project would have been little more than a shot in the dark.

This book was written to improve communication. Our world has become one of exploding technology, instant access to information, and a mobile workforce. Communication between people seems to get shortchanged. For an industry that prides itself on creating the latest and greatest communication products, the computer industry itself has a very difficult time getting the message across. The bottom line is that it takes human beings to communicate. The computer is simply a tool to facilitate the process.

Interaction between human beings and computers is a yin-yang relationship of complementary opposition. You can't have one without the other. The key to improving human communication is understanding and using the right tools. The microcomputer is just such an instrument. *Local Area Networking with the Macintosh* can show you what tools are available and provide the ground base for expanding your communication knowledge and skill. Once you have the tools in hand, the rest is up to you.

Several people have been instrumental in the development of this book. Hartley Lesser, the best computer-magazine editor in the business, was more than helpful with his insights, comments, and contacts. My friend Mike Gray helped me through hard times by providing the necessary spiritual and psychological inspiration when I needed it most. Last but not least, I'm grateful to Sharon and my son Eli. Without Sharon's intelligent and insightful input, her insistence on clarity, I might easily have fallen into the nether world of Techno-Twit. As for Eli, he displayed a degree of patience not found in many six-year-olds.

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Introduction

For many computer users, communicating with each other has long been a source of confusion and frustration. Over the years the entire world of interactive communication and local area networking has been shrouded in mystery. Baffled by strange languages and science-fiction-like hardware, users often have had to struggle against the currents of reason in order to understand and use local area networks. Since the introduction of the Macintosh computer, however, the whole interactive process has emerged from the fog. Welcome to the world of Local Area Networks (LANs) and the Macintosh.

Just as the Macintosh has set a new standard of user friendliness for the world of microcomputers, so it does for the world of local area networking. The Macintosh has ushered in a new age of user interaction. No longer do humans feel controlled by their computers. With the Mac, people believe they are finally in command. The Macintosh has given them a sense of "Now I can do what I want to do."

Like all Macintosh applications, LAN applications must adhere to the Mac Interface Standard. The Mac standard has brought ease of use and friendly interface to over one million Macintosh owners. These owners demand simplicity, and they demand power! Macintosh LAN applications are setting new communication standards by providing both ease of use *and* power.

Local area networks are simply defined as a grouping of any number of personal computers, usually within close proximity to each other, all sharing one or more peripheral devices. How many computers constitute a LAN is debatable. According to

Apple, one Macintosh and one LaserWriter is a network. For our purposes, LANs include at least three computers, one hard disk, and a printer. Usually the local area network also includes one or more units that constitute a host unit. This host unit usually acts as a server for the other computers on the network; these can access the host and share files, records, ideas, etc.

ROOTS OF LANs

It would be great to say that local area networks came from Alpha Centauri. Since this is not the case, then where did they come from? LANs are not a product of our information-based technological society. LANs grew out of a human need to communicate. Our ancestors did it with drums, letters, pony express, telegraph, and telephone. Now with computers and modern LAN concepts, we have taken technology to another level of sophistication. However, the basic need for communicating ideas to other people has never changed.

Modern LANs developed from large corporate networks where individuals used terminals to tap into large mainframe computers. The problem that people had with this configuration was a lack of intelligence. Not a lack of human intelligence, although many users of early LANs would swear the LAN they used made them feel stupid! The lack of intelligence was with the hardware and software. Network terminals were *dumb*! That is, they could only show you information and maybe send that information to a printer. There was no way for the terminals to manipulate *and* alter the information. With the advent of the personal computer, it became clear that terminals did not have to be dumb. Now personal computers could be terminals. Once you received your information from the main computer, you could then go off-line, use an application on your PC, and improve your personal productivity. As more personal computers entered the workplace, there became less of a need to tie up the company mainframe. Smaller work units began to emerge. These smaller work units needed to share information amongst themselves. There was, and is, a need to share information from PC to PC. Thus the Local Area Network was born.

DEVELOPING THE MACINTOSH LANs

The Mac started off as a cute Yuppie computer. It had enough power to satisfy the curious, but not enough for the power hungry. Apple took the proper steps to ensure the Mac's survival. Power is now a solved problem. With over a million Macs in use, the time has come to connect and communicate.

As Michael Gray pointed out in the foreword to this book, communication is an art. The Macintosh has brought this art to the world of microcomputers. In the short time since its introduction, Apple's pride has outsold all other microcomputers, a remarkable feat for a four-year-old product. Many of these Macintosh users want, and need, to talk with each other, and local area networks (LANs) are a wonderful means to accomplish this.

For each of the last three years, industry pundits have decided it was the "Year of the LAN"—the point at which LANs would become a widespread industry phenomenon. But the Year of the LAN never really materialized for several good reasons: LANs have been expensive, complex to set up, and difficult to manage. Now, along comes the Macintosh with its icons and consistent user interface—just the ticket to get humans into "life in the fast LAN."

IBM users have had powerful LANs for several years. Until now, the Mac has been left out; it lacked LAN capabilities. In 1985 Apple introduced their token contribution to the LAN world. Called AppleTalk, it was a low-cost alternative for networking the Mac. AppleTalk's main objective was to connect multiple Macs to the LaserWriter. Apple also announced an AppleTalk card for the IBM PC and promised to bring the two machines closer together.

From the beginning, Apple had intended to link Macs together. The Macintosh was designed with built-in communications hardware. No boards to add! AppleTalk was Apple's solution for creating a LAN with the Macintosh. Unlike other LANs for other computer systems, this one required no special technical knowledge to physically connect the network. There was no need to hire a special network manager to act as a troubleshooter and technical-support guru.

AppleTalk was a nice idea badly implemented. Neither the creator nor third-party developers did very much to support AppleTalk. Then in 1985 Apple introduced the LaserWriter, which could only be accessed via AppleTalk. The LaserWriter was (and is) expensive for one person to own. On the network, 14 users to one LaserWriter translates into workstations producing near-typeset-quality documents for less than \$500 per computer workstation. Not bad if you are producing a lot of publications. Apple hoped to install thousands of these little networking nodes and make AppleTalk more than just a little white box and wire.

Now, two years later, improvement has become a reality. In the process, Apple managed to sell over 250,000 network nodes. Of course, Apple would have you believe that these nodes are installed in full-fledged networks. In reality, most of the networks connect small work groups (of eight to ten people) and allow them to share an expensive peripheral—the LaserWriter. At \$50 a connection, AppleTalk provides a low-cost and *low-powered* LAN, a strategy that served Apple well in the beginning. The company hoped that eventually they and third-party developers could introduce more and powerful LAN solutions.

For the Macintosh to make it in the corporate marketplace, it had to have powerful LAN capabilities. Apple recognized this fact and set to work to redirect AppleTalk and create a full-featured, powerful LAN environment for the Macintosh. What they got was a great deal of support from third-party developers like Tangent Technologies, Centram Systems West, and InfoSphere. These were the first companies to produce what Apple had only talked about. Because of the perceived lack of power with the Mac 512K, the developers enjoyed only limited success. When the Mac Plus was introduced in 1986, LAN sales began to pick up. It seems that these early companies had begun to pave the way for Apple. Now with the Macintosh SE and Macintosh II, Apple has come full circle. Sales of LAN software, hardware, and support products have climbed dramatically.

Without the ability to communicate within a network, the Mac would have been doomed to the status of a common, low-power workstation. Until recently the needs of small, medium, and large corporations, colleges and universities, and public schools were not being adequately met with the Macintosh.

Organizations needing LANs with speed and power had to buy computers other than Macintosh. Now the new Macs have supplied these qualities to the world of LANs. Part of Apple's communication strategy is the interconnectivity of operating systems. Create the enabling technology and let the Mac communicate with anyone! With the capabilities of the Macintosh to "communicate" with almost any other computer, Mac screams for faster, more powerful products.

As mentioned, there is an art to communication, and the Macintosh has enabled a lot of individuals to become proficient in this art. The Macintosh introduced the world of microcomputers to people who had never used a computer before. Even individuals who had computer experience found the Mac a breath of fresh air. No longer would they feel controlled by the computer. Now there was a computer *they* could control.

THE MAC PERSONA

The Macintosh provides users with a give-and-take approach to communication. Of course the Mac is not perfect or infallible. Programs that should be able to accomplish a specific task often let the user down. However, because of the nature of the Mac, many of these disappointments can be easily overcome. The Mac always seems to provide another way to accomplish the same thing. Marriage counselors tell you that a good relationship is never "give and take", but "give and receive." Macintosh gives back. When a problem is encountered, users often find themselves discovering some new aspect of the same old program. Jean Piaget, the famous Swiss child psychologist, discerned the self-discovery method of learning while observing young children at play. These same principles can be applied to learning computer technology. When the user practices exploration and self-discovery, there is an increased learning curve with new applications.

A great deal has been written regarding the Macintosh as a "right-brained" computer. This means the Mac forces us to utilize the creative side, or right hemisphere, of our brain. Upper-

level managers are requesting that their mid-level managers learn to use the Macintosh to enhance their creative selves. It's too bad that many people have to wait until they are well into their adulthood to begin this creative learning process. As developmental psychologists have known for a long time, the ages between two and five are critical times in the learning process. Almost 90% of our learning habits and skills are already developed by the time we reach kindergarten.

The Macintosh aids symbolic reasoning by providing concrete visual feedback. To be fair, most computers provide this response in one form or another. However, because the Mac utilizes simple representations (icons) for file and command structure, even very young children can understand and manipulate fairly complex relationships. This does not mean that everyone will understand hierarchical file structures or system calls to the heap. Mac users can, however, develop an understanding of the thinking process needed to understand the operation of any microcomputer system.

The Macintosh user interface allows every program written for the Mac to operate in the same manner. The Finder, with its pull-down menus, is always present. Half the fun of using new Macintosh applications is exploring the various pull-down menus and discovering what innovations they provide. Almost like a gift-filled stocking on Christmas morning, the Macintosh usually provides no unpleasant surprises, only those that lead into more productive areas of the program. Some industry experts are calling this common interfacing "intuitive." Mac users often call it *fun!* However, in the stoic world of computers the term "fun" is not a buzz word. In fact, it may not even be in the dictionary of common computer terms. Maybe the philosophy of the Macintosh will bring the word "fun" into the vocabulary of the microcomputer world.

The Mac is friendly. It is a philosophy, not just a piece of hardware. As an example, here is a typical line of "code" from an MS-DOS system. This sample code allows a PC to simply log-on to a LAN:

A > LOGIN JohnD:Hq:3Com

This is how you log-on with a Mac:



AppleShare Admin

[Double-Click]

Like the IBM PC, the Mac is just a machine—wire, ICs, electronic parts. The Macintosh has allowed people to do what they need to do without the muss and fuss of loading an operating system and learning strange commands to turn various functions on and off, wasting time that can be spent getting the job done. With the Macintosh, even first-time computer users can be immediately productive.

A key word with the Macintosh is *tool*! The Mac has shown the computer world that it *is* a tool. Tools help people get things done. Carpenters, mechanics, and dentists use their tools to help them do a better job faster. The Macintosh has brought to many of us the tool to write better reports, access information from huge data sources, buy products, and do our banking without leaving home. For those who work with words, word processing with the Macintosh continually provides a “gee-whiz” response as we show off our masterpieces, complete with MacPaint pictures. More and more ads are done with a Macintosh and a Laser-Writer. With MacPaint and other graphics applications, those of us who could not draw a straight line with a ruler now have graphic art tools to create whatever we want. Along with this freedom of electronic expression is the need to share our creations. Simply picking up the telephone and telling our boss what we have done is no longer sufficient. As the Chinese have long said, “One picture is worth ten thousand words.”

Quite a few years ago the technology of the telephone was being marketed to the buying public. People saw it as a technological toy, something for the inventors and the scholars. A few saw its incredible potential for increasing and improving mass communication. The Macintosh also started off as a toy, some-

thing to play with. As we are aware, the telephone has become a very advanced communication tool. Like the telephone, the Mac has also become a communications tool. Many workers in small-to-large companies can now easily type a message, letter, report, or book and communicate it to anyone on the network, or in the world for that matter. The Mac helps them do it with power and ease.

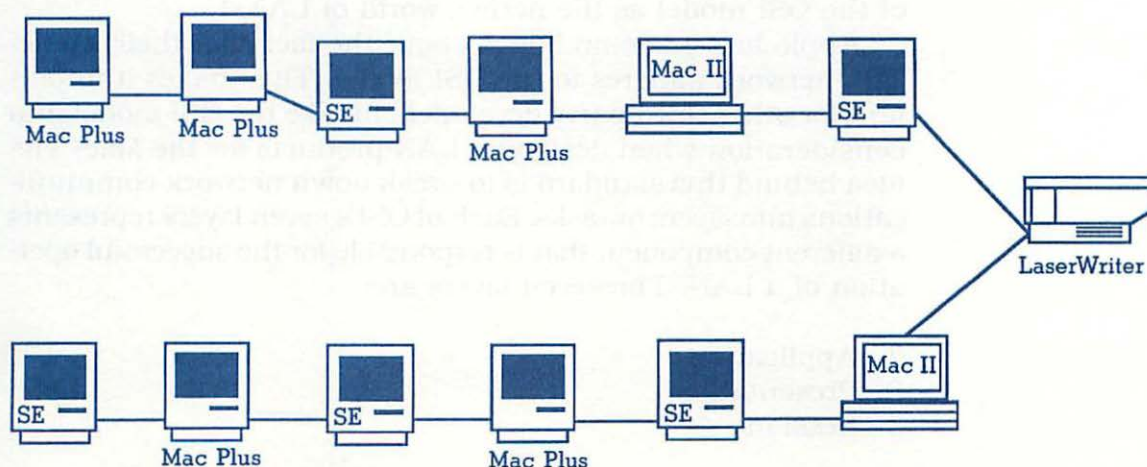
MACINTOSH AND THE LAN COMMUNITY

The world of LANs has always been filled with technobabble, user-hostile interfaces, and highly paid systems administrators. It can cost companies more to train and retrain individuals on LAN use than the actual cost of the LAN itself! Macintosh provides a price/performance advantage. Mac users will not tolerate any LAN product that is not "Mac-like." This means that LAN developers are pressured to create easy-to-use and powerful LAN products. As the hardware becomes more powerful, software has to bridge the gap between human and machine. The Macintosh already has the lead in human interfacing, and it's this interfacing that can open up LANs to more and more people. It is not nearly as scary using a Mac LAN as it is using a LAN made up of IBM PCs. With companies using, and wanting to use, LANs, the Mac is the perfect solution. The Macintosh even pleases those die-hard PC users that want IBM compatibility. Apple has made sure that not only does the Macintosh provide the user with IBM compatibility, but that numerous third-party programs offer file transfer and conversion utilities. These utilities allow files created on an IBM application to be converted to a Macintosh format.

The best example of this is Microsoft's Excel. Excel can read *and* write Lotus 1-2-3 files. This provides for two-way file conversion and transfer. A file created with 1-2-3 (files with a WKS extension) can be read by Excel. The same file can be converted to an Excel file and shared with other Excel users. After changes have been made, the file is easily converted back to the 1-2-3 WKS format. Everyone gets to use their favorite program, regardless of hardware, and yet no one has to be deprived of the information created with these applications.

Communicating with other computers and operating systems is called “internetwork connectivity.” Again, internetwork connectivity is a key element in Apple’s strategy for desktop communications and the Macintosh. The Mac’s consistent operating system and powerful communication capabilities create a new psychology of internetwork connectivity. LAN users are not as constrained by the hardware and software as they are with other systems. For past LAN users this represents something different. Instead of performing a function because it is the *only* way, Macintosh LANs offer users alternate methods and flexibility. Both the hardware and software can be customized to meet specific needs. There is, of course, less flexibility with the hardware. You can, however, place *any* Macintosh on the network by simply “plugging it in.” Managers and end users can configure the network the way *they* want it, not the way they *have* to! This “freedom” often confuses people. Not having to do something a certain way forces people to communicate and make decisions. Because a Mac LAN is flexible and easy to set up, human communication is needed. Individuals that use the network now have a say in the topography and configuration of their LAN. Figure 1 shows a sample topography of a simple Macintosh LAN. This sample includes several options that you will read about.

FIGURE 1 Sample topography of a Macintosh LAN



Until the Macintosh came along, LANs were difficult to set up, complicated to use, and expensive to maintain. With the introduction of the Macintosh and its iconoclastic, user-friendly interface, LANs are taking on a new look. Users are finding they can get on and off the network with a click of the mouse. Companies are finding they can save money by not having to hire specialized systems administrators. Usually, in-house people can be trained in less than half the time required using other systems. New employees can be quickly trained in basic network operations, as well. And reduced training time equals reduced training costs.

THE OSI MODEL

Even though the Macintosh represents a different methodology and psychology for LANs, there are still some standards to adhere to. The International Standards Organization (ISO) worked out LAN standards they call the OSI model. OSI stands for Open Systems Interconnection. The OSI model for network operation is a key element in the design of Macintosh LAN products. While the explanation of this model can be quite complex and boring, it will provide some theoretical underpinnings to the operation of LANS. Also, sales literature and technical specs often refer to the OSI model. Having some idea of what it means helps in making intelligent buying decisions. Actually, you could think of the OSI model as the nether world of LANs!

Apple has made no bones about the fact that their AppleTalk network adheres to the OSI model. This makes it important for other third-party developers to take the OSI model into consideration when designing LAN products for the Mac. The idea behind this standard is to break down network communications into layers or tasks. Each of OSI's seven layers represents a different component that is responsible for the successful operation of a LAN. The seven layers are:

7. Application
6. Presentation
5. Session

4. Transport
3. Network
2. Data Link
1. Physical

You will notice that the layers are listed from the end user level down. This hierarchy represents the complexity of the model. End users usually deal with only the top two or three layers. Unless you are into the technical end of networks, you probably won't move into the other layers unless you happen to like bits, bytes, and wiring things together.

7. Application. This is the level that most of us work with on the network. This layer represents the necessary functions to run your many applications. It is important to note that this layer is *not* the actual application (word processor, database, etc.). It is just the layer that makes sure your application functions correctly on the network. Functions such as file transfers, printing, and E-Mail would fall into this layer.

6. Presentation. This layer translates your layer 7 commands into a language that is understood throughout the network. The basic Macintosh operating system, or even MS-DOS (for those LANs that are integrated), is part of this presentation layer. This layer makes sure that every computer on the network is speaking the same language. When documents need to be printed on the LaserWriter, no matter which computer you are on, the presentation layer takes care of the translation. The ability to synchronize multiuser applications for the network is also part of the presentation level. As more multiuser applications become available for the Mac, this aspect of layer 6 will become very important; this level is responsible for controlling applications for multiple users.

5. Session. This layer determines when a station (computer) on the network can communicate. It acts like an on-off switch. Session can control when you access a host or

server, and/or when you can relay a message to someone via electronic mail.

4. **Transport.** This layer ensures that data transported to the other upper layers is sent successfully. Layer 4 checks network transmission and asks for retransmission if necessary. Transport is the interface between the lower and upper layers of the OSI model. Without this layer, users on the network would not be able to communicate with the rest of the network. Think of this layer as the postman who delivers your mail.

3. **Network.** This layer can be thought of as the entire postal service. Layer 3 is responsible for routing signals to the proper users. Layer 3 translates a network "name" into a physical address and picks the best route over the network.

2. **Data Link.** Layer 2 is responsible for putting your data together to be sent out over the network. If we continue the post office analogy, this layer is like gathering what you want to send, stuffing it into an appropriate-sized envelope, addressing it, and then sending it out.

1. **Physical.** This layer consists of the wires, connectors, add-on boards, etc., necessary to send your data over the network.

Figure 2 is a graphic representation of the OSI model.

As indicated, these layers represent a model for developers to follow when developing and implementing LAN products. At the theoretical level, all seven layers are independent modules. It is obvious, however, that many of the layers overlap. The Macintosh ushers in a new method of viewing the OSI model. Instead of seven separate modules, the model is viewed as a continuum of layers. This approach serves to integrate the OSI model into a holistic concept, as opposed to the current modular view.

Now, if all of this technical explanation of the OSI model is confusing, it can be put into human terms. Think of the model as pertaining to human communication within an *office net-*

FIGURE 2 The OSI Model

THE OSI MODEL

7. Application
6. Presentation
5. Session
4. Transport
3. Network
2. Data Link
1. Physical

work. You have a supervisor, or manager (systems administrator?), who makes decisions and then communicates these ideas and decisions to the employees. This requires human communication. To get the data to the employees there must be:

- A physical delivery system
- A method for getting the data into a form that is understandable to everyone
- A method for routing the information
- Some way to make sure that the data is being disseminated to everyone
- A way to decide who gets what information
- A mechanism for feedback
- Information that is readable by everyone

What we have here is the OSI model starting at layer 1 and going down to layer 7. Of course all of this is an oversimplification and could be expanded to include many more variables. Most of the companies with LAN products have used the OSI model for several years.

THE LAN INDUSTRY

The computer industry has caught on to this need for networking. Many companies are actively developing LAN products for the Macintosh. Among the major players in the LAN marketplace who have been drawn to the Macintosh and its unique interface are the following companies:

- 3 Com
- Novell
- AST Research
- Hayes Microcomputer Products
- Microsoft Corporation

All of the above have a history of producing quality LAN products, both hardware and software. One company—3Com—created Ethernet, one of the first LANs for microcomputers and originally designed to connect multiple IBM PCs. Since its introduction, Ethernet has become an industry standard. As you will read, connecting the Mac to an Ethernet LAN is no problem for the Macintosh. Not only can you tie the Mac to an Ethernet network, but the Mac can simultaneously be connected to a VAX, IBM 3278, and IBM PCs. To top it off, all of these computers can share information with each other. Sounds like science fiction but it is reality. However, all of this interconnectivity has a price, not only in terms of dollars, but also in terms of an investment in improving human communication.

LANs have not caught on as fast as the industry would have us believe. Until Macintosh and AppleTalk, LANs were mostly IBMs connected together. These networks are powerful, but often difficult to configure and operate. Training costs can also be high. Of course these problems have spawned the need for other forms of assistance. As a result stores and libraries are full of books about LANs, and several LAN magazines have appeared. As always, new technology propagates the need for more and better information sources. Thus writers write books about LANs and communications.

A RESOURCE GUIDE

People need information to help them understand the information with which they are interacting and also to show them how to use data more productively. People in this situation usually “buy a book.” Considering the quality of computer manuals, computer books should be better sellers than they are. LANs are complicated enough without adding the confusion of manuals and poor documentation. Hopefully, this book will be a practical resource guide for setting up and using LANs with Macintosh computers. Even though Macintosh LANs don’t present the difficulties that other systems do, there are still times when you need a little help just to get started.

Getting started can sometimes be the hardest part of setting up an LAN. There are usually a million questions to be answered *before* any purchase is made. Whose LAN should we buy? What type of wiring do we want to use? Do we want multiuser software, and if we do what kind? How many users will be attached to the network? Will our LAN integrate different brands of computers? The questions go on and on. If a buyer is uninformed, salespeople can have a field day. Not that some salespeople aren’t well-versed in the inner workings of LANs, but these are few and far between.

The decision to network is not an easy one. It takes a lot of planning to make the right buying decisions. You cannot purchase and install LANs as you would single-user systems. If you do not plan your LAN well and include *all* of the end users, the LAN can quickly become the company’s albatross. This book should provide you with enough information so that you can feel comfortable making certain decisions about a Macintosh LAN. Your end users will also find this book valuable. Now they can gain knowledge about Macintosh LANs that allows them to add intelligent input into the decision-making process.

Detailed planning, communication, and this book all add up to improved human interaction. These points will provide you with a LAN that maximizes your employee resources, reduces training time and costs, and makes use of the most innovative microcomputer ever designed—the Macintosh!

LAN Tips, Suggestions, and Installations

Over the last several years, LANs have not been particularly successful as a solution to the communication problems of business. Oddly enough, this poor record has been due to a lack of communication. Traditional LANs have had a difficult time communicating with the humans who use them. This has been due to several variables. First, PCs that were part of the LAN were difficult and complex to operate. Second, LAN software has often been complex and difficult to install and manage. These variables have placed some unwanted burdens on the humans responsible for the day-to-day operation of the network.

Now the Macintosh has come along. It is easy to learn and use, has a consistent operating system, and provides users with a powerful tool. Mac users do not tolerate programs that don't follow the Mac interface. There are many users who say, "If I can't figure out at least 80–90% of the program **WITHOUT** the manual, then I know this program could be troublesome." With this attitude, the challenge is to bridge the gap between the need for sophisticated LAN power and the easy-to-use, consistent operating environment of the Macintosh.

Many companies have faced this challenge and provided Mac users with LANs and LAN peripheral products that adhere closely to the Mac standards. With Apple's two new Macintoshes, the Macintosh SE and the Macintosh II, Apple has stepped into a new generation of computers. The new Macs take the power of the Mac Plus even further. Add-on boards and powerful software are already beginning to make their way into the LAN world. The Macintosh LAN has become a powerful communication tool. The best part—**it's still a Macintosh!**

Heavy philosophy aside, the Mac has indeed helped to improve LAN communications. Macintosh has placed a very powerful tool in the hands of many people, some of whom thought they could *never* use a computer. As a result, individuals have become more aware of the need for—and *power* of—creative communication. Macintosh LANs are an expression of this need. And as data communication becomes easier, maybe verbal communication will improve!

The following tips and suggestions are not meant to dictate how your LAN should be set up and administrated; they are simply guidelines to follow. Some of them are practical-sense ideas. However, they might easily be overlooked as you become immersed in the technical world of LANs. At the end of these generalized tips and suggestions are some topographies and ideas for setting up a Macintosh-oriented LAN in your organization. To help you appreciate the range of complexities that Macintosh LANs can accommodate, organizations are broken down by size. The size and nature of a particular organization determines to a large extent the complexity, structure, and topography of a LAN. I have also included some specific types of businesses that might fit within the various size classifications.

There are four areas to look at when setting up your LAN. These are:

- Hardware (the computer itself)
- Software
- Cable
- Users

Within these four areas are specific “do’s and don’ts” that will help when you’re creating your network. Keeping these tips and suggestions in mind can ease your anxiety concerning installing and operating a LAN.

HARDWARE

1. Decide how many computers will make up your LAN. You need to make an accurate *initial* decision as to how many computers and peripherals are to be part of the

network. Does everyone in the office **need** to be networked? Do they **want** to be networked? Most of the Macintosh LANs will limit you to 20–32 nodes. With more users on the network, the network processing speed decreases dramatically. Instead of one giant LAN, consider organizing into smaller work groups.

2. Decide what brand of computers are to be included.

Whose computers are you going to use? Obviously, Macintosh is one. You can integrate IBM-PCs and their clones (MS-DOS computers) into the same network. Your decision may be based upon the number of MS-DOS computers already in place. If this is the case, how many Macs are you adding? What kind of computers is the rest of the company using? If there are no computers being used at all, then your decision is easy—Macintosh! However, many companies rely on a “standard” to help them decide which brand of computer the company will buy and use. The idea is that providing a standard eliminates the need to shop around for a computer system. Macintosh has made some large inroads into these standards. One of the reasons is that standards can cost you time and money!

The real key to deciding which computers to use is first to decide what you want to do with them. Connecting to the company’s IBM mainframe may be better handled by MS-DOS computers. Putting out a company newsletter or creating presentation graphics can be well-served by the Mac. In *no way* does this mean the Mac is limited to only graphic art tasks. The Mac can do anything other computers can do. It is just that the Mac does some things *much* better.

It’s also important to consider your users when selecting your hardware. Which computer do your users find comfortable and familiar? If they have been using MS-DOS computers for the past five years, it may be difficult for them to give them up. They may resist having to learn a new machine, new software, and a new way of doing things. But if the majority of your people are first-time users, then the Mac is just the ticket.

3. Determine the additional hardware needs for each computer on the network. Make sure you have *all* of the additional “pieces” for each node. If you are using AppleTalk, make sure any MS-DOS computers on the network have AppleTalk cards installed. Your MS-DOS computers cannot be integrated into your Macintosh LAN without this card. If you are planning on using an Ethernet-based network, then your MS-DOS computers must have the appropriate Ethernet card installed. Also, make sure *every* node on the network has a network connector.

If you are planning to link into mainframes or other networks, or if your network is going to spread over a very long distance, then you need a “bridge.” Kinetics FastPath™, an Ethernet bridge, is an example. Interbridge™ from Hayes Microcomputer Products is another example, a bridge that links multiple AppleTalk networks together. There are also bridges (or links) that connect you with fiber-optic networks, IBM 3278 mainframes, VAX systems, and so on. MacMenlo, by Menlo Systems, is an example of a link to the Tandem computer system.

A LAN that is to cover distances greater than your cabling requires another type of bridge, commonly called a “repeater.” A repeater simply intercepts network data and repeats the signal while boosting the signal’s power. A repeater bridge like Interbridge™ is an example of a product that can increase your LAN range. Modem servers can also increase your LAN range by providing a long-distance link via the telephone system.

4. Decide the location of each computer and peripheral (node) before you begin installation. One of the first things to do when you begin to organize your LAN is to draw a schematic of where your cable and computers will go. It is a good idea to know exactly where each node will be located *before* you draw a cabling schematic. Check the surroundings carefully. Look for power lines that could interfere with network transmission. Fluorescent light fixtures are also trouble spots. They cause electromagnetic interference (EMI). Make sure there is adequate space for the

computer and users. Too often an area designated for a computer is later found to be too small.

Installing your network printer, such as a LaserWriter, in a centralized location works better than sticking the thing way off in a back office. Likewise, locating your modem where there is no phone outlet means paying the additional cost for an extra phone jack installation.

5. Make sure each node works independently before connecting it to the network. To identify hardware problems that are not network-related, check out each node *before* you place it on-line. In each case, if the computer malfunctions, you have prevented a larger problem and saved network downtime. Check your printers, modems, network bridges, and hard disks prior to booting up the network.

6. Determine the location of the server(s). Careful planning here can save frustration later on. Some file serving software called a "distributed file serving" system, allows anyone on the network to act as a file server. TOPS is a good example of a distributed file server. With this type of server, human communication becomes a key issue because of the need to communicate individual needs and wants.

If you are using a centralized server, plan carefully where it is to go. Keep it away from sources of electrical and electromagnetic interferences, such as heaters, air conditioning units, and large electrical panels.

7. Make sure your hardware is compatible with everything. Always make sure that your hardware is compatible with your software and cable. For example, TOPS sells an AppleTalk card with their TOPS for the PC. When first introduced, it worked well with TOPS software. It would *not* work, however, with Tangent Technologies PC MacBridge software. Similarly, a connection into a VAX system may not allow you access to an IBM 3278 mainframe. Know what goes with what. If you are in doubt, check the specific product descriptions or contact the companies to make sure your hardware and software are compatible.

 **SOFTWARE**

1. Make sure every computer on the network is using exactly the same system files. Every Macintosh computer has to use exactly the same versions of system files, including the following:

- System
- Finder
- ImageWriter
- LaserWriter
- LaserPrep
- DA/Font Mover
- Installer
- Chooser

2. Find software that meets your needs. Do you want a disk server, a file server, or an E-Mail program? Before you buy *any* software, do a complete needs assessment. You may save money in the long run. If you only want to network three to five people so they can share a LaserWriter and a hard disk, you may not need to put in an expensive file serving system. A simple disk server may do. On the other hand, Macintosh file serving software allows you to expand at a later time. The decision won't be an easy one; it will take time and communication. If you can answer some of the following questions, you can begin to determine your LAN needs.

- a. How many computers will be networked?
- b. How big a facility do you want to network?
- c. Do you want to share a centralized database?
- d. Do you want to share applications or data?
- e. Do you need to access a mainframe system?
- f. Do you need to access another network?

3. Make sure your software is compatible with all your hardware. Some of the LAN software leads you to believe that it operates on *any* Macintosh. But the fine print will

specify “any Macintosh with at least 512K of memory.” If you have some older 128K Macs still around, they will require an added expense to upgrade them to Mac 512K or Mac Plus. When you are integrating MS-DOS computers with your Macs, make sure the software works with your MS-DOS machine. Some IBM clones have problems on a network with Macintosh. Leading Edge has had problems running TOPS. Trying to run Tangent Technologies PC Mac-Bridge software with the TOPS PC card used to cause problems, but now these two fine products work well together. Infosphere’s MacServe and TOPS do not cooperate on the same network. Be careful about intermixing two different file servers.

4. Check to see what additional hardware is needed.

Does your software have extra, perhaps hidden, hardware needs? Check to see whether or not you need anything in addition to what you’ve planned to buy. To link into an Ethernet network, for example, you need some additional hardware that creates a physical bridge to the other network.

5. Check to see if your software allows internetwork connections. One of the advantages of a Macintosh LAN is its ability to cross LAN barriers. You can now physically connect and link up with Ethernet, IBM Token Ring, and Novell networks. However, if internetworking is essential to your LAN, make sure your LAN software is capable of providing the link.

6. Know the software’s capacity. If you need to connect 150 users, do not buy software that accesses only 20 or 30 users. Find out what multiuser software is compatible with your file servers. Can the multiuser application work as a concurrent application with a dedicated file server system like AppleShare?

7. Decide whether you need multiuser or single-user applications. There are still a few multiuser applications

for the Macintosh. This is sure to change. Meanwhile, many companies have used a "backdoor" solution to this problem. Many applications are now "AppleShare compatible." This means that they have methods for locking out all but one user to a specific file. Microsoft Word is a good example. Even though any number of users can access the application itself, only one person at a time can edit and *save* changes to a specific file. This is not multiuser software, although many users can use the same application. True multiuser software allows more than one user to access and make changes to the same file.

There is another side to the multiuser/single-user problem. Current and past research has indicated that most organizations with LANs are not interested in having multiuser applications, except for databases. It seems companies are more interested in having the ability to transfer and share files from one to another applications format. In other words, if you write a letter using Microsoft Word on the Mac, you may want someone using WordPerfect on an IBM to read and modify the document. Once these changes have been made, you can then translate that document back into a Word format. This ability to translate data files to another application while still maintaining all of the correct formatting is invaluable.

8. Does the LAN software contain network management? Being able to manage your network has many advantages. Farallon's Traffic Watch and StarCommand software are excellent examples of network management software. If you do not have any management software, try to find some. It makes life with a LAN much easier.

CABLE

1. Find out if the cable is compatible with both your software and your hardware. Some companies have started to sell fiber-optic networks for the Macintosh. Sounds great in theory. The problem is software and hardware. The Mac 512K and Mac Plus are not capable of taking advantage

of fiber optics' great speed. Transferring data at 40 megabits per second sounds great. In reality, some of the Macs just can't handle it. Such speed requires a special card and software for both the Mac SE and the Macintosh II. If you decide to use Farallon's PhoneNET and AppleTalk, make sure you get a PhoneNET-to-AppleTalk connector. In other words, find out exactly what you need to make the correct connection.

2. Have enough cable. Always buy double the amount of cable you *think* you'll need. It's easier to subtract extra cable than it is to add it.

3. Have enough cable connectors and splicers. If you are using AppleTalk or PhoneNET, each node on the network must have a connector. These include hard disks, Laser-Writers, Scanners, CD-ROM drivers, and other printers. When you buy an AppleTalk connector, you are given about six and one-half feet of cable. AppleTalk is capable of going 1,000 feet between computers with small connectors that splice several lengths of AppleTalk cable together. A better method is to buy AppleTalk cable in rolls of 1,000 feet each. Then buy connector kits and make your own connector ends. This ensures that you have enough cable for your needs.

4. Use repeaters for long distances. Even though AppleTalk is limited to 1,000 feet and PhoneNET to 3,000 feet, you can go much further with repeaters. Repeaters are devices that intercept the LAN signal, give the signal a boost in the rear (amplify the signal strength), and send it on its way. InterBridge from Hayes Microcomputer Products is an example of a repeater. By using repeaters and modems you can effectively increase your LAN's distance.

5. Know where to install the cable. Before you begin making plans for the location of your computer, know where the cable needs to go. Create cable schematics, avoid large power lines, power supplies, electromagnetic fields (such as generators, heaters, or air conditioners), and anything else

that could cause interference. If you have run your cable close to something that could cause interference, be sure that your cable is well-shielded (see Chapter 2, Cable Installation).

USERS

1. **Train all your users.** Anyone who is going to use the LAN needs to be trained in its operation. The ease of learning its basic operations is one of the features that make a Macintosh LAN impressive. The consistency of its operating system makes a Macintosh LAN one of the easiest to set up and learn, reducing training time and saving money. One of the first large corporations to embrace the Macintosh standard was the Sea First Bank in Seattle, Washington. They found training time on the Mac was one-tenth of that on their IBM systems.
2. **Don't overtrain users.** As easy as the Macintosh is to learn and use, don't overtrain your users. Many LAN users have little need to know the relational structure of the company's database or how to program custom menus in Omnis 3 PlusTM. Training them in these areas is a poor use of training time. Ongoing communication with the LAN users will reveal what *their* training needs are.
3. **Communicate.** On-line communication will improve when you also encourage live communication regarding users' needs and wants, system deficiencies, and ideas for improvements.
4. **Always back up data.** Make sure there is a scheduled routine for backing up data. There are now some companies that provide a timed backup procedure. Mirror Technologies and SuperMac Technologies make backup programs that provide for automatic backup at predetermined times. Another company, Diversified I/O, makes a similar backup program. (See Chapter 5, LAN Peripherals, for more detailed descriptions of these programs.)

These suggestions should help you get off to a good start. The first steps are usually the hardest when you're starting a new project. Companies that never before thought of networking are now considering it because of the Mac. Many of these companies may not have a great deal of the technical expertise they need to set up a LAN. The following guides should provide them with a base to build on.

ORGANIZATIONAL TOPOGRAPHIES

Knowing that you have an idea of what to do and what not to do, how do you do it? Good question! Every organization that is thinking about a LAN has different needs based on the size of the organization, the number of employees, the number of offices, and, most important, the data processing needs. These factors combine to determine an organization's LAN needs.

Before going much further, I should explain why I use the term "organization" as opposed to "business" or "company." As we know, the Macintosh is not just for business people and their companies. Corporate America would have us believe *they* determine whether a particular computer market lives or dies. The Mac's friendly, consistent user interface and operating system—and subsequent shortened learning curve—are the qualities that sold the Mac to over one million users. The Macintosh opened the doors of computing to individuals who never dreamed they could operate and make productive use of a computer. The same qualities also distinguish Macintosh LAN systems. Macintosh LANs won't be installed only in business-related organizations. Other organizations can, and need to, use a Macintosh LAN to good advantage. Church groups, state and federal governments, colleges and universities, and—above all—our public schools are some of the organizations that will benefit. That's the reason I use the term *organization* instead of company or business.

I divide organizations into three groups according to size—small, medium, and large (not original, but useful). Organizations are classified in this manner to give you a sense of where your particular organization fits into the scheme of things. Here are a few topographies and some suggestions that may help you decide what to buy.

1. **Determine each user's needs.** Obviously, every user needs a Macintosh. But not every user needs a Macintosh II or Macintosh SE. The computing power necessary depends on a user's type of computing. A small organization that does a lot of graphic-intensive work probably needs a combination of Mac IIs and Mac SEs. Users who primarily do word processing and unsophisticated graphics can get by with a Macintosh Plus. Remember, determining which Macs suit which user is a bit like buying that bulk candy at the grocery store. You can "mix-n-match 'em."

2. **Integration of MS-DOS.** If you must integrate an MS-DOS computer into your Mac LAN, make sure you have the appropriate add-on cards. These add-on cards allow the MS-DOS computer to communicate with Macs over a variety of network media (cables).

3. **Match peripherals to needs.** Like computers, peripherals are selected according to needs. Intensive graphic needs require large hard disks. Start with 80 megabytes and go up. A good formula (guesstimate, to be precise) for graphic-intensive organizations is: 1 user=20 megabytes of space.

Less intensive graphic needs—including word processing and spreadsheets—require less storage space. The formula for these needs might be: 1 User=1 megabyte. If you maintain the majority of your data on floppy disks, then start at 20 megabytes per user and go up.

4. **Modems.** If you are planning to access remote databases, either commercial or private, make sure you have a modem. The modem must be compatible with your Macs. The big tip here is to secure the proper modem cable. Most modems are fairly generic in operation. If the modem accepts the standard Hayes instruction set, then it will run on the Mac. If it won't operate, you probably have the wrong cable. If in doubt about the proper one to use, call the company that sells the modem.

5. **Add-on cards and bridges.** Macintosh SE and Mac II computers need add-on cards or bridges in order to connect to Ethernet or mainframes. MS-DOS computers need an AppleTalk card in order to communicate to Macs over AppleTalk.

6. **Connectors.** Everything—computers and peripherals—must have network connectors. Unless they have specialized needs, small organizations should get by with either AppleTalk cable and connectors or PhoneNET connectors and twisted-pair telephone wire.

7. **Match cabling to the size of your organization.** Small organizations can use AppleTalk twisted-pair, twisted-pair telephone wire, or existing telephone wires. Medium to large organizations might need to move up to Ethernet networks or IBM Token Ring.

Small Organizations

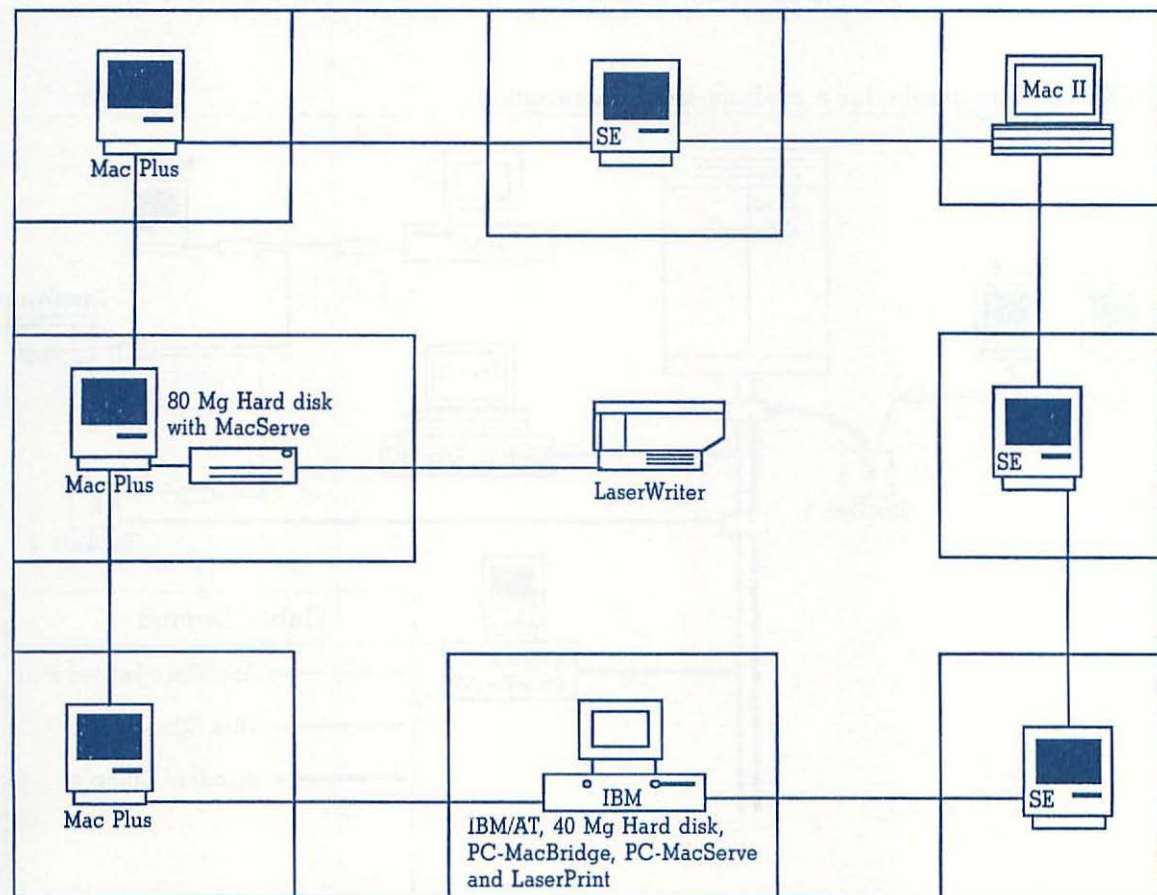
Small organizations—from two to fifty employees or members—include small church groups, civic organizations, public or private schools, consulting firms, and professionals in private practice. Small professional organizations include physicians' offices, mental health groups, architectural firms, attorneys, engineering companies, and so on.

Many of these small organizations need only a simple disk server, such as MacServe from Infosphere. They have no need for sophisticated file serving systems, such as the 3+™ network from 3Com. Being a small organization often means having a limited budget. These smaller groups need a LAN that is powerful but inexpensive to install. The cost of a LAN system might appear to be unreasonably high until you break down the total cost of the LAN on a per node basis. This is called the price/node ratio (P/N ratio). An excellent example of this comes from Apple's original marketing scheme for the LaserWriter. Many people thought the LaserWriter to be overpriced at \$7,000. However, in an organization that connected 14 users to the LaserWriter, the P/N cost was \$500. This means that for \$500 each

of the 14 users had access to a machine that produced near-typeset-quality documents. Considering the cost of professional typesetting, a single user could offset the cost of his or her node with the first publication.

This same principle holds true with LANs. Small organizations would do well to look closely at the P/N ratio of the LAN system they purchase. Since they often have little or no in-house technical support, they need a LAN system that is easy to install, learn, use, and maintain. A typical topography in a small organization is shown in Figure 1.1.

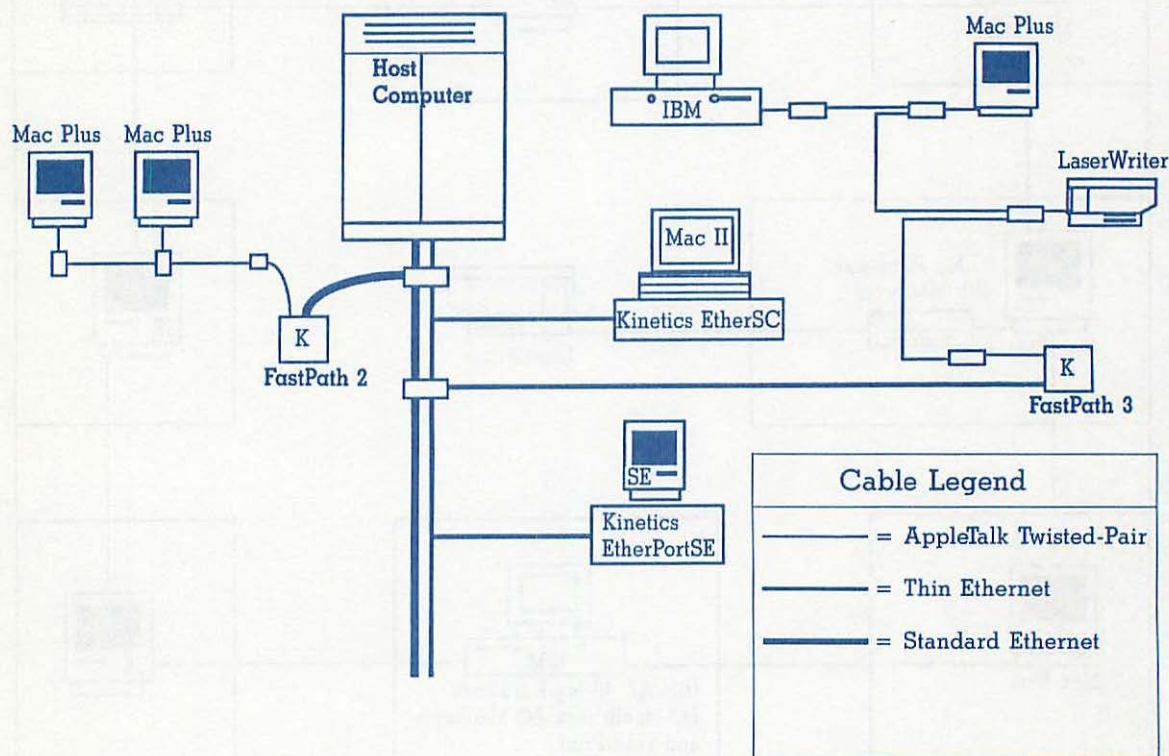
FIGURE 1.1 Topography for a small organization



Medium-Sized Organizations

Medium-sized organizations range in size from 50 to 200 people. These organizations might include larger school districts, a large college or university, some medical concerns, and many types of businesses. Medium-sized organizations have unique needs. Often they need to communicate in small work groups, each one much like a small organization in itself. At other times, a medium-sized organization must connect to mainframes, Ethernets, or other alien networks. This internetwork connectivity is something that large organizations use. A medium-sized organization might look at topographies that combine both small work group topographies with internetwork connections. A sample topography might look like the one in Figure 1.2.

FIGURE 1.2 Topography for a medium-sized organization



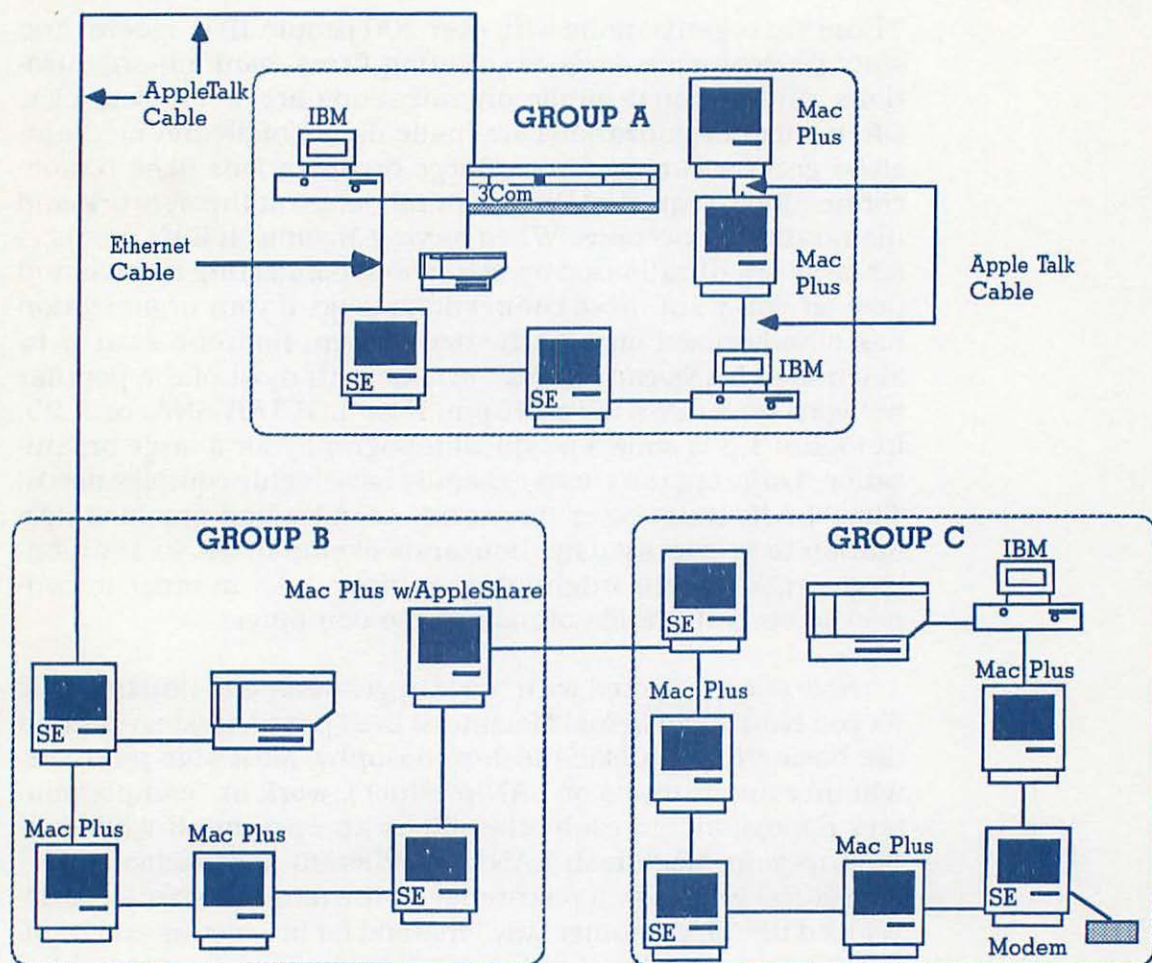
Large Organizations

These are organizations with over 200 people. IBM, federal and state governments, large accounting firms, banking organizations, and national public organizations are some examples. Often, large organizations are made up of small- and medium-sized groups. However, most large organizations need remote connections, requiring the use of modems on the network and mainframe connections. When buying Macintosh LAN products for large organizations, consider who is connecting to what and how far you want these connections to go. If your organization has standardized on a particular system, find out what it is. Macintosh LANs can connect or talk with most of the popular network systems, such as 3Com, Novell, TCP/IP, SNA, or X.25. In Figure 1.3 is shown a typical topography for a large organization. Large organizations generally have highly complex needs. Their LANs must cover thousands of miles and provide information to be accessed by thousands of employees. In addition, large organizations might also require a LAN in order to connect to several brands of mainframe computers.

Now you are armed with tips, suggestions, and illustrations. As you read about actual Macintosh LAN products, keep in mind the basic yin-yang Macintosh philosophy. Most Mac products, whether applications or LAN products, work in “complementary opposition” to each other. Keep an open mind when setting up your Macintosh LAN. Try different approaches.

Several years ago, a researcher by the name of Marc Gold developed the “Try Another Way” method for instructing and training developmentally disabled individuals. The premise behind his training method was simple: If you try one way of doing something and it does not work, try another way. In general, we adults tend to be dogmatic in our attitude toward work—especially with computers. “By God, if it doesn’t work the way you told me it would, it’s no good!” With the Macintosh, if a particular configuration or topography does not work for you, try another way!

FIGURE 1.3 Topography for a large organization



Cable, Topographies, and Terms

Before we begin our exploration into the various LAN products, I want to familiarize you with some basic LAN concepts. These concepts include basic standard topographies and configurations, some basic terminology, and standard LAN operating procedures. LAN cabling or wiring considerations are also covered. It is important to understand the various types of cable or wiring that can be used for your LAN. Understanding these “basics” and “standards” will help you as you read about and study the various products. It makes life easier when you have to decide just what the heck to buy.

In the introduction I covered the OSI (Open Systems Interconnection) model with the intention of providing you with a theoretical basis for working with LANs. If you are very familiar with LANs and the OSI model, you may want to skip this chapter and proceed to the products. I would caution you, however, that the information presented in this chapter is related specifically to the Macintosh. Compared to other computers, the Mac is a different “animal,” and there may be information here that will prove to be valuable later on.

Here are some important elements that make up the layers of the OSI model:

- Types of LAN transmission—baseband/broadband
- Methods of LAN transmission—asynchronous/synchronous
- Cable installation suggestions
- Types of cable
- LAN topographies

With the Macintosh, many elements of the OSI model overlap each other. For example, cable/wiring is considered part of the physical layer. It is necessary with the Macintosh to know whose software you are using before considering the type of wiring to install. Some software does not care what the speed of transfer is. Other applications send information at a set speed regardless of the type of cable you are using.

TYPES OF LAN TRANSMISSION

There are two basic types of LAN transmission—baseband and broadband. These two bandwidths determine the amount of, and the sophistication of, LAN transmissions.

Baseband

This is the simplest, cheapest, and least sophisticated transmission bandwidth. A baseband LAN uses the entire bandwidth of the cable to transmit data. The data is usually sent as just a single digital signal. There is no need for expensive demodulators. Baseband can be thought of as a single-station radio. This radio can pick up whatever the radio station happens to be broadcasting at a particular time—rock and roll, classical music, or jazz.

Broadband

Broadband networks carry several signals over different channels at the same time. One channel may be for video signals, one for voice, and one for data. Each channel is modulated (tuned) to a different frequency. At the receiving end, broadband networks require very expensive demodulating equipment to reinterpret the signals and put them into an understandable form. This is how cable TV can send you 50 or more TV stations.

Most of the LANs for the Mac use a baseband technology. Soon there will be add-on cards to provide broadband transmission with the Macintosh II and Macintosh SE. Combined with fiber-optic cabling, broadband transmissions will allow us to use our Macs to send data, talk on the phone, and see who we are talking to, all at the same time.

METHODS OF LAN TRANSMISSION

There are two methods of LAN transmissions that can be sent over broadband or baseband—asynchronous and synchronous. These two methods determine how the data that is sent down the cable can be interpreted.

Asynchronous

This is the most common method for sending information. Asynchronous communication sends data by the bit. When a character is sent, the receiving end reads that bit and then “echoes” it to your screen. With asynchronous communication, it is necessary for the sender to be able to “talk” the same way as the receiving unit. In telecommunications it is essential that the receiving unit have the same settings as the host unit. With LANs, asynchronous communication means that every node on the network has to be “speaking the same language.” If you send the letter “B,” another node on the network must interpret that character as the letter “B”!

Furthermore, asynchronous communications require more bits to be transmitted in order to get the same message across than do synchronous communications. These characters are spaced by start and stop bits, specific signals that tell each computer when transmission has started and when it has stopped. In asynchronous communication, these signals are sent before and after each character. The importance of asynchronous communications on the network is vital. All of the communications with Mac LANs is asynchronous. Apple’s File Protocol (AFP) calls for asynchronous communication standards. Part of the reason for this has been that the small microcomputers have not been capable of handling and controlling the sophisticated software and hardware needed for synchronous communications.

Synchronous

This type of transmission is more sophisticated than asynchronous communication. With synchronous communications, data can be sent in “blocks,” as opposed to individual bits, be-

cause start and stop bits aren't required to regulate transmission. Instead, in synchronous communication characters are spaced by *time*. Synchronous transmissions require a *very* precise timing clock. Because you don't have to add start and stop bits, synchronous transmissions take fewer bits and less time to send. It might seem that synchronous transmission is the best way to go. However, because you need a precise timing clock and lots of RAM, synchronous communication is expensive and difficult to use. For this reason, synchronous communication is usually done with mini- and mainframe computers. Fairly sophisticated and less expensive synchronous timing clocks are soon to come. The newer Macs, with their capacity for larger RAM, should easily be able to handle synchronous communication.

CABLE INSTALLATION SUGGESTIONS

Careful planning for cable installation will help you create a strong skeleton for your LAN system. Here are a few tips and suggestions to remember when you begin to design your cable scheme:

1. **Make detailed cable diagrams.** Be sure to draw a schematic of where your cable will go. Label connecting points, repeater positions, connectors, terminators, and modem connections. If you are using a star configuration, you should locate your host and each of the nodes.
2. **Select the correct cable.** Make sure you make a careful evaluation of *all* your needs, present *and* future. Selecting the proper cable will save you time and money when you decide to upgrade your system to the latest and greatest.
3. **Always install more cable than you think you will need.** This actually should be one of Murphy's Laws. You will almost always need to add that extra node or to stretch the boss's connection to his office down the hall.

4. Do not place your cable along or near electrical wiring or fluorescent light fixtures. They will wreak havoc with your LAN. The interference they put out can cause loss of data and a LAN that is constantly down.

5. Label all of your cables and peripherals. Be sure to label all of your cable, modem servers, connectors, computers, servers, and printers according to your schematic drawing. This tip will save you many hours of frustration when installation time comes. Each cable can be assigned a color-coded number, and peripherals can be given a letter or number combination with the same color coding.

6. Have a good idea where your cable can go before you install it. One of the big mistakes is thinking cable can go along a certain route only to find out later that it can't. The result is an added expense to relocate your cable. Inspect your building (wiring blueprints can be helpful) and plan for the cable's location ahead of time.

7. Lay out your cable according to the size of your LAN. If you have a small LAN with five to ten users, you probably won't have to run cable through ventilation systems or buy special cable duct. Sometimes running the cable along the baseboard or the edge of the ceiling will work just fine. If your LAN is going to be quite large, then you need to carefully examine just where the cabling needs to go. This is to avoid placing your cable in areas that can cause interference with network communication.

8. Make sure you know how strong your cable is. The strength of the cable is called the "pull strength." Your cable may appear tough and strong, but it takes only a very small break or crack in the cable to cause hours of downtime and expensive repairs to the cable. Knowing the pull strength is also important when you want to bend and twist the cable around corners or through small holes. Bending a coaxial cable around a 90-degree corner, for example, is not a very good idea.

Cabling/Wiring

The type of cable you select for your LAN is important. It can determine your network speeds, network distance, and capacity for transmitting data as well as the reliability and integrity of your data. Factors such as network speed, distance, and capacity can be evaluated somewhat selectively. In other words, how far, how fast, and how much allow for some flexibility. Reliability and integrity, however, are very objective, essential factors with no room for flexibility. It is imperative that your data reach its destination without error. Loss of signal usually means loss of data. Loss of data usually means that your information doesn't get to where it should go. When this happens, the boss gets mad, and *you* have more work to do. Not a very productive way to work. This loss of signal over distance is called **attenuation**. It is your LAN cable that can assure minimum attenuation and increase reliability and integrity.

Another feature of cable is **shielding**. Shielding surrounds the cable and is usually made up of a thin metal foil or metal braiding. The purpose of shielding is to act as an extra insulator against interference. Shielding affects your network's distance and speed. Poorly shielded cable may have problems with interference and attenuation, thus limiting the distance and speed of your network. For example, poorly shielded cable has to have a slow network speed to cover a longer distance. Speed up the network and you reduce the distance.

To shield or not to shield, that is the question. Remember, unshielded cable allows a greater distance for your LAN, but at a slower speed. Unshielded cable however, also exposes your LAN to possible interference. Shielded cable, on the other hand, allows your LAN to transmit faster over a shorter distance. And shielded cable provides much better protection against interference.

Three basic elements make up your LAN: computer, software, and cable. Cable affects your network's speed, capacity, and distance. However, your cabling, software, and computer hardware are all interrelated. Each one depends on the others. For example, a fiber-optic cable is capable of handling transmission speeds of 200 megabits per second. Your Macintosh—and most LAN software that adheres to the AppleTalk File Protocol (AFP)—can

transmit at only 230.4K bits per second. This is not to say that software couldn't be written to accommodate faster speeds. It already exists. The Mac itself can handle faster network speeds. Connecting to the SCSI port of the Mac can provide LAN transmission speeds from 2 to 4 megabits per second. Connecting your LAN through the AppleTalk port limits your transmission speeds to the standard 230.4K bits per second. As you can see, you can transmit faster than your cabling can carry the information. More often, however, your cable can carry signals much faster than your computer or software can transmit. New innovations in Mac software and the open architecture of the Macintosh SE and the Macintosh II now bridge the gap between the capacities of your cable and the capabilities of your hardware and software.

There are three basic types of cabling for your LAN—coaxial, twisted-pair and fiber-optic. In examining these three types of cabling, there are several factors to consider that can aid in your selection of the appropriate cable for your LAN. These factors are:

1. **Speed.** What are the maximum transmission speeds of the cable?
2. **Distance.** How far can the cable carry a signal, and what is the rate of attenuation without repeaters?
3. **Capacity.** What is the cable's bandwidth?
4. **Immunity.** What type of interference affects the cable?
5. **Strength.** How easily will the cable bend without cracking or breaking?
6. **Size and weight.** How big and heavy is the cable?
7. **Cost.** How much does the cable cost per thousand feet? (Prices below are estimates and can vary depending upon your dealer.)

Coaxial

This is the oldest, most common type of network wiring. Coaxial cable is an electrical cable that is generally used for cable TV. The cable itself is a solid piece of metal (usually copper) that is surrounded by insulation and then covered with metal braiding. This metal braiding acts as a second conductor. Coaxial can carry several voice, data, and video signals simultaneously. Though it sounds like the perfect cable for LANs, there are some

drawbacks. Coaxial is difficult and cumbersome to install. A large roll of coaxial cable is heavy. Installation usually means permanent installation; when a LAN has to be altered or moved, alterations may require rewiring. Rewiring is expensive. Figure 2.1 shows what coaxial cable looks like.

The characteristics of coaxial cable are:

- **Speed.** Coaxial is capable of handling transmission speeds of 2 to 5M bits per second with fairly low attenuation.

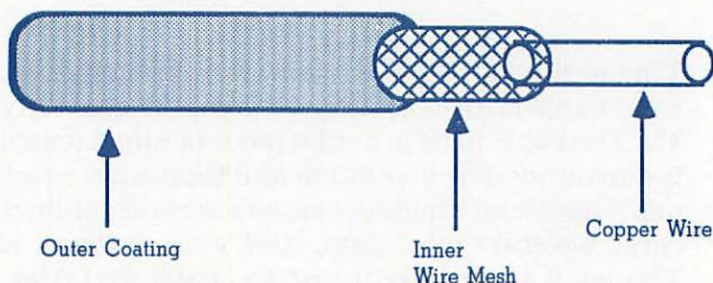
- **Distance.** Coaxial is good for about 1,000 feet before attenuation becomes a problem. Some coaxial manufacturers would have you believe that coaxial is capable of greater distances.

- **Capacity.** Coax has a much higher bandwidth than twisted-pair and can thus carry more data at higher speeds.

- **Immunity.** A single coaxial line that is well shielded should be immune to most interferences, including radio frequency interference (RFI)/electromagnetic interference (EMI), and crosstalk. Multiline coaxial is another story. Multiline coaxial consists of several coaxial wires grouped together. These wires are very close together, and interference is a problem if there is not adequate shielding.

- **Strength.** Coaxial is very strong but not very flexible. New advances in coaxial technology have increased the flexi-

FIGURE 2.1 Coaxial cable



bility of coax. But coax will never have the flexibility of twisted-pair or fiber-optic.

■ **Weight.** Of all the cables, coax is the heaviest. Cable weight may not seem important—until you begin the installation process. Common coax can run 40 to 60 pounds per thousand feet! Your ceiling may not appreciate the additional weight.

■ **Cost.** The cost of any cabling will vary. The quality and volume of cable ordered can affect the cost. Currently, coaxial can cost from 44¢ to \$2.30 a foot. The better the quality, the higher the cost. Coaxial cable with a heavy shielding will cost more than coaxial with a layer of cheap shielding.

Twisted-Pair

This is the “new kid on the block.” Even though twisted-pair wiring has been used for years, it is just now coming into its own as a wiring medium for LANs. Twisted-pair is two copper wires twisted around each other. The twists in twisted-pair act as a shield against RFI and EMI. The more twists, the less interference. High quality twisted-pair has a large number of windings per foot. This type of twisted-pair is generally better for data transmission. Cheaper twisted-pair has less shielding and not as many twists per foot. This is the type of twisted-pair used to carry voice transmissions. Telephone are wired with twisted-pair wiring and for this reason, existing telephone wires are now being used in LANs. The RFI/EMI interferences can be controlled even more by shielding the cable with some type of noise-reduction material. A foil/mylar or metal braiding are examples of shielding material. The cable used for the AppleTalk Personal Network is shielded twisted-pair.

The characteristics of twisted-pair wiring are:

■ **Speed.** Twisted-pair is not considered a “fast” network cable. It can handle speeds up to 4 or 6M bits per second. However, twisted-pair cannot transmit these speeds for any great distance. Shielded twisted-pair can carry up to 4M bits per second for a distance of 300 feet. Unshielded twisted-pair can go somewhat farther, close to 1,000 feet. In many

cases, slower speeds for a greater distance is an acceptable trade-off. In the world of Macintosh LANs, where the standard has been 230.4K bits per second, twisted-pair can cover distances to 4,000 feet without repeaters.

■ **Distance.** Like the speed factor, distance is a relative issue. Good, well-shielded twisted-pair cable can handle transmission up to 4,000 feet without the need for repeaters. The faster you want to send data, the shorter the length for twisted-pair.

■ **Capacity.** Twisted-pair can handle virtually any type of baseband transmission. Two twisted-pair cables can handle about 24 two-way conversations.

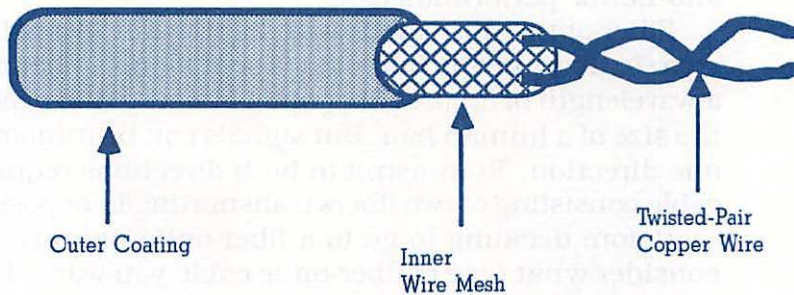
■ **Immunity.** The more twists in twisted-pair, the better the immunity to RFI/EMI and crosstalk. Also the addition of a good shielding material can increase twisted-pairs immunity to these interferences.

■ **Strength.** Twisted-pair is a very strong and flexible cable. Because of its strength and flexibility, you can install twisted-pair in more places than coax—around corners, along baseboards, under carpeting, etc.

■ **Weight.** Unlike coaxial cable, twisted-pair is much lighter and thus is easier to install. Typical twisted-pair cable weighs in at 15 to 20 pounds per thousand feet. When compared to the 40 to 60 pounds for coaxial cable, it is easy to see the weight advantage that twisted-pair has.

■ **Cost.** Twisted-pair cable can cost anywhere from 4½¢ per foot for unshielded cable to 26¢ per foot for heavily shielded cable.

Here is an idea of what a typical twisted-pair cable might look like. Figure 2.2 shows a fairly high-quality twisted-pair cable.

FIGURE 2.2 Twisted-pair cable

Fiber-Optic Cable

I referred to twisted-pair as being the new cable on the block. What is even newer is fiber-optic cable. Actually, fiber-optic cabling has been around since the 1950s. However, it's just now starting to be used in the LAN environment. We are seeing a giant increase in the demand for fiber-optic networks. Several companies have already announced fiber-optic add-on cards and software for the Macintosh SE and the Macintosh II. Fiber optics have so many advantages that the cables may eventually replace coaxial and twisted-pair.

The main stumbling block to the use of fiber optics in LANs has been the lack of computer software and hardware development. Simply put, there is as yet no software or hardware that can take advantage of the speeds and bandwidths available with fiber-optic transmission. Fiber optics can transmit data at speeds in excess of 200 megabits per second! So far, no one has written software or designed hardware that takes real advantage of fiber optics.

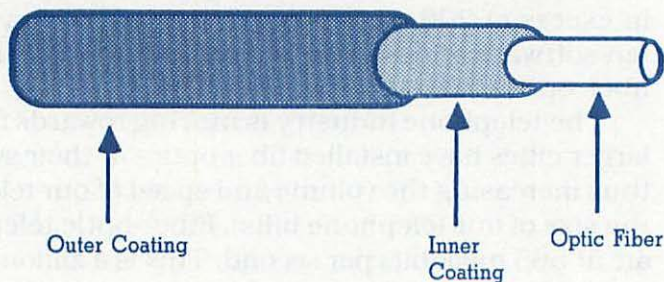
The telephone industry is moving towards fiber optics. Many larger cities have installed fiber optics at their switching stations, thus increasing the volume and speed of our telephone calls (and the size of our telephone bills). Fiber-optic telephone lines operate at 565 megabits per second. This is a zillion times faster than any LAN can use. There could come a day when even this speed is slow for a LAN, but for now our micro-based LANs have a difficult time handling speeds much over 40 megabits per

second, LANs will benefit from this technology with lower costs and better performance.

Fiber-optic cables work with light waves instead of electronic signals. This means that data is sent along a fiber-optic tube on a wavelength of light. A fiber optic is a *very* thin glass tube about the size of a human hair. But signals can be transmitted in only *one* direction. To transmit in both directions requires a duplex cable consisting of two fibers transmitting in opposite directions.

Before deciding to go to a fiber-optic network, you need to consider what type of fiber-optic cable you want. There are currently two types, "single mode" and "multimode." The two types of fiber-optic cables are differentiated by the way light travels through the glass tube. In multimode cable, the light bounces off the walls of the glass. Single-mode cable sends a concentrated beam straight down the middle of the tube. The glass tube in the single-mode fiber is also smaller than the multimode fiber. For standard LANs, the multimode fiber is used. In fact, the companies that have announced fiber-optic networks for the Mac will use multimode fibers. Multimode fibers are less expensive than single-mode fibers, but they have a greater attenuation. The single-mode fiber has better attenuation and is more suitable for sending signals over very long distances. Single-mode fiber is also more expensive than multimode fiber cabling. A typical fiber-optic cable is shown in Figure 2.3.

FIGURE 2.3 Fiber-optic cable



The characteristics of fiber-optic cable are:

■ **Speed.** Data transmission speeds are fast with fiber optics! However, the speed question is interesting. It would seem obvious that light waves travel faster in space than electrons do on a copper wire. In reality, both travel at the speed of light, 180,000 miles per second. The difference is in the *way* light travels through the transmission medium. To put it simply, light waves traveling through a small glass tube meet with less resistance than do electrons traveling over a copper wire.

■ **Distance.** Telephone companies are sending signals over fiber-optics cables to repeater stations that are over 30 miles apart! In the LAN world, this translates into an adequate distance for your needs. For most LANs, distance probably won't be an issue.

■ **Capacity.** Fiber-optic cable is not only fast, but it carries a lot of data. A single cable containing two fibers can handle over 1,300 two-way conversations. Twisted-pair can deal with about 24. In the future, the capacity will increase. There is an almost infinite number of light waves. Because fiber-optic cable uses these light waves to transmit data, there could be an almost unlimited number of transmissions along the same cable. Imagine voice, video, and data signals all transmitting at the same time on the same cable!

■ **Immunity.** Fiber cable is immune to RFI/EMI and cross-talk. Fibers can cross each other, can be installed right next to any other type of wiring, and can even be placed right next to more fiber-optic cables. This level of immunity means no loss of data integrity due to interference problems.

■ **Strength.** Fiber-optic cable is strong, but not as strong as coax or twisted-pair. It is more flexible than coaxial, but not as flexible as twisted-pair. If the cable is placed in a protective sheath of some type, it can last quite a long time. Fiber-optic cable is also not as susceptible to damage by water and other elements.

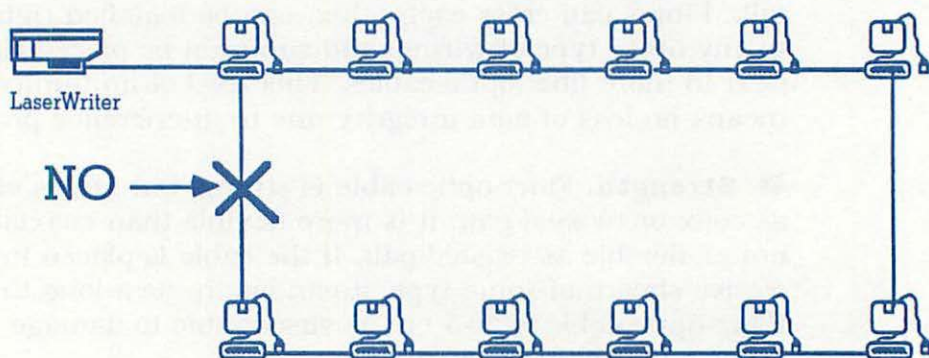
■ **Weight.** Fiber cable is quite thin. It weighs 9 pounds per 1,000 feet. Twisted-pair weighs about 18 to 20 pounds.

■ **Cost.** Fiber-optic cable can actually cost you less than coaxial. Of course, it depends on the quality of coaxial cable you install. If you install very high quality coax, it could cost you as much as \$2.30 per foot. Fiber-optic cable costs about 80¢ per foot.

LAN TOPOGRAPHIES

Now that you have seen the different types of cabling available for LANs, let's take a look at some LAN topographies. The topography of a LAN is a description of how the network can be hooked, or linked, together. With Macintosh LANs, there are only a few basic topographies available. These are serial, parallel, and star. These topographies should not limit your creative experimentation when configuring your LAN. You can now effectively link your Mac LAN into a variety of other LANs that utilize different topographies. For example, you can connect and link into the IBM Token Ring network. This network allows you to connect your PCs into a loop configuration. There is also the Kinetics FastPath™, which is a bridge into an Ethernet network. There is one topography that must be avoided with Macintosh LANs. This is the circular or loop connection. See Figure 2.4.

FIGURE 2.4 Loop topography



Lets take a look at some of the different topographies available.

- **Serial topography.** This configuration connects your network nodes (computers, laserwriters, modem servers, etc.) in a series. Each node is connected to another, and any node in the series can communicate with any other node. A sample serial topography is shown in Figure 2.5.
- **Parallel topography.** Macs can also be connected in a parallel sequence. See Figure 2.6.

FIGURE 2.5 Serial topography

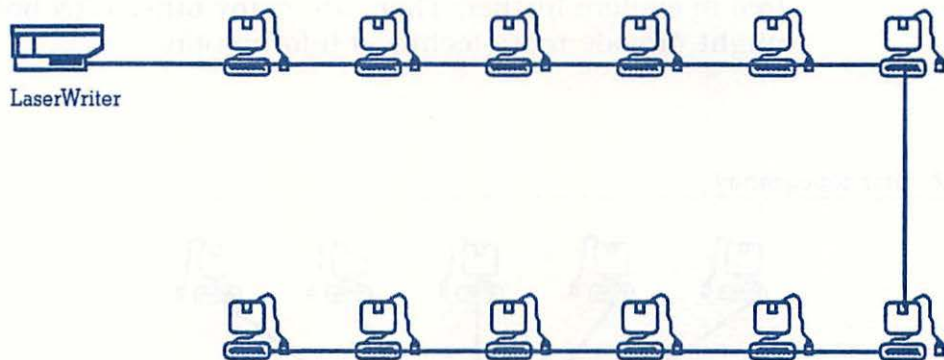
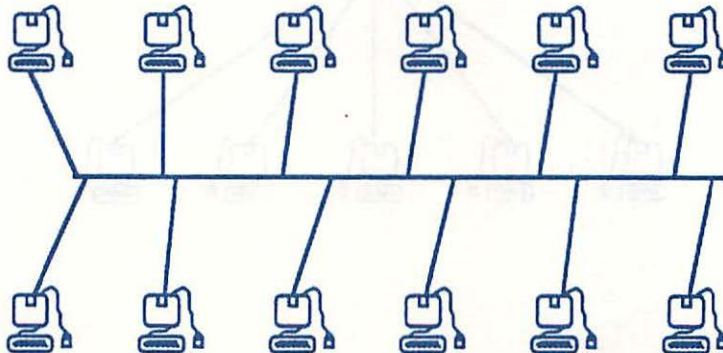


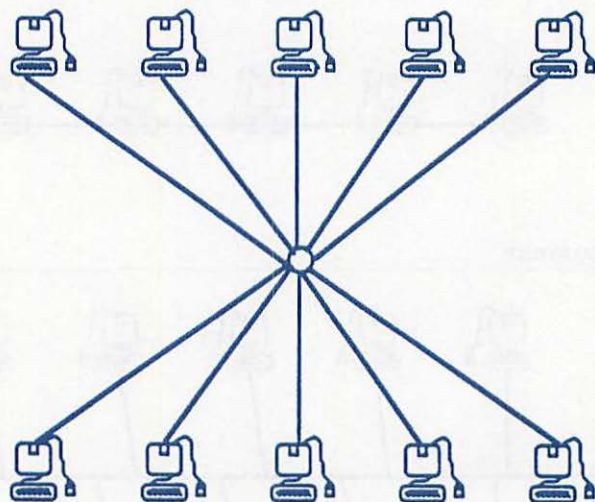
FIGURE 2.6 Parallel topography



- **Star topography.** This is the topography that is most popular with other computer systems. Telephone switching systems are an example of a star topography. With a star, LANs can be expanded to include other stars, serial, or parallel LANs. The star topography is also an excellent link into other “foreign” networks. See Figure 2.7.

In this chapter I have attempted to familiarize you with some basic terms, ideas, and technical concepts behind LANs. The approach was not intended to be too technical, yet at times I have found no way around it. As all of us have come to appreciate, the Mac is a very nontechnical computer. Most of you will probably just set up your LANs and expect them to work. However, for those who need to understand more “technical things,” feel free to explore further. There are many other LAN books that might provide more technical information.

FIGURE 2.7 Star topography



LAN Companies

Yes, this is the good part! The companies listed here are pioneers. Some may be old hands in the LAN world but new to the Macintosh game. These companies are entering an untested marketplace. After all, the Macintosh is just a toy, isn't it?

Companies like 3Com have had a lot of practice with LANs. However, many a Mac developer can attest that the Macintosh is a different animal. These companies all see a profitable market in Macintosh LANs. They want to make money! This means more and better products for the Macintosh LAN market. With each new generation of more powerful Macintosh computers come more powerful applications.

We have already seen many Macintosh products evolve. ThinkTank™ from Living Video Text is a good example. ThinkTank has grown from a simple outline processor to the high-powered and sophisticated outliner, More™. With the Macintosh SE and the Macintosh II, More has taken still another step up on the evolutionary ladder. There are many other examples of this sort of evolution. The key to the success of these products is the Mac itself. Even though the products become more powerful and sophisticated, they remain easy to learn and use. The result is better communication and increased productivity.

As you will see, there are some very powerful and sophisticated LANs and LAN products for the Macintosh. Yet all these products maintain the easy-to-use standard Mac interface. In the confusing world of LANs, this ease of use and learning is welcome indeed. At this point, it may be a good idea to define some LAN terms that will help you understand what these companies have to offer.

LAN DEFINED

Local area networks can be simply defined as a grouping of 5 to 12 personal computers, usually in close proximity and sharing one or more peripheral devices.

The common local area network also includes one computer (or more) on the network that acts as a **host** unit. This host unit usually acts as a server for the rest of the computers on the network. The other computers on the network can access the host and share files, records, and ideas.

Disk Servers vs. File Servers

The concept of **file sharing** leads us to another, often confusing, concept. In the world of LANs there have been two methods for “sharing” information. Usually this information is located on a centralized hard disk called a *host*. The two methods are *file serving* and *disk serving*. Many people don’t know the difference; others may not care. However, the distinction between a file server and a disk server is important.

Disk Server

A disk server allows each user on the network to store and retrieve files from a centralized hard disk. Each user has a section, or volume, of the hard disk in which they can store their files. Basically, a disk server provides storage space to the network users. Generally, users cannot “share” files with other users. They can allow other users to “see” a file but not make changes to it. Infosphere’s MacServe™ is an example of a sophisticated disk serving system.

File Server

File servers allow *all* users on the network to access files. Of course, many of these files can have optional restricted access. Files created with multiuser applications can be opened, edited, and the changes saved by more than one user. File servers come in two forms. One is a **dedicated file server**, and the other is a **distributed file server**.

Dedicated file server This file server is “dedicated” to one purpose—file serving. A dedicated file server is usually software residing on a hard disk and requires the power of one computer to operate. Often the dedicated file server uses one of the computers on the network as its “brains.” AppleShare™ is an example of a dedicated server that uses a computer exclusively to run the program. This means that you have to dedicate one of the computers on the network to run the file server. When you do this, the computer that is acting as the host cannot be used for anything else. The exception would be an application that operates in conjunction with the file server. This is called a **concurrent application**.

Other dedicated file servers are combinations of hardware and software. The software comes with its own intelligent host. This host has all the power of a computer without the disk drives and monitor. Memory, peripheral ports, and size of hard disks can be configured according to the needs of the LAN. 3Com's 3Server3 together with 3+ networking software is an example of this type of dedicated system. The computers attached to this system are free to perform any normal computer functions.

Distributed file server A distributed system “distributes” the duties of the host over several stations. With a distributed file server, any computer on the network can act as a host unit. The server software is installed on any user's startup disk. Users then decide what folders and files they want to make available to the network. Once users have made folders and files accessible to the network, remote users then “mount” these folders and files as logical disks on their computer. The Transcendental Operating System™ (TOPS) from Centram Systems West is an example of a distributed file serving system.

With the distributed file server system, communication among LAN users is essential. Without good communication, users can easily lose track of who has what. Individual users now have control over network management. It is up to each individual to decide what folders and files are to be made available and who will have access to them.

Disk servers are no longer as popular as file servers. In a local area network, users want and need to be able to modify files within their area of responsibility—anytime!

The line distinguishing between a file server and a disk server has become very fine. In the “good ol’ days” (about five years ago), disk servers were the only game in town. They provided LAN users with the ability to access a mass storage system. With the increased sophistication of LAN systems came more complex serving needs, and the file server methods were created.

LAN PRODUCTS

Many of the companies producing LANs for the Macintosh also market peripheral hardware and software. These products are covered in Chapters 4 and 5. For the buyer, sorting out who makes what and what it does is confusing. To avoid this confusion, here is a working definition of the types of products covered in this first chapter.

These are products, hardware and/or software, that provide methods of connecting multiple personal computers, including Macintosh. These products provide some form of systems administration for the sharing of applications, peripherals, and data. Macintosh LAN products can be divided into three categories:

1. Hardware only
2. Software only
3. Combination of hardware and software

Many products are beginning to cross over into the other categories. A combination of hardware, software, and “firmware,” is used with the Macintosh SE and the Macintosh II. Some of the products are confined to the physical level of the OSI model. Other products are at the presentation level. Still others provide components that range from the physical level to the very top application level. This wide range of flexibility makes Macintosh LANs unique—the most powerful and easiest-to-use LANs in the business.

Some of the LAN companies listed furnish extensive installation steps and management information. These companies have generally made LAN products their only business. You may consider them the *major* players in the Macintosh LAN market.

Other companies with less in-depth coverage are still important in the LAN game. If you want more information about their products, contact them.

3Com Corporation

Company name: 3Com Corporation

Address: 3165 Kifer Rd
Santa Clara, CA 95052-8145

Telephone no.: (408) 562-6400

Product name(s): 3+ for the Macintosh™ (software)
3Server3™ (hardware)
Netadaptor™ (firmware)

Type of LAN: 1. Hard disks
2. File server software
3. Adaptor cards

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
IBM-PC/XT/AT
Most IBM clones

Network wiring supported: AppleTalk twisted-pair
Coaxial
Twisted-pair phone line
Fiber-optic
Ethernet

Maximum length of network: AppleTalk—1000 feet
without repeaters
Ethernet—1000 feet
without repeaters

Maximum number of users: 32 without repeaters

Network speed: AppleTalk—230.4K baud
Ethernet—10 Mbytes

PRODUCT DESCRIPTION

Next to Apple, 3Com is the biggest player in the Macintosh LAN game. Apple needed 3Com to endorse and adopt the AppleTalk File Protocol (AFP). More important, Apple needed 3Com to develop a Macintosh LAN that connected with 3Com's 3Server3 and communicated with the 3+ network software. Not an easy job. 3Com played around with an AppleTalk connection. It was called EtherMac™, and it allowed Macintosh to link into an Ethernet network. There were limited file-sharing capabilities and some electronic mail service. Worst of all, you had to use an IBM to start up the network before a Macintosh could log on.

EtherMac was a "first generation" LAN program. Once logged-on, the Macintosh looked like a terminal connected to an IBM mainframe, with 9-point Monaco font and simple cut-and-pasting of screen characters. Nothing fancy, but the Mac was linked into the 3Com system. Now, 3Com has integrated the Macintosh with Ethernet while maintaining the Macintosh standards.

There are four main product areas that 3Com has developed for the Macintosh. These are:

- 3+ File Server
- 3Server3
- 3+Mail service
- Adaptor cards

These four products allow Macintoshes to connect with (and share files and electronic mail with) other Macs, MS-DOS computers, and mainframes. These connections take place over a variety of mediums. Users are no longer locked into AppleTalk Personal Network (APN) connections. Macintosh SE and Macintosh II users have impressive choices:

- AppleTalk
- Ethernet
- Token Ring network

With Ethernet adaptor boards, the Macintosh SE and Macintosh II connect directly to Ethernet. The Mac 512K and Mac Plus continue to need the APN and an Ethernet bridge to connect to Ethernet.

It might seem that 3Com considers the Macintosh just another computer connected to Ethernet. But when you examine 3Com's product line, you realize the planning and strategy that went into the inclusion of the Macintosh. Let's take a look at the features 3Com has to offer Macintosh LANs.

3+ File Server

In many respects, the 3+ File Server offers fairly standard features. These include file and record locking, multiuser file sharing, printer spooling and user directories that provide a network-wide "Name" service for identifying users and servers. The Name service (directory) performs other important functions besides simple user identification. On a small network, the Name service is used to control network access and security. As your network grows, the Name service allows users to access resources by name on a local or remote basis. Users in remote geographic locations can access a 3Com server or AppleShare server simply by selecting the appropriate name, without knowing the exact physical location of the resource they are trying to access.

The 3+ File Server supports more than one server running on the same network. A small work group network with only one 3+ is usually configured as a "non-concurrent" server. Larger networks may want more than one server and are called "concurrent" servers. Multiple servers have advantages and disadvantages that depend upon user needs. Security is harder to manage and maintain with the concurrent server. With the 3+, you can run both the 3+ and AppleShare concurrently, allowing users to utilize Appleshare for application sharing and data storage while having access to the 3+ File Server to bridge into an IBM Ethernet network—a powerful choice for Macintosh LANs.

The concept of *multiple* distributed file servers is important. There are some Macintosh LANs that offer distributed file serving. TOPS from Centram Systems West and MacServe from Infosphere are examples. The difference between 3+ and these

others is a feature unique to 3Com. 3+ allows specific network services to be distributed across different *dedicated* servers. See Figure 3.1 for an example.

As you can see in the figure, work groups A, B, and C are all independent networks. Yet all three of them are interconnected and controlled through the 3+ File Server. This is the concept of distributed, concurrent servers—more than one server, each doing something different, yet all interconnected.

Other features of the 3+ network system include:

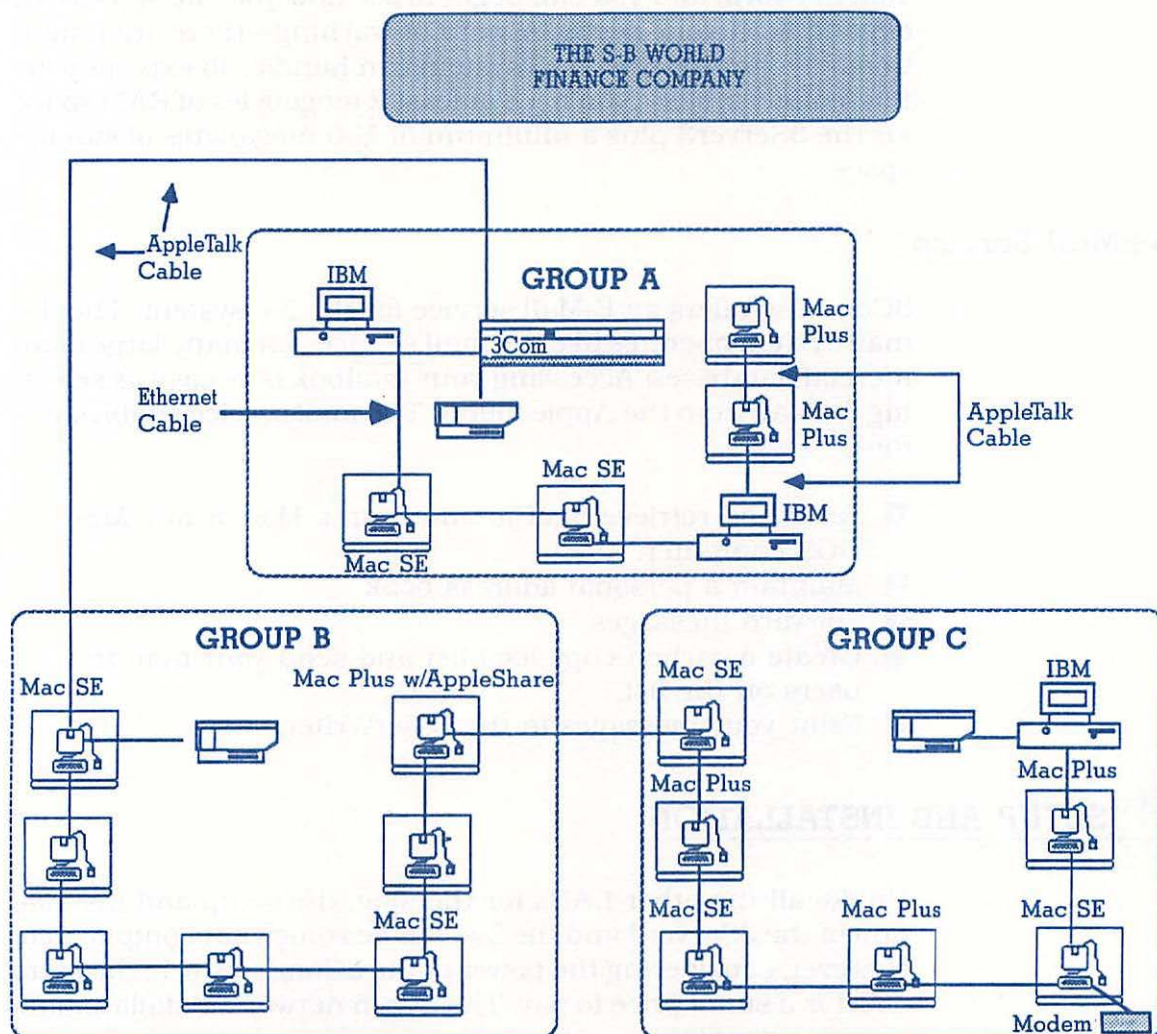
- **3+ Mail.** This is the 3Com electronic mail service. A user can send, receive, and store messages with any other user on the network. Messages can be routed for other users to read, carbon copies of messages can be sent to specific users, messages can be dated and time-stamped, and messages can be saved for later reading.
- **Internetwork routing.** This feature allows users to cross various AppleTalk networks to access mail and/or files on a different server. These different networks can be linked by standard AppleTalk network connections or through modems.
- **Network-to-network bridging.** Network-to-network bridging permits users to access foreign networks, including Ethernets and IBM Token Ring networks.
- **3+ 3270.** This feature allows a Macintosh node on a 3+ network to communicate with an IBM 3270 mainframe.

With all these different connections, remember, the 3+ server can also be used with an all-Mac network or a combination of Macs and MS-DOS computers.

3Server3

The 3Server3 is the dedicated network server for AppleTalk, Ethernet, and Token Ring networks. The 3Server3 provides a basic 960K of internal RAM. Additional RAM can be added as a later option. The 3Server3 comes in a variety of sizes from 40 megabytes up. An important feature of 3Server3 is the multiple media support. A single 3Server3 supports both AppleTalk and Ethernet at the same time. Up to 100 users on Ethernet can

FIGURE 3.1 Workgroups



Workgroup A is a mixture of IBMs and Macs all connected together with Ethernet to do some desktop publishing. Workgroup B is all APN; their network uses an AppleShare server. There is also an Ethernet connection to a 3+ server. The AppleShare server provides file serving for group A doing the company newsletter. But the folks in workgroup B are doing the writing for the newsletter, and they need to send their writing to workgroup A for editing and pasteup. When workgroup A has finished, the final document goes to workgroup C, who in turn sends the newsletter via modem to the typesetter, the boss, and the electronic bulletin board. Workgroup C is also responsible for "research and development." The folks in workgroup C are constantly accessing public information sources such as Dow Jones News Retrieval™, the company mainframe or NewsNet™, and the ever-popular Computing Today™ newsletter. Workgroup C, a combination of Macs, MS-DOS computers, and modem servers is interconnected with a combination of fiber optics, Ethernet, and twisted-pair telephone connections from Farallon Computing.

access the server. Add to that the 31 users on a single AppleTalk network, and you can begin to see how your networks can expand with your needs. A word of warning—there are limitations to what the 3Server3 system can handle. To expand your interconnectability, you need at least 2 megabytes of RAM space for the 3Server3 plus a minimum of 150 megabytes of storage space.

3+Mail Service

3Com also offers an E-Mail service for the 3+ system. The 3+ mail system operates like the mail services on many large commercial databases. Accessing your mailbox is as easy as selecting 3+Mail from the Apple menu. The mail service enables you to:

- Send and retrieve mail to and from a Mac or any MS-DOS computer.
- Maintain a personal address book.
- Forward messages.
- Create a carbon copy (cc:) list and send your mail to users on the list.
- Print your messages to the LaserWriter.

SETUP AND INSTALLATION

Unlike all the other LANs for the Mac, the setup and installation of the 3Server3 and the 3+ can be somewhat complicated. However, considering the power of the 3Com network, the extra effort is a small price to pay. The 3Com network installation requires *extensive preplanning*! A brief installation and setup guide follows. To cover the installation in great detail here would take much too long, but this guide should provide you with an understanding of the basic process.

The 3Com LAN supports both Macintosh and MS-DOS on the same network. A nice feature—but there's a catch. If you're integrating Macs and MS-DOS computers, the installation process can become a bit complicated. In order for the MS-DOS computers to integrate and share the various LAN services, *all*

the services for both the MS-DOS and Macintosh are installed on the 3Server3 from an MS-DOS computer. For a Mac-only network, you install the services through only the Macintosh.

The basic 3+ server provides 6 different services to each user on the network, including:

1. **3+Name.** This tracks all the network users' and servers' names.
2. **3+Share.** This service manages file and print services, allowing disks and printers to be shared over the network.
3. **3+Mail.** This is 3Com's E-Mail system.
4. **3+Backup.** This service copies files from any 3+ network server to any tape backup system connected to your network.
5. **3+Route.** This service is responsible for routing users to other 3+ networks via modems.
6. **3+Netconnect.** This sets up interconnection between Ethernet and AppleTalk. 3+Netconnect is a gateway through which Ethernet and Appletalk communicate with each other.

There's both good news and bad news concerning the installation process. Any or all of these services can be installed on the 3Server3. That's the good news. The bad news is, in order to integrate the Mac and MS-DOS computers, the services are installed from the MS-DOS computer. 3+ system software is installed on startup disks for the Macintosh. However, for MS-DOS computers to integrate with the Mac and access all the services, the 3+ services also must be installed on the 3Server3 from an MS-DOS computer. The installation process is quite painless if you *read the directions* and pre-plan.

Before you begin to install the various services on the 3Server3, you need to decide which ones you want. 3Com has provided you with some standard configurations—sets of services that have been preconfigured for you. It's a good idea to select one of the preconfigured sets. If you decide to install the services individually, you'll need to configure and adjust the various parameters associated with each service. That can be a tedious process. The table in Figure 3.2 shows the preconfigured sets.

FIGURE 3.2 Preconfigured 3+ services table

Services	Preconfigured Standard Installation Sets																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3+Name	X	X	X	X	X		X	X	X	X	X						
3+FileShare-5 users	X	X	X	X	X	X											
3+FileShare-Unlimited							X	X	X	X	X	X	X	X	X		
3+Mail-5 users		X	X	X	X												
3+Mail-Unlimited								X	X	X	X		X	X	X	X	X
3+Backup			X	X	X				X	X	X			X	X		
3+Route				X						X	X				X		
3+NetConnect					X	X					X	X	X	X	X	X	X

I will not describe in detail how the services are installed from the MS-DOS computer. If you heed the following list of Do's and Don'ts and follow the on-screen instructions, the MS-DOS installation should go smoothly. Remember, these rules are for 3+ systems that integrate MS-DOS computers with Macs.

CAUTION: If you are setting up a 3Server3 and 3+ network for the first time, you must install and set up the MS-DOS systems before you install the Macintosh services and system.

Do's and Don'ts

1. Decide which services you need *before* installation.
2. Do find someone that is good with MS-DOS.
3. Don't be in a hurry!
4. Do shut down the network.

5. Do reestablish a console (node) connection with the server. Basically, this means to start up an MS-DOS node and establish a network connection with the server.
6. Select a standard configuration that includes the 3+NetConnect service. Also, be sure to write down the number of the standard set(s) that you install.
7. Once the services have been installed, print out a Configuration Report from the MS-DOS PC.
8. When prompted to select your media type, select "Ethernet." Selecting any other media causes some very odd problems with network communications. Have no fear, the AppleTalk drivers are added later when you install 3+NetConnect services.
9. You can double-check the status of the various services by selecting Item #2 in the 3+Server Installation and Configuration screen. This is the first screen you will see after you boot up the services installation disk on your MS-DOS computer. This option allows you to install or de-install *individual* services.
10. Select several of the other menu options from this opening menu. These different options let you fine-tune your network communications. For example, the 3+ system will automatically assign an IBM-type extension to Mac and MS-DOS files. With this extension, desktop icons can be opened with Macintosh applications. This is one of the most powerful features of the 3+ network. Not only can you save MS-DOS files as Macintosh files, but you can control these "file extension mappings." The 3+ network uses an Extension Mapping Table (Figure 3.3) to establish the appropriate Macintosh and MS-DOS file names.

When you create a DOS file with one of the extensions found in the table, the Macintosh service checks it against the table and creates corresponding Creator and Type fields. The results are an appropriate Macintosh icon. The table is hierarchical and is searched from top to bottom. The first match that is found is the one that is used. For example, if a MS-DOS user creates

FIGURE 3.3 3+ extension mapping table

Mapping Number	MS-DOS Extension	Macintosh File Creator	Macintosh File Type	MS-DOS Equivalent	Macintosh Equivalent
1	PUB	ALD2	PUBF	Aldus Pagemaker Version ???	Aldus Page-Maker Version 2.0
2	TXT	MACA	TEXT	Any ASCII file with .TXT extension	MacWrite Text-only file
3	BAT	MACA	TEXT	Any batch file (.BAT extension)	MacWrite Text-only file
4	RDY	MORE	TEXT	LVT Ready! file	LVT More file
5	WKS	XCEL	TEXT	Lotus 1-2-3 version 1.0 WKS file	Excel WKS file
6	WK1	XCEL	TEXT	Lotus 1-2-3 version 2.01 WKS file	Excel WKS file
7	TXT	WORD	TEXT	Microsoft Word Text-only file	Microsoft Word Text-only file
—	COM	3MAC	DEXE	Executable files with .COM extension	None. PC executable icon.
—	EXE	3MAC	DEXE	Executable files with .EXE extension	None. PC executable icon.
—	TXT	<NULL>	TEXT	Any ASCII file with .TXT extension	None. Generic PC document icon.
—	*	DDOC	3MAC	Any file without an extension or that has no match in table.	None. Generic PC document icon.

a text file called SAMPLE1.TXT, the table is searched and the first match that is found is MACA, TEXT. When saved, the file becomes a "text-only" file that can be opened directly by MacWrite. You can also open a text-only file with Word. Likewise, a Macintosh file can be given an MS-DOS name (one to eight characters with a one- to three-character extension); MS-DOS users will see the file with that name when the Extension Mapping Table is employed. The Extension Mapping Table should not be confused with the file transfer or conversion software that transfers and/or converts MS-DOS files to Macintosh application

files, such as Dayna Communication Corporation's File. Conversion programs generally retain the formatting of the original files.

After you have installed the services, take a deep breath, have a drink, and head on over to the Mac.

Macintosh Installation: Network Administrator's Level

As with so many Macintosh products, most of the work is done transparently. That means that you, the end-user, need not worry about a lot of technicalities. There are two levels of software to install on the 3+ network for the Mac. There are the network administrator's level and the user level. Of course, the more complex level is the administration level. You *must* install this level first. If you do not, then the Mac users will be lost. Not being able to logon to a very expensive LAN can make even the most even-tempered Mac lover more than a bit irritable. Before you begin, write down the number of your standard installation set, as you did when you installed from the MS-DOS side.

Installing software at the network administration level accomplishes the following:

- Establishes the network media, either AppleTalk or Ethernet. With the Mac SE and Mac II, you may be using Ethernet cards, in which case you will want to select Ethernet as your media. For an integrated system (Macs and MS-DOS computers), be sure that you install the appropriate system parameters when you install the 3+NetConnect service from the PC side of things.
- Initializes the server. This is done only if you are setting up the network for the first time and it is going to be an all-Macintosh network.
- Names the server. After all, without a name we have no identity.
- Provides the server with an administrator's password.
- Installs the 3+ system files.
- Installs the 3+ network services for the Macintosh. Remember, what you did from the MS-DOS computer allowed the DOS machines on the network to interact on friendly terms with Macs.

- Enters name service information.
- Enters printer information.
- Reboots the server.

Installation Procedure

1. Check to make sure all connections are secure. Turn on the 3Server3.
2. Insert the 3+ for the Macintosh installation disk into the internal drive of the Mac.
3. Double-click on the 3+ for the Macintosh installation icon. Your screen should look like the one in Figure 3.4.
4. If you are installing for AppleTalk, click on AppleTalk. If you are using strictly Ethernet, click on Ethernet. If you are mixing your AppleTalk Macs with Ethernet DOS PCs, then click on AppleTalk.
5. You now must start the server. As it was with the old Model T automobile, the 3Server3 needs a "jump start." Open the front panel of the 3Server3 and locate the thumbwheel dial in the left-hand corner. Turn the dial to 6 if you are installing AppleTalk; turn to 4 to install Ethernet. Your screen will ask you to "6-boot the server"; just click "OK."
6. A dialog box will appear and tell you that it is waiting for a start request from the server. Don't get impatient. This process can take up to a whole minute!

FIGURE 3.4 Network media screen

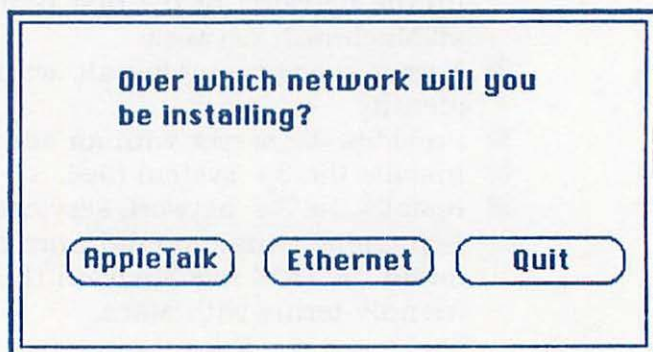
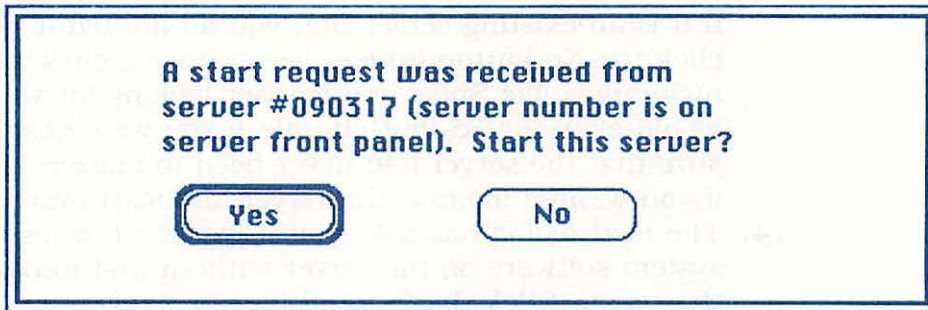
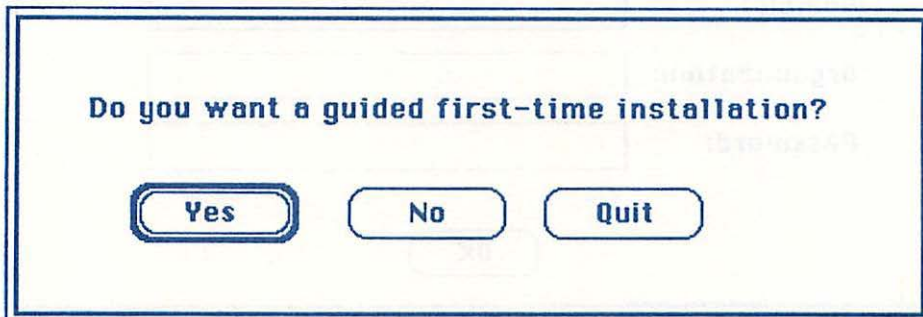


FIGURE 3.5 Start request screen

7. When the server request is received, a dialog box like the one in Figure 3.5 will appear.
8. Now insert the 3+ System Files disk in your external drive.
9. Since you have started the server, the Mac should inform you of this fact with a dialog box.
10. At this point you should take a deep breath and relax, because the real installation process is about to take place.
11. After the server has been started, the dialog box shown in Figure 3.6 should appear.
12. It's a good idea to click the Yes button. This takes you very slowly through the installation process.

FIGURE 3.6 Guided installation dialog box

13. You will now be asked to initialize the server. If this is a new server, it should have come initialized from 3Com. If it is an existing server that you *do not want*, then click the No button (unless you want big guys with nicknames like Spike and Bruiser looking for you). You would click the Yes button only if you were *absolutely sure* that the server had never been initialized before or if you wanted to erase the server and start over again.
14. The next dialog box asks you if you want to install the system software on the server without first initializing the server. Click the Proceed button.
15. The Mac begins to do its thing. When all is said and done, a dialog box says that the server is ready and is restarting.
16. Now you are prompted to name your server. You should see a screen like the one in Figure 3.7.

Type in a unique name. Tab to the Domain line. A domain is the geographical location of the server. A sample domain name might be "North End Broom Closet." Now tab to the Organization line and type in

FIGURE 3.7 Server name screen

Please give the server a new 3-part name and password

Name:	<input type="text"/>
Domain:	<input type="text"/>
Orgainization:	<input type="text"/>
Password:	<input type="text"/>

the name of your organization (company, subsidiary, etc.). The last line is a password. Be sure to make it unique and meaningful (like a marriage). Write it down and keep it in a safe place. Click "OK."

17. A dialog box will indicate that the system files are installing on the server.
18. After the installation is finished, you are returned to your desktop.

3+ Services Installation The following steps install the Macintosh 3+ services from the Install menu.

1. Select "Preconfigured Services" from the Install menu.
2. The screen should appear as in Figure 3.8.
3. Here you need to remember your standard installation set number from the DOS installation. Click the Next Set button until you come to your preconfigured, standard services set number. When you find your set, click the Install button.

FIGURE 3.8 Preconfigured services screen

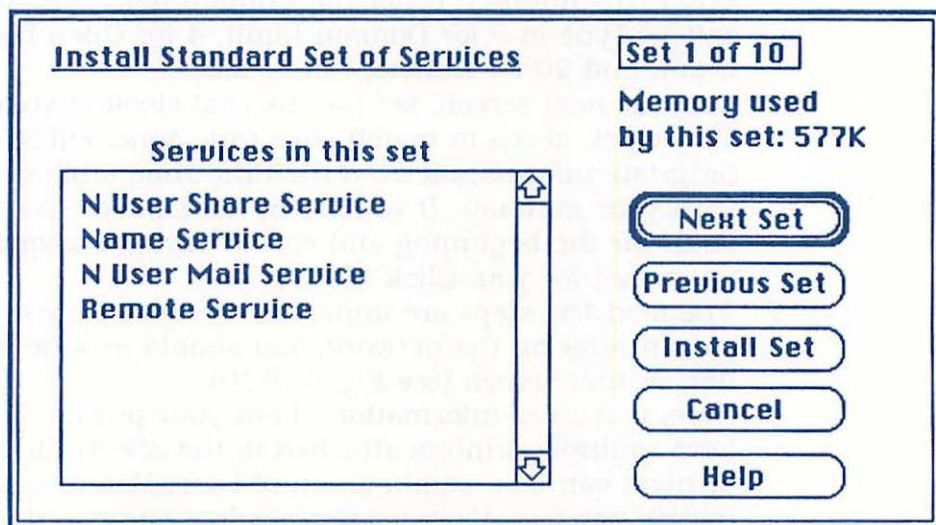


FIGURE 3.9 3+ name parameter screen

Network Number	401E7
Default Domain	HQS
Default Organization	3COM
Domain Limit	5
Open Domain Limit	4
Buffers	20

More Cancel

4. Your screen should look like the one in Figure 3.9.
5. Enter the appropriate information. The Network Number is located on the outside of the name service DOS disk. Enter this number. Enter the Domain name and organization. Type in 5 for Domain Limit, 4 for Open Domain Limit, and 20 for Buffers. Click "More."
6. On your next screen, set the internal clock of your server. This clock needs to match your time zone. Fill in the appropriate information from the time zone table supplied with your manuals. If you are in the United States, the dates for the beginning and end of daylight saving time are preset for you. Click "OK."
7. The next few steps are important because they set up your printer on the network. You should now be at the first printer screen (see Figure 3.10).
8. Here, you enter information about your printer. You can have multiple printers attached to the 3Server3. These printers can be a combination of LaserWriters and dot-matrix printers. Each printer needs a name and a port to

FIGURE 3.10 Printer parameters screen

Printer Parameters

☒ Com1: Description

☐ Com2:

☐ Com3: Form Type

☐ Com4: Baud Rate

☐ Com5: Buffer Size

☐ Lpt1:

☐ Lpt2: Retries

☒ Eject a page between jobs

☒ Print banner page

Protocol: ☒ XON/XOFF Parity: ☒ Even

☐ ETH/ACK ☐ Odd

☐ Hardware ☐ None

☐ Hardware & XON/XOFF ☐ "1"

☐ "0"

send signals to. In the description box, type the name of your printer. Now click Com1 as your first communications port. You can click Com2, Com3, etc., for any additional printers you are adding to the system. Defaults, Protocol, and Parity are set for you. If you need to alter the defaults, check your printer manual. The protocol and parity settings allow you to fine-tune your printer parameters. For the Apple LaserWrite, click the following buttons:

Protocol: XON/XOFF

Parity: Even

9. Click OK and you see another printer parameter screen. This printer form allow you to set up additional printer parameters. Click OK if you are not going to set up additional network printers.

FIGURE 3.11 Route parameters screen

3+Route Configuration Ver. 1.1.1

Route:

Comments:

Route to Headquarters

Network Number: 40E41

Phone Number: 408-555-555

COM Port: ANY Timeout: 3

Schedules:

Start: 00:00 Finish: 00:00 Mon Tues Wed **Thurs** Fri Sat Sun

← →

Configure Next Route Previous Route Quit

The next screens allow you to establish Route Parameters. See Figure 3.11.

Route parameters establish the modem links with remote connections. You need to be careful when setting up these communication parameters. You cannot use the same ports that are being used by the printer(s).

After the 3+ network is installed, your final dialog box dialog box looks like the one in Figure 3.12.

Once the network system software is installed on the 3Server3, you can install the various administrative services.

Macintosh Installation: User Services

Once your network system software and network services are installed, it's time to create user startup disks. Creating user

FIGURE 3.12 Final installation screen

disks is easy. The installation process uses the standard Macintosh installer utility. Here's the procedure:

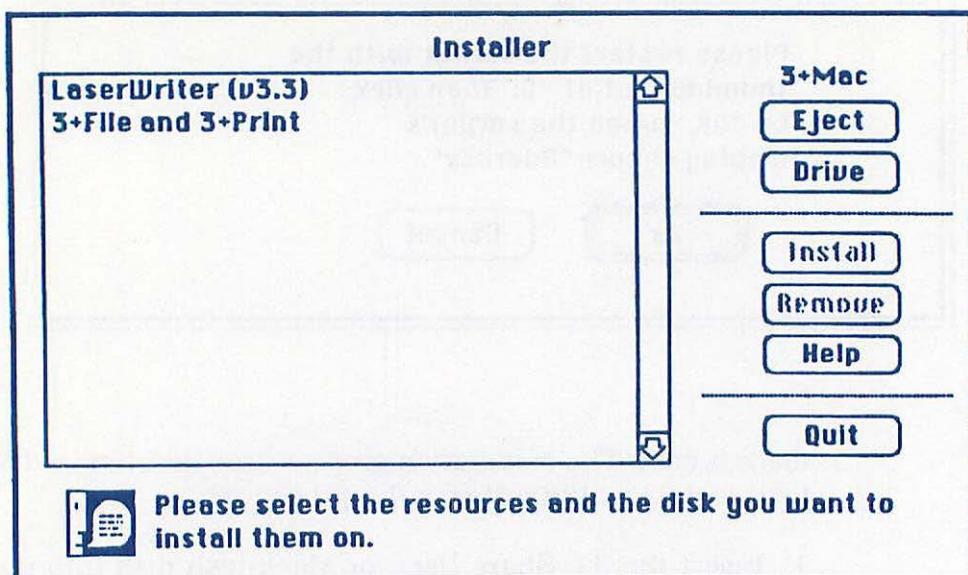
1. Insert the 3+ Share User for Macintosh disk into the internal drive.
2. Open the Installer icon. Your screen looks like Figure 3.13.
3. Click the Drive button until you see the drive you wish to install the 3+ system on. Select "3+ File" and "3+ Print" from the Installer menu and click the Install button.
4. Repeat this procedure to create as many user disks as you need.

Configuration and Topography

Your configurations and topographies can be as varied as your needs. You can combine AppleTalk personal networks and Ethernet networks. You can also bridge into the IBM Token Ring network. With products from Centram Systems and Farallon, your topographies can be any of the following:

- Serial
- Parallel
- Star

FIGURE 3.13 Installer screen



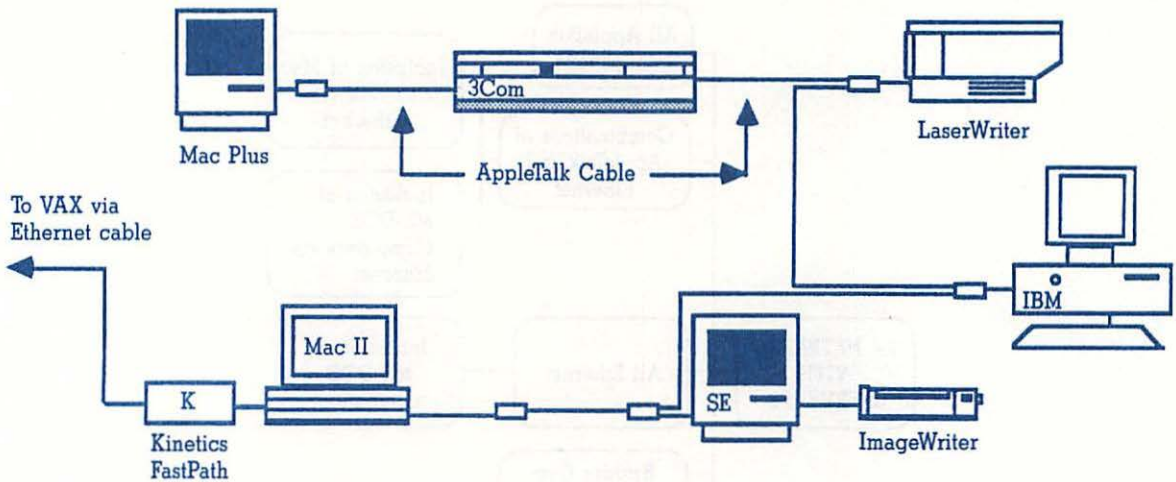
These configurations and topographies are designed to be used by Mac-only networks or Macintosh and MS-DOS combinations. In Figure 3.14 is a typical 3+ network configuration.

Remember, your bridges *must* be installed at the point where you wish to bridge into the different networks.

As you can see, the 3+ network allows you easily to integrate Macintosh and MS-DOS computers over different media. The table in Figure 3.15 is an overview of the various configurations available with the 3+ network. Since there are so many combinations, you can make your decision based upon your *needs* (much different from your wants).

NETWORK MANAGEMENT

Network administration with the 3+ system is complex. It would be crazy to attempt to provide complete details for managing a 3+ LAN. What is important is to appreciate the various administrative options available to you.

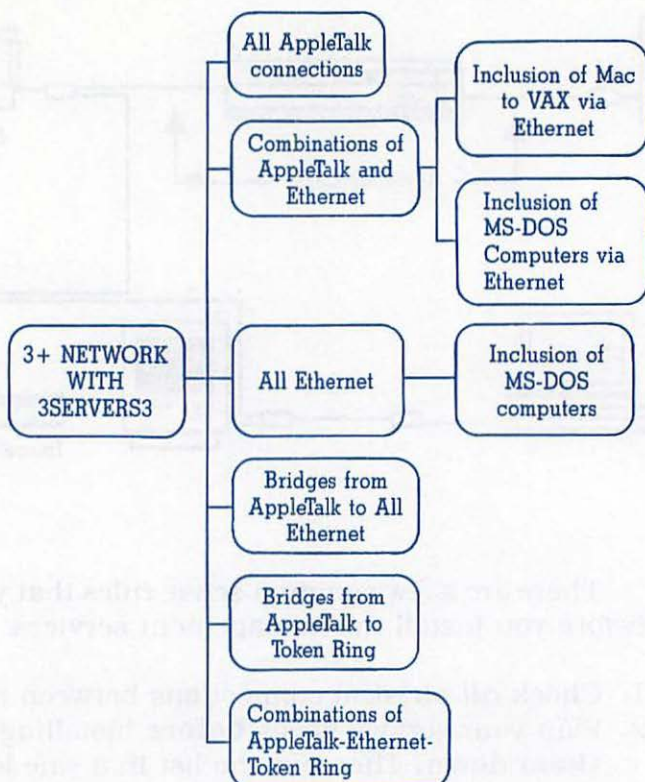
FIGURE 3.14 3+Network configuration screen

There are a few common-sense rules that you should follow *before* you install the management services.

1. Check *all* physical connections between machines.
2. Plan your service needs **before** installing and **write them down**. Then put the list in a safe location.
3. Make sure you have installed the basic 3+ services *before* you install the management services.

Remember, if you are integrating MS-DOS computers, you must set up the server with software from *both* the Macintosh and the MS-DOS computers. This ensures that both systems have the same services, names, printing resource information, and routing information. Remember to install the resources on the MS-DOS side first. Also, remember that MS-DOS users can print out configuration reports that provide you with a printout of the parameters you have set.

In order to begin to understand how the 3+ network can be administered, it is important to know the three basic services that you installed. These services are:

FIGURE 3.15 Configurations available with 3+

- **3+Name.** This service stores the various names used with the 3+ system.
- **3+Share.** The 3+Share includes file- and printer-sharing services and manages all information about shared folders and printers.
- **3+NetConnect.** The 3+NetConnect service is actually an optional service to install. It provides transparent access to other networks (Ethernet, Appletalk, or Token Ring).

To login as the administrator, follow these steps:

1. Turn on your Mac and insert your 3+ startup disk into the internal drive.
2. Insert the 3+ administrator disk into the external drive.
3. Open "Chooser" from the Apple menu. Select the 3+Plus Mac icon.
4. If you have multiple networks and/or zones, they will show up in their appropriate windows. A sample window with multiple networks and zones might look like the one in Figure 3.16. Select the network and/or zone you are connecting to and type in "ADMIN" as your user name. Then click the Login button.
5. At the Login window, type in your password (did you remember to write it down and put it in a safe place?) and click the Login button.
6. Close your Chooser window and open the 3+ Administrators application. You should now see your Network window, which looks something like Figure 3.17. This is the window where you set the access privileges and add or delete users, domains, aliases, groups, members, or servers.

FIGURE 3.16 Chooser window with zones

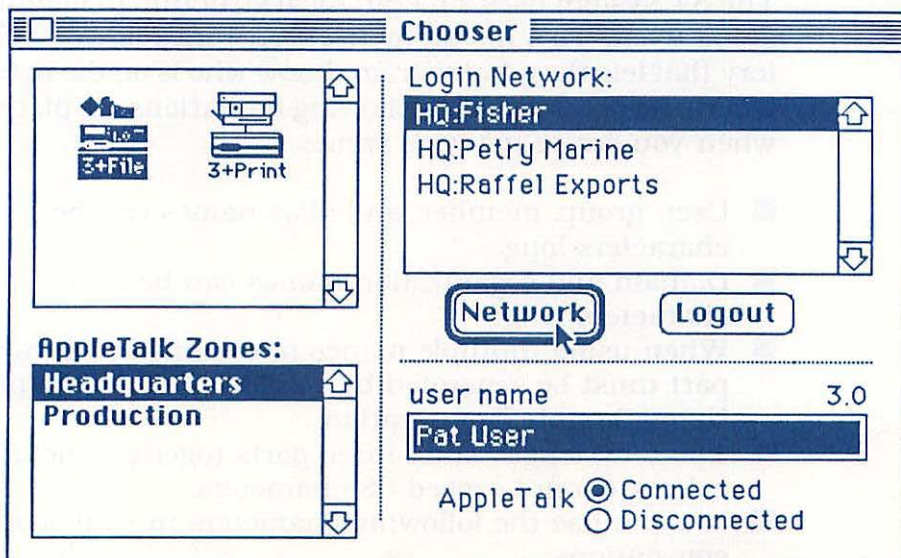
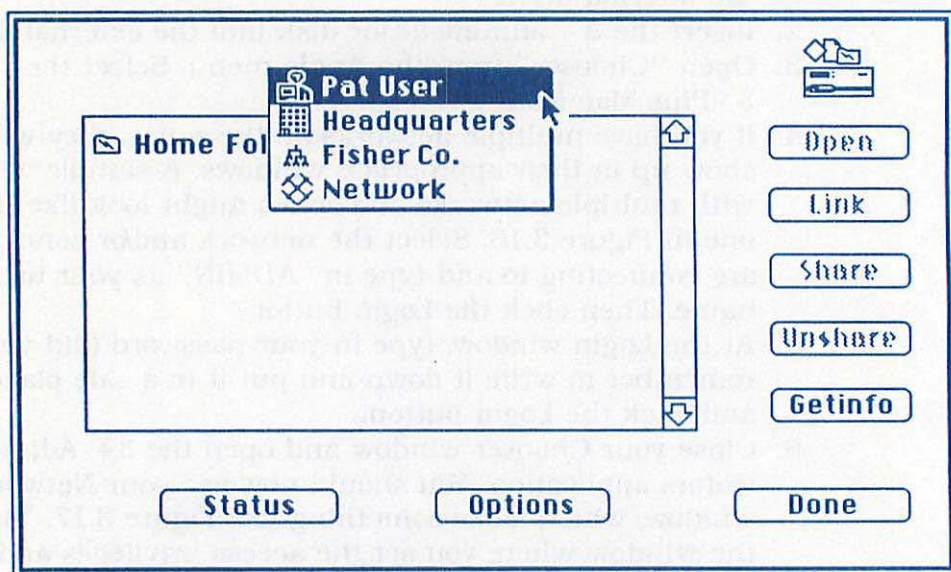


FIGURE 3.17 Network window



3+Name Service

The 3+ system uses a hierarchical structure to identify who is doing what. This hierarchy uses network names as the directory that lets the administrator know who is on the network and where the users are. The following limitations are placed on you when you create network names:

- User, group, member, and alias names can be 1 to 40 characters long.
- Domain and organization names can be from 1 to 20 characters long.
- When using multiple names to establish pathways, each part must be separated by a colon (:). For example, Name:Domain:Organization
- The total length of all three parts together, including colons, cannot exceed 58 characters.
- You can use the following characters in your naming conventions:

- Letters A to Z and a to z
- numbers 0 to 9
- special characters: dash (-) underscore (_), period (.), single quote ('), and blank ()

3+ does not distinguish between upper- or lower-case letters. Therefore, MARK VELJKOV:WRITERS:SEATTLE is the same as mark veljkov:writers:seattle.

As long as you follow these standard naming conventions, you will have no problem.

Here is the name hierarchy:

1. **Organizations.** An Organization is usually your company. Typically, there is only one Organization per network; you can, however, have more.
2. **Domains.** A Domain is a group or division within your Organization. If you have multiple networks within your Organization, you assign them as a Domain.
3. **User Names.** Each person that uses the 3+ network must have a user name.
4. **Groups.** Groups are generally part of a Domain. Using Group names is valuable for E-Mail services. When you use Group names, it becomes easy to leave messages for a select group of people within a Domain.
5. **Members.** These are all of the User, Group, and Alias names that make up a Group or Domain.
6. **Aliases.** These are nicknames, shortened names, secret decoder names, etc., for existing Users, Groups, and Servers.
7. **Servers.** Since you can have multiple servers connected together, each Server must have a name.

Each of these areas is dependent on the others. Most would call this interdependence "symbiosis"; the computer industry calls it "synergy." You can have domain names without group names and vice-versa. But in very complex network configurations, using all the varieties of names simplifies file and E-mail transfers. Reaching the various levels is handled by the standard Macintosh Hierarchical Filing System (HFS).

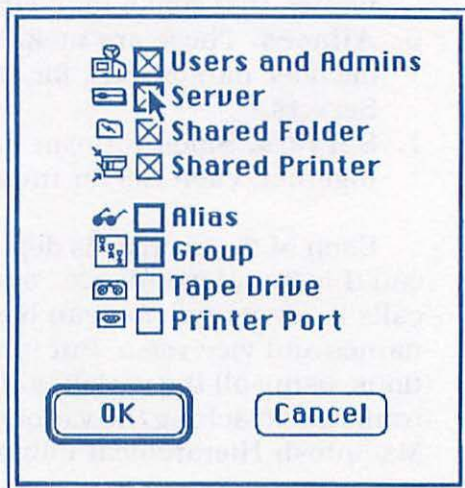
After you login as the administrator, you will see the Network window. In the middle of the Network window is the name "Admin" with a small icon next to it. Click on this icon and a menu drops down. What you see is a listing of Domains on your network. Select a Domain and you see an extensive list of Servers, Groups, Members, Aliases, and Users. Some of the listings in the Network window may include a complete path of names. For example: Users:Domains:Organization. The following procedure will show how deep you can go into the hierarchy:

1. Select the Admin icon in the middle of the Network window.
2. Click the Options button.
3. Your screen should now look like Figure 3.18.

Click the appropriate names that you want to view and then click the OK button. The names and services checked will appear in the Network window after you select a Domain.

Names can be set up and changed when you login as the administrator. In the Network window there are two menu selec-

FIGURE 3.18 Options window



tions that will let you add or delete users, servers, domains, members, groups, etc. These menus are Options and Add. Add is self-explanatory and allows you to add a user, server, domain, group, alias, or member. The options menu lets you delete the same. To delete a name of any type, select "Delete Item" from the Options menu. To add or delete a name, you have to click through the various levels of names to get to the level you want. To change a user, click through the organization to the domain, to the group, to the user. Once at the user level, you can add and delete a user or add and delete an alias.

There is another option for altering existing information about a server or a domain. Once you have selected the appropriate domain from the Network window, select the server, group, or user you wish to modify. Now click the Get Info button. The Get Info window supplies you with information about the particular name you have selected. You may now alter most of that information within the Get Info window.

3+Share File Service

3+ file serving works very much like the AppleShare™. Each user on the network is assigned a "Home Folder" and its location. The Home Folder is where each user stores his or her data. Keep an accurate record of disk space remaining on the server. Each Home Folder automatically expands with more data, and it may not take long to use up the storage space on a server. Since the 3Server3 can be partitioned into multiple drives, it's a good idea to assign specific drives to specific groups or users.

Once users are logged into their Home Folders, they can create folders for shared data. This is where the similarities to AppleShare become clear. Here's the procedure for creating shared folders:

1. Open the Home Folder.
2. Create new folders. One of the folders will be designated as the "Shared Folder." Shared folders are used to hold any applications or files that you wish to share on the network. Non-shared folders are used to store the data you do not want to share.
3. Open "Chooser" from the Apple menu.

4. Find and select the folder you want to share and then click the Share button.
5. You will now see the Share window, which looks like Figure 3.19. As you can see, this is where you set the access privileges for shared folders and their enclosed files. Figure 3.20 illustrates the various rights, what they are used for, and comments.

CAUTION: Use the "Write" or "Create" access rights with **extreme** caution. If you assign these rights for folders that contain *non-multiuser* applications like MacDraw, users will need to modify files *one at a time*. Trying to access and modify a file simultaneously will damage the file, folder, and contents of the folder. If you want to use non-multiuser applications in a shared folder, set the access rights to "Private" or "Read-Only."

FIGURE 3.19 Share folder window

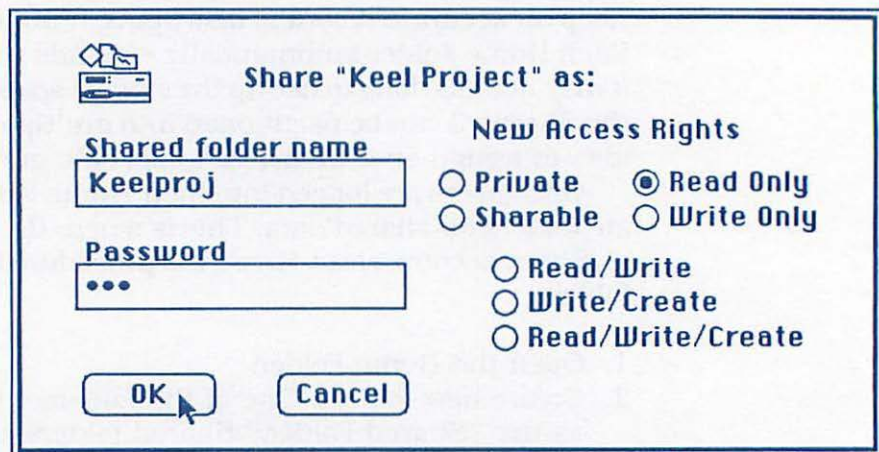


FIGURE 3.20 Access rights table

Access Right	Meaning
Private	Only one user at a time can access the folder via the volume name. A password must be assigned by the creator for other users to have access.
Read Only	Users can read files and folders, but cannot modify them or create new ones.
Shareable	Users can create new volume names for the folder, as well as read, modify, create, and delete files and folders in the volume.
Read, Write, Create	Users can read, modify, create, and delete files or folders in the volume.
Read, Write	Users can read from and write to files and folders within the volume.
Write, Create	Users can modify, create, and delete files and folders within the volume, but cannot read them.
Write Only	Users can modify files in the volume, but cannot read them or create new ones.

3+Print Service

Setting up network print services is probably the most complex part of the 3+ system. Most of the printer service should have been set up when you first installed the services. Printers are as much of a shared resource as the server is. You can access printers just as you can access various servers on the network. You can also link into printers that are in different network zones.

Printer services are set up to print documents in the order they are received. The documents are placed in a **que** and held there until the printer is ready for them. The 3+ system allows you to alter this que by setting the priority of the print jobs in the que. The lowest priority is 1; the highest is 99. Unless you change it, the default priority for all print jobs is 50. All print jobs remain in the que until it is their turn to be printed. As net-

work administrator, you can change the priority of any user's print job. You can also delete any user's print job from the print queue. This is a valuable feature when you have to deal with "printer hogs." Printer hogs are users who monopolize printing services. One of the more powerful printing features is the ability to move an entire print queue to another printer on the same network—wonderfully convenient if one printer should malfunction in the middle of an important project (as it will, according to Murphy's law).

Altering printing services is similar to creating shared folders and setting network parameters.

1. From the Chooser, login as the "Server-User" on the server to which the printer is connected.
2. After logging in, close the Chooser window and double-click on the Admin application.
3. Open "Chooser" from the Apple menu and select the 3+Print icon. The names of network printers should show up in the Chooser window. Select the shared printer you want to change. Close the Chooser window and you will see the 3+ Network window.
4. Select the shared printer and use the Printer menu to set options, show printer status, move a printer queue, and change printer configuration. A basic explanation follows of how to login and alter printer functions. In brief, once you login you can:
 - Designate a printer as shared
 - Change a printer's password
 - Change a printer's name
 - Change a printer's configuration
 - Reorder a print queue
 - Move a print queue
 - Unshare a printer

Hardware Provided

Macintosh: 3Server3
AppleTalk connectors
Ethernet adaptor card for Macintosh II

Software Provided

Macintosh: 3+ Network Software

3+Name
3+Share
3+Mail
3+Backup
3+Route
3+NetConnect

IBM: 3INSTALL

3+ Installation #1 (drivers) for Macintosh
3+ Installation #1 (3Server) for Macintosh
3+ Installation #1 (3INSTALL) for Macintosh
3Server/3+ System for Macintosh
3+Share 3Server/File and Print for Macintosh
3+NetConnect for Macintosh

PRODUCT PRICE(S)

Macintosh: 3Server3 \$5,995
3+ \$495

Product Pros

■ The 3+ network is both flexible and powerful. 3Com's 3+ network should satisfy all of your LAN needs and then some! The many services provided by the 3+ system provide a user with excellent file-sharing capabilities, printer sharing, and network management.

■ The 3+ network is not designed for small (four to five Macs) networks. Its sophistication is revealed in large networks that integrate multiple LANs over different media. The 3+NetConnect service makes these internetwork connections work. The power behind the 3+NetConnect service is not just the integration of Macintosh and MS-DOS com-

puters. It lies in its capacity to link the Mac to Ethernet or Token Ring LANs with one click of the mouse button.

■ File and printer sharing are positive and powerful features. The Extension Mapping Table used by 3+ can automatically create Macintosh files from MS-DOS files. While these may not be perfect conversions, they truly integrate the Macintosh and MS-DOS operating systems. File sharing is very similar to AppleShare. Users control access rights to folders and files they create. The many file-sharing access rights provide control for single-user applications. Built into the 3+ file-sharing system is control for multiuser applications as soon as more of them become available for the Mac.

■ Considering how slow the LaserWriter can be, 3+ print sharing allows multiple printers to be attached to the same server. While this feature is not especially new, the added capabilities of altering and moving the entire print que are. Users can now search for a printer that is either not busy or can give them a higher priority in its que.

■ A key element in any LAN is the capability to find your way around. It's all done with names. The 3+ name service offers a system that helps users know who are on the network and what they are doing. The best part of this name service is that it operates just like the standard Macintosh Hierarchical Filing System (HFS). Users don't have to learn complicated command syntax simply to log into a new domain.

■ The lack of a complex command syntax is another key feature of 3+. Users can share files and printers, change networks, and send mail through interaction with the standard Macintosh user interface. Macintosh users need not learn bizarre codes, obscure languages, or alien messages to accomplish the basic tasks of 3Com's LAN.

Product Cons

■ The 3+ network is complicated to set up and configure, especially when you are bridging to other LANs, and it takes a good deal of preplanning and consultation. For companies who want to integrate Macs into 3+ networks that are already in place, the installation process should be easier. Setting up a complete 3+ system from scratch can take a couple of hours or more. For Macintosh-only networks, the 3+ system may be like trying to cross Lake Erie in the Queen Mary—a comfortable trip once you get under way, but is it worth the hassle of getting started?

■ Likewise, small Macintosh-only LANs probably don't need the power of the 3+ network. Where 3+ really shines is in its ability to bridge into alien networks—"to boldly go where no man has gone before."

Apple Computer, Inc.

Company name: Apple Computer, Inc.

Address: 20525 Mariani Ave.
Cupertino, CA 95014

Telephone no: (408) 996-1010

Product name(s): AppleTalk™
AppleShare™

Type of LAN: 1. AppleShare—file server software
2. AppleTalk board for IBM PC and clones
3. LaserShare—LaserWriter software for allowing MS-DOS computers to access the Apple LaserWriter.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
IBM PC/XT/AT
Most IBM clones

Network wiring supported: AppleTalk twisted-pair
Farallon twisted-pair
Fiber-optic
EtherNet

Maximum length of network: 1,000 feet without repeaters

Maximum number of users: 32 without repeaters

Network speed: AppleTalk coaxial—230.4K
PhoneNET twisted-pair—230.4K
Fiber-optic—Over 2 Mbytes
EtherNet—1 to 3 Mbytes

PRODUCT DESCRIPTION

Apple has historically relied on third-party developers to create products for their computers. Now Apple itself has entered the LAN field. Actually, Apple has been in the LAN field since 1985, when it introduced AppleTalk as a method for connecting the Macintosh to the LaserWriter. Then Apple announced a number of enhancements that would provide additional network features, including an AppleTalk board for the IBM PC, a file server, and hard disks. That was two years ago. Most of these products are just now becoming available.

Even though it has taken the company two years to get their LAN products to market, Apple has created a new LAN standard called AppleTalk! AppleTalk is more than just a cable and small white connector; it incorporates all of Apple's networking structures as well as a basic structure for developers to follow when developing Macintosh LAN products. This structure comes in the form of communication standards called the Apple File Pro-

tol, or AFP. Besides the AFP standards, Apple has created networking products of its own, which fortunately have entered the market at a time when buyers are beginning to take the Macintosh seriously. Apple now sells several LAN products. They are:

- AppleShare™
- AppleTalk PC Card™
- LaserShare™

AppleShare and the AppleTalk PC Card are examined here. Check out Chapter 4, “LAN Peripherals,” for a description of LaserShare.

Before describing AppleShare and the AppleTalk PC Card, it would be good idea to look at the background behind the Apple File Protocol (AFP). The philosophical and operational structure of AFP set the standards for all subsequent Macintosh LAN products.

Apple File Protocol

Several companies were offering LAN products for the Mac before Apple entered the race. Tangent Technology’s PC-MacBridge, Centram’s TOPS, and Infosphere’s MacServe were the first Macintosh LAN products. One of the many problems these early developers faced was a lack of networking standards. Apple had plans. It intended to introduce new and more powerful Macintoshes and to create a communication standard that would exceed existing technical specifications. Thus the Apple File Protocol was born.

AFP standards were developed by Apple in conjunction with its AppleShare file server. Their purpose was to provide developers with file protocol standards for LAN development tools so they could create products that would adhere to the Macintosh standards. Mac users do not tolerate programs that are not “Mac-like.” In the past, the world of LANs resembled an adventure in the Twilight Zone. Mac users refused to tolerate the codes, commands, and mumbo-jumbo associated with the traditional LAN. AFP standards give developers the necessary tools to create LAN products that have the look and feel of the Macintosh—

easy to learn, easy to use. Above all, communication is easy with products that follow AFP standards; users can send and receive information over a LAN with a simple click of a mouse.

AFP is part of the AppleTalk standards. Actually, AppleTalk is Apple's LAN. The AppleTalk Personal Network (APN) is just one implementation of AppleTalk. The components of AppleTalk closely follow the traditional OSI standard. Figure 3.21 shows the comparison of AppleTalk to the OSI model.

As you can see, AppleTalk encompasses many different communication elements, with plenty of room allowed for expansion and improvement. AFP is the most important part of the AppleTalk network—the part the end user has to deal with. Like the presentation layer of the OSI model, AFP standards give users “What You See Is What You Get” (WYSIWYG). Along with Apple Corporation, other AppleTalk developers are incorporating the AFP standards into their AppleTalk products.

FIGURE 3.21 AppleTalk-OSI comparison

OSI	AppleTalk
Application	Application Specific Protocols
Presentation	Apple File Protocol (AFP) PostScript
Session	Apple Session Protocol Apple Data Stream Protocol
Transport	Apple Transport Protocol Zone Interconnection Protocol
Network	Datagram Delivery Protocol
Data Link	AppleLink Access Protocol (ALP) Ethernet
Physical	Twisted-Pair (Apple, Farallon) Coax, Fiber Optic, PBX, Other

AppleShare

AppleShare is Apple's file server, providing dedicated file serving for Macs and IBMs on the AppleTalk network. AppleShare is set up on a single, dedicated Mac that becomes the physical center of your network and its activity. Thus dedicated, your AppleShare server cannot be used for any other purpose.

AppleShare is installed in either of two ways, as a server or a user's workstation. AppleShare provides full file-serving capabilities. It does this in several ways. It gives users direct control over storage and use of files residing on the server. Users can determine which files and/or folders can be read, written to, or listed by other users on the network. AppleShare allows both individual workstations and groups of workstations access to the file server. With this approach, and with multiple servers on the same network, you have some powerful controls over the allocation of work assignments. Some individuals like to work alone, while others are more productive working in a group. AppleShare allows users to work either way and still enjoy the convenience of the LAN.

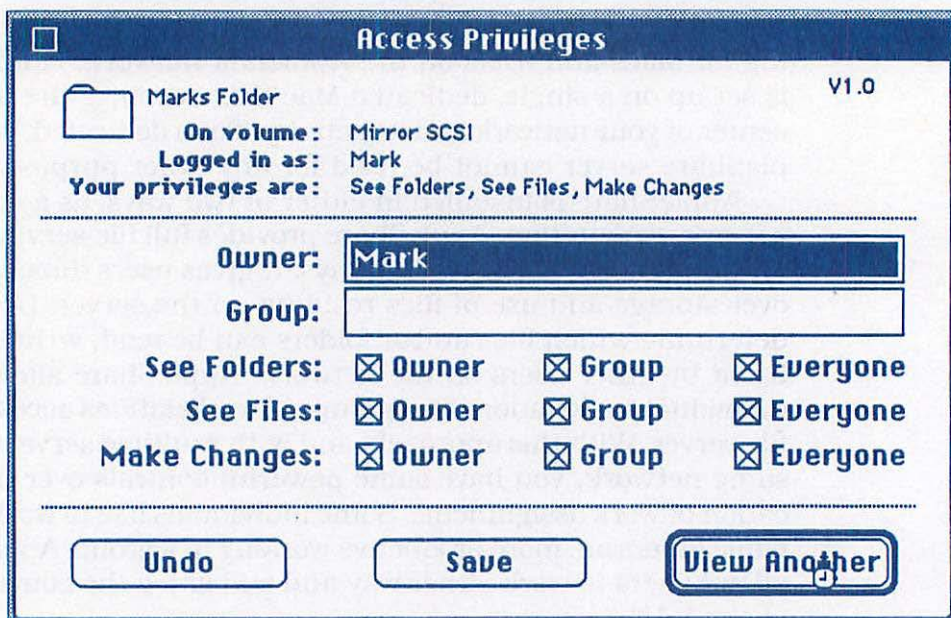
AppleShare lets users set access privileges via a desktop accessory (DA). To those familiar with MacServe or TOPS, the DA approach is nothing new. When "Access Privileges" is selected from the Apple menu, you see the screen shown in Figure 3.22. The Access Privileges screen allows each user to set access levels and passwords. Access privileges give the individual workstations powerful control over users' access to files.

As mentioned, AppleShare requires that at least one Mac is given over to central file-serving purposes. Even though you have to dedicate a Macintosh as a file server, you can add one network server application to run concurrently with the others. This might be a company database or an E-mail application such as Inbox. You can have more than one of these applications on your server, but only *one* application at a time can be active.

AppleTalk PC Card

The AppleTalk PC Card was announced by Apple in 1985. Needless to say, it never came to market. Tangent Technology was the first to introduce a PC card, called PC MacBridge, that al-

FIGURE 3.22 Access Privileges screen



lowed MS-DOS computers to share the LaserWriter on the AppleTalk network. Since the PC MacBridge introduction in 1985, Tangent has added many more features to its Macintosh product line. Now Apple has finally gotten into the act. Its AppleTalk PC Card is designed to accomplish the same functions as PC MacBridge and TOPS PC card. It integrates the IBM PC/XT/AT (or any IBM clone) into the AppleTalk network. Apple, however, has not developed AppleTalk network drivers for the AppleTalk PC Card. In other words, once your MS-DOS computer is attached to the network, you need some software to allow it to talk to the LaserWriter, other Macs, and file servers. The AppleTalk PC Card can use Tangent's PC MacBridge software, MacServe, or TOPS for effective integration of the MS-DOS computer into the AppleTalk network.

SETUP AND INSTALLATION

These installation steps are for the AppleTalk Personal Network (APN). Bridging to other networks requires certain other special procedures. Check out the installation steps for some of these products to see how they connect to the APN. Some of these products are covered in Chapter 5.

Both the server and the user nodes are easy to set up. There is a “Server Installer” and a “Workstation Installer.” You must use the newest System and Finder files designed for AppleShare, and they should be included with AppleShare. AppleShare was initially designed to operate with System 3.2 and Finder 5.3, and these versions work fine. However, Apple is sure to update both the System and Finder files. To be sure you have the most current version, check with your Apple Computer dealer. To see the version number of the System and Finder, insert either the Server Installer disk or the workstation disk into a drive. Click on the System File icon and select “Get Info” from the File menu. This should tell you the version number. At your Desktop, select “About Finder” from the Apple Menu. This dialog box shows you the version number for the Finder.

Server Installation

Since the server requires a dedicated Macintosh, it is best to install your server software first. Servers are installed on hard disks. You can have more than one hard disk attached to the Mac that is acting as your server, but only one of these can be a startup server. The other hard disks become “Volumes” for network use. Follow these steps for installing your AppleShare server:

CAUTION: Open the Control Panel from the Apple menu and click the “Connected” button for AppleTalk *before* installing the server. Then shut down and install the server.

1. Make sure all AppleTalk connections are secure.
2. Make sure your server has the new version of System and Finder.
3. Boot the Mac that is to be used as the server. From the Apple menu, select "Control Panel" and make sure that AppleTalk is activated. If AppleTalk is not connected, click the "Connected" button. Close the Control Panel window.
4. Insert the Server Installer disk into the internal drive. Double-click on the Server Installer disk icon.
5. Double-click on the "AppleShare Admin" icon, shown in Figure 3.23.
6. AppleShare looks for any AppleTalk system files on the designated hard disk and then tells you that it can't find any. Click "OK", and AppleShare will install the necessary system files and administration programs for AppleShare.
7. After the server has been installed, you set it up for network use. This is where your preplanning (remember doing that?) pays off. If you re-boot your Mac, it starts up as the network file server. Initially, you have no users or group set up, so that if users try to logon they will get a message that they are not registered with your server.
8. AppleShare now creates a new Users & Groups file where you will store user and group information. Ap-

FIGURE 3.23 AppleShare Admin icon



AppleShare Admin

pleShare prompts you to select a Users & Groups file or create a new one. When installing a new server, simply click the "New" button. AppleShare does the rest.

9. After creating a Users & Groups file, you have to assign the server a unique name identifying the server to the network and an "Admin Key." Your screen should now look like the one in Figure 3.24.

The Admin Key allows an administrator access to the AppleShare Admin file (the one you used to install AppleShare) *after* the server has been shut down. Be sure to write down the name of your Admin Key. The Admin Key acts like a password for the person responsible for administering the network. Without the Admin Key, no one can set network-wide access privileges or create new users and new groups.

10. Now AppleShare asks you to set up the server "Custodian." You need to name and assign a password for your custodian. See the Custodian screen in Figure 3.25. Every server must have a custodian. A custodian is a user who becomes the caretaker of all unowned folders on the

FIGURE 3.24 AppleShare Admin Key screen

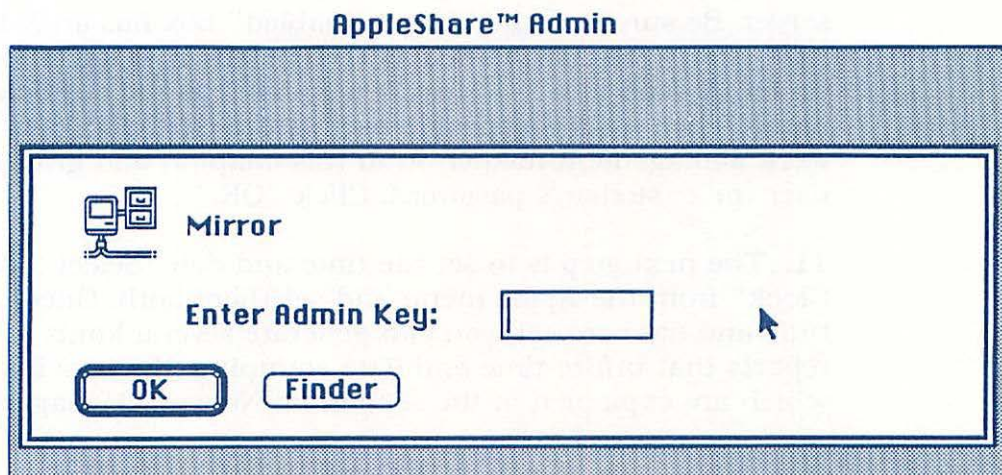
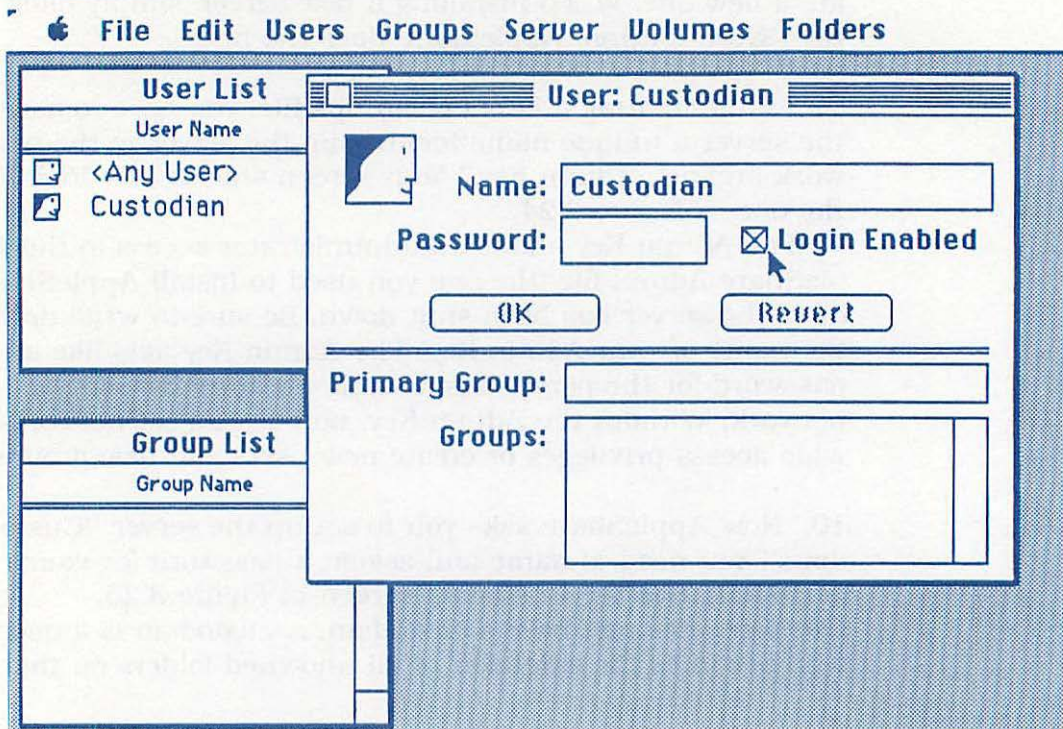


FIGURE 3.25 Custodian screen



server. Be sure that the "Login Enabled" box has an X in it. This allows the user named as the custodian to logon to the server. A good idea is to use "Custodian" as the custodian's name. Then assign a specific user as the custodian (see Network Management further on in this chapter) and give *that* user the custodian's password. Click "OK."

11. The next step is to set the time and date. Select "Alarm Clock" from the Apple menu and set them both. Once the time and date are set, you can generate several kinds of reports that utilize time and date stamping, the benefits of which are explained in the section on Network Management.

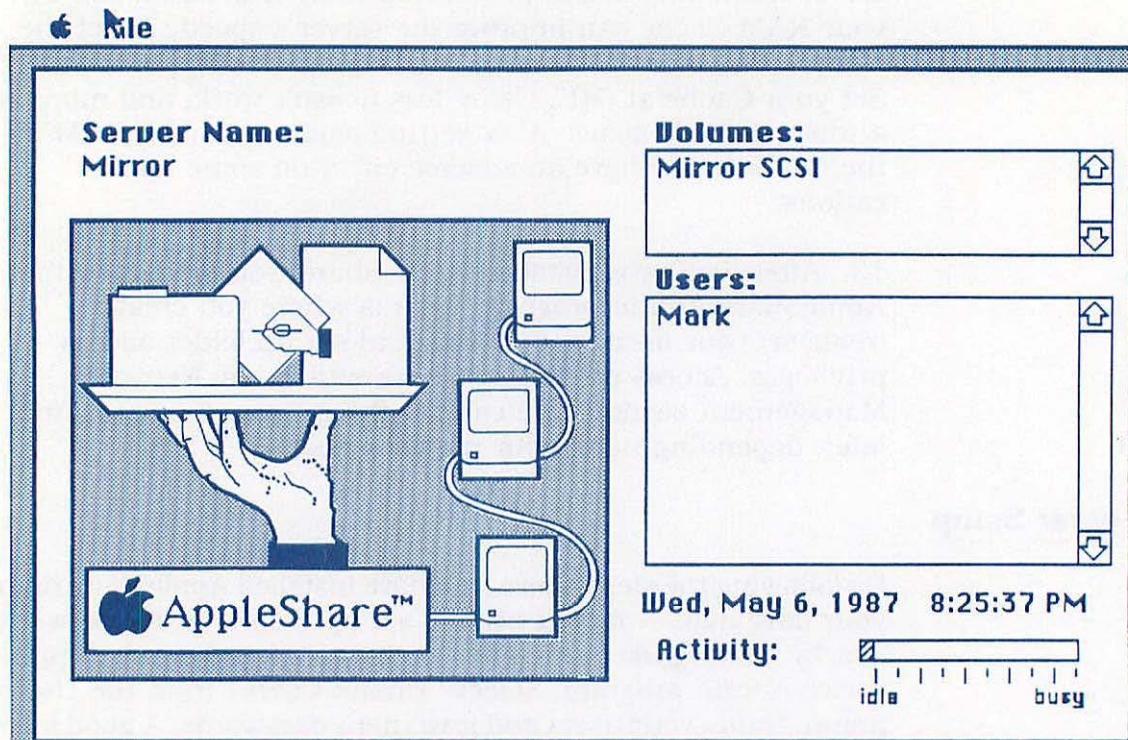
12. The last step is setting your RAM Cache. Since the server frequently stores bits of information in RAM, setting your RAM Cache can improve the server's speed. To set the RAM Cache, use the Control Panel under the Apple menu. Set your Cache at 64K. Using less doesn't work, and more is a waste of RAM space. Also, setting aside too much RAM in the Cache could have an adverse effect on some applications.

13. After you have installed AppleShare, you are left in the AppleShare Admin program. This is where you create (register) your users and groups and set up folder access privileges. Access privileges are covered in the Network Management section. You can set them up now or wait until later, depending upon your network needs.

Server Setup

By following the steps above, you have installed AppleShare onto your hard disk. Now you need to set up the server for network use, by naming users and groups. You are already in the AppleShare Admin program. Select "Create Users" from the Users menu. Name your users and give them passwords. A good idea is to have your users write this information on a small slip of paper ahead of time. You can also create groups of workers with equal access to specific folders. As with access privileges, groups can be set up at a later time. Usually, after your LAN has been in operation for a while, natural groupings of workers begin to take shape. It may be wise to meet with the LAN users and let them decide whether or not they want group access on the network. After you have created your users and groups, set access privileges, and so on, you can quit and reboot your new AppleShare file server! Your system will inform you that it is checking your startup volume. This checking process might take two or three minutes, but don't be alarmed. If the installation has gone well, you should soon see an AppleShare screen that looks like the one in Figure 3.26.

FIGURE 3.26 AppleShare screen



Workstation

Installing AppleShare on workstation disks requires some simple preplanning. You can install AppleShare on startup disks that contain nothing more than system files, or you can install AppleShare on application disks. Installing on application disks means you do not intend to use the applications on the server. This approach may be acceptable if you are interested in storing only your data files on the server. There are both pros and cons with this approach.

PROS

- You can customize your application disk to include exactly what you need. You are not dependent upon the server's system.
- Using the server's system can slow network access time.

CONS

- If you are logging onto the network from a floppy, you may not have enough room on your disk for an application, a system folder *and* AppleShare. You can, however, delete desk accessories and fonts to free-up the necessary room.
- You do not have access to all the fonts and desk accessories that might be available if you were using the server's system.

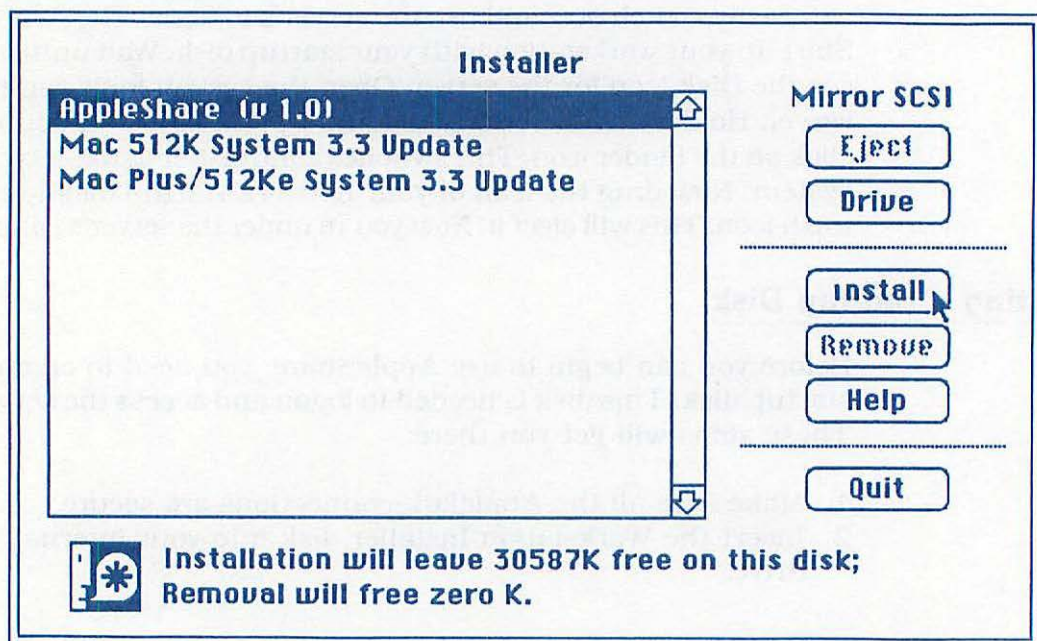
If you create a network startup disk with no application, you can easily switch over and use the server's systems. Here's how: Start up your workstation with your startup disk. Wait until you see the Disk icon for the server. Open the system folder on the server. Hold down the Command and Option keys and double-click on the Finder icon. This switches control over to the server's system. Now drag the icon of your network startup disk to the trash icon. This will eject it. Now you're under the server's control.

Creating a Startup Disk

Before you can begin to use AppleShare, you need to create a startup disk. This disk is needed to logon and access the server. These steps will get you there:

1. Make sure all the AppleTalk connections are secure.
2. Insert the Workstation Installer disk into your internal drive.

3. Insert a startup disk with or without an application into the external drive. This startup disk must have a system folder on it. You can use a hard disk connected to the workstation. It doesn't matter if the System and Finder are the current ones needed for AppleShare; you'll be able to make the necessary changes when you install AppleShare.
4. Open the Workstation Installer disk. As you will notice, there are two folders and the Apple Installer application. Double-click on the Installer application.
5. Your screen should look like Figure 3.27.
6. Click on the "Drive" button until you see the name of your startup disk.
7. If you need to update the system on your startup disk to the newest system, click on the appropriate system update name. There is one for the Macintosh 512K and one

FIGURE 3.27 Installer screen

for the Macintosh Plus. Select one of these and click the "Install" button. If your startup disk already contains the newest System and Finder files, you can proceed directly to installing AppleShare.

8. Select the AppleShare (V 1.0) name and click the "Install" button. The Installer does the rest.

You can create as many workstation disks as you need, but you're allowed only one server installation. AppleShare installation is quite painless. The Macintosh alerts you to what is going on and notifies you with dialog boxes to do specific things.

Final Installation Points

Before you get your network up and running, there are a few last-minute points to cover.

1. Shut all computers down and turn them off.
2. Double-check each and every connection to each and every computer and peripheral.
3. Start up the server first.
4. Check out the network. Before daily work begins, make sure your server is talking to your users. Ask a few users to save some files to a folder, others to access applications, and so on.

Following these steps helps to ensure a smooth transition to actual network operation. It is easier to work out bugs and kinks before users begin to demand network time.

CONFIGURATION AND TOPOGRAPHY

AppleShare follows the standard APN configuration and topography. You can use the standard serial topography. If you want to use any other topography, such as a star, you'll need some special adaptors and programs; Apple doesn't sell the necessary hardware and software to make a star topography. The APN is limited to serial topography. If you would like to do a star, "H", or parallel topography, check out Farallon Computing or Cen-

tram Systems West, companies that offer products that give more flexibility to the AppleTalk Personal Network. Apple *does* support internetwork connections, however, and there are bridges and boards that allow you to connect the APN to Ethernet or IBM Token Ring. (See Chapter Four for companies that sell these products.) As always, you must avoid loop topographies. In Figure 3.28 is an example of typical serial AppleTalk topography.

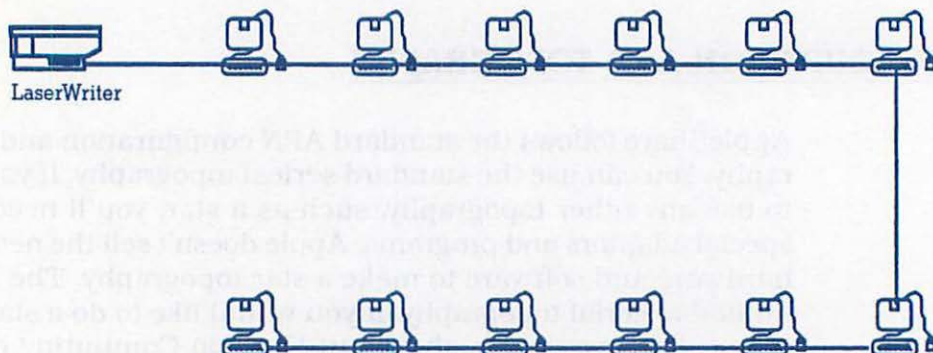
Cabling

With AppleShare and the APN, you have two cabling choices. The first is the standard AppleTalk twisted-pair cable, which comes with your AppleTalk connectors and has a maximum length of 1,000 feet between network nodes. The other type of cable is twisted-pair telephone line, which gives you the advantage of using existing telephone lines. With PhoneNet™ connectors from Farallon, you can use either existing or new telephone lines and expand your distance between nodes to 3,000 feet.

■ NETWORK MANAGEMENT

At times, network management with AppleShare can be somewhat confusing. However, with thorough planning and discussion beforehand, an AppleShare network is relatively simple to

FIGURE 3.28 AppleTalk serial topography



administer. Since you are using a dedicated server approach, it is important for management and users to understand the “rules of the road”—things that you can and cannot do with AppleShare. Unlike other LANs, AppleShare provides quick, easy, and controlled access to volumes, folders, and files. At the same time, it is easy to lock a user out of a specific folder, thus locking that user out of any other folders or files contained in that main folder.

AppleShare doesn't require a highly trained systems administrator to manage the network—one of the most attractive features of Macintosh LANs. Anyone with some knowledge of computers can learn to administer an AppleShare LAN. However, all this ease of learning and use doesn't eliminate the need for *preplanning* and *communication*!

Network administration and management is handled by the “AppleShare Admin” file, the same file that you used to install the network server. Double-clicking on this file provides the tools to set passwords, allow folder and file access, create users, and define groups. Two reports are available, the Server Report and the Volume Report. Both of these reports provide a systems administrator or a manager with valuable network information. The Server Report lists all registered users and their group membership. It tells you how many files and folders are in each user's volume and how much space these files and folders occupy.

There are two main levels of network management with AppleShare. The server level and the user, or workstation, level. Each level provides a variety of options for controlling the way files, folders, and applications are accessed and manipulated.

Before you begin to configure your folders, groups, etc., we should cover some basic AppleShare terminology and concepts.

■ **Volume.** A volume is a hard disk attached to the Mac dedicated to AppleShare. Several hard disks can be attached to the Mac, any or all of which can be designated as volumes for network use. Of these volumes, one can be designated as the startup volume.

■ **Server.** You may have several servers on the same network. Each server must be clearly identified, i.e., must have a unique name on that network. The server controls who

has access to files, and the kind of access users have to these folders and files. You cannot use one server to control access to other servers on the same network.

■ **Custodian.** This is the caretaker of all unowned folders, the person who was established as custodian when you installed AppleShare. A smart idea is to leave the name of the custodian as “Custodian,” when you assign a user or administrator to be the custodian. Only the custodian can access folders and files that are unowned or were on the hard disk *before* AppleShare was installed. The server automatically assigns the custodian any folders with incomplete information about who created and owns them.

■ **Access privileges.** Access privileges control the amount of privacy provided by the server and user. Access privileges can be set by selecting “Access Privileges” from the Apple menu. Anyone on the network can set access privileges, but the administrator has total control over these privileges. The user who has access to AppleShare Admin can use AppleShare to control the access privileges to any volume or folder on the server, including users’ private folders.

■ **User.** A “user” is anyone who is registered as a user on the server and identified by his or her unique network name. A user may or may not have a password.

■ **Guests.** A “guest” is an unregistered user, anyone who logs on to the network without a password or a registered user name. Guests cannot own a folder. Guests who create a folder turn over access privileges to the custodian.

Server/Administrator-Level Management

To get to the server, or administrator, level, double click on the file “AppleShare Admin” and enter the password. From here you can control access to your server’s folders and the functions of the main user categories.

There are three user categories:

1. **Owner.** The owner of a folder is the person who created a folder or was assigned ownership.
2. **Group.** Any group that the administrator created, usually consisting of users with common interests, files, or applications.
3. **Everyone.** Anyone who logs on to the server, whether a registered user or a guest.

As the network administrator, your job is to determine the access privileges for the three user categories, based upon access to *folders*. Access privileges are set for folders and files *within a specific folder*. The privileges that you can assign are:

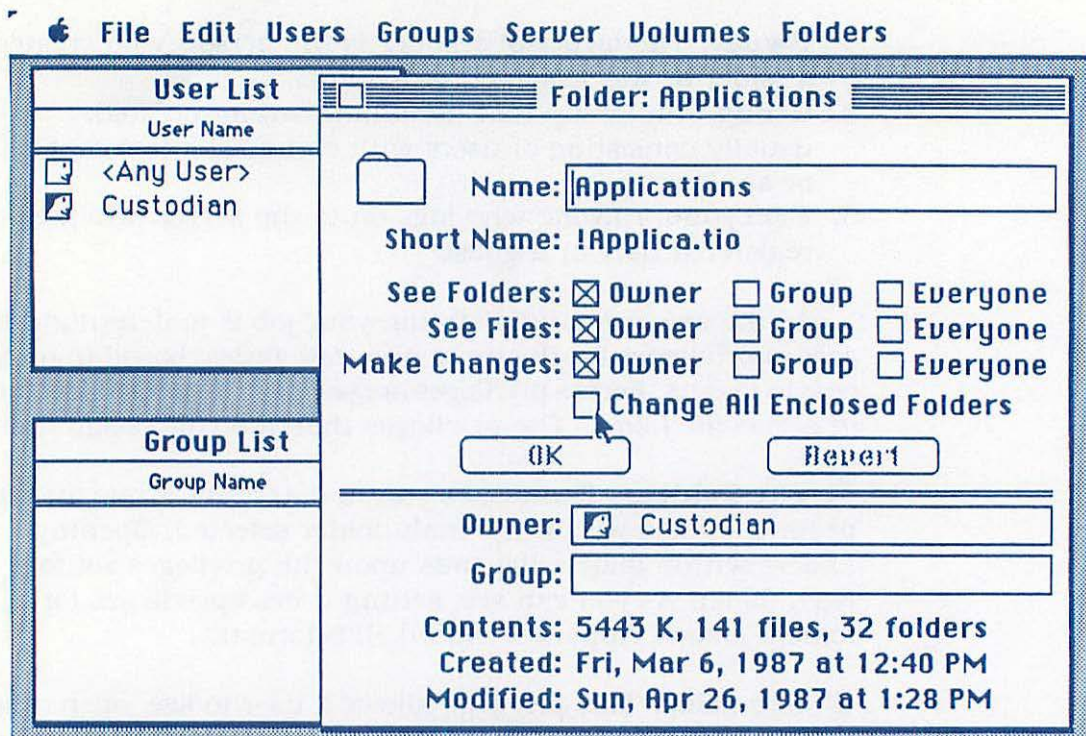
■ **See Folders.** This allows you to determine who can see or open folders within the main folder selected. Opening folders within folders depends upon the privileges set for each folder. As you can see, setting access privileges for folders follows Apple's standard HFS format.

■ **See Files.** This privilege allows a user to see, open, and copy documents and applications within a particular folder. Be careful when setting this privilege. Some applications, especially those that don't adhere to AFP standard, need to have *both* "See Files and Make Changes" set before the application will work. If a particular application begins to consistently bomb, reset the folder containing that application. Then set it to "See Files and Make Changes" (see below).

■ **Make Changes.** This allows a user to make changes to the contents of the folder, such as moving or deleting folders or files.

To set access privileges for a folder, select "File & Folder Info" from the Folder menu. Your screen should look like Figure 3.29. Any one, or all three, of the access privileges can be assigned to a specific folder. Each privilege is set independently of the others. Setting a folder's privileges as "Make Changes" does not

FIGURE 3.29 File & Folder screen



automatically allow you to "See Folders" or "See Files." As you can tell, there are a variety of combinations that you can set according to your specific network needs.

When setting access privileges to folders, there is another option that is important. This is the "Change all enclosed folders" option. When you select a folder to set access privileges, only access to the *folder itself* is affected. Unless you click "Change all enclosed folders," *the inner folders remain inaccessible*. This means a user on the network can open the folder, but not any other folders within. Access privileges must be set separately for a folder and for the files it contains.

Users generally nest folders within folders, a natural way to organize on the Mac. For example, a main folder might be called "Applications." Inside are other folders containing applications. If you do not check "Change all enclosed folders" when setting

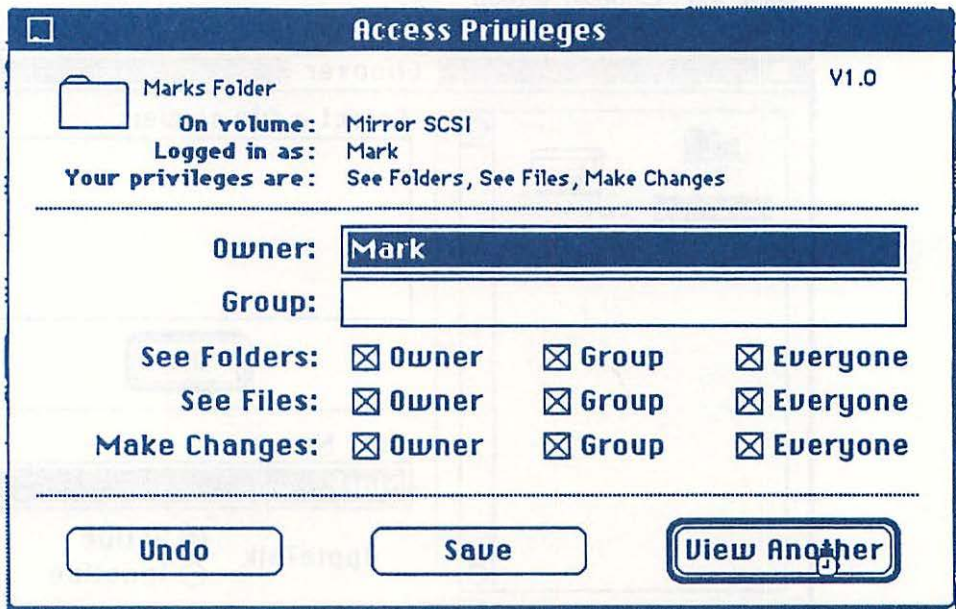
access privileges, then users can open the Applications folder but cannot get to any of the applications because they are in folders that have not been assigned any access privileges.

CAUTION: The “Change all enclosed folders” does not come up as a default option. You have to set it. If you forget, you will have to shut the server down and go back into the AppleShare Admin program.

User-Level Management

Network management for the user level is controlled by the “Access Privileges” found in either the Apple Menu or the File menu at the Desktop level. Selecting “Access Privileges” from the Apple menu brings up the screen shown in Figure 3.30. In this screen,

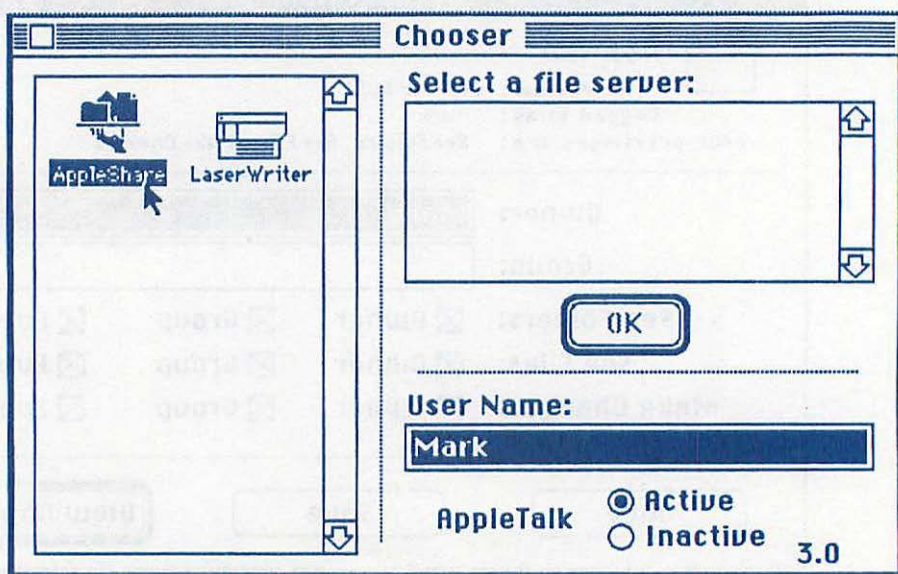
FIGURE 3.30 Access Privileges screen



users can set access privileges for the folders they create. Logging onto the network is done with the Chooser from the Apple menu. To logon to the network, follow these steps:

1. Boot up your workstation with the network startup disk.
2. Select "Chooser" from the Apple menu. Your screen should look like Figure 3.31.
3. Select the AppleShare icon on the left. A list of AppleShare servers will appear in your main dialog box.
4. Select a file server, type in your network name, then click "OK."
5. AppleShare now wants to know if you are a registered user or a guest. A guest is allowed access to the file server, but cannot access a folder unless the folder has been set to be viewed by "Everyone."
6. Select the registered user button, type in your network name, and click "OK."

FIGURE 3.31 Chooser screen



Zones

Zones, another element to consider at both the server and the user levels are a group of one or more networks connected to each other via a "bridge." A bridge is a peripheral, such as the Hayes InterBridge™, that connects multiple networks.

Zones show up at the server level as remote volumes. They only show up, however, if you are using the Hayes Interbridge and have installed the "Zone Chooser." Then users can access different zones by selecting the appropriate zone from the Chooser menu. Zones appear in a dialog box in the lower left-hand corner of the the Chooser. A user can select a zone by clicking on it. Once connected to a zone, a user can logon to another server and access "mounted" volumes that have been designated for network use. Zones can greatly expand the 32-node limitation of the AppleTalk Personal Network, as well as providing internetwork connections such as links to Ethernets or Token Ring networks.

Hardware Provided

Macintosh: AppleTalk Personal Network connectors and cable.

IBM PC: AppleTalk PC Card

Software Provided

Macintosh: AppleShare™, LaserShare

IBM: None

Product Pros

■ AppleShare is easy to set up, install, and manage. Because it's so easy to use, there's really no need to spend extra money to hire or train someone as a network administrator. However, Apple does offer a Network Administrators Course. Training users on AppleShare is easy, too, because there are no complex codes or commands to learn. Most users learn to logon and access the majority of network features after about 10 to 15 minutes of instruction.

■ AppleShare gives users a great deal of control over information access. The server provides enough power to enable individual users to determine who can see and do what with specific files. To some degree, these options compensate for having to dedicate an entire Macintosh as a server. User options can, of course, be controlled by someone at the administration level, thus providing an added level of security and network management.

■ One important and positive aspect of AppleShare is not written down in any manual. And that is the simple fact that AppleShare is from Apple. Because Apple developed and is marketing AppleShare, users should expect excellent support, upgrades, and product enhancements in the future.

■ AppleShare is supported by a large number of certified Apple Dealers. These dealers are specially trained to sell, install, and service AppleTalk products, including AppleShare. Companies that are installing large numbers of APNs have the comfort of knowing that Apple is fully supporting their product.

■ The ease of connecting to other networks is another important aspect of AppleShare. The use of bridges such as the Hayes InterBridge and Kinetics FastPath™ make internetwork connections possible. AppleShare also makes these internetwork configurations available to any user on an AppleTalk network.

Product Cons

■ The biggest problem with AppleShare is the fact that you must dedicate a \$2,000 computer to run your network. Many managers consider this a waste of a powerful tool. Centram's TOPS and Infosphere's MacServe do not require a dedicated Mac. Dedicating a Mac as a file server means either you have to purchase an additional computer or someone has to give up his or her Mac workstation. Typical

Mac users would rather sell their mothers than lose their Macintoshes. The concept of a dedicated file server dates back to the oldest LANs, when the company mainframe usually acted as the file or disk server.

■ With a dedicated file server network like AppleShare, there is a tremendous amount of disk accessing that slows down network activity. One AppleShare server with eight to ten users is *slow*! It can take several minutes to save a file, and the larger the file, the longer it takes. Printing also seems to take forever. But this time factor may not be that bad when you consider the alternative to the LaserWriter—typesetting. Typesetting can take anywhere from two days to two weeks. Compare that with the 20 to 30 minutes it takes a network LaserWriter to print your file, and the wait isn't so long.

■ I mentioned under the "Pros" heading that a positive aspect of AppleShare and the APN is the fact that it is from Apple. Unfortunately, this same fact has its dark side. All LAN products need support. LAN applications are not a typical productivity application, and so far Apple has not done a great job of supporting them. The AppleShare manuals are skimpy and don't provide enough troubleshooting information. Local dealer support for simple products has worked for Apple in the past, but networks are something else again. Apple hasn't done a very good job of training its dealers. Most dealers *know* about the products, but can't offer enough support to do much more than assist you in the installation.

PRODUCT PRICE(S)

Macintosh: AppleShare	\$799
LaserShare	\$299
IBM PC: AppleTalk PC Card	\$399

PhoneNET

Company name: Farallon Computing

Address: 1442 A Walnut St., Berkeley, CA 94709

Telephone no.: (415) 849-2331

Product name(s): PhoneNET

Type of LAN: Twisted-pair cabling
PhoneNET connectors
PhoneNET-AppleTalk repeaters
PhoneNET StarController™ with StarCommand software

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
Macintosh IBM PC/XT/AT
Most IBM clones

Network wiring supported: AppleTalk twisted-pair
Farallon twisted-pair

Maximum length of network: 2,000–3,000 feet without repeaters

Maximum number of users: 20–32 without repeaters

Network speed: 234K baud with either coaxial AppleTalk or twisted-pair PhoneNET

PRODUCT DESCRIPTION

PhoneNET is an alternative LAN that can be used to connect Macintosh and MS-DOS computers. Farallon does not sell LAN software such as a file or disk server, but PhoneNET can use file or disk servers from any third-party developer. PhoneNET

uses the common twisted-pair wiring that is found in many buildings; you may know it by another name—telephone wire. PhoneNET is AppleTalk-compatible, but adds some extra features that AppleTalk doesn't offer.

One of these features is increased distance between nodes. With standard AppleTalk connectors and cable, you are limited to 1,000 feet. With PhoneNET connectors and twisted-pair wiring, the distance between nodes is increased to 3,000 feet. Another feature is the use of standard RJ11 connectors, the same type of connectors that we have on our phones. The advantage is that they are not easily pulled out, whereas with AppleTalk connectors it's easy for someone to accidentally unplug your network connection.

PhoneNET is both hardware- and software-compatible with AppleTalk. Any program that follows Apple File Protocol (AFP) will operate with PhoneNET. PhoneNET can also be connected to IBMs with the IBM cabling system. Besides hardware, PhoneNET can also use a number of different LAN administration software packages. Centram's TOPS, Infosphere's MacServe, Tangent Technology's PC-MacBridge, Think Technology's InBox, Kinetics's EtherNet Bridge, Hayes InterBridge, Apple Computer's AppleShare and 3Com servers are a few of the programs that currently run with PhoneNET.

One significant advantage of PhoneNET is its ability to use existing telephone lines. Many companies already have miles of twisted-pair wire laid out, and thus could save the cost of rewiring their buildings.

SETUP AND INSTALLATION

Setup and installation of PhoneNET is as easy as setting up AppleTalk. The connectors use the standard RJ11 telephone-type connectors. One end of the connector plugs into the DB9 part of the Mac; the other end is the RJ11 modular connector. There are several setups that can be used with PhoneNET. One is to combine twisted-pair wiring and AppleTalk wire. You'll need additional hardware for this setup, as well as PhoneNET-AppleTalk adapter cables. Be sure to order these if you plan to integrate

twisted-pair wire with AppleTalk cable. PhoneNET also allows the integration of Macs and MS-DOS computers, if you use an AppleTalk adapter card. There are several cards available, and some come with file-serving/disk-serving software. You can select the following cards for your PCs:

- AppleTalk Card, from Apple Computer, Inc.
- TOPS AppleTalk Adapter Card, with TOPS software, from Centram Systems West
- PC MacBridge, with or without software, from Tangent Technologies

There are four installation configurations available with PhoneNET:

- PhoneNET Backbone (using existing telephone wiring)
- AppleTalk Serial (also called Daisy Chains)
- PhoneNET Star
- AppleTalk and PhoneNET combination

Let's take a look at the installation steps for these four configurations.

PhoneNET Backbone

With this configuration you use existing telephone wires. Simply plug one end of the PhoneNET connector into a Mac or AppleTalk card in a PC and then plug the RJ11 end into the telephone socket on the PhoneNET connector. This connection will work if your telephone uses only 2 wires (the red and the green ones), because PhoneNET used the yellow and the black wires. If your telephone system uses more than two wires, it is advisable to have someone from the telephone company assist you in the installation. You can wire the connections yourself, but it's tricky if you have never done anything like this before. The backbone configuration does well when wired in a parallel topology. To do this, follow these steps:

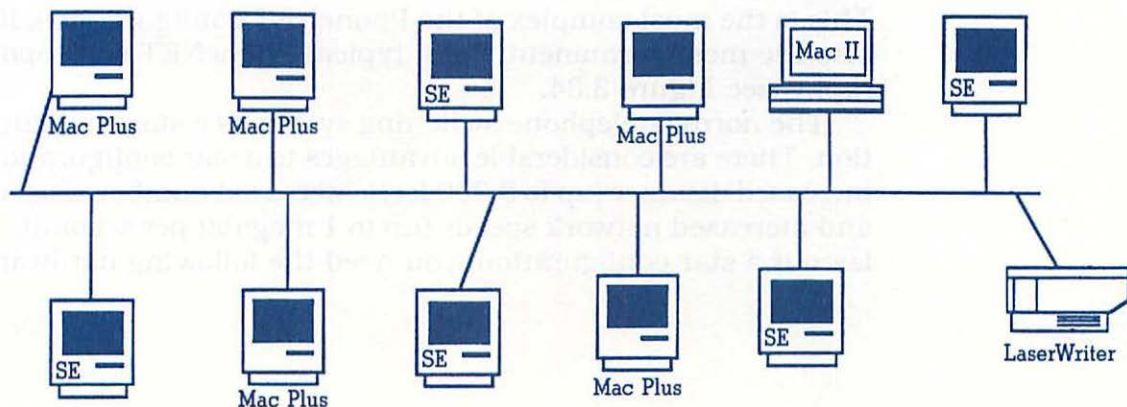
1. Run standard copper telephone wire (22G stationwire) throughout the area to be networked and install telephone wall boxes at appropriate locations.
2. Install a 120 Ω resistor across the yellow and black wires inside each wall box.
3. Attach a PhoneNET connector to each device on the network.
4. Link the connectors together with extra telephone extension cables.

Network distance can be 4,000 feet with this backbone configuration. A parallel topography with a backbone configuration might look like Figure 3.32.

Serial

The simplest type of PhoneNET topography. Connect PhoneNET connectors with the AppleTalk DB9 or DIN-8 connectors, plugging them into the back of your Mac. the DB9 connectors are for the older style 512K Macs. The Mac 128K can also work, but you may have some difficulty operating certain applications, due to the lack of memory. The Mini DIN-8 (the round plug) connector plugs into the printer port of the Mac Plus or Mac SE. You

FIGURE 3.32 Parallel topography



need one connector for each device on the network (Macs, IBMs and LaserWriters). Plug each connector into the Mac. Then use additional wiring to link the various units together.

There are several drawbacks to a serial topography:

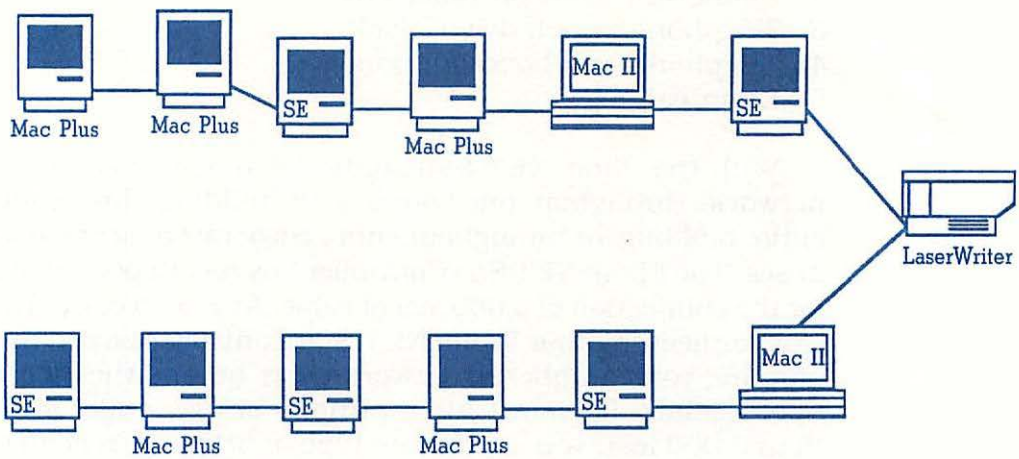
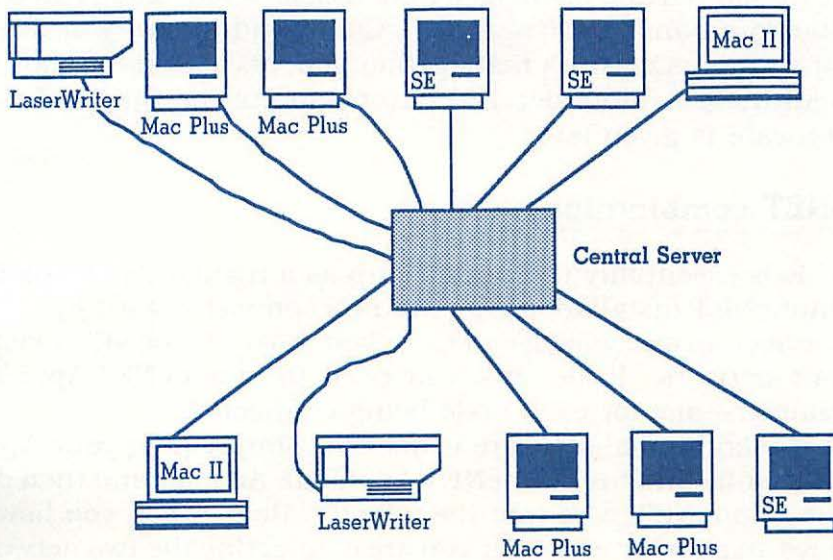
1. Do not use a serial topography if you intend your network to be permanent. If a node is removed from the middle of the network, the network will separate into two pieces. Depending on the number of hosts you are using, users can find themselves either bumped off the network or losing data. If you are interested in a more permanent network arrangement, a star configuration would be better (see PhoneNET star configuration below).
2. PhoneNET can be extended to 3,000 feet. When using a serial topography, the total network length cannot exceed 2,000 feet.
3. With a serial topography, the total number of users should not exceed 20—less than AppleTalk allows. This shouldn't be considered a major drawback, however, since the speed of PhoneNET slows proportionately with the increase of users on the network.

A serial topography with PhoneNET looks like Figure 3.33.

PhoneNET Star Configuration

This is the most complex of the PhoneNET configurations; it's also the most permanent. For a typical PhoneNET star topography, see Figure 3.34.

The normal telephone switching system is a star configuration. There are considerable advantages to a star configuration: increased distance (up to 3,000 feet); increased number of users; and increased network speeds (up to 1 megabit per second). To lay out a star configuration, you need the following hardware:

FIGURE 3.33 Serial topography**FIGURE 3.34** Star topography

1. PhoneNET connectors for all devices on the network
2. PhoneNET StarController box
3. Telephone punch-down block
4. Telephone wall boxes (optional)
5. Extra cable

With the PhoneNET StarController box, you can establish networks throughout one floor of your building, throughout the entire building, or throughout entire corporate or academic campuses. The PhoneNET StarController box has 12 ports that allow for the connection of 3,000 feet of cable. Any or all of the 12 ports can connect to other PhoneNET StarController boxes, thus expanding your number of network users beyond the 32 allowed by AppleTalk. If you are attempting to bridge longer distances than 3,000 feet, you need some type of bridge or repeater. One such product is the Hayes InterBridge™ from Hayes Microcomputer Products.

You can also bridge to other networks, such as Ethernet. To accomplish this requires a different type of bridge. One example is the Kinetics FastPath™ Ethernet Bridge.

Once you have created your star network, the network can be monitored and de-bugged from *any* location, using Farallon's StarCommand™ software. StarCommand allows you to perform various network management chores within the star configuration. A more detailed description of the StarCommand software is given later.

AppleTalk/PhoneNET combination

This is essentially the same setup as a regular AppleTalk and PhoneNET installation. Macs or PCs connected with AppleTalk connectors and wiring can be linked into a PhoneNET twisted-pair network. To do this, you need the PhoneNET-AppleTalk Adapter—one for each node being connected.

No additional software is needed. Simply plug your AppleTalk cable into the PhoneNET-AppleTalk Adapter and then plug the PhoneNET wire into the adapter. Remember, you have to have an adapter wherever you are connecting the two networks together.

CONFIGURATION AND TOPOGRAPHY

There are several topographies available with PhoneNET, and they work in either a single or multiple office environment. Serial, parallel, star, or a combination of topographies can be used. You have already seen parallel, serial, and star topographies. In Figure 3.35 is a sample topography that is a combination of the other three.

You must avoid circular or loop connections like the one in Figure 3.36.

NETWORK MANAGEMENT

Farallon has numerous software packages for network administration. They also make several network administrative utility packages of their own. These are:

■ **PhoneNET Network Traffic Testing Disk.** This program is a small desk accessory that allows users on the

FIGURE 3.35 Combination topography

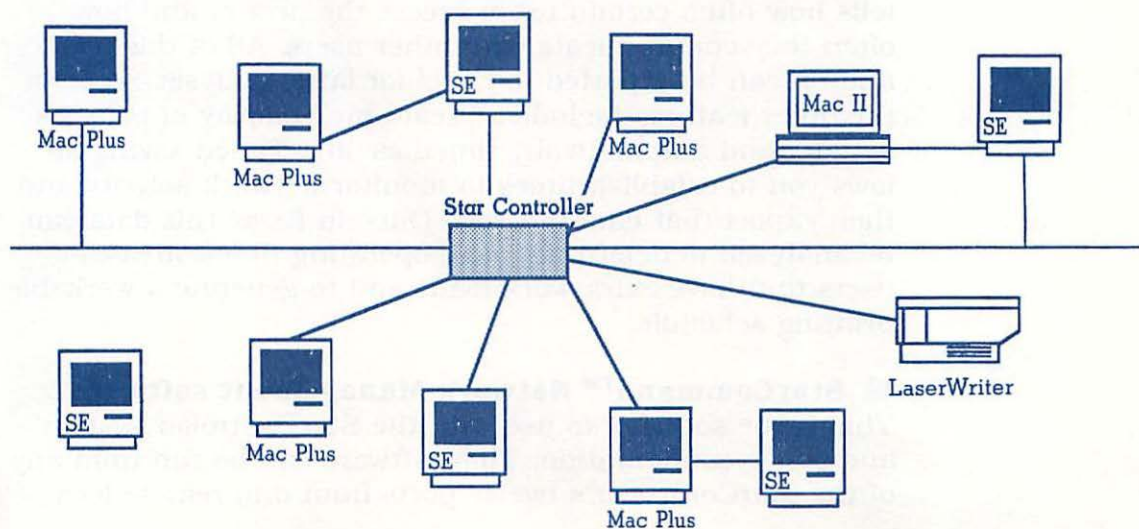
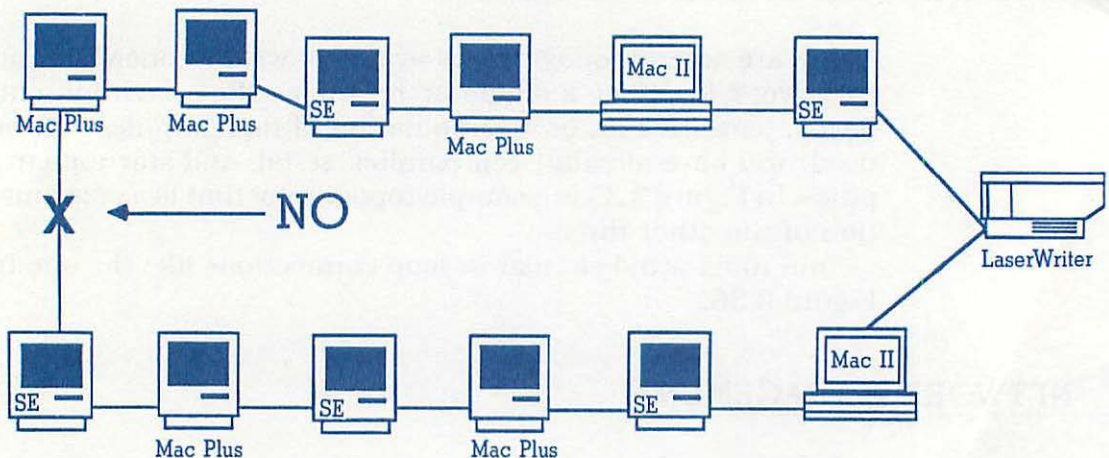


FIGURE 3.36 Loop topography



LAN to see who the other users are and to view network printing activity. The latter can be useful for determining when to send a print job to the printer.

■ **PhoneNET Traffic Watch™.** This is a comprehensive network analysis program designed for managers to monitor who is talking to whom on the network. Traffic Watch also tells how often certain users access the printer and how often they communicate with other users. All of this information can be exported to Excel for later analysis. Some of the other features include a “real-time” display of network activity and automatically timed saving. Timed saving allows you to establish times to monitor network activity and then export that data to Excel. Once in Excel this data can be analyzed to determine peak operating times, areas, or users that have extra work loads and to generate a workable printing schedule.

■ **StarCommand™ Network Management software** This is the software to use with the StarController system and a star configuration. This software can be run from any of the StarController’s twelve ports from *any* remote loca-

tion. This means that a modem that is linked to the StarController could act as the management link for a manager thousands of miles away. The StarCommand software is a bit like Business FileVision, and it uses the Hierarchical Filing System (HFS) very well. Maps of regional LANs can be presented, and the manager can then click his way to the individual building level. Once there, individual offices are viewed by clicking on a floor plan. The manager can also isolate the location and characteristics of various network problems to a specific room or work group. Again, with a modem, all of this network administration can be done from *any* remote location, providing the manager's computer and modem are connected to the StarController and modem.

The PhoneNET system can use other commercially available network management software and hardware. These are file servers, bridges (adapter cards), and network translation software that are the software "bridges" to foreign networks. This is less confusing than it sounds. Chapter Four discusses these and other products in detail. For now, here are some of the product that PhoneNET supports:

■ File servers

- TOPS—Centram Systems West, Inc.
- MacServe—Infosphere
- HyperNet 2000—General Computer
- The Keeper—Reach Technologies
- 3Server3 and 3+—3Com

■ Bridges, cards, and translation software

- PC-MacBridge™ (IBM AppleTalk Card)—Tangent Technologies
- TOPS™ (IBM AppleTalk Card)—Centram Systems West, Inc.
- IBM AppleTalk Card—Apple Computer, Inc.
- InterBridge™ (repeater)—Hayes Microcomputer Products
- FastPath™ Ethernet Bridge—Kinetics

- Netway 1000 Gateway (to IBM 3278 mainframes)—Tri-Data
- AlisaTalk (networking for VAX/VMS mainframe systems)—Alisa Systems, Inc.

There are, and will be, many more products supported by Farallon and PhoneNET. A good rule of thumb is that any product that works with AppleTalk will work with PhoneNET. PhoneNET is 100 percent compatible with PhoneNET.

Hardware Provided

Macintosh: PhoneNET connectors
PhoneNET-AppleTalk adapters
PhoneNET repeater
PhoneNET StarController
Twisted-pair cable
Cable construction kits
50-pin telephone time tap
Telephone wall boxes
Telephone wall plates

IBM PC: IBM cabling system line tap

Software Provided

Macintosh: PhoneNET Network Traffic Watch
PhoneNET Network Testing Utility disk
StarCommand Network Management
MazeWars+ (a network game for the “fun-at-heart”)

IBM: None

PRODUCT PRICE(S)

Macintosh: PhoneNET connectors.....	\$49.00
PhoneNET-AppleTalk adapters.....	\$8.00
PhoneNET Repeater.....	\$185.00
PhoneNET StarController.....	\$995.00

Twisted-pair cable.....	\$35-\$75.00
Cable construction kits.....	\$49-\$95
50-pin telephone line tap.....	\$40.00
Telephone wall boxes.....	\$5.00
Telephone wall plates.....	\$9.00
RJ11 connectors (10-pack).....	\$4.00
PhoneNET Network Traffic Watch.....	\$195.00
PhoneNET Network Testing Utility disk.....	\$29.00
StarCommand Network Management.....	\$500.00
MazeWars+ (a network game for the "fun-at-heart").....	\$49.00
IBM PC: IBM cabling system line tap.....	\$60.00

Product Pros

■ Probably one of the strongest pros for PhoneNET is its ability to use existing telephone wiring to create a network. It is also 100 percent AppleTalk compatible. These two features alone make PhoneNET an attractive alternative. Farallon has done an excellent job of developing and manufacturing innovative products. The StarCommand software is one of the best network management programs on the market for any LAN on any computer. You get power plus easy setup and installation. Farallon also sells the small adapter plugs, resistors, extra wire, etc., that you might need for your installation.

■ Since PhoneNET is primarily a hardware-oriented LAN, the product can be used with numerous third-party file servers and external peripherals. Add the integration of MS-DOS computers, and you have a very powerful LAN solution.

Product Cons

■ The first problem with PhoneNET that pops up is *speed!* It's a problem with AppleTalk, too. The basic operating speed of PhoneNET is 234K bits per second (baud). This can be increased to 1 megabit per second with a StarCon-

troller system. However, to get this speed will require a PhoneNET Plus™ connector system.

■ Installation can be a problem, too. Even though a basic PhoneNET system is very easy to install, modern offices have modern telephone systems. PhoneNET is designed to work with single-line or multi-line telephone systems. When you start to get into integrating PhoneNET with multi-line and PBX (Public Branch Exchange) systems, you had better know telephone systems. To save yourself time and money in the long run, it's wise to ask the telephone company for assistance.

MacServe

Company name: Infosphere

Address: 4730 Southwest Macadam Ave.
Portland, OR 97201

Telephone no.: (503) 226-3515

Product name(s): MacServe (software)
LaserServe (software)

Type of LAN: 1. File server software
2. Print spooler

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

Network wiring supported: AppleTalk twisted-pair
PhoneNET

Maximum length of network: AppleTalk—1,000 feet without
repeaters
PhoneNET—3,000 feet without
repeater

Maximum number of users: 32 without repeaters

Network speed: AppleTalk/PhoneNet—230.4K baud

PRODUCT DESCRIPTION

MacServe was one of the first disk servers available for the AppleTalk network. Since its beginnings, MacServe has held the distinction of being a powerful dedicated *disk server* as opposed to file server. There were two reasons for this. First was the lack of multiuser applications. Second, there were no file protocol standards for the Mac. As you know, all this has changed; MacServe is now developing a file server. As a disk server, MacServe still provides many features and, like standard disk servers, performs the following functions on a network:

- Permits sharing of hard disk(s) on a LAN
- Partitions hard disk(s) into as many as 16 volumes
- Allows for the sharing of these volumes on the network
- Provides network management
- Manages the sharing of other network peripherals such as laser printers and other hard disks

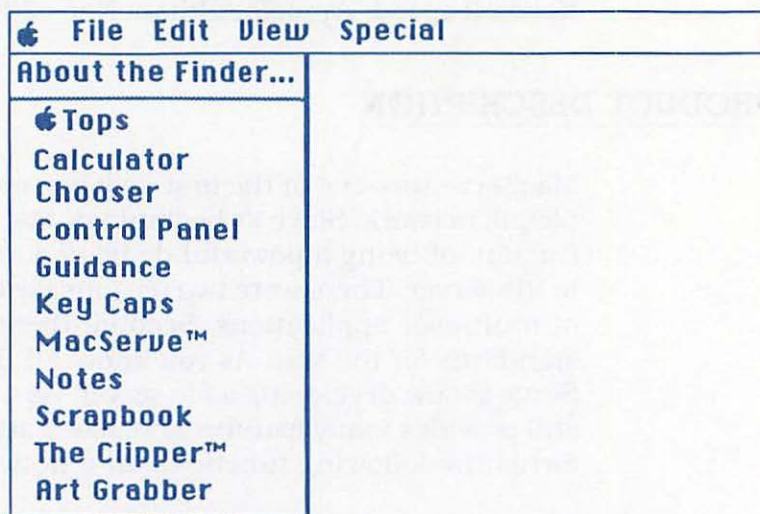
MacServe has all of these features and more. MacServe is installed on your system as a Desk Accessory, as in Figure 3.37.

Like Centram's TOPS, access to the shared hard disks can be obtained from the Apple menu. Each node on the network must have MacServe installed on a startup disk. Each hard disk must also have MacServe installed to act as a server. Once MacServe is installed as a network server, it runs primarily in the background. That is, a Macintosh used as a server can be used for other activities as well.

MacServe also provides other options at the user interface level. For example, everyone on the network has a network name, identifying each as a unique node on the network. It is this name that identifies the users for disk access and resource sharing.

Each volume on any hard disk designed as a server can be password-protected to ensure security.

FIGURE 3.37 MacServe D/A



MacServe allows multiple servers to exist on the same network, assigning specific tasks to specific hard disk systems on the network. This is a nice feature when you have an office that uses many different talents for different jobs. For example, in a company that produces magazines, most writers aren't concerned with graphics or pasteup, and it makes sense to give them their own hard disk for storing files and sharing resources. Some of the writers, however, might be interested in where their articles are going to be placed in the magazine. With MacServe, a writer on the network can take a look at the graphics that will be added to their story or the ad that will go on the same page. MacServe works with any Macintosh that supports AppleTalk, including the old Macintosh Filing System (MFS) and the newer HFS machines.

MacServe does nothing to speed up the AppleTalk network, however, which still operates at the standard 230.4K baud.

SETUP AND INSTALLATION

Setting up and installing MacServe is easy and straightforward. First, you should connect your network nodes. Be sure and check

all your connections, both at the connector level and at the computer level. Be *sure* you don't have a loop topography. Next, determine which units are to act as servers; these are the first units on which you'll install MacServe. You'll need a *separate copy* of MacServe for each of the servers. After MacServe has been installed as a server, the other nodes can use the MacServe disk to install MacServe as a "user only" node. To install MacServe as a server, follow these steps:

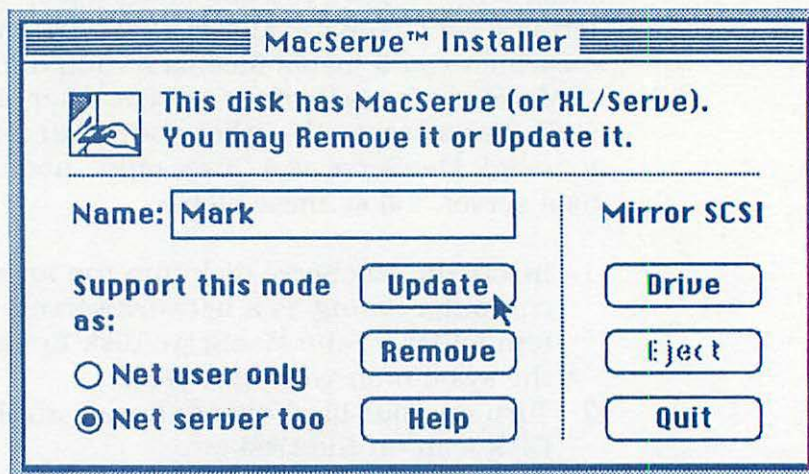
1. Insert the MacServe disk into the internal drive of each computer acting as a network server. You'll use the system folder on the MacServe disk to install MacServe onto the system on your hard disk.
2. Turn on your hard disk and wait until you see the Hard Disk icon on the Desktop.
3. Open the MacServe Disk icon and double-click on the MacServe Installer icon. The Installer icon is pictured in Figure 3.38.
4. Your screen should now look like the one in Figure 3.39.
5. Since you are installing a server, be sure the button labeled "Server too" is clicked on. Each MacServe disk is used to create a single server for an unlimited number of users.
6. Click the drive button on the right-hand side of the MacServe dialog box until you see the name of your hard disk drive. This ensures that you are installing MacServe onto your own hard disk.
7. If you need help, click the Help button to bring up a list of help topics. Then simply double-click on the topic you need help with.

FIGURE 3.38 MacServe Installer icon



Installer

FIGURE 3.39 MacServe Installer screen

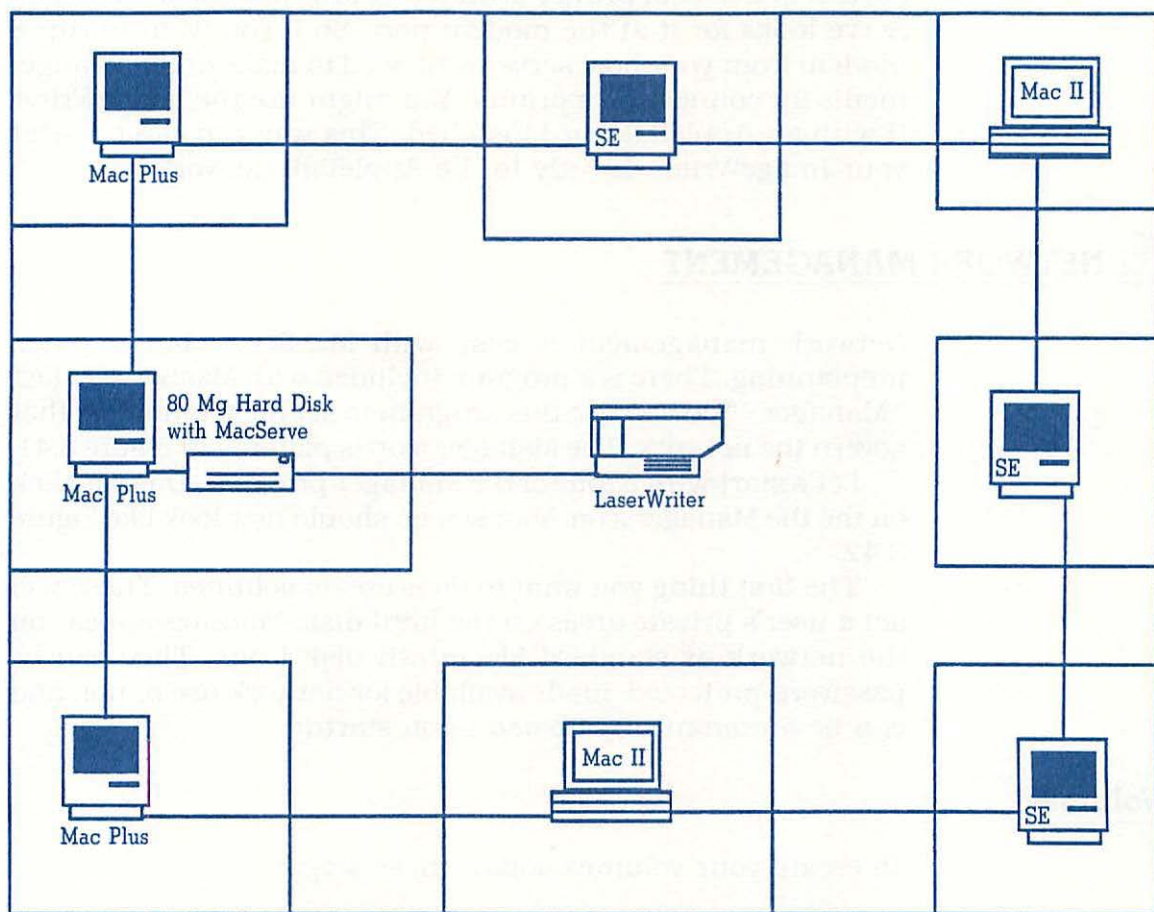


8. Enter a unique name that will identify you on the network and print ques.
9. Click the Install button to complete the installation process.

Use these same procedures to install MacServe on *any* start-up disk. As I mentioned, one MacServe disk can be used to install *one* server and an unlimited number of “user only” stations. These same procedures are used to install MacServe for the other users on the network. The only variation is that you cannot select the “Server too” selection in the MacServe installer dialog box.

CONFIGURATION AND TOPOGRAPHY

Any standard Macintosh LAN configuration and topography works with MacServe. As usual, avoid the dreaded loop topography. With a medium-sized network of 10 to 15 computers, it's a good idea to have more than one hard disk working as a server. This should speed up network activity because not everyone will be trying to access the same hard disk. A sample topography might look something like the one in Figure 3.40.

FIGURE 3.40 MacServe topography

If you're using PhoneNET connectors, you can use your existing telephone lines. Using the PhoneNET StarController from Farallon gives you the added dimension of configuring a star network. You should probably use Farallon's StarCommand network management software with MacServe. Managing a star network can be difficult without appropriate network management software.

If you are using an ImageWriter printer and/or a modem, you need to remember several things when configuring MacServe.

First, make sure your ImageWriter is connected to the **modem** port. When a local printer is attached to your host server, MacServe looks for it at the modem port. So if you want to run a modem from your host server, you need to make other arrangements for connecting a printer. You might use the ImageWriter II with an AppleTalk card installed. This way you can connect your ImageWriter directly to the AppleTalk network.

NETWORK MANAGEMENT

Network management is easy with MacServe, but requires preplanning. There is a program included with MacServe called “Manager.” You can use this program to set the parameters that govern the network. The Manager icon is pictured in Figure 3.41.

Let’s start with a tour of the Manager program. Double-click on the the Manager icon. Your screen should now look like Figure 3.42.

The first thing you want to do is create *volumes*. These will act a user’s private areas on the hard disk. Volumes appear on the network as standard Macintosh disk icons. They can be password-protected, made available for network use or not, and can be automatically booted upon startup.

Volumes

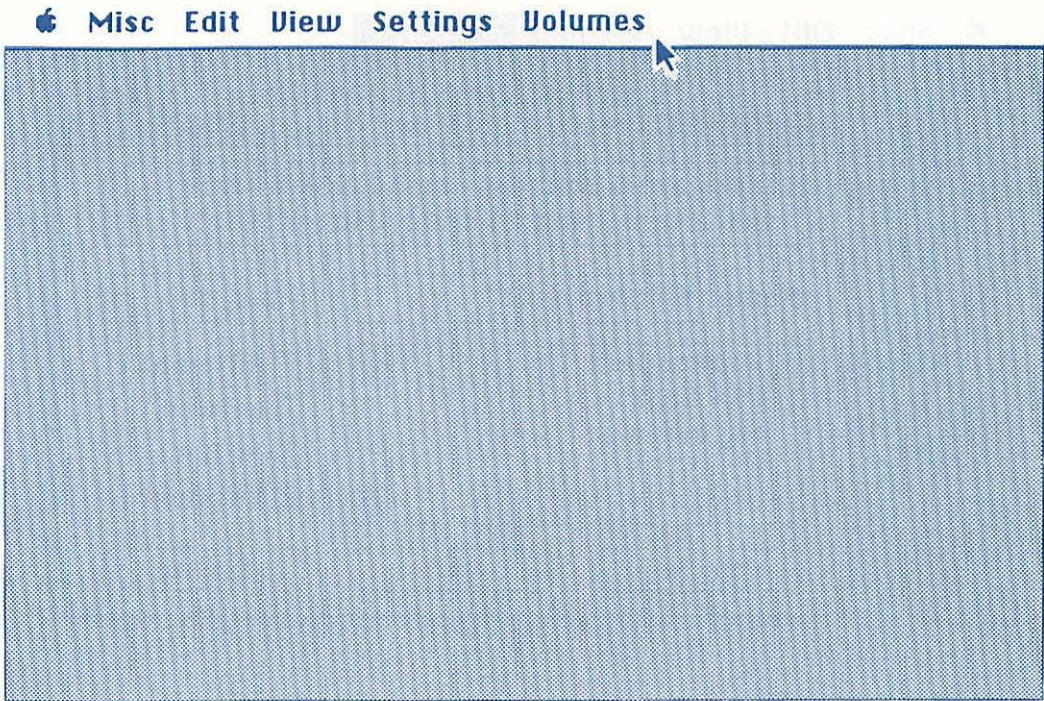
To create your volumes, follow these steps:

1. Select “Create” from the Volumes menu.
2. Your screen now looks like Figure 3.43.

FIGURE 3.41 Manager icon



Manager

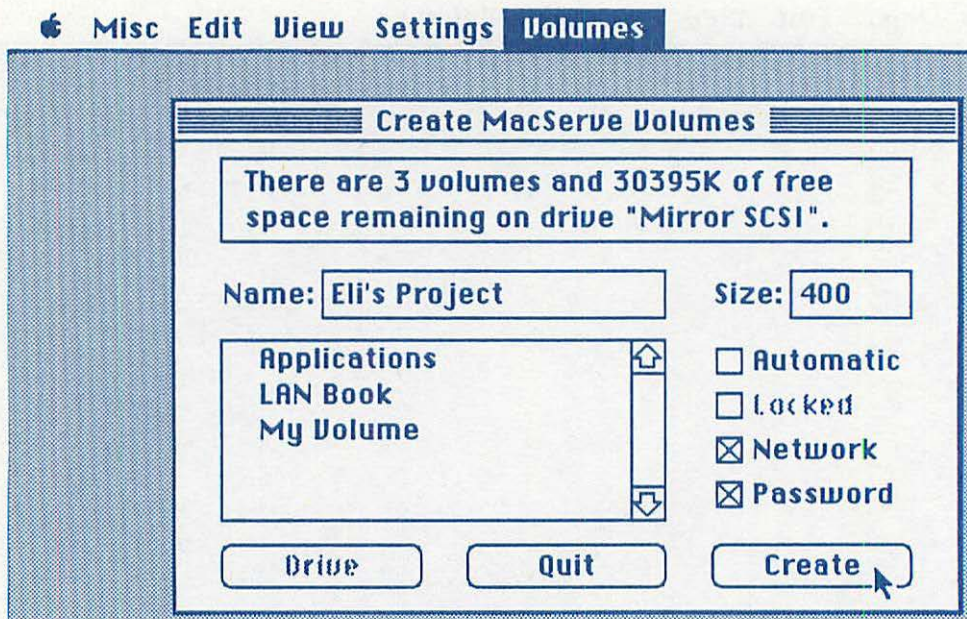
FIGURE 3.42 Manager screen

3. Use your Drive button to select the hard drive that is attached to the host server.

4. Enter a name for the first volume. Choose a name that will be recognizable to everyone on the network. For example, create an "Applications" volume to store applications or maybe a volume called "Eli's Project" for all of the files and applications associated with Eli's project. You can create up to 16 volumes.

5. Assign a volume size. The default size is 400K, the same size as single-sided Mac disks. The size of the volume is limited by the amount of disk space available. Determining the size of your volumes is where preplanning pays off. For someone who needs to store only a few temporary text files,

FIGURE 3.43 Volume screen



400K is adequate. If you need both an application *and* room for files, go with 800K. If you expect to need larger volumes in the future, estimate and assign a larger size at this time. The size is somewhat permanent. There is a method for resizing a volume, but it's risky. To resize a volume you have to create a new volume of the corrected size. Then select "Archiver" from the Misc. menu. Use the Archiver to copy the contents from the old volume to the new one. Now delete the old volume. This process works, but it can cause disk fragmentation. Too much disk fragmentation makes it difficult for MacServe to find things on your disk and can cause loss of data and system crashes.

6. Set the initial features of the volume. As you can see, you can set four different features for each volume. These are:

- **Automatic.** A feature that tells MacServe to open the volume each time your system is started—useful

when there are volumes that have to be available whenever the system is on. MacServe limits the number of automatic volumes to six. If you select more than six volumes for automatic startup, then MacServe will open only the first six volumes it finds. Volumes on automatic default open as "network volumes," accessible to any users on the network.

- **Locked.** This feature is available only when there is at least one file in the volume. It allows the manager to lock a volume to make it "read-only," protecting the volume against any modification. Be careful when locking a volume with applications in it. Many single-user applications need to write information to the disk, and with a locked disk, the application is not able to complete its task, possibly resulting in system error or data loss.
- **Network.** Network is the default setting. If it is *not* selected, the volume is available to only one computer. Other users on the network do not even see the Volume icon.
- **Password.** This allows you to set a password for the volume. First, you are prompted with a dialog box that asks you for a password. You can enter up to a 14-character password, and MacServe double-checks to make sure it's correct. Now the Create button is active. Click "Create" and you have assigned a password for the volume.

Your volumes can be altered by selecting "Alter" from the Volumes menu, allowing you to make changes to the structure of a volume.

Print Spooler

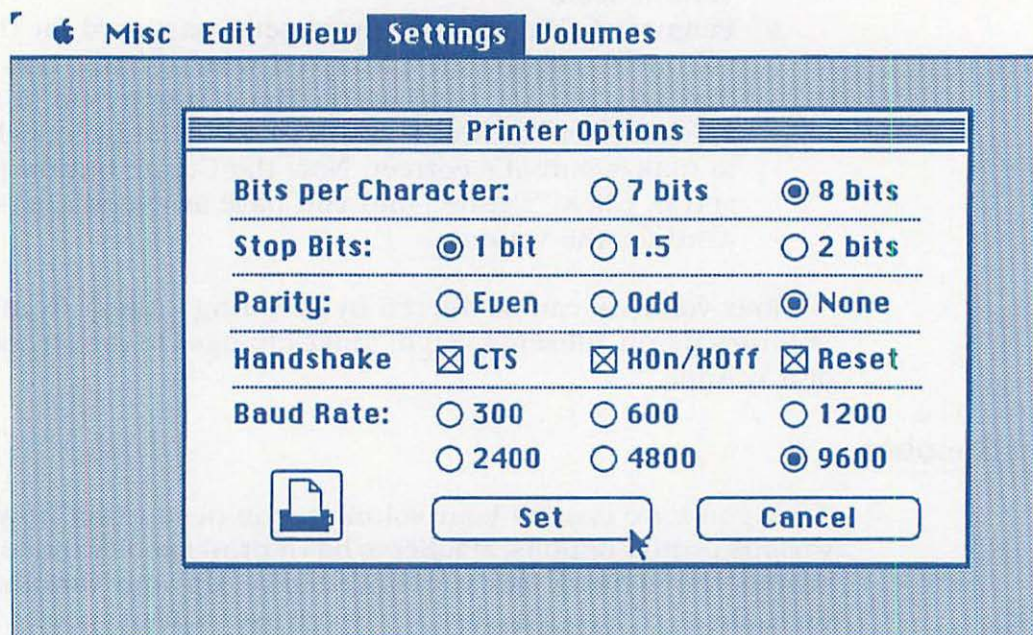
After you have created your volumes, you need to set up your various printer options. MacServe has a print spooler that operates on the network, but you'll need to set up your various options ahead of time. Because MacServe uses a print spooler, pay special attention to the setup of these various options. With a

LaserWriter attached to the network, these settings take on even more importance. When users on the network print their documents, they want them to be printed in a reasonable amount of time. Most of these options are preset for you. But if you have an unusual printer, check with the printer's manual to reconfigure these options.

To set up your printer options, follow these steps:

1. Select "Printer Options . . ." from the Settings menu. Your screen now looks like Figure 3.44.
2. If you're using a LaserWriter or ImageWriter printer, simply click "Set." If you want print serving enabled, do nothing. Click on the small Printer icon to disable the print spooler.
3. Select "Print Spooler" from the Settings menu. Here you can set the size of the print spooler and determine

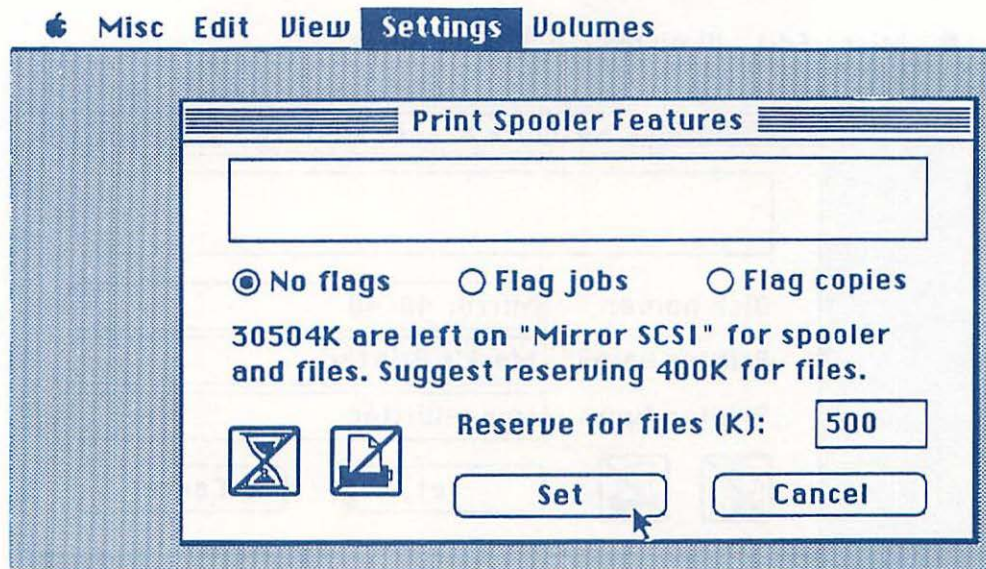
FIGURE 3.44 Printer Options screen



whether or not you want to flag your print jobs. Flagging print jobs is a method of identifying whose stuff is coming off the printer. The Print Spooler window looks like the one in Figure 3.45.

4. For printing documents with a large number of graphics, set the reserve at 800K or more. Graphic files take up a great deal of disk space. Text documents take up less room, so if you're printing primarily text files leave the reserve at 400K.
5. The **Flag jobs** and **Flag copies** buttons do two things. "Flag jobs" ejects a page and then prints a page with the name and creator of the document being printed. Flagging a job lets you know when the document begins to print and whose document it is. "Flag copies" does the same thing for *copies* of a document that are being printed.
6. The two small icons at the left set printing priorities. When you click the hourglass icon, documents that are not sent to the print spooler get printed first. Clicking on

FIGURE 3.45 Print Spooler screen



the Printer icon causes the print spooler to pause—useful when you want to attach a modem or download information before going back to finish printing.

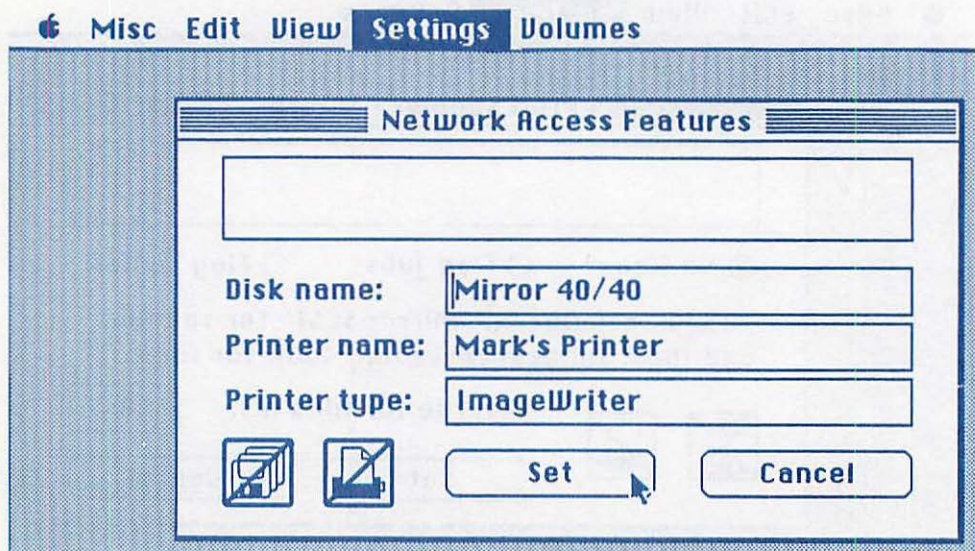
Controlling Network Access

Some special features control network access to the disk server and print spooler. Selecting “Network Access” from the Settings menu allows you to set the name of your disk server, print spooler, and printer type. These functions are important when using disk servers and printers on the same network. When you select “Network Access” your screen looks like the one in Figure 3.46. Clicking on either of the two icons allows you to either enable or disable specific network accesses.

Passwords

The password you select restricts access to options in the Volumes and Settings menus. It's important that you remember your password and change it frequently. Security, however,

FIGURE 3.46 Network Access screen



can be a double-edged sword. If you change your password too frequently, you're apt to forget it. Writing it down and keeping it in a secure place (like your wallet or purse) is one solution to the problem. And, of course, if tight security is not an issue, you may not want to set any password at all.

Hardware Provided

There is no hardware provided with MacServe. If you purchase a Mirror Technologies 40/40 hard disk, you'll receive Infosphere's MacServe. Infosphere is also included as an option when you purchase Tangent Technologies' PC-MacBridge with PC-MacServe.

Software Provided

Macintosh: Each unit contains one disk that allows you to install MacServe as a server for *one* unit only! But you can use that same disk to make an unlimited number of user nodes.

IBM: None

PRODUCT PRICE(S)

Macintosh: \$225.00 per server, with unlimited user or workstation installations.

Product Pros

■ If your network needs are simple, MacServe may be just the ticket. As you can tell, MacServe is easy to set up and use. Network administration does not require a great deal of time, but it does require some preplanning. It's important to know how many volumes are needed and the appropriate size of each volume *before* you begin to install your server(s)

and users. Even though MacServe is not a true file server, Infosphere has left provisions for support of multiuser software. Accessing the server from any node is easy—you just pull down the Apple menu and select “MacServe.” MacServe also works well with E-Mail products such as InBox and Mail Center. With the addition of E-Mail, MacServe is a simple and powerful network program.

■ Many smaller offices and workgroups don’t need sophisticated file-serving systems. MacServe is the answer. It’s not fast or fancy, but it allows multiple users to share *disk space* and printers. You don’t need a dedicated Macintosh. MacServe works in the background and allows the host to work as an independent node on the network. The best “Pro” of all is that MacServe rarely bombs, and this is a real plus.

Product Cons

■ While MacServe is adequate for handling simple network activities, it does not meet some of the more sophisticated network needs. MacServe won’t let more than one user access a single file. Only one user can open and make changes to a file. The print spooler can cause a real network slowdown. Theoretically, the print spooler can maintain 32 documents in the print queue; but in reality, if there are more than 5 or 6, printing can take a *very* long time! The print spooler is a nice idea, but it requires a large hard disk to handle the space needed. If you are using a 10- or 20-megabyte drive, disk space can disappear in a hurry when there are 9 or 10 users trying to print with the spooler.

■ MacServe does very little to speed up the already slow AppleTalk network. Its methods for handling network activity tend to require excessive disk accessing and cause network slowdowns. The more users on-line, the slower MacServe.

The Keeper and the Nucleus

Company name: Reach Technologies, Inc.

Address: P.O. Box 9820
Suite 925
Austin, TX 78766

Telephone no.: (512) 280-1977

Product name(s): Keeper Plus™
Nucleus™

Type of LAN: 1. Hard disk
2. File server software

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

Network wiring supported: AppleTalk twisted-pair
Farallon twisted-pair

Maximum length of network: 1,000 feet without repeaters

Maximum number of users: 32 without repeaters

Network speed: 230.4K baud with either coaxial AppleTalk or twisted-pair PhoneNET cable.

PRODUCT DESCRIPTION

Reach has produced a couple of outstanding LAN products for the Macintosh—the Keeper Plus™ and the Nucleus™. The Keeper Plus is a stand-alone hard disk with file-serving software. You can have multiple Keepers on the same network. This means that a Keeper-based LAN could be a distributed file serving system. The Nucleus also uses stand-alone hard drives and contains file-serving software, but the difference between the two

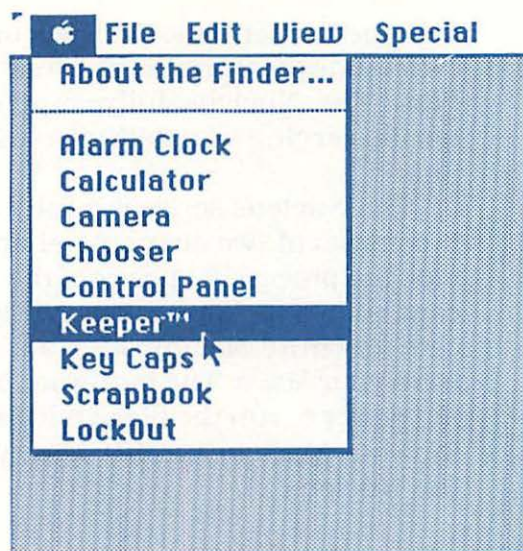
is that the Nucleus series is a dedicated file server. There are a variety of options available for the Nucleus family. Basically, the Nucleus eliminates the need to dedicate a Macintosh for file-serving duties. Businesses with demand for interdepartmental networks and a need for extended security and access privileges should find that Nucleus fits their needs. For companies needing a central file server, multiuser access to the same file, and mass storage, the Keeper Plus will fit the requirements.

The Keeper Plus™

The Keeper Plus is a stand-alone hard disk with a file server. What makes the Keeper Plus unique is that it doesn't use file-serving *software*. The file-serving capabilities are located in ROMs inside the Keeper Plus. The Keeper also contains its own processor, called a **smart** file server, to control file serving. Since the Keeper Plus contains a file server and processing power on firmware, there is no need to depend on the Macintosh for certain functions. As an example, certain disk I/O procedures that are generally handled by the Macintosh are now controlled by the Keeper Plus, speeding up network access time. This is called the "central file server" approach to networking, with one main file server connecting all computers—the same type of networking that mini- and mainframe computers have used for years.

The Keeper Plus has advantages over other dedicated file server systems. You don't have to dedicate an entire Macintosh as a file server. The Keeper Plus and the Nucleus are "smart." Inside, along with the hard disk, there is a smart controller board that provides the intelligence for the Keeper.

The Keeper Plus offers full file-serving capabilities. There are disk, folder, and file locking. The Keeper, via the Apple menu, can automatically perform file lockouts so that the first user has read/write privileges. This is useful for single-user applications, because other users can read, but not write, to a file. The Keeper does, however, provide for multiple users to make changes to a single file, provided the application supports multiusers. Password protection is also available at the disk, volume, and folder levels. As with most of its counterparts, network access is obtained as a desk accessory via the Apple menu. (See Figure 3.47.)

FIGURE 3.47 Keeper from the Apple menu

The Keeper Plus provides each user with a Keeper Plus start-up disk, which allows the user to logon to the network. Once on, each user relinquishes system control to the Keeper Plus.

Every user can have his or her own volume on the Keeper Plus, up to a maximum of 64 volumes ranging in size from 2K to whatever is the available amount of disk space. Each volume is *dynamically sized*. This is a unique feature of the Keeper. When you create a volume, the disk volumes expand or contract in size in 2K increments as you add or delete files. The Keeper Plus decides how big each volume needs to be.

You can have more than one Keeper Plus on the same network, allowing the user to select a specific Keeper Plus by name, partitioning work to several servers. Partitioning is done by a network administrator.

If you want, you can have 30 Keepers and one Mac—a bit lonely, but with a lot of storage space. Several Keepers on a network do provide a great deal of flexibility.

The Nucleus™

Like the Keeper Plus, the Nucleus series of file servers have their own unique features as well as some not provided by the Keeper Plus. The Nucleus fully supports HFS and AFP standards. Its file-serving capabilities closely resemble those of AppleShare™.

The Nucleus series is a fully integrated networking system. It consists of two elements—hardware and software—that provide the processing power of the Macintosh with the file-serving capabilities of AppleShare. With AppleShare you have to dedicate an entire Macintosh to act as the file server. The Nucleus frees your Macs. The hardware provides the necessary processing power to run the file-serving software. So instead of connecting your Macs to another Mac, you connect all of your Macs to the Nucleus.

Nucleus Software

The Nucleus software closely resembles AppleShare. Access to the Nucleus comes by selecting the Chooser accessory from the Apple menu. This in turn allows the user to select the Nucleus file server. Once selected, the operations of the file server are like AppleShare: Folders and files are given access privileges, and the system administrator can assign privileges for specific folders and the data within those folders. Network users must install the Nucleus software on their startup disks before they can logon to the server from the Chooser. Users set access privileges from the Apple menu for the folders they create.

Nucleus Hardware

The hardware consists of a CPU board and 512K of RAM. In essence, the Nucleus is a Macintosh. The main board consists of a 68000 processor, 512K of cache RAM, and an SCSI chip that allows for a direct interface with other SCSI devices. Reach also sells the Nucleus with either 20 or 40 Mbyte hard drives. You are not limited to their hard disks, however. You can use virtually any of the SCSI hard drives on the market.

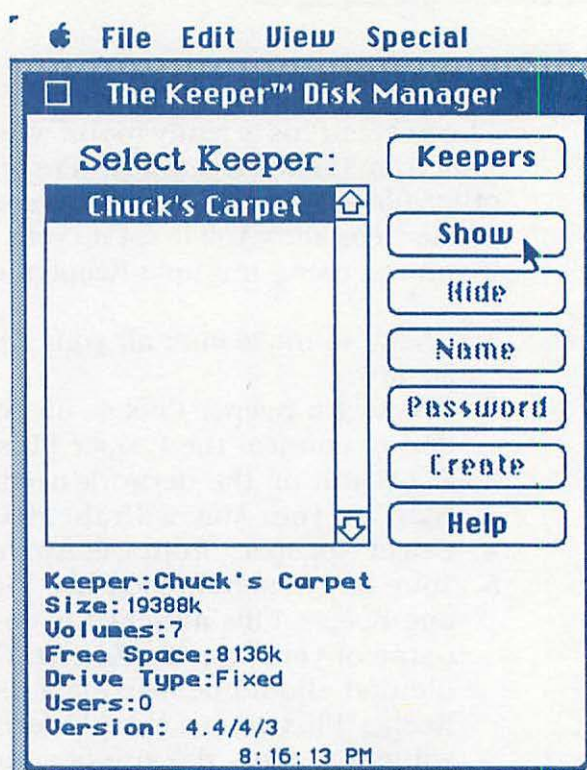
SETUP AND INSTALLATION

The Keeper Plus

The Keeper Plus is ready to run when you take it out of the box. Plug it in, hook it up, and you're off and running. As with any other file server, the Keeper Plus setup requires preplanning. These steps allow you to set up your first server. They apply even if you are using multiple Keepers on the same network.

1. Check to make sure all your AppleTalk connections are secure.
2. Connect a Keeper Plus as an AppleTalk connection. You do not connect the Keeper Plus to a Macintosh.
3. Each unit on the network needs a Keeper System disk. Start up your Mac with the Keeper System disk.
4. Select "Keeper" from the Apple menu.
5. Your screen should look like Figure 3.48. If you have only one Keeper Plus attached to your network, you see the name of your specific Keeper. Click on Show. The only file that should be listed is a file called "KSystem." The Keeper Plus comes already formatted with one giant volume roughly the size of your disk.
6. To create other volumes, double-click on the name of your selected Keeper. Now click on Create. Your screen should look similar to the one in Figure 3.49. You are prompted to enter a new disk name. This is the name of your particular volume. Don't worry about setting a size for the volume, because the Keeper Plus has dynamic volume sizing, and the volume will adjust its size according to what you add or delete from it. Click "OK" and you can set a password for the volume. If no password is needed, just click on the name of your initial volume (KSystem), click the Show button, click the name of the new volume you have just created, and click the Show button.
7. Now close the Keeper window. The volume you checked should appear on your Desktop. The Keeper creates a disk icon that looks like the one in Figure 3.50.

FIGURE 3.48 First Keeper screen



8. You can now open the Volume icon and copy applications or files to it.
9. Be sure and mount the KSystem volume. This allows you to switch system control over to the Keeper Plus. Simply open the System Folder on the KSystem volume, hold down the Command and Option Keys, and double-click on the Finder icon. After you return to your Desktop, you can drag the Keeper Startup disk to the trash to eject it.

You can create as many volumes as disk space permits, although the methodology used to manage your network may not permit more than a limited number.

FIGURE 3.49 Create screen

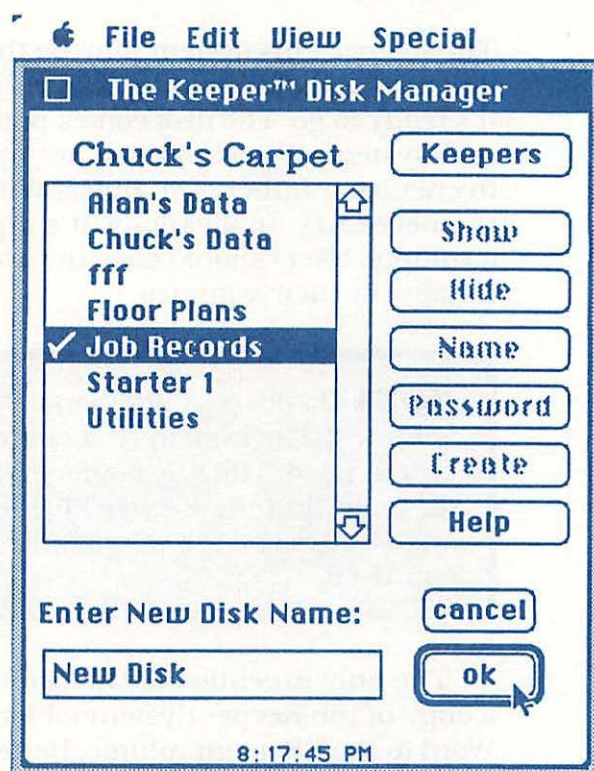


FIGURE 3.50 Keeper Disk icon



CONFIGURATION AND TOPOGRAPHY

The Keeper Plus system may be the easiest and most straightforward LAN system to configure. Basically, you plug it in and it's ready to go. The disk comes preformatted with the most current system. When you first set up the Keeper Plus, you need to create a number of volumes. Within these volumes you copy the necessary applications. It's a good idea to give every user a volume. Users should copy the applications they want or need to have in their volumes.

CAUTION: Do not copy additional system folders to each user's volumes! The system that comes with the Keeper Plus is all you need. The KSystem folder contains special software for operating the Keeper Plus. If you copy other Systems and Finders into the volumes, the Keeper Plus becomes very confused.

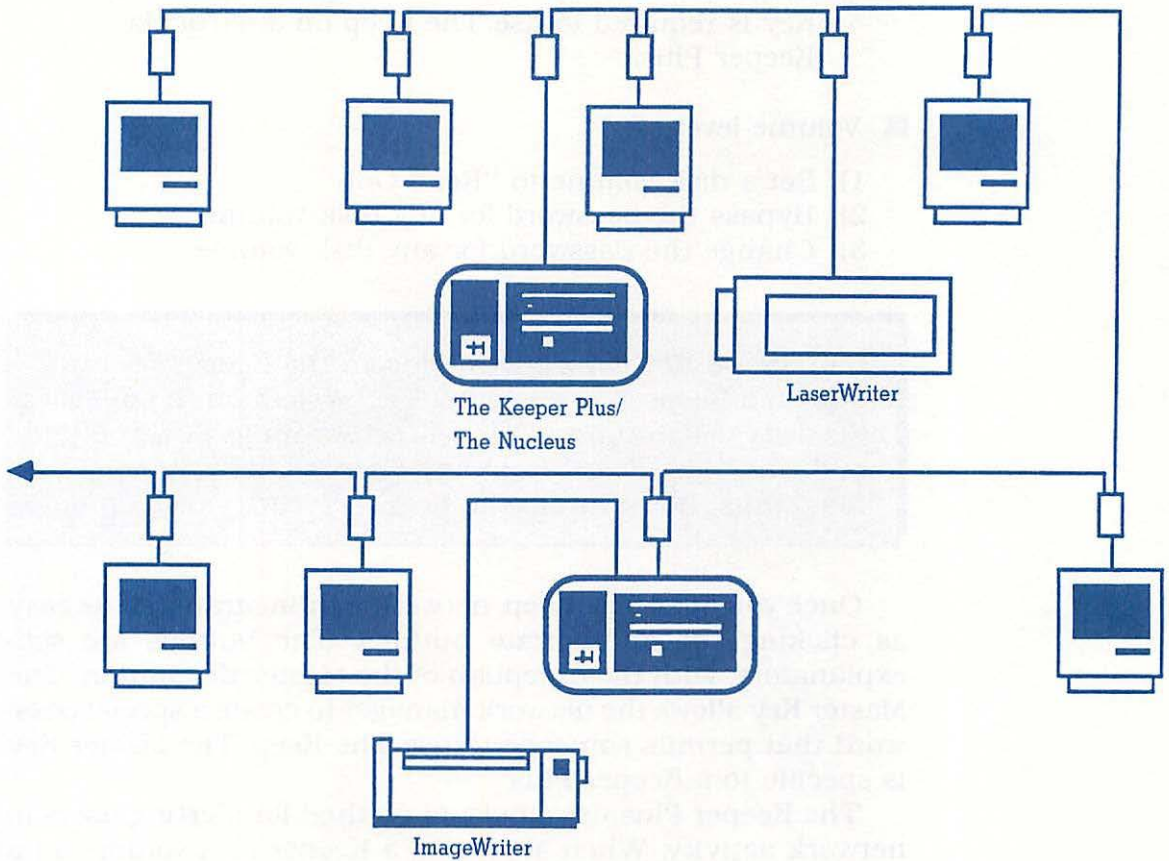
The only exception is Microsoft's Word™. Word has to have a copy of the Keeper System folder in its volume. You can copy Word to the KSystem volume. Better yet, just place a copy of the Keeper System Folder in the same volume Word is in.

Keeper Plus and the Nucleus both follow the topography rules of all AppleTalk networks. If you're using the shielded twisted-pair AppleTalk cable, you're restricted to serial topography. If you use the Farallon twisted-pair telephone connections, you can add parallel or a mix of serial and parallel. Avoid loop topographies. For typical Keeper Plus or Nucleus topography, see Figure 3.51.

NETWORK MANAGEMENT

The Keeper Plus

Most network management takes place at the user level. All nodes must use a Keeper System disk to start up. By accessing "Keeper" from the Apple menu, users can mount and unmount

FIGURE 3.51 Keeper/Nucleus topography

volumes, set passwords, and select network printers. The Keeper Security disk contains the program used by a network manager; it's called "The Keep," and it's found in the Apple menu on the Keeper Security disk. There are two levels of Keeper Plus management, disk level and volume level. Here is what can be done at each level:

■ Disk level

- 1) Initialize the Keeper Plus
- 2) Name a Keeper Plus

- 3) Assign a password for a Keeper Plus
- 4) Set a "Master Key" for each Keeper Plus. The Master Key is required to use The Keep on a particular Keeper Plus.

■ Volume level

- 1) Set a disk volume to "Read Only"
- 2) Bypass the password for any disk volume
- 3) Change the password for any disk volume

CAUTION: Do **not** copy anything from the Keeper Security disk to a Keeper Plus volume. The system on the Keeper Security disk is unique and will screw things up if you try and run "The Keep" from any Keeper Plus volume. The Keep must be run from the Keeper Security disk *only*.

Once you open The Keep, network administration is as easy as clicking the appropriate buttons. The buttons are self-explanatory, with the exception of the Master Key button. The Master Key allows the network manager to create a special password that permits someone to use The Keep. The Master Key is specific to a Keeper Plus.

The Keeper Plus uses a visual method for alerting users to network activity. When accessing a Keeper or a volume on a Keeper Plus, users see either nothing or little "Macs" next to the name of the Keeper volume. The number of little Macs represent the number of other users who are accessing that particular volume. No little Macs indicate that no user currently has that volume mounted. In a network environment, the Keeper Plus gives "write" privileges to the first person to open a volume. Any other users are given "read only" rights. If you are using single-user applications, only the first person to mount the volume can make any changes to a specific file. The Keeper Plus supports some multiuser applications with file and record locking, permitting more than one user to write and make changes to a specific file.

The Nucleus

The Nucleus is identical to AppleShare. In fact, it is AppleShare. The only difference is that the hardware needed to run the file server is not a Macintosh. Network administration is the same for the Nucleus as it is for AppleShare. Refer to the section on Apple Computer for a detailed explanation of how to configure the Nucleus (AppleShare).

Hardware Provided

Macintosh: The Keeper Plus (20, 40, 80, or 120 Mbyte configurations)
 The Nucleus Brain (basic configuration is 512K or RAM)
 Nucleus 20 and 40 (includes 3.5" 20 or 40 Mbyte hard disks)

IBM PC: None

Software Provided

Macintosh: The Keeper Plus—file server/network management and security
 The Nucleus—file server/network management and security

PRODUCT PRICE(S)

Macintosh: The Keeper Plus.....	\$1795
The Nucleus Brain.....	\$1595
Nucleus 20.....	\$2595
Nucleus 40.....	\$3395

Product Pros

THE KEEPER PLUS

■ The Keeper Plus is like a MacDonald's™ Kid's Meal—everything comes in one package. The Keeper Plus provides a hard disk and file server in one neat package. The concept behind the Keeper Plus file server system may be one of the best in business. Any user can easily access any server(s) on the network, logon, logoff, and create volumes. The fact that the Keeper Plus sits in the middle of the AppleTalk network gives a great deal of flexibility in the design of a network. Security could be better, but network management is simple and straightforward. You don't need to spend a fortune training someone to manage a Keeper Plus network. One or two days of training should be sufficient.

THE NUCLEUS

■ Not having to waste a Macintosh as a file server is the main advantage of the Nucleus. It contains everything you need to set up a powerful file server that closely follows the AFP standards. If you need to bridge your network with other APNs or Ethernets, the Nucleus is the way to go. On the hardware side you can have from 512K to 2 Mbyte or RAM space. You can combine the Nucleus with its own 20 or 40 Mbyte hard disk or use a hard disk of your choice. Most major hard drives are compatible with the Nucleus. The file server is AppleShare. You have plenty of security, and control over your network. Network management does take a bit more training than does the Keeper Plus, but if individuals are familiar with AppleShare, they'll have no problem with the Nucleus.

Product Cons

THE KEEPER PLUS

■ The Keeper Plus is slow! With more than 10 users accessing the same Keeper, basic file operations can become tedious. There are difficulties in sharing single user software. The best way to avoid problems is to have users use their own copies of a specific application. If you want to connect to other networks like Ethernet, you'll have a problem. Basically, the Keeper Plus can't communicate with any other network other than the Keeper. But you *can* access other AppleTalk Personal Networks (APNs) via the Hayes Inter-Bridge product.

THE NUCLEUS

■ Most of the problems with the Nucleus are the same problems that exist with AppleShare. Fortunately, the Nucleus does not have AppleShare's major drawback—you don't have to give up a Mac to get the AppleShare file server. The Nucleus, however, has all the drawbacks typical of the APN—slow transfer speeds, difficulty with handling more than 10 to 12 users, and printing difficulties when using print spoolers.



Company name: TOPS

Address: 2560 Ninth St., Suite 220
Berkeley, CA 94710

Telephone no.: (415) 549-5900

Product name(s): Transcendental Operating System (TOPS)

Type of LAN: File server software and add-on AppleTalk board for IBM and clones

Computers supported: Macintosh 512K

Macintosh Plus

Macintosh SE

Macintosh II

IBM PC/XT/AT

Most IBM clones

Network wiring supported: AppleTalk twisted-pair

Farallon twisted-pair

Maximum length of network: 1,000 feet without repeaters

Maximum number of users: 32 without repeaters

Network speed: 234K baud with either coaxial AppleTalk or twisted-pair PhoneNET.

PRODUCT DESCRIPTION

TOPS is software for the Macintosh and software plus an add-on board for the MS-DOS computers. The company has worked long and hard on TOPS, and the programs show the effort. The features of the TOPS network are deceptively simple. Besides providing distributed file serving on the AppleTalk network, TOPS provides a standard network operating environment to integrate Macintosh computers with PCs over the AppleTalk or Farallon networks.

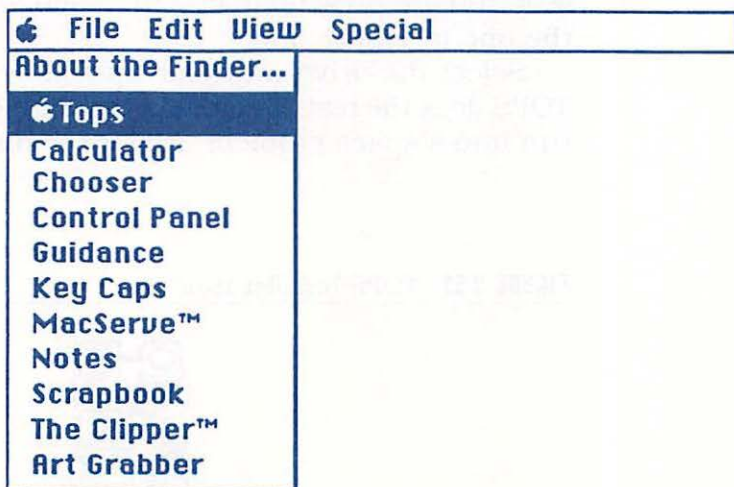
There are actually three network configurations available with TOPS. The first is an all-Mac network. The second and probably the most popular configuration is the Mac-PC integration. The third configuration is all IBMs on AppleTalk. Considering the slow speed of AppleTalk, this last configuration may be a poor choice. TOPS will work with any Macintosh having 512K or more of RAM. On the MS-DOS side, TOPS runs on the IBM PC/XT/AT and almost all IBM clones. At the present time TOPS supports most of the hard disks on the market. TOPS also supports AppleShare™ and the Apple File Protocol (AFP) standards. TOPS

supports AppleShare by running as an additional server visible to AppleShare.

TOPS is a distributed file server, meaning anyone on the network can act as a host. The host files can be made available to the appropriate users on the network. One obvious advantage of a distributed file serving arrangement is that even if the primary host unit goes down, the entire network doesn't. Anyone else can pick up the duties of "publishing" files for use on the network. In other words, anyone on the network can act as the host.

TOPS is made for the IBM series as well as the Mac. TOPS for the IBM includes an add-on board as well as software. This board is necessary to tie the IBM into the AppleTalk or Farallon networks. TOPS for the Mac and the PC are easy to use and set up. TOPS is a RAM resident program and takes about 65K of RAM space. TOPS fully supports HFS on the Mac. Once TOPS is loaded into memory and you have decided what is available for network use, you don't have to worry about network management. TOPS works in the background. On the Mac, TOPS is a Desktop accessory. (See Figure 3.52.)

FIGURE 3.52 TOPS as a D/A



With the PC you will have to set up a DOS procedure to access the TOPS menu. You can also access all of TOPS features from the DOS command line. TOPS will run under MS-DOS 2.1 or higher.

Each computer on the network, whether Mac or IBM, must have its own TOPS disk. Each IBM must also have a TOPS, AppleTalk card installed. The AppleTalk board fits into any available slot (except 8) on your PC. TOPS is *not* copy-protected, but each disk is serialized with a unique ID number. When you get on the network, TOPS checks your serial number against the other computers on the network. If TOPS finds another computer with your number, you won't be allowed on the network. It's smart to write the serial number down on all your backups.

The real advantage of TOPS is its ability to handle not only network file management, but sharing of data between seemingly incompatible operating systems and sharing of expensive hardware peripherals.

SETUP AND INSTALLATION

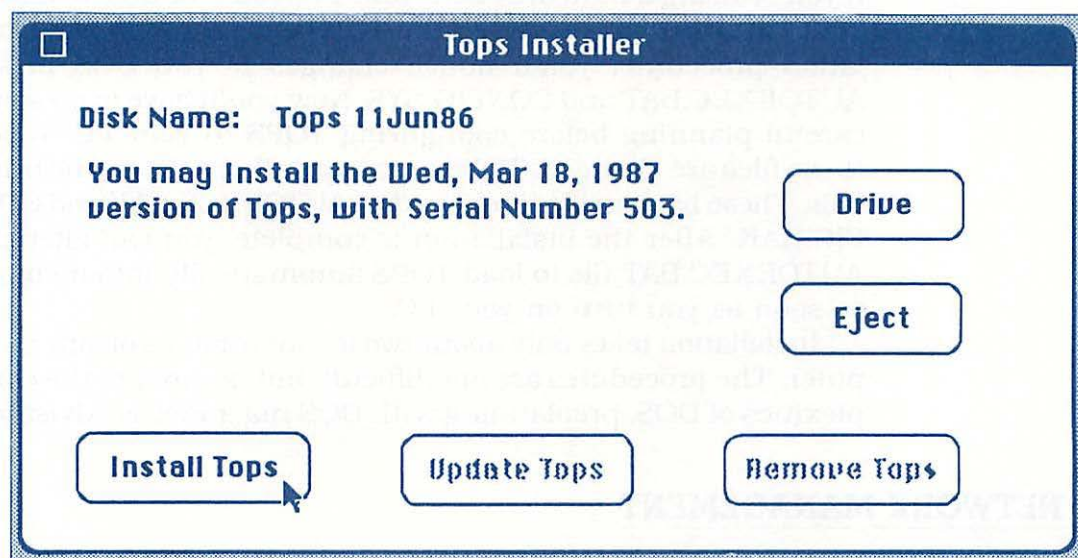
Installing TOPS on both the Mac and the IBM is easy. Since TOPS is a distributed file server, you'll have to install TOPS on all your startup disks. The TOPS installation icon is shown in Figure 3.53.

The installation procedure for the Mac is simple and painless. You are presented with an installation dialog box like the one in Figure 3.54.

Select the drive your startup disk is in and click "Install." TOPS does the rest. If you're using the old 400K drives, you may run into a space problem. About the only way to alleviate it is

FIGURE 3.53 TOPS Installer icon



FIGURE 3.54 TOPS Installer dialog box

to trash as many unnecessary files, desk accessories, and fonts as you can. If TOPS is going onto your hard disk, you'll probably have enough space. Your network can be floppy-based, but a hard-disk-based configuration (the preferred method) will be much faster and more efficient. Once TOPS is installed on your startup disk, you're ready to join the network.

Installation on the PC is also easy. The AppleTalk board is a half-size board and will fit into any open slot except number 8. Once it's plugged in, software installation is easy. Again, it's advisable to use a hard drive in your PC. Like the Mac, TOPS for the IBM *can* be run from floppies, but you'll go crazy with the lack of disk space and loss of data integrity. The following procedure installs TOPS on your PC.

1. Turn on the PC, and wait for the C>.
2. Put the TOPS disk in the floppy drive.
3. Type "INSTALL A:" at your DOS prompt.
4. Follow the directions on the screen.

Menus and prompts guide you painlessly through the task. If you're using a hard disk with your PC, you'll be able to install TOPS into a subdirectory. As the TOPS goes through its installation procedure, you'll notice changes in two DOS files—AUTOEXEC.BAT and CONFIG.SYS. Now you'll have to do some careful planning before configuring TOPS to your PC. When these files are changed, TOPS automatically backs up the originals. These backup files are stored as AUTOEXEC.BAK and CONFIG.BAK. After the installation is complete, you can alter the AUTOEXEC.BAT file to load TOPS automatically into memory as soon as you turn on your PC.

Installation takes only about two to four minutes on any computer. The procedures are not difficult, but because of the complexities of DOS, preplanning with DOS machines is advisable.

NETWORK MANAGEMENT

Since TOPS is a RAM-resident program, it's already set up to be loaded into memory when you start your computer. Accessing TOPS on the PC is different from on the MAC. On the PC, type "LoadTops" to get to the TOPS menu. On the Mac, TOPS is accessed by selecting TOPS from the Apple menu. Your first TOPS screen looks like Figure 3.55.

If this is your first time running TOPS, type in your network name. This name identifies you as a server on the network. Unlike the serial number, this network name can be changed. On the PC you can program one of your function keys to take you directly into the TOPS menu. Using the function key approach can be done at the DOS level *only!* Outside of DOS, trying to reconfigure function keys could interfere with a particular application that you're using. As you become an advanced TOPS user, or if you're experienced with MS-DOS, you can access all of the TOPS functions from the DOS command line. Once in the TOPS menus, you can assign your network name.

Once you have TOPS loaded into memory, it's there until you either power down or uninstall. To use your Mac without TOPS, you have to shut the Mac down, reboot, and hold the option key after you see the "Welcome To Macintosh" screen. This feature

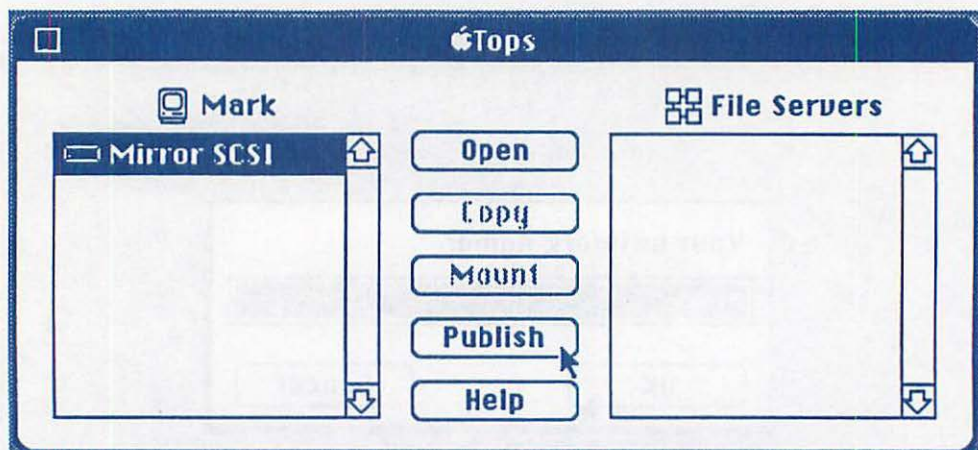
FIGURE 3.55 TOPS Network Name screen

is useful when you need to work independently of the network but still need to use network peripherals.

The first thing to do is to decide which files to make available for network use. On the Mac, pull down the Apple menu and select TOPS. On the PC, you must enter into the TOPS menu program or issue the appropriate TOPS command at the DOS level. Now you can perform your network management. When you select TOPS, you will have a variety of options. See the TOPS opening screen in Figure 3.56.

At this point you need to “publish” the files you want. Publishing means making folders or subdirectories available for network use. It also tells the network you’re a “server.” Remember when you first selected TOPS from the Apple menu, you assigned yourself a unique network name. Each server must have one. It is the network name that identifies you as a server, but only users who have published something are considered to be servers on the network. Follow these steps for publishing data:

FIGURE 3.56 TOPS opening screen



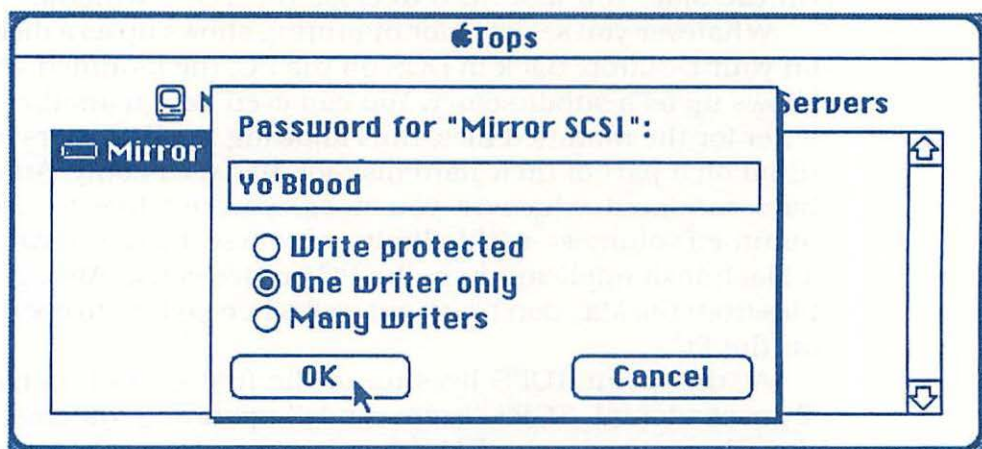
MAC

1. From the left-side dialog box select the disk or folders you want published. If you want to restrict access, or if you're using multiuser software, hold down the **OPTION** key *before* you click on the "Publish" button. This will bring up an additional dialog box that allows you to set access parameters and passwords. See Figure 3.57.
2. Set your parameters and you are published for network use. Click "OK."

IBM PC

1. Access the TOPS menu by either typing "LOADTOPS" at the **C>** or by using a function key that you may have programmed.
2. Once in the TOPS menu, follow the directions at the bottom of the screen to publish directories, subdirectories, data files, etc.

FIGURE 3.57 TOPS Access Privileges screen



From this point on you can publish anything you like.

As indicated in the above steps, when you publish something, you are able to decide how you want to control access to it. You have a choice of “Read Only”—no writers, “One Writer Only”—first come, first served, or “Many Writers.” The default configuration is One Writer Only. With the lack of multiuser software for the Macintosh, this is probably the safest configuration to use. More than one person trying to write to the same file with a single-user application causes catastrophic problems. If you are using multiuser applications, check with the manufacturer to be sure that the product will run under the TOPS network.

From the main TOPS menu you also see who the other on-line servers are and what they have published, provided they didn’t password it. On the Mac, the servers are listed on the right-hand side of the TOPS menu. On the PC, you simply select Servers from the menu. With the PC, just press the appropriate function key to exit back to DOS.

If something has been published by a server, then you “mount” whatever was published. After you select the item that

has been published, select "Mount" from the appropriate menu. On the Mac, you just need to close the TOPS window.

Whatever you selected for mounting shows up as a disk icon on your Desktop. Back in DOS on the PC, the mounted volume shows up as a subdirectory. You can even assign another drive letter for the mounted files, thus allowing the IBM users to partition off a part of their hard disk for Mac users only. After you have mounted whatever you need, you are free to use the mounted volumes—within limits, of course. First, you can't run a Macintosh application on the PC or vice versa. Also, graphic files from the Mac don't turn out well when you try to open them on the PC.

At this point TOPS lives up to the first part of its name—Transcendental. TOPS "transcends" operating systems. Even though you can't run IBM programs on a Mac, you can easily integrate the two machines on the same network and have them talking to each other in very civil tones. To the Mac, IBM subdirectories appear as if they were a disk in the disk drive. PC files become generic document icons. To the PC, Mac folders appear as DOS subdirectories. Files appear to be standard PC files.

At this point TOPS begins to show its value. Let's look at some possible scenarios. For example, suppose you had several IBM ATs and several Macs with *no* hard disk. Any or all of the IBM ATs could supply several megabytes of storage space for your Mac files and programs. You can run your Macintosh from the IBM hard drives, just as if they were Mac hard drives. Even though you can't run an IBM application on your Mac, you can store Mac applications and startup files (System, Finder, AppleTalk ImageWriter, LaserWriter, etc.) on the PC. Then, when you mount the appropriate volume on your Mac, you can double-click on the Finder icon for the newly mounted disk, and the IBM subdirectory becomes your startup disk. Now eject *all* your Mac disks and run your Macintosh as if you had your own hard disk. This configuration leaves your Mac disk drives free for your data disks. The same thing can be done with the PC. DOS can be stored on a Macintosh hard drive, and your PC can operate using a Macintosh TOPS server.

SAMPLE TOPOGRAPHY AND CONFIGURATIONS

These samples are just that—*samples!* They are meant to give you only a starting-point, not the whole range of possibilities.

There are four topographies that can be used with TOPS. You have to stay with the standard serial connections if you use AppleTalk connections. With the twisted-pair Farallon connections you have all four topographies available. See Figures 3.58, 3.59, 3.60, and 3.61.

You must avoid circular or loop connections as in Figure 3.62.

Here's a sample network configuration using TOPS and AppleTalk cabling.

5 Mac SEs with internal hard disks

- 5 Mac Plus computers:**
- 1 with 80 Mbyte hard disk and tape backup
 - 1 with 40 Mbyte hard disk with tape backup
 - 2 with 20 Mbyte hard disks
 - 1 with two 800K floppy disks

FIGURE 3.58 Serial topography

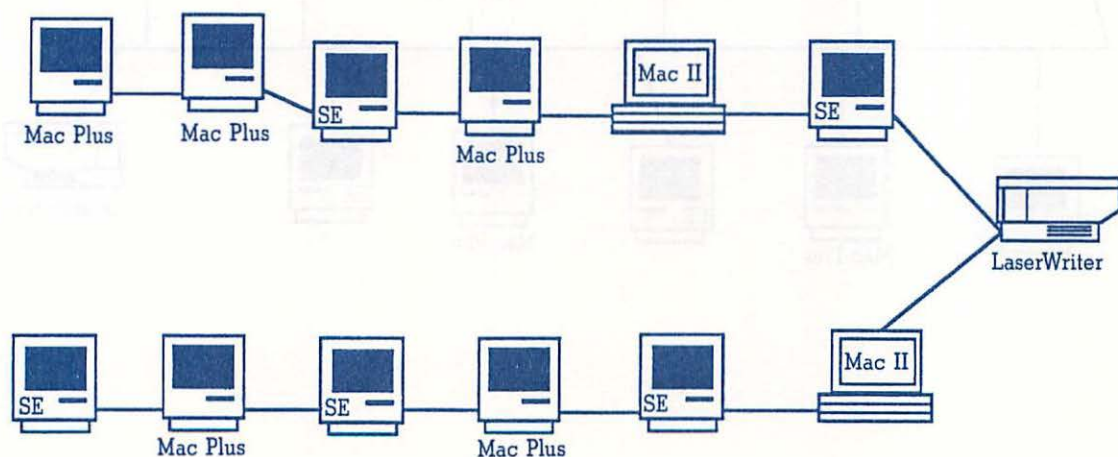


FIGURE 3.59 Star topography

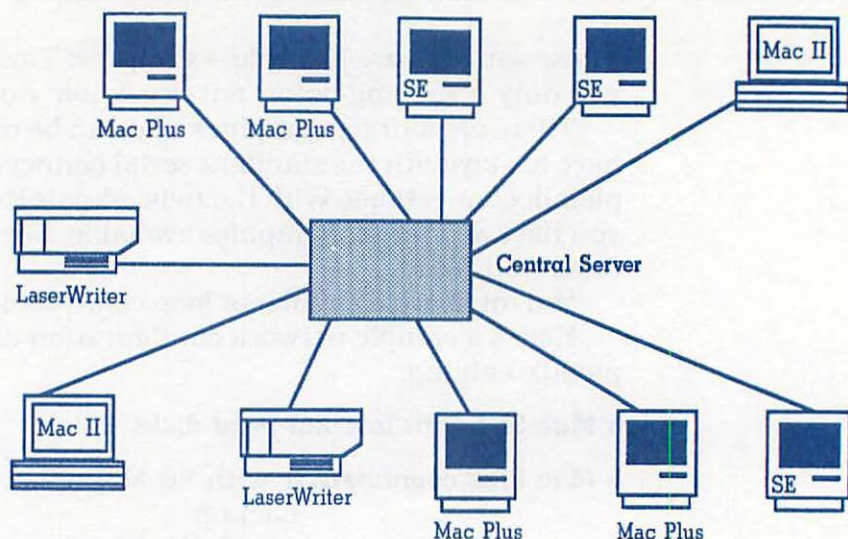


FIGURE 3.60 Parallel topography

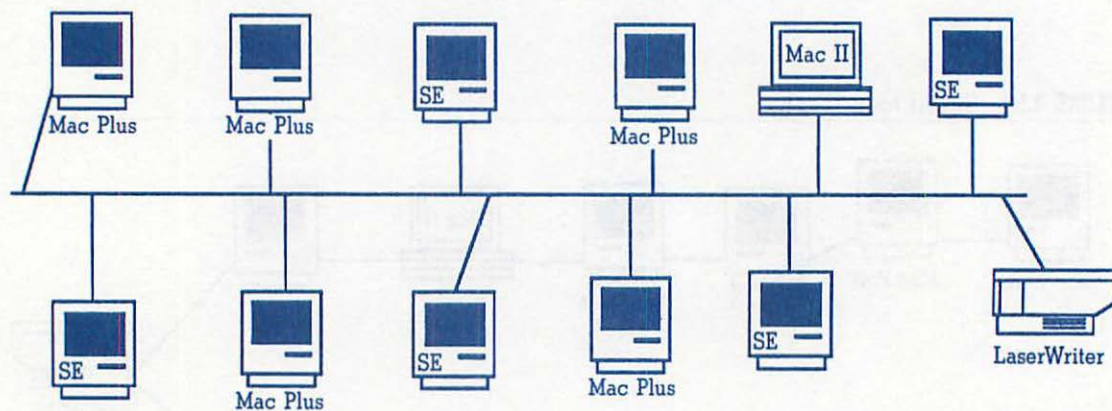
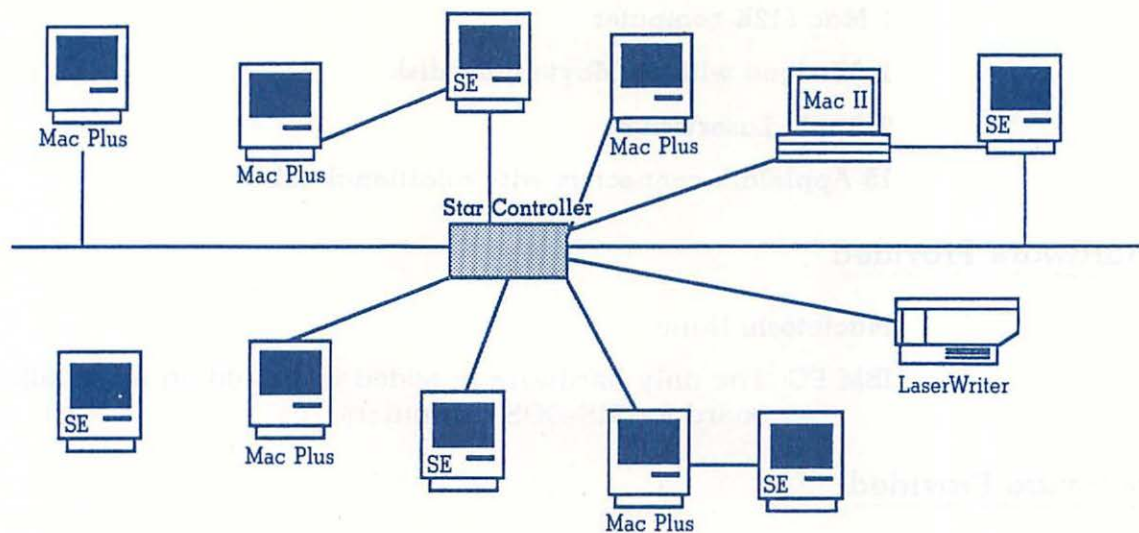
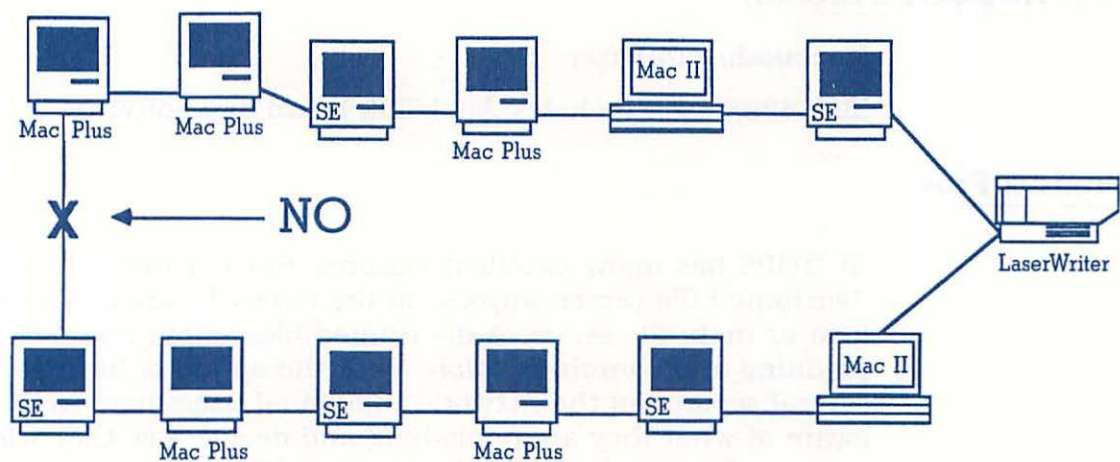


FIGURE 3.61 Combination topography**FIGURE 3.62** Loop topography

- 1 Mac II with 80 Mbyte hard disk
- 1 Mac 512K computer
- 1 AT clone with 20 Mbyte hard disk
- 2 Apple LaserWriters
- 15 AppleTalk connectors with additional cable

Hardware Provided

Macintosh: None

IBM PC: The only hardware provided is an add-on AppleTalk board for MS-DOS computers.

Software Provided

Macintosh: TOPS software for one user

IBM: TOPS software for one user

PRODUCT PRICE(S)

Macintosh: \$149/user

IBM: \$395/user. Includes AppleTalk board and software

Product Pros

■ TOPS has many excellent features. Since it works as a distributed file server, anyone on the network can act as the host or main file server. A distributed file system requires planning and *communication*. With the option of having several servers on the network, individual users have to be aware of what they are publishing and decide how they wish to control access to their selected files. TOPS is easy to install on the Mac, and just as easy to use. Installation on the PC takes a bit longer to install and configure. A good working knowledge of DOS is valuable. Being able to program function keys, write AUTOEXEC files, and work with Direct

Memory Access (DMA) channeling will make life with TOPS much easier. Because the TOPS system is a distributed system, one server can go down without the entire network going with it. The worst scenario is the famous Mac bomb. Anyone accessing a server when it does go down will be provided with several options. You may be allowed to continue working with the application or file you were using until you need disk access. At this time, TOPS gives you a message about the server being off-line and then asks if you want to save changes to one of your disks.

Product Cons

■ One of the excellent features of TOPS is at the same time one of its drawbacks. There are some problems inherent in a network with a distributed file-serving configuration. Most of them arise because of lack of foresight and communication. For example, if an operator who is scheduled to publish specific files is unavailable, how do other users get to the files they need? The way to prevent such problems is with preplanning and discussion.

■ Another problem with TOPS concerns its integration with MS-DOS computers. Since the MS-DOS computers use Direct Memory Access (DMA) channels to control where information is channeled through the bus, TOPS can get confused. The confusion arises when you access the TOPS menu. TOPS may not know what memory channel to access in order to locate network servers. The result will be that no servers show up on the network. One solution is to add a line to your CONFIG.SYS file. Usually, if you add "DMA-NONE," and then reboot TOPS, your servers come on line.

■ TOPS is unique, but those who have worked with PC-Net should see some similarities between the two. The fact that TOPS is a distributed file-serving system requires managers to rethink their network schemes. Users need to discuss and plan their network before jumping in. Preplanning helps ensure smooth operation.

PC-MacBridge

Company name: Tangent Technologies

Address: 5720 Peachtree Parkway
Suite 100
Norcross, GA 30092

Telephone no: (404) 662-0366

Product name(s): PC-MacBridge
PC-MacBridge/ATB
PC-MacBridge/AFP

Type of LAN: 1. File server software
2. AppleTalk board for IBM PC and clones

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
IBM PC/XT/AT
Most IBM clones

Network wiring supported: AppleTalk twisted-pair
Farallon twisted-pair

Maximum length of network: 1,000 feet without repeaters

Maximum number of users: 32 without repeaters

Network speed: 320.4K baud with either coaxial AppleTalk or twisted-pair PhoneNET cable

Product Description

PC-MacBridge has been around longer than any other networking software for the Mac. When PC-MacBridge was first introduced, its primary purpose was to connect the IBM into the AppleTalk network so that the IBM could access the Apple LaserWriter. PC-MacBridge originally used a program called Mail Cen-

ter™ from Videx Corporation in Portland, Oregon. Mail Center provided a rudimentary E-Mail program for the Mac. Then Tangent Technologies made some adjustments and came up with a compatible MS-DOS version, allowing simpler file transfer between MS-DOS computers and the Macintosh. This transfer was done under the guise of E-Mail files. Now the Mac could send and receive text files from the IBM and use these files for various—and probably evil—purposes. Likewise, the MS-DOS computers could utilize wonderful TEXT files created on the Mac, format the files with a word processor, and send them to the LaserWriter! (This was of course in the “good ol’ days,” circa 1985!)

Currently, PC-MacBridge supports AFP servers like MacServe from Infosphere, AppleShare, and TOPS, providing file-serving capabilities and integration of MS-DOS computers. With the variety of file conversion programs available (see Chapter 4, LAN Peripherals), many files created with one specific application can be converted to another application on a different type of computer. With the MacServe, Tangent has created a full complement of LAN products. For those who want simple E-Mail operations and the ability to connect their IBMs to the LaserWriter, then the PC-MacBridge/ATB (AppleTalk Board) and software should do the trick. If you want your MS-DOS computer to function as a standard node on the AppleTalk network, you need to add the PC-MacBridge/AFP (Apple File Protocol) component. PC-MacBridge/AFP allows an MS-DOS computer to become a client on AppleShare.

Tangent also sells PSprint, which converts files created with Word, Word Perfect, and others into PostScript documents that can then be sent directly to PostScript laser printers such as the Apple LaserWriter. PSprint allows users to access the powerful page description features of PostScript laser printers.

SETUP AND INSTALLATION

PC-MacBridge is easy to install on both the Mac and the MS-DOS computers. Follow any of the standard topographies for setting up your LAN, avoiding a loop. You need a copy of the MS-DOS, PC-MacBridge software for each MS-DOS node on the network.

The number of Macintosh hosts you intend to use determines the number of copies of PC-MacServe that you need. For purposes of this example, it is assumed that there will be only one computer serving as the host. You also need a PC-MacBridge AppleTalk card for each MS-DOS computer on the network.

Tangent has an agreement with Infosphere to sell MacServe with PC-MacBridge. The procedure for installing the Mac software is the same as it is for installing MacServe. On the MS-DOS side, there are few extra steps to do. Following these installation procedures should get your LAN up and running in a couple of hours.

There are a few important items to remember *before* you start the installation process:

1. Make backups of *all* your software!
2. Your host unit *must* have a hard disk. Without it, network administration will become a kluge and cause a lot of problems too ugly to mention. A hard disk makes installation and operation much easier. However, if your MS-DOS computer is not so lucky as to have a hard disk, the PC-MacBridge can be run from a floppy-based system.
3. Be sure all units in the LAN are plugged in and your topography has *no* loops in it.
4. When planning your LAN, determine the clock speed of your MS-DOS computer. The PC-MacBridge AppleTalk card comes in two flavors, one for PCs that have a CPU clock speed of 4MHz and one for the 8MHz machines. If you have one of the clones that allow you to switch between the two speeds from your keyboard, get the 8MHz card. Most of the newer IBM AT and AT clones come standard with the 8MHz CPU. If in doubt, ask your dealer.

These installation steps make several assumptions:

1. At least one of your Macs has a hard disk.
2. At least one of your MS-DOS computers has a hard disk.
3. There are at least three computers in your LAN.

Mac Installation

This installation process assumes that you are installing PC-MacServe.

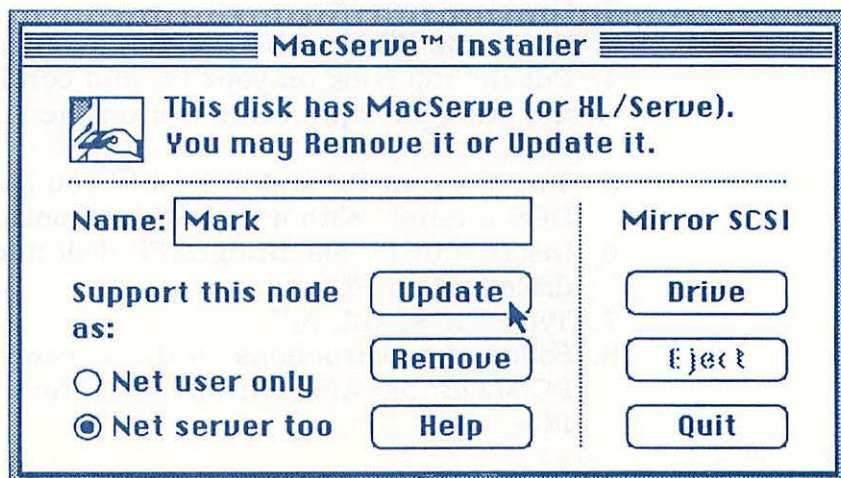
1. Make a backup copy of PC-MacServe!
2. Turn on your hard disk and boot up the host unit.
3. Insert PC-MacServe into the Mac that will serve as the host unit.
4. Open the PC-MacServe disk and double-click on the installer icon, as shown in Figure 3.63.
5. Your screen should now look like the one in Figure 3.64.

FIGURE 3.63 Installer icon



Installer

FIGURE 3.64 Tangent-MacServe screen



6. Since you are installing a server, be sure the button labeled "Server too" is clicked on. Each PC-MacServe disk can be used to create a single server and an unlimited number of users.
7. Click the Drive button on the right-hand side of the PC-MacServe dialog box until you see the name of your hard disk drive, to be sure you're installing PC-MacServe onto your hard disk.
8. If you need help, click the Help button. This brings up a list of help topics. Simply double-click to choose a topic.
9. Enter a unique name, one which will identify you on the network and print ques.
10. Click the Install button to finish the installation process.

Use these same procedures to install PC-MacServe on *any* startup disk. As I mentioned, one PC-MacServe disk can be used to install *one* server and an unlimited number of "User Only" stations. These same procedures are used to install PC-MacServe for the other users on the network. The only variation would be that you cannot select the "Server too" selection in the PC-MacServe Installer dialog box.

MS-DOS Installation

1. Make a backup of your software!
2. Open up your PC.
3. Insert the PC-MacBridge/ATB into any slot except slot #1.
4. Put the top back on your PC and connect the cable to the available 9-pin connector on the PC-MacBridge/ATB card.
5. Turn on your PC and wait until you get the standard DOS prompt. With a hard disk it looks like this—**C>**.
6. Insert your PC-MacBridge/AFP disk into the available drive in your PC.
7. Type: "INSTALL A:"
8. Follow the instructions on the screen for installing the PC-MacBridge/AFP software onto the hard disk of your PC.

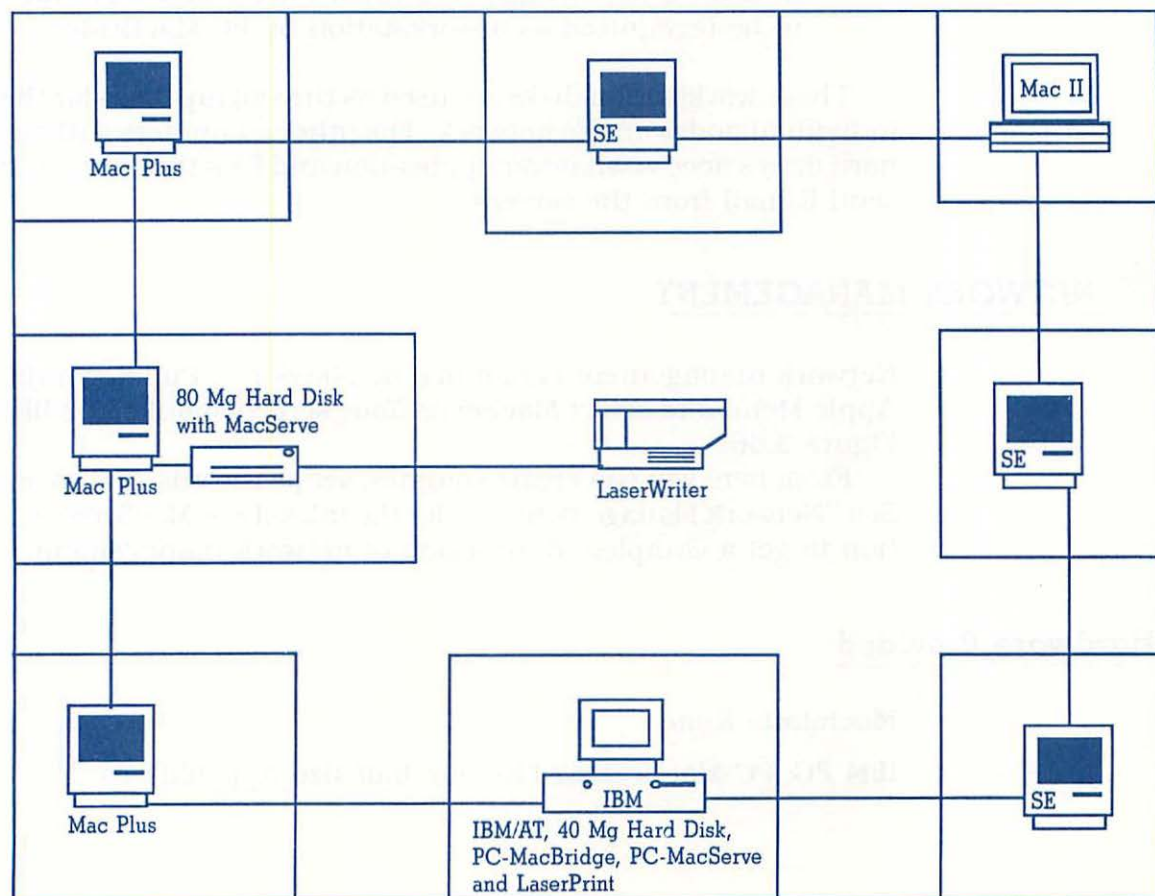
CONFIGURATION and TOPOGRAPHY

You can configure PC-MacBridge in any standard AppleTalk configuration, such as the one in Figure 3.65.

Here are some basic configuration suggestions:

1. Partition 5 to 10 megabytes of the IBM AT's hard disk as a Macintosh or PC-MacBridge volume. Install PC-MacBridge on this volume.

FIGURE 3.65 PC-MacBridge configuration



2. Set up two of the Macs with hard drives. The other four will be work stations. On one Mac with a hard drive, install PC-MacBridge server software. On another Mac, install either Mail Center or inBox. This host unit now provides the E-mail services for the network, while the other host acts as the file server.
3. Create working startup disks for the four workstations. A working startup disk contains a system folder with the following files:
 - System
 - File
 - MacServe (this is put into the system folder when you install PC-MacBridge). You must have a MacServe file to be recognized as a workstation by PC-MacBridge.

These workstation disks are used as the startup disks for the individual nodes on the network. The other computers without hard drives access whatever application and files they need and send E-mail from the servers.

NETWORK MANAGEMENT

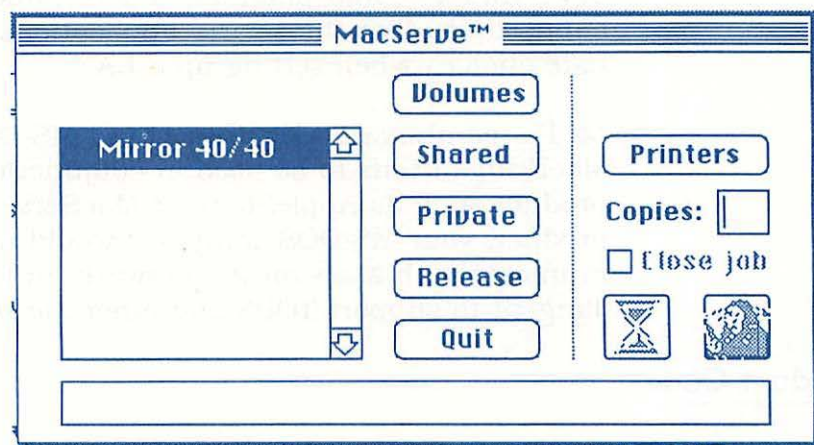
Network management is handled by MacServe. Pull down the Apple Menu and select MacServe. Your screen should look like Figure 3.66.

From here you can create volumes, set passwords, and so on. See “Network Management” under the Infosphere-MacServe section to get a complete description of network management.

Hardware Provided

Macintosh: None

IBM PC: PC-MacBridge/ATB—one half-size AppleTalk card

FIGURE 3.66 PC-MacServe management screen

Software Provided

Macintosh: PC-MacServe

IBM: PC-MacBridge/AFP
LaserServer

PRODUCT PRICE(S)

Macintosh: PC-MacBridge with PC-MacServe\$395.00

IBM PC: PC-MacBridge/ATB with AFP software\$350.00

Product Pros

■ PC-MacBridge was a pioneer in the Macintosh LAN market. Since its introduction in 1985, Tangent has done a great deal to improve the product. Most important, Tangent's strategic alliances with other developers have allowed the company to concentrate on other projects and continually enhance its product line. In addition to providing support for

Videx's Mail Center™, Tangent also supports Think Technology's InBox™, Infosphere's MacServe, and AppleShare. This support for other third-party applications offers users alternate choices when setting up a LAN.

■ For combination Macintosh and MS-DOS networks, PC-MacBridge needs to be used in conjunction with an E-Mail product such as AppleShare or MacServe. Without this product, your MS-DOS computer would not be able to communicate with Macs on the network. In the future, look for Tangent to support TOPS and other file-serving applications.

Product Cons

■ PC-MacBridge requires file or disk servers from a third party, thus forcing the user to rely on several companies for tech support. When a problem occurs, it can be difficult to determine whose product is at fault. Currently, PC-MacBridge/ATB works with 4 and 8 megahertz CPUs. But some MS-DOS computers like to run at 10 or 12 megahertz, and these faster CPUs can give PC-MacBridge/ATB some difficulties. With the faster CPUs, the system locks up and forces you to reset your clock speed (if you can).

HyperNet 2000

Company name: General Computer

Address: 215 First Street
Cambridge, MA 02142

Telephone no.: (617) 492-5500

Product name(s): HyperNet™ 2.0

Type of LAN: File serving software and hard disk

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

Network wiring supported: AppleTalk twisted-pair
PhoneNET twisted-pair

Maximum length of network: 1,000–3,000 feet without
repeaters

Maximum number of users: 32 without repeaters

Network speed: 230.4K baud

PRODUCT DESCRIPTION

HyperNet 2.0 is file-serving software that supports AppleShare and HFS file system. It works with any available SCSI hard drives, although it was originally designed to operate with the HyperDrive series of hard disks. HyperNet 2.0 is a basic file-serving system and does not require a dedicated hard disk to act as the host. It operates under a distributed file server system, so that any hard disk on the network can act as a file server. Distributed file servers on the same network disperse the work load. No one server is responsible for the entire network.

HyperNet 2.0 contains most of the standard LAN elements. Some of the features are:

■ **Remote File Access.** This allows clients (users) on the network to access folders, files, and applications from the server and to read and write to a single file. This is the feature that supports multiuser applications.

■ **Multiple File Access.** HyperDrives create “drawers” that are used to store applications and data. HyperNet 2.0’s Multiple File Access permits multiple users access to the same drawer at the same time. Multiple File Access is another component used with multiuser applications.

HyperNet 2.0 does an excellent job of supporting AppleShare. Unlike AppleShare, HyperNet 2.0 does not require a dedicated file server. It can, however, access an AppleShare server. Likewise, an AppleShare server sees a HyperNet 2.0 server as a valid server on an AppleTalk LAN.

All the basic Macintosh LAN features are available with HyperNet 2.0. File locking allows only one user at a time to write to the file. Other users are allowed to read the file, but can make no changes to it. To secure sensitive files, HyperNet uses an encryption program, a utility that comes with the HyperDrive hard disk systems. It also offers standard password-protection. Since HyperDrives use “drawers” instead of “volumes,” each drawer can be encrypted or password-protected.

SETUP AND INSTALLATION

If installing HyperNet 2.0 on a HyperDrive system, most of the setup and installation has already been done for you. HyperDrive comes completely formatted, just waiting for you to create drawers. All you need to do is to install HyperNet 2.0 on the drive. Actually, all hard disks come out of the box preformatted and ready to go. This makes installation of HyperNet 2.0 easy. At the Finder, insert the HyperNet 2.0 installation disk. Double-click on the HyperNet 2.0 Installer icon and follow the on-screen instructions. Client stations are installed the same way. Each client creates a startup disk. He or she then can start up and log on to the network with this disk.

Since HyperNet 2.0 is a distributed file server, anyone on the network can act as a server. This allows you to distribute the work load over several users. The benefits and drawbacks of a distributed file-serving system are well documented. It would seem that a distributed file-serving network is best suited for specific types of workgroups, such as desktop publishing. People in such groups need to share different types of files with many other users.

HyperNet 2.0 is installed as a familiar desk accessory. To logon to the network, simply select “HyperNet” from the Apple menu. Enter your password and you are logged on. Now you can mount drawers from your server that have been available for network use.

 **CONFIGURATION AND TOPOGRAPHY**

HyperNet 2.0 can be configured on any Macintosh and SCSI hard disk. Because HyperNet 2.0 is a distributed system, you can have any configuration that fits your needs. In fact, configurations can be changed to meet changing needs.

HyperNet 2.0 uses the standard AppleTalk serial topography. You can also use Farallon's PhoneNET if you want to add a parallel or star topography.

Hardware Provided

Macintosh: None, unless you bought HyperNet 2.0 with a HyperDrive hard disk.

IBM PC: None

Software Provided

Macintosh: HyperNet 2.0 Server and Client Installer

IBM: None

 **PRODUCT PRICE(S)**

Macintosh: HyperNet 2.0.....\$299.00

 **FastNet**

Company name: Dove Computer Corporation

Company address: 1200 N. 23rd St.
Wilmington, NC 28405
(919) 763-7918

Product name(s): FastNet™

LAN quality: Excellent. FastNet allows a Macintosh node to connect to a variety of LAN systems—DECnet™, Starlan™, PCNet™, and IBM's Token Ring. These bridges provide additional flexibility for users who require internetwork connections without giving up their AppleTalk network.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

The FastNet system is an intelligent controller between the Macs SCSI port and other LANs. With FastNet, Macs can now have access to Ethernets, DECnets, Starlan, PCNet, and IBM's Token Ring network. The key to the FastNet system is the transparency of interfacing with these various networks. File transfers, file access, problem launching, and E-Mail are major network activities controlled by the familiar Macintosh icons.

FastNet uses the SCSI port of the Macintosh. Macintosh SE and the Mac II can use Ethernet boards for a direct connect Ethernet connection. When using the SCSI port, network speed is about 1.5 megabytes per second, much faster than the 230.4K baud rate of AppleTalk.

FastNet is a smart peripheral. It contains its own 68000 processor that allows communications to be processed and controlled within FastNet, thus freeing up the CPU of the Macintosh for other processing activities. The controlling software resides in RAM and takes up only 64K of space.

PRODUCT PRICE(S)

FastNet..... \$1499

LAN Peripherals

Like Cleopatra needed Marc Antony, like Crosby, Stills, and Nash need Young, LANs need peripherals. Peripherals include hard disks, optical disks, network repeaters, and bridges for internetwork connections. All these peripherals add the frosting to the LAN cake. Without them, LANs would probably be boring. In fact, without peripherals, the best LAN would be Sneaker-Net.

SNEAKER-NET

This is the least expensive and complicated of all networks on the market today. It is also the most widely used network in existence. Users of Sneaker-Net *never* have to worry about hardware-software compatibility. The network is simple to set up, use, and support. This is the way Sneaker-Net works. Worker A finishes a drawing that is to go into the company's monthly newsletter. This drawing needs to get to Worker B, who does the pasteup. Worker A saves his file to a data disk (which must be a floppy disk). Worker A then removes the data disk, puts on his or her sneakers (if not already wearing sneakers), walks over to Worker B, and hands Worker B the data disk. Worker B then places this data disk into a drive, copies the file to a data disk, hands the data disk back to Worker A, and finishes laying out the newsletter. There are, of course, some inherent complications in this network. However, for those companies that cannot afford the high cost of other LANs and/or have no technical prowess, Sneaker-Net may be just the answer.

The structure of this section is like the rest of the book. The peripheral section looks like this:

LAN Support Companies

Company name:

Company address:

Product name(s):

LAN quality:

Product description:

Product price(s):

LAN peripherals are classified into four distinct areas:

1. **Add-on cards.** Add-on cards are new to the Macintosh. The reasons are obvious. It was too difficult to develop add-on cards for a computer that users had to take to their dealer just to add more memory. The add-on card business is starting to catch on with the introduction of the Macintosh SE and Macintosh II. Some companies are selling add-on cards with other products. So far, only one company has turned its attention to developing just add-on boards for the two new Macs. AST, the only company listed, made its fame by developing cards for MS-DOS computers; now it has turned its expertise to the Macintosh. Even though AST is the only company listed for add-on boards, more companies are sure to come along. 3Com has an Ethernet board for the Macintosh II that is sold as part of the 3+ network. Avatar has developed a card that connects the Mac SE to a VAX/VMS minicomputer. Information on these cards is provided in their respective sections.

There are also video cards expanding the video capabilities of the MAC SE and MAC II. Look for SuperMac Technol-

ogies to be leading the way in this area. Video cards were not included in the add-on card section, because they don't have a direct relationship to LANs (a debatable point, I'm sure). They will, however, have an impact on sales of the new Macintosh computers. Apple will soon be releasing their UNIX card. Called A/UX (Apple/UNIX—get it?), this card is sure to raise some eyebrows in the industry. It represents a new direction, a third generation, of Macintosh-to-mainframe communication standards.

2. Bridges. Bridges do just what their name implies—they create a bridge from one network to another. To get from an AppleTalk network to an Ethernet LAN, you need a bridge; to link your Mac to a VAX via Ethernet, you need a bridge; to connect multiple AppleTalk networks, you need a bridge. For any kind of Ethernet connection, the Kinetic FastPath™ is the ticket. FastPath is easy to connect and set up. Hayes Microcomputer Products saw a need to extend the distance between nodes and to connect multiple AppleTalk networks. Thus InterBridge™ was developed. InterBridge is essential for multiple LANs. Their “Zone Chooser” is a key element for allowing users to jump to different parts of the network called zones.

The Zone Chooser looks just like the Apple Chooser, with the exception of an additional window. When the Server icon is selected in the Chooser window, the Zone window displays the various zones (other networks) that are connected. Users simply select a zone to see a list of available servers and printers in that zone. Look for bridges to connect you to more than just Ethernet. IBM Token Ring and UNIX bridges are just around the corner. As you can tell, bridges are useful for more than just crossing the river.

3. Hard disks. This category includes both hard disks and Write Once, Read Many (WORM) optical disks. Hard disks with LANs are a *must*. Without them, the LAN would be slow and not worth the time and money you put into it.

WORM drives, also called CD-ROMS, are a new technology. They're similar to hard disks, the difference being the medium

used for storing the data. Instead of the standard mylar-covered disk, WORM drives are like compact disks for music. The drives hold many times more information in a smaller space than hard disks. Unlike a hard disk, you can write information to the WORM drive only once. You had better get it right the first time! The LoDown WORM drive is the only WORM drive currently available for the Macintosh. This drive stores from 400 to 800 MB! If you have a need for mass storage, this may be the way to go—especially for those of us who use a lot of graphics, such as architects, engineers, and CAD users. Look for more developers to release WORM drives in the near future.

4. Mac-to-mainframe connections. In large companies, the mainframe is still the primary computer to access. Personal computers are all right for some tasks, but to really get the job done, look to the mainframe. As we are all aware, there has been a proliferation of personal computers. With the increase in the number of microcomputers has come an increase in their power. Microcomputers are proving to be powerful workhorses when connected to the company mainframe.

The Macintosh, with its wonderful user interface, was to be the perfect “smart terminal.” Now the proper term, so it seems, is “workstation.” Needless to say, it has taken developers until now to refine Mac-to-mainframe communications. We are now seeing the second generation of communication programs. These Mac-to-mainframe connections provide access to minis and mainframes with a click of the mouse. Once connected, users are maintaining much of the standard Mac interface, including pull-down menus, cutting and pasting of on-screen data, graphic storage and retrieval, macros, and point-and-click procedures for logon and logoff.

Apple is busy working on their A/UX (Apple UNIX) product, which will usher in the third generation of mainframe connections. Third-generation programs should provide a total Mac environment, even during the host session!

This section does not go into great depth with each product. To do so would require a huge book. Neither is this section a compendium of “press releases.” The products are judged relative

to their effectiveness in a LAN environment. There are many products on the market for the Macintosh computer; few of them, however, are compatible with a network environment.

Most of these LAN products follow and support the Apple File Protocol (AFP). Future products, too, will need to follow the AFP standard if they want to be successful. If you are looking for network products, be sure they support AFP standards.

There are sure to be even more products on the market by the time this book reaches you. Suffice it to say the companies presented here are breaking new ground and setting new communication standards for others.



Company name: AST Research, Inc.

Company address: 2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333

Product name(s): Mac86™
AST-Pak™
Mac286™
AST-ICP™
AST-RM4™

LAN quality: Good to excellent. The cards that AST has created are guaranteed to take the Macintosh well into the future. The Mac86 and Mac286 are cards that supply MS-DOS compatibility, something like a MacCharlie™, but an add-on card. How these two products fit into a LAN depends upon user needs. The other cards were all designed to support network needs, supplying additional memory, ports, slots, and support for A/UX.

Computers supported: Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

AST has been making add-on boards for MS-DOS computers for years. With the introduction of the Macintosh SE and the Macintosh II, AST has entered the Macintosh market with a variety of products for both the Mac SE and the Mac II. These products include coprocessor boards for the Mac SE and the Mac II, a multifunction board, and memory expansion. The coprocessor boards, a combination of products from several different companies, are designed to provide MS-DOS compatibility with the Mac SE and the Mac II. AST has manufactured the add-on boards; Phoenix Technologies, Ltd., MS-DOS software. The 5.25" disk drive is supplied by Apple Computer, Inc. All the AST products have been designed to adhere to the Apple File Protocol (AFP) standards. The products for the Macintosh SE and the Macintosh II are described below.

Macintosh SE

Mac86

The Mac86 is a coprocessor that provides an Intel 8086 processor, allowing users to run MS-DOS applications. The Mac86 is essentially an IBM XT clone. Once in the MS-DOS mode, Mac users can still use the basic Macintosh features. You can cut and paste text between the two operating system environments and use pull-down menus to select needed functions. MS-DOS programs can reside on a hard disk or the external 5.25" floppy. The Mac86 plugs directly onto the internal expansion port of the Mac SE. On the board is a 10-megahertz, Intel 8086 microprocessor, the same as found in the IBM XT. The board also provides a controller for Apple's 5.25" floppy disk drive.

The Mac86 runs any MS-DOS application that supports the IBM Monochrome Display Adapter (MDA) or the IBM Color Graphics Adapter (CGA). Once loaded, the MS-DOS system appears on the Desktop as a standard Mac icon. Double-clicking the icon brings you into the world of MS-DOS, where applica-

tions can be loaded and run from either the Mac SE hard disk or the 5.25" floppy drive. Once MS-DOS files are created, they appear as nested files within folders and follow the HFS standards.

The Mac86 supports the LaserWriter, LaserWriter Plus, and ImageWriter printers. You can print directly to the LaserWriter while in an MS-DOS application, through the Mac SE. While in the MS-DOS mode, you can print to an ImageWriter in an emulated EpsonTM FX 80 mode. Access to printers is supported over the AppleTalk Personal Network (APN).

AST-Pak

This is a multifunction board that fits into the internal expansion slot of the Mac SE. The AST-Pak provides memory expansion (up to 2Mbytes) and a unique I/O bus. The I/O bus allows the attachment of additional boards for further expansion of the Mac SE system. This new bus is called FlexBusTM and allows developers to create additional boards that fit onto the FlexBus board. With this flexibility you don't have to dedicate the one expansion port of the Mac SE for only one purpose. You can mix base boards and option boards to get the configuration you need. With the addition of the AST-Pak SSF Option Board, you have two serial ports and a 5.25" IBM disk driver controller.

Macintosh II

Mac286TM

The Mac286 is the Macintosh II equivalent of the Mac86. The Mac286 was co-developed by Apple Computer and Phoenix Technologies and is a self-contained 80286 microcomputer. It comes with 1MB of RAM, a DMA controller, a socket for an optional 80287 math co-processor, and a controller for a 5.25" MS-DOS floppy disk drive. The Mac286 is two full-length boards that occupy two slots in the Mac II. The board allows you to run MS-DOS applications designed for the IBM AT, at IBM AT speeds. The Mac286 handles all of the application processing leaving

the Mac II free for other uses, making the Mac286 ideal in a LAN setting.

The Mac286 supports the IBM Monochrome Display Adapter (MDA), the IBM Color Graphics Adapter (CGA), or the Hercules Monochrome Graphics Adapter. Like the Mac86, you simply load the Mac286 software into the Mac II. The MS-DOS environment appears as an icon on the desktop, allowing you to select which operating system environment you want to work in at the Finder level. When running Switcher™ you can have the best of both worlds. Once loaded, MS-DOS applications have a full 640K of RAM to use. This, of course, leaves any and all memory of the Mac II free. Once in the MS-DOS mode, you operate an application as if the MAC II were an IBM. Specific functions and configurations are available from your Mac menus.

The Mac286 supports the LaserWriter, LaserWriter Plus, and ImageWriter printers. You can print directly to the LaserWriter while in an MS-DOS application, through the Mac SE. While in the MS-DOS mode, you can print to an ImageWriter in an emulated Epson™ FX 80 mode. Access to printers is supported over the AppleTalk Personal Network (APN).

AST-ICP™

The AST-ICP (Intelligent Communications Processor) provides two to four additional synchronous/asynchronous serial ports. In addition to the ports, the AST-ICP has an 8Mhz 68000 processor and 512K of RAM. The primary initial function of the board is to provide multiuser terminal attachments for A/UX, the Apple UNIX operating system. If you are not running UNIX, the ports could be configured for AppleTalk and AppleTalk bridges.

One of the benefits of the AST-ICP board is that it provides developers with a standard for alternative synchronous protocols, including SNA (great for communicating with IBM 3278 mainframes) and Bisync and X.25 (a standard communications protocol in Europe). Support for the X.25 protocols opens the door for the Mac II to become a very intelligent workstation in a "Wide Area Network (WAN)."

AST-RM4™

The AST-RM4 is a memory expansion board allowing RAM expansion to 4 Mbytes in 1 Mbyte increments. The board uses the standard 256K DRAMS. The memory appears as global memory to the Mac II. The main use of the AST-RM4 is to meet the memory-intensive needs of running multiuser and multitasking applications such as the Apple UNIX.

None of the AST boards have been available long enough for us to get a feel for their intimate, positive capabilities. There are obvious advantages of being the "only game in town." To be sure, there will be other add-on boards for the Mac SE and the Mac II. AST is seeking the advantage of being first and setting some standards. More than likely, its AST-ICP board and AST-RM are destined to become de facto standards. Other companies will soon be releasing MS-DOS emulation products, but for now, AST seems to have cornered the market. This isn't so bad, considering that AST has always been known for quality products, and its two-year board warranty speaks well for the company.

It's just as difficult to determine a new product's bad points as it is its good points. None of the AST boards have been available long enough to give an accurate indication of any major problems. When competition shows up, shortcomings will be more obvious. Until then, "a nod's as good as a wink to a blind horse."

 **PRODUCT PRICE(S)**

Mac86™	\$599
AST-Pak™	\$499
SSF Option Board.....	\$249
Mac286™	\$1499
AST-ICP™/2 connectors.....	\$949
AST-ICP™/4 connectors.....	\$999
AST-RM4™(1 Mbyte).....	\$899

FastPath and EtherSC

Company name: Kinetics, Inc.

Company address: 2500 Camino Diablo
Suite 110
Walnut Creek, CA 94596
(415) 947-0998

Product names(s): FastPath™
EtherSC™

LAN quality: Excellent. If you want to bridge your AppleTalk Personal Network (APN) to Ethernet, you must have a bridge of some type. FastPath provides that bridge and then some. The add-on cards for the Mac SE and the Mac II (see “Add-on Cards” in this chapter) provide a direct Macintosh-to-Ethernet connection. Whether you go with FastPath bridge or direct connect, the Kinetics products provide excellent LAN connectivity.

Computers supported: Macintosh 512
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

When Apple introduced the Macintosh SE and the Macintosh II, it ushered in a second generation of microcomputer communications. A key element in Apple's marketing plans is internet-work connectivity. Leading the way is Kinetics with their FastPath bridge to Ethernet. Kinetics' products fall into the physical layer of the OSI model. They provide that physical link to

Ethernet networks, and this means connectivity to DEC VAX/VMS systems, UNIX systems, and IBM PC systems. It's important to remember that the Kinetics products act as "gateways" to other systems. FastPath and EtherSC do not provide a file server or network management. If you have to connect a VAX/VMS system, you need the appropriate software for your host. Here are a few of the software products that work well with all of Kinetics' products. For more information on these products refer to Chapter 5: Software and Utilities.

- AlisaTalk. VAX/VMS software that provides a file server, LaserWriter spooler, terminal emulation, and more for Macintoshes.
- pcLINK. Provides a VAX-based disk server, printer spooler, and terminal emulation. pcLINK also provides connectivity to UNIX systems. Cray, Stratus™, Prime™, Cray™ (Via UNIX), Sun™, Encore™, and Convex™ computers.
- TOPS. TOPS provides a distributed file server system for Macs, IBM PC, and UNIX systems.

Ethernet has been a major force in the LAN world for a long time. Connectivity to Ethernet was seen by Apple as "legitimizing" its AppleTalk LAN. Connectivity to Ethernet also meant a foot in the corporate door. Apple knew that Ethernet was the de facto standard for LANs in major corporations. The Kinetics FastPath and EtherSC have provided the bridge that Apple needed.

Kinetics has created several products designed to bridge the gap between the APN and Ethernet. EtherSC and FastPath are the two products that act as the main bridges. Another product is EtherPort SE, and internal Ethernet controller card for the Macintosh SE. You can use either AppleTalk or TCP/IP protocols. Let's take a look at EtherSC and FastPath.

EtherSC

The EtherSC was the first product that Kinetics created for the Macintosh. It connects a Mac Plus directly to Ethernet through the SCSI port. You can use either AppleTalk or TCP/IP protocols.

The EtherSC is a product designed to link one or two isolated Macs into an Ethernet network, but it is not designed to link entire APNs to Ethernet. The EtherSC *does* provide an extra SCSI port, meaning you don't have to give up your SCSI hard disk to connect an EtherSC. The EtherSC is not just a piece of hardware; software is also included to provide terminal emulation, file transfer, and file storing services.

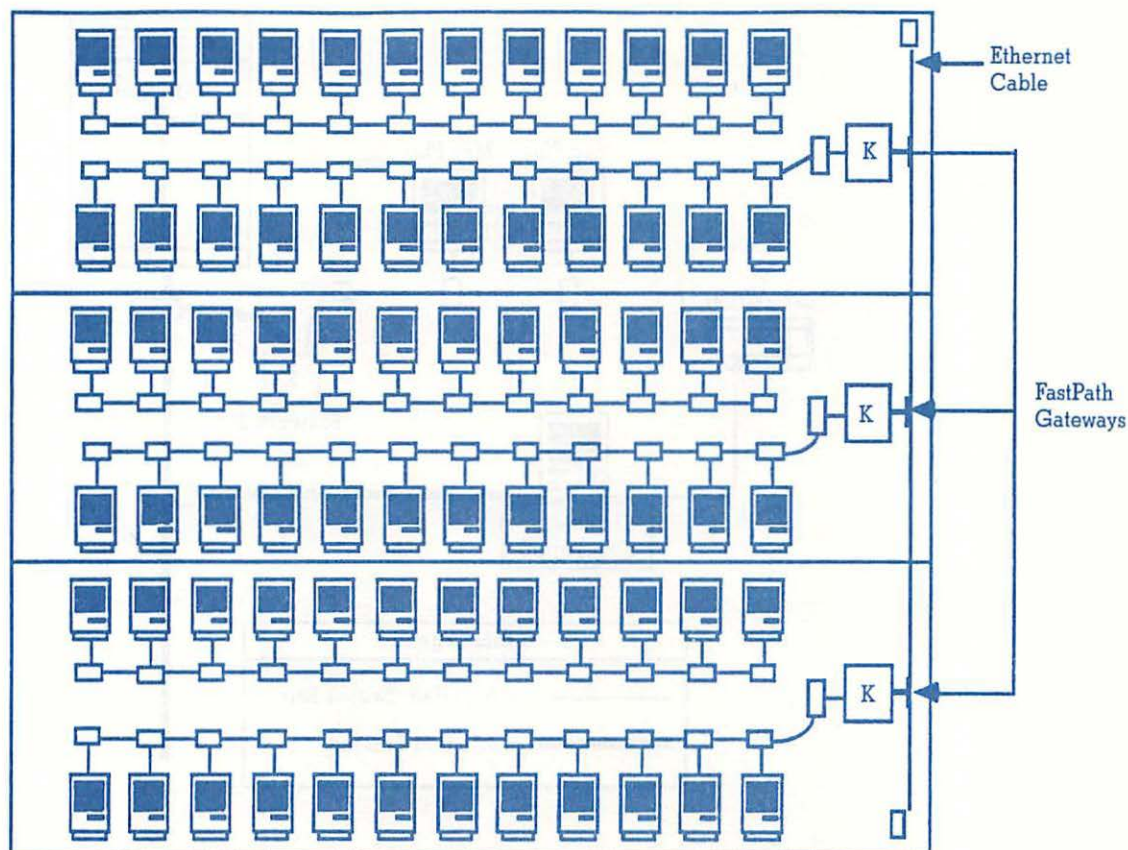
FastPath

The FastPath allows you to connect entire APNs to an Ethernet network. It can also be used as a bridge to connect multiple APNs with a fast Ethernet backbone. When FastPath is used as a gateway, Macs can connect to a variety of computer systems. The list includes DEC VAX/VMS, UNIX, and IBM PCs. FastPath doesn't care which system you connect via Ethernet. With this flexibility, FastPath provides a gateway to most major computer systems.

CONFIGURATION AND TOPOGRAPHY

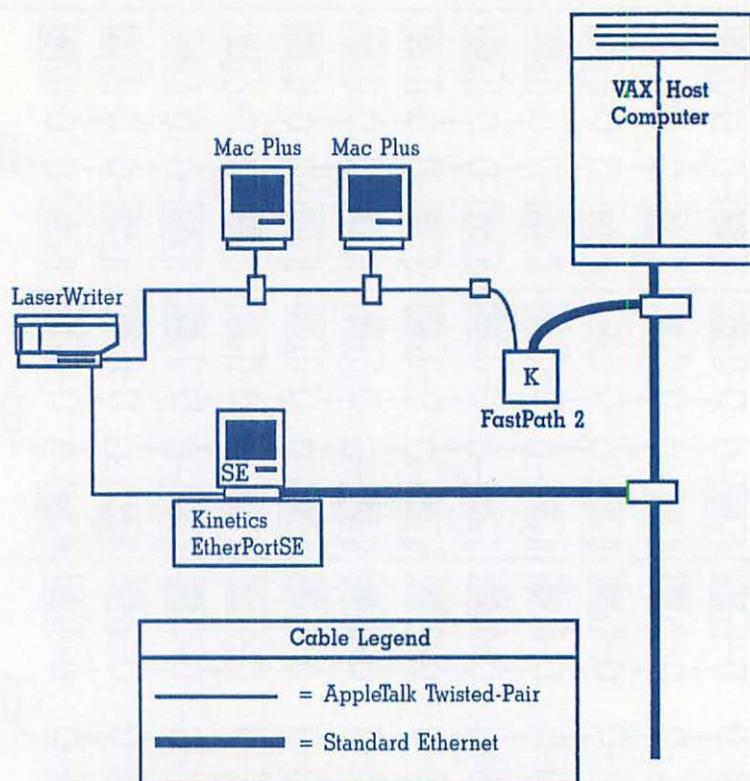
See Figure 4.1 for an example of a possible AppleTalk-Ethernet configuration and topography. This figure shows a network of Macs that spans several floors of an office building using FastPath connections to connect each APN to an Ethernet backbone. This backbone in turn connects all three floors of APNs into one giant network. FastPath can do this because it supports ZIP (Zone Access Protocol). With FastPath, you can designate one or more APNs as a zone. These zones can then be accessed via the Chooser from the Apple menu. Once connected into another zone, FastPath allows you to select devices within that zone. A device might be another server or a LaserWriter.

Figure 4.2 shows a simple Mac-MS-DOS-VAX connection. Figure 4.3 shows the complexity of networks that can set up using FastPath bridges. As you begin to see, there are many interconnections possible with FastPath.

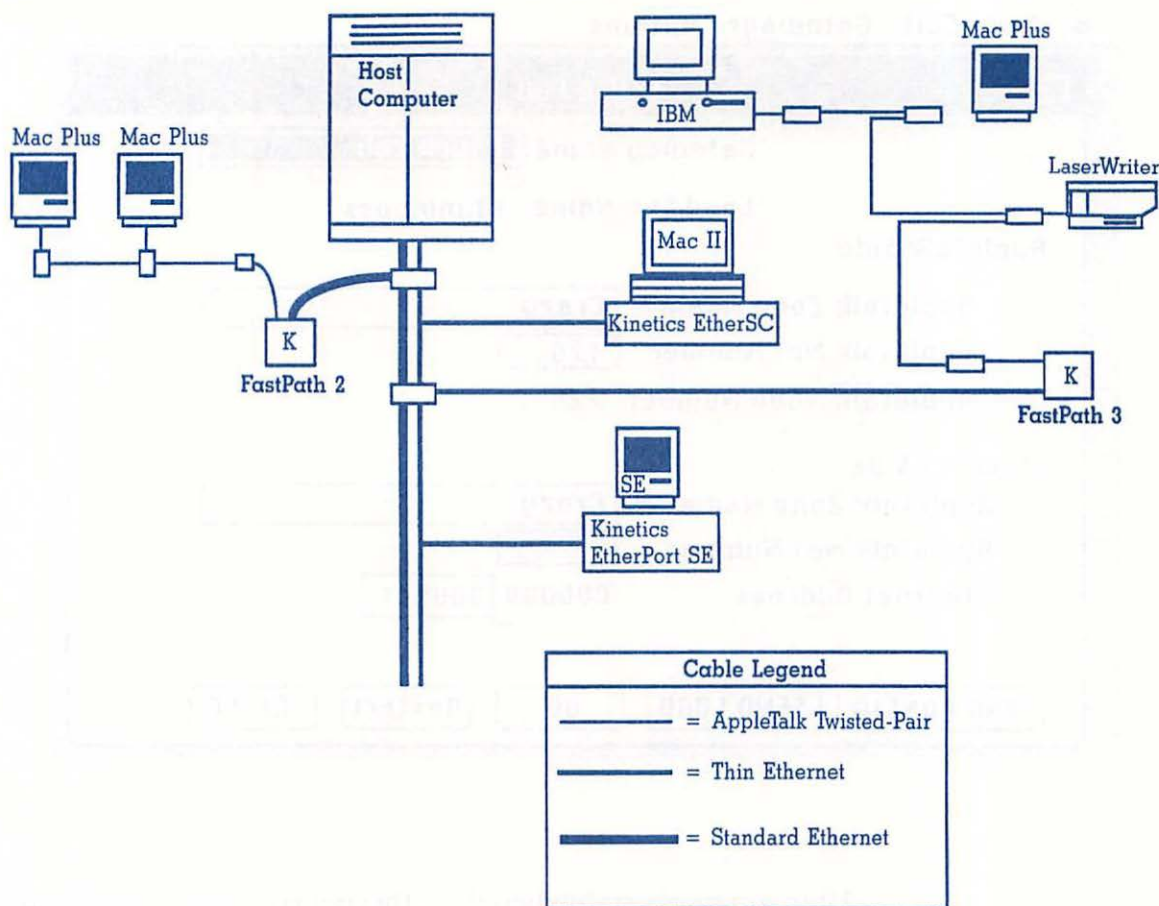
FIGURE 4.1 AppleTalk-Ethernet configuration and topography

SETUP AND INSTALLATION

In keeping with the Macintosh tradition, a FastPath is not difficult to install. Configuring the FastPath can be somewhat complex, depending upon your host system. Kinetics has made this process as painless as possible by giving you a Kinetics Internet Protocol Data Sheet and a Kinetics FastPath Programmer's Manual. To install a FastPath bridge for APNs, you need the following hardware:

FIGURE 4.2 Mac-to-VAX simple configuration

1. **Kinetics FastPath.** One(1) for each network you are connecting.
2. **Ethernet Cable.** There are actually two different Fast-Path models, KFPS-2 and KFPS-3. Model KFPS-2 is designed to connect with regular Ethernet cable and requires transceivers for each FastPath unit. KFPS-3 is designed for a direct connection with *thin* Ethernet cable, using a T-connector. The T-connectors must be covered with a plastic boot to prevent any metal of the T-connector touching metal on the FastPath.
3. **AppleTalk Connectors.** Each FastPath must have an AppleTalk connector to connect it to any APNs.
4. **Terminators.** You must have an Ethernet terminator (not sold by Arnold Schwarzenegger) at the terminus of each Ethernet network.

FIGURE 4.3 Complex Mac-to-VAX with FastPath and Ethernet

Once you have installed your FastPath(s), establishing connections is easy. The software provided with the FastPath connects you to Ethernet and allows you to configure your FastPath for a specific set of protocols. These configurations can be saved and recalled. A sample FastPath configuration screen looks like the one in Figure 4.4.

You can either use the configuration sets from Kinetics or create your own. Some host units require their own configuration data. pcLINK and AlisaTalk supply a FastPath configuration with their products. Once connected, you're ready to join the fun.

FIGURE 4.4 Sample FastPath configuration screen

File Edit Gateways Options

☐ **Psych Lab**

Gateway Name

Load File Name

AppleTalk Side

AppleTalk Zone Name

AppleTalk Net Number

AppleTalk Node Number

Ethernet Side

AppleTalk Zone Name

AppleTalk Net Number

Ethernet Address

After you have established the Ethernet connection with your particular host, you can use the Chooser DA to join a network in a specific zone. Once in the zone, other devices, servers, and so on become accessible to you.

In addition to Ethernet cable, the FastPath and the EtherSc are compatible with AppleTalk twisted-pair or twisted-pair telephone cable. You can also use Farallon's PhoneNET™ in addition to, or in replacement of, AppleTalk cable and connectors. Using PhoneNET gives you the advantage of extra distance with low attenuation.

Kinetics can boast that it has the most Mac-to-Ethernet connections in the business. Actually, for quite some time FastPath and EtherSc have been the only Ethernet bridges available for AppleTalk. Neither of the products is difficult to install or configure, although setting up a configuration file can be tricky and may require several attempts to get it right. The actual physical connection is as simple as connecting any Macintosh peripheral. Its products' ease of installation and use are the key elements in Kinetics' success in the Macintosh LAN market.

Another advantage of both the EtherPc and the FastPath is the capability of using a variety of protocols. Users are not limited to just AppleTalk, but can also use TCP/IP, VAX/VMS, and UNIX protocols.

FastPath and EtherSC have been tested extensively at a variety of computer shows, including MacWorld, AppleWorld, and the Seybold Conference on Desktop Communication, to name a few. These shows generally have a tough audience. Kinetics products have stood up to the tests with very few problems.

It is difficult to find fault with a product that does so much. Sometimes a product that attempts to do everything becomes a bit too eclectic, which some users may find confusing. The best way to find out if the product works with your specific configurations is to ask. Because of the variety of protocols supported, configuring can be tough. If you've never worked with these types of protocols and configurations, things can become confusing fast. Fortunately, Kinetics has supplied users with numerous configuration files and good support.

Documentation for FastPath and EtherSc is thin. Many topics (such as creating configuration files) are left to the user's imagination. The manual seems to take prior knowledge for granted. Users should contact Kinetics for detailed assistance.

PRODUCT PRICE(S)

FastPath.....	\$2500
EtherSC.....	\$1250

MacCharlie and Dayna File

Company name: Dayna Communications, Inc.

Company address: 50 South Main St.
Salt Lake City, UT 84144
(800) 531-0600

Product name(s): MacCharlie™
Dayna File™

LAN quality: Fair to good. Both MacCharlie and the Dayna File are stand-alone products. They connect to one Mac. Macs with MacCharlie or Dayna File can then be connected to a LAN. A Mac equipped with MacCharlie or Dayna File becomes an important element in your LAN.

Computers supported: Macintosh 512
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Dayna Communications of Salt Lake City has come a long way since introducing MacCharlie over two years ago. They've now added another product to their state of Macintosh peripherals—Dayna File.

MacCharlie provides the full functionality of running MS-DOS-based applications on the Mac, while the Dayna File offers file transfer and file conversion capabilities only. With these two products, a user on a LAN can run programs or transfer files from an MS-DOS computer. Both of the products work well in a network situation. They support AppleShare, TOPS, MacServe, etc. With this network support, transferring and converting MS-DOS files to Macintosh can be done from remote locations.

MacCharlie

Dayna Communications should be commended for the efforts they have made with MacCharlie. Over a year ago, Dayna announced one of the most ambitious peripherals yet for the Mac—a device that would allow the Mac to run IBM programs! The industry was skeptical, to say the least. When MacCharlie was first released, there were problems: the unit was only 75 to 85 percent compatible with IBM software; IBM programs could be run only in the MONOCHROME mode; and MacCharlie's screen refresh was even slower than the Mac disk drives. Since then, Dayna had made significant improvements in MacCharlie.

MacCharlie is easy to set up and operate. It comes with two components: the first is the base unit, consisting of two double-sided 5.25" disk drives, 640K of RAM, 8088 processor, two RS422 ports, one RS232 port, and MS-DOS 3.2; the second component consists of the expanded keyboards. The keyboard extension provides all the standard IBM keys and numeric keypad. There are several different versions of the MacCharlie keyboard. One is a unit that fits over the older and smaller Mac keyboards, and the other fits over the Mac Plus keyboard. You can also use third-party keyboards like Tangent Technologies PC-MacKey™.

Setting up MacCharlie is no more difficult than attaching any other Macintosh peripheral. The part it connects to depends upon which Macintosh you are using. With a 512K, MacCharlie connects to either your printer or modem port. Since you probably want to use MacCharlie as a network node, you have to connect it to the modem port. With a Mac Plus, MacCharlie connects directly to the SCSI port. MacCharlie also contains its own SCSI port, so that you don't have to give up your hard disk.

Start up with the MacCharlie-Macintosh system disk. You can also use this disk as your network startup disk. The MacCharlie icon looks like Figure 4.5.

Now insert a backup copy of your MacCharlie MS-DOS 3.2 disk into MacCharlie's drive A. Double-click on the MacCharlie icon and MacCharlie does the rest. You should see the Phoenix Software name and a RAM test. Press the spacebar to stop the RAM test. You are now in the MS-DOS mode complete with the familiar A>.

FIGURE 4.5 MacCharlie icon

MacCharlie

One of the primary questions raised about MacCharlie is compatibility. The basic MacCharlie unit runs most any MS-DOS application that is configured for monochrome graphics. To run Windows, color, or high-res graphics requires an expansion chassis with the appropriate graphics and connect the Mac into a network as if it were an IBM. Why anyone would want to do this remains one of the mysteries of the universe.

Dayna File

Many users don't need the full functionality of a MacCharlie. They just want to be able to transfer MS-DOS files back and forth to the Mac and still retain their formatting. Dayna File transfers data between 5.25" or 3.5" MS-DOS disks and the Mac. Dayna File comes with your choice of one or two 5.25" or 3.5" disk drives. The 5.25" drives can be either 360K or 1.2MB; the 3.5" drives are the IBM standard of 720K. Dayna File uses either the printer/modem port or the SCSI port. Like MacCharlie, Dayna File includes an additional SCSI port for attaching extra hard disks or other SCSI peripherals. The Dayna File includes file conversions, sometimes referred to as filters, for numerous applications. The conversions are listed in Figure 4.6.

Dayna File transfers files in either binary, MacBinary, or text (ASCII) formats. When you are ready to make a transfer, you insert an MS-DOS disk into Dayna File and double-click on Dayna File, File Conversion icon. The file conversion screen looks similar to the DA/Font mover, with full HFS support and Macintosh file-naming conventions. You can select the port that Dayna File is connected to and the type of transfer desired. You can also select the appropriate filter to preserve your formatting—a terrific time-saver.

Both Dayna File and MacCharlie are stand-alone products that support AFP standards. This means any Mac on the net-

FIGURE 4.6 Conversion list

MS-DOS	Macintosh
Word Perfect	MacWrite/Word 3.01
MultiMate	MacWrite/Word 3.01
Display Write 3	MacWrite/Word 3.01
Word Perfect	MacWrite/Word 3.01
WordStar	MacWrite/Word 3.01
Document Content Architecture (DCA)	MacWrite/Word 3.01
Multiplan	Multiplan-SYLK
Lotus 1-2-3	Multiplan-SYLK

work can have MacCharlie or Dayna File connected and then share their data with other users. With MacCharlie, users can actually use many MS-DOS applications with their Mac. In a network setting, when combined with the Dayna expansion chassis, MacCharlie provides an additional MS-DOS machine. MacCharlie works well with Switcher™. Running MacCharlie and Switcher gives a user the best of both worlds.

Dayna File is for those users who have no need to run MS-DOS applications on their Macintosh. The file transfer capabilities of Dayna File are simple and straightforward. Dayna File can be used with a node on the network. Once a file has been transferred and converted, it can be placed on a server for network access.

Even though both MacCharlie and Dayna File support AFP standards, there may be some problems with network operation. Both of the products are untried in a LAN environment. With simple LAN operations, both products seem to work fine. Data can be transferred and made available on the network from either MacCharlie or Dayna File. Operating MS-DOS network software

on MacCharlie is another thing. You can run into some difficulties when attempting to run MacCharlie on the network in both the MS-DOS and the Macintosh mode. Switching between the two operating systems while connected to a LAN causes systems errors. So if you want to use MacCharlie on a LAN, have only one operating system running.

PRODUCT PRICES

MacCharlie (256K, 1 5.25" drive).....	\$795
MacCharlie (640K, 2 5.25" drive).....	\$995
Dayna File.....	\$595

InterBridge

Company name: Hayes Microcomputer Products, Inc.

Company address: 705 Westech Dr.
Norcross, Georgia 30092
(404) 662-7100

Product name(s): InterBridge™

LAN quality: Excellent. InterBridge was designed to act as a bridge to other AppleTalk Personal Networks (APN), allowing multiple APNs to address shared devices on other APNs such as other servers, LaserWriters, plotters, etc. Without InterBridge, the APN would be limited to 31 nodes on a single LAN. With InterBridge, an APN can effectively communicate with hundreds of Macs on different APNs.

Computers supported: Macintosh 512
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

The Hayes InterBridge is about the size of a modem. It's used to link APN "Zones" together. A zone is simply another network you can connect to. AppleShare, TOPS, and 3+ network all support zones. Zones appear in the Chooser window when you select a file server or log onto the network. InterBridge allows you to make these connections to various zones.

InterBridge is a bridge between APNs, but *not* a gateway to foreign LANs. This is an important concept to remember. However, InterBridge is compatible with gateways from other developers, if their gateways adhere to the AppleTalk File Protocols. You can address shared devices, including modems, printers, file servers, plotters, etc., up to 15 InterBridges away. Almost any device that is shareable on the network can be accessed via an InterBridge.

CAUTION: All **version numbers** of software packages that are used with shared devices (LaserPrep or LaserWriter drivers) **must be the same on every network**. If users have different versions and attempt to use a shared device, an error message will come your way.

Since InterBridge works with an APN, it becomes just another node on a network. It counts as one of the 32 devices that are allowed on an individual network.

SETUP AND INSTALLATION

Hardware

Installing an InterBridge is a relatively simple process. It's the setup and configuration that are somewhat complex. As with any LAN design, you need to preplan for InterBridge. Knowing where InterBridge goes reduces downtime and user frustration. If you look on the back panel of InterBridge, you see four ports,

two serial ports (S1 & S2), and two AppleTalk ports (A1 & A2). Since InterBridge is a node on the network, simply plug an AppleTalk connector to port A1. There are actually two bridges that you can configure, a local bridge and a remote bridge.

Local Bridge

To create a local bridge, connect an AppleTalk connector to port A1. This connects InterBridge to the first network. Now connect another AppleTalk connector in port A2 and to the other network. That is all there is to installing a local bridge.

Remote Bridge

A remote bridge is used to connect your network to another network that is a long distance away. You must use a modem in conjunction with InterBridge to create a remote bridge. Any remote network that you are bridging must also have a modem and InterBridge. To build a remote bridge, you use an RS-232-C cable that connects from the S1 port of InterBridge to your modem. You must also configure your modem with some specific Hayes AT commands, for either synchronous or asynchronous communication. Basically, your modem needs to accept Hayes AT commands and be configured with the following features:

- Numeric formatting of result codes
- Command-state character echo off
- Implementation of all control signals
- Ring-counting auto-answer features disabled
- Modem uses DTR signal (for asynchronous communication)
- Carrier state information passed

Once you have your AppleTalk cables and RS-232-C cable installed, it's time to power up and configure your ports.

Software

InterBridge comes with a manager disk containing the software that configures the four ports on InterBridge. You use the manager to:

- Tell InterBridge which devices are connected to the ports.
- Change the zone name of the network.
- Change the network number.
- Change the AppleTalk name of an InterBridge.
- Decide on the data transmission characteristics of the serial ports.
- Find out which InterBridges are available on the network.
- Place calls on dial-up remote bridge links.

Most of these operations are performed from the Manager program with the exception of the "Zone Chooser." The Zone Chooser is a desk accessory and is installed with the Font/DA mover. The Zone Chooser has the traditional DA icon. To install it, follow these steps:

1. Click on the Zone Chooser DA icon.
2. Make sure you are installing to your startup system.
3. Open the startup system, select Chooser, and click the Remove button.
4. Now select Zone Chooser and click the Copy button.
5. Exit the DA/Font mover. The Zone Chooser is now installed.

The Zone Chooser is a very important desk accessory. Without it, you can't bridge to other APNs. If you're using AppleShare, TOPS, PC-MacBridge, or the 3+ network, and you want to connect to remote APNs, you need InterBridge and the Zone Chooser.

Not only can you configure InterBridge's ports and alter zone data, you can monitor the network activity in each connected zone. InterBridge has a Routing Table Display showing which networks can be accessed through InterBridge, how many bridges away they are, their current status, and how busy the networks have been. How busy the networks have been is very important to a network manager. The InterBridge Manager disk also contains some helpful self-tests. The result of these self-tests can be viewed in the InterBridge diagnostic window.

 **WRAP-UP**

For configuring internetworks that bridge a large distance, or for connecting multiple APNs in the same building, InterBridge is a must. When you consider that the APN, using Apple twisted-pair cabling, is limited to 1,000 feet between nodes, you can begin to see the importance of InterBridge. For connections to foreign networks, InterBridge is the foundation. It has become the standard for internetwork bridging devices. It is a key element in Apple's LAN marketing plans. The fact that it comes from Hayes ensures that it's a high-quality product that will be supported long into the future.

 **PRODUCT PRICE(S)**

Hayes InterBridge.....\$495.00

 **Hard Disks and Mass Storage Systems**

Company: AST
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333

Name of drive(s): AST 2000/4000

Storage sizes: 2000 (20 Mbytes—20 Mbyte tape backup)
4000 (74 Mbytes—60 Mbyte tape backup)

LAN quality: Excellent

Prices: AST 2000.....\$1695
AST 4000.....\$4695

Company: LoDown
 10 Victor Square, Suite 2000
 Scotts Valley, CA 95066
 (408) 438-7400

Name of drive(s): LoDown 20/30/40/80
 LoDown 20/20

Storage sizes: 20/30/40/60/155/234 Mbytes
 20 Mbyte hard disk—20 Mbyte tape backup

LAN quality: Excellent

Prices: 20 Mbyte.....	\$995
30 Mbyte.....	\$1295
40 Mbyte.....	\$1995
60 Mbyte.....	\$2495
155 Mbyte.....	\$3995
234 Mbyte.....	\$6595
WORM 400.....	\$6150
WORM 800.....	\$8245
CD-ROM.....	\$1595

Company: Mirror Technologies
 2209 Phelps Rd., Box 304
 Hugo, MN 55038
 (800) 328-6795, Ext. 428

Name of drive(s): MagNET

Storage sizes: 20/30/40/85 Mbytes
 40 Mbyte hard disk with 40 Mbyte tape backup

LAN quality: Excellent

Prices: MagNET 20X.....	\$779
MagNET 20X w/MacServe.....	\$849
MagNET 30X.....	\$1295
MagNET 30X w/MacServe.....	\$995
MagNET 40/40 w/MacServe.....	\$2395
MagNET 40X.....	\$1195
MagNET 85X w/40 Mbyte tape backup.....	\$3995

Company: Bering Industries, Inc.
280 Technology Circle
Scotts Valley, CA 95066
(408) 438-8779

Name of drive(s): Totem™

Storage sizes: Fixed hard disks
20/40/80/140 Mbytes

Removable Bernoulli Cartridges
Single—20 Mbyte cartridge
Dual—20 Mbyte cartridge/20 Mbyte fixed disk

Combinations
20 Mbyte cartridge & 20/40/80 Mbyte fixed
disks

LAN quality: Excellent

Prices: Fixed hard disks

20 Mbyte.....	\$795
40 Mbyte.....	\$1795
80 Mbyte.....	\$2795
140 Mbyte.....	\$3895

Removable Bernoulli cartridges
Single.....\$1495
Dual.....\$2295

Combinations
20 Mbyte.....\$2295
40 Mbyte.....\$2995
80 Mbyte.....\$3995

Company: CMS Enhancements, Inc.
1372 Valencia Ave.
Tustin, CA 92680
(714) 259-9555

Name of drive(s): MacStack™
 Compact Model
 Power Tower

Storage sizes: MacStack—20/40/43/80 Mbytes
 Compact Model—20/40 Mbytes
 Power Tower—320/640 Mbytes

LAN quality: Excellent

Prices: MacStack
 20 Mbyte.....\$795
 43 Mbyte.....\$1295
 80 Mbyte.....\$1795
Compact Model
 20 Mbyte.....\$795
 40 Mbyte.....\$1195
Power Tower
 320 w/60 Mbyte tape backup.....\$12,995
 640 w/60 Mbyte tape backup.....\$16,995

Company: SuperMac Technology
 950 N. Rengstorff Ave.
 Mountain View, CA 94043
 (415) 964-8884

Name of drive(s): DataFrame XP 20
 DataFrame XP 40
 DataFrame 20
 DataFrame XP 40+40

Storage sizes: 20/40 Mbytes

LAN quality: Excellent

Prices: DataFrame XP 20.....\$1299
 DataFrame XP 40.....\$1899
 DataFrame 20.....\$1099
 DataFrame XP 40+40.....\$2599

Company: Jasmine Technologies, Inc.
555 De Haro St.
San Francisco, CA 94107
(415) 621-4339

Name of drive(s): Jasmine and BackPac 40™

Storage sizes: Jasmine External
20/40/50/80/160 Mbytes

BackPac
40 Mbytes

LAN quality: Excellent

Prices: Jasmine External

20 Mbyte.....	\$649
40 Mbyte.....	\$999
50 Mbyte.....	\$1159
80 Mbyte.....	\$1399
160 Mbyte.....	\$3499
<u>BackPac 40</u>	\$1299

Company: Rodime, Inc.
29525 Chagrin Blvd.
Pepper Pike, OH 44122
(216) 765-8414

Name of drive(s): Rodime PLUS™

Storage sizes: Internal and External
20/45 Mbytes

LAN quality: Excellent

Prices: External

20 Mbyte.....	\$1195
45 Mbyte.....	\$1595
<u>Internal</u>	
20 Mbyte.....	\$1295
45 Mbyte.....	\$1695

Company: Personal Computer Peripherals Corp.
 6204 Benjamin Rd.
 Tampa, FL 33634
 (800) MACBUTT

Name of drive(s): MacBottom™

Storage sizes: 20/21/32/45 Mbytes

LAN quality: Good to excellent

Prices:

HD 20 Serial.....	\$1195
HD 21 SCSI.....	\$1195
HD 21M w/built-in modem.....	\$1395
HD 32.....	\$1395
HD 32M w/built-in modem.....	\$1595
HD 45.....	\$1795
HD 45 w/built-in modem.....	\$1995

Company: Peripheral Land
 47800 Westinghouse Dr.
 Fremont, CA 94538
 (415) 657-2211

Name of drive(s): PL Series—external
 PLi Series—internal

Storage sizes: PL Series—external
 20/30/50/80/172/230 Mbytes

PLi Series—internal
 30/50/65 Mbytes

LAN quality: Excellent

Prices: PL Series—external

20 Mbyte.....	\$995
30 Mbyte.....	\$1295
50 Mbyte.....	\$N/A
80 Mbyte.....	\$2495
172 Mbyte.....	\$4995
230 Mbyte.....	\$6995

Pli Series-internal

30 Mbyte.....	\$995
50 Mbyte.....	\$1295
65 Mbyte.....	\$1450

Company: Warp Nine Engineering
1751 W. County Rd., Suite 107
St. Paul, MN 55113
(800) 654-5294

Name of drive(s): The Photon™

Storage sizes: External
20/30/40 Mbytes

Internal
20/30/45 Mbytes

LAN quality: Excellent

Prices: External

20 Mbyte.....	\$569
30 Mbyte.....	\$789
40 Mbyte.....	\$949

Internal

20 Mbyte.....	\$499
30 Mbyte.....	\$649
45 Mbyte.....	\$899

Company: Peak Systems
1201 Spyglass
Austin, TX 78746
(800) 225-7509

Name of drive(s): Plus™ Series and Sierra™

Storage sizes: Plus—20/30/45/65/80 Mbyte
 Sierra—40 Mbyte hard disk/40 Mbyte
 tape backup

LAN quality: Excellent

Prices: 20 Mbyte.....\$1095
 30 Mbyte.....\$1395
 45 Mbyte.....\$1895
 65 Mbyte.....\$2395
 80 Mbyte.....\$2695
 40/40.....\$2695

Company: Priam
 20 West Montague Expressway
 San Jose, CA 95134
 (800) 345-9242

Name of drive(s): MacDisk™

Storage sizes: 40/100/230 Mbytes

LAN quality: Excellent

Prices: 40 Mbyte.....\$1895
 65 Mbyte.....\$2295
 103 Mbyte.....\$2695
 233 Mbyte.....\$3995

Company: NuData
 3206 Scott Blvd.
 Santa Clara, CA 95054
 (800) 832-8268

Name of drive(s): Data Cell™

Storage sizes: 20/40/80/125/160/250/330/660 Mbytes
 30 Mbyte hard disk and 40 Mbyte tape backup

LAN quality: Excellent

Prices: 20 Mbyte.....	\$1095
40 Mbyte.....	\$1695
40/40.....	\$2695
80 Mbyte.....	\$2195
125 Mbyte.....	\$3995
160 Mbyte.....	\$4950
250 Mbyte.....	\$8250
330 Mbyte.....	\$9800
660 Mbyte.....	\$17,100

**MAC-TO-MAINFRAME INTRODUCTION**

This section deals with a very important aspect of Macintosh communications connection to a mainframe computer. LANs can extend their power and usefulness if at least one unit on the network is connected to a mainframe. Connection to a mainframe is the root of LANs. In the early days of computers a series of terminals connected to the company's mainframe was considered by some to be a LAN. Today, connection to the mainframe is just another cog in the LAN wheel. With the Macintosh, these connections have been taken out of the nether world of mainframe communications. Now, Mac-to-mainframe communications can be as easy as the Mac itself. This makes a great deal of information and power accessible to more individuals.

Mac-to-mainframe connections can include both hardware and software. Often there has to be a physical connection to the mainframe, usually some type of "converter" box. Apple tried to provide connectivity to the IBM mainframe with their AppleLine and Cluster Controller products, but both were difficult to set up and use. They were also large and required extra space allocation. Now, a product such as the Netway 1000A from Tri-Data accomplishes the same functions as Apple's AppleLine and Cluster Controller with a box the size of a modem. Other companies use a software-only approach, leaving the physical connection up to the mainframe company. MAC Menlo from Menlo Business Systems is an example of a software-only solution.

Whichever way you decide to go, using the Macintosh to communicate with the mainframe opens powerful resources, often with the click of a mouse. The main goal is to improve the capabilities that increase the productivity and efficiency of people trying to do their jobs. Users don't need to know how to put a cable between here and there. It's not important to them where the information is stored or how their computers are connected. A user simply wants to know, "How do I get that information without having to go through a lot of mumbo-jumbo?" What makes Mac-to-mainframe connections unique is that the Macintosh, with its ease of use and standard user interface, allows fast and easy access to a great deal of information stored on a variety of mainframe computers.

The companies included here have created second-generation Mac-to-mainframe connections. The first generation consisted of simple terminal emulators, which provided very little in the way of a Macintosh interface after connection to the host. MacTerminal is a good example of a first-generation communication application. With MacTerminal, setting up communication application protocols and settings are Mac-like. Once connected to an IBM 3278 or other mainframe, the Macintosh interface becomes limited. Many of the second-generation applications provide additional Macintosh features to make life easier, such as multiple windows, instant switching between host sessions and applications, multiple host sessions, file transfers that include automatic MacBinary and XModem file transfers, and much more. It won't be long before third-generation products are available. Third-generation Mac-to-mainframe connections should provide more steps toward completion of the Macintosh user interface integration, including Desktop, disk and file icons, and file manipulation while connected to the *host*! Imagine booting up your Mac, clicking a communications program, connecting to a VAX/VMS, and seeing another Desktop. This Desktop now shows your VAX directories and files as Mac icons. Double-click, and the directories or files are open.

If this sounds like science fiction, it's not. Apple is already attempting to reach this goal with the Apple UNIX (A/UX) product. Apple is making available parts of its proprietary ROM to UNIX developers. The idea is to provide UNIX developers the

necessary tools to create UNIX applications that have both the look and the *feel* of a standard Macintosh application.

Here are a few Mac-to-mainframe products. There are sure to be more in the future. In fact, the future may already be here!



Company name: Alisa Systems, Inc.

Company address: 221 E. Walnut St.
Suite 230
Pasadena, CA 91101
(818) 792-9474

Product name(s): AlisaTalk™

LAN quality: Excellent. AlisaTalk was designed to use the VAX system as a file server for an AppleTalk network. With AlisaTalk, users can access the power and storage capacity of a VAX for their network

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
VAX/VMS

PRODUCT DESCRIPTION

In its basic form, AlisaTalk connects Macintosh to Digital Equipment Corporation's VAX/VMS systems, using the AppleTalk network and Ethernet gateway. AlisaTalk provides two primary capabilities to a standard AppleTalk Personal Network (APN). One is a file server; the other is a LaserWriter PrintSpooler. Both of these features utilize the power and storage capacity of a VAX minicomputer. AlisaTalk allows multiple APNs to use either the

VAX/VMS system or their own personal file servers, such as AppleShare, TOPS, and MacServe.

AlisaTalk uses a standard DEC Ethernet port, Ethernet cable, and one or more Kinetics FastPath™ bridges. The FastPath bridge provides the link between the Ethernet cable and the Apple twisted-pair. The main software resides on the VAX and uses the Ethernet and FastPath to transfer data between the two systems.

As I mentioned, there are two main features of AlisaTalk—file serving and a LaserWriter print spooler. Alisa Systems implemented AppleTalk on the VAX to avoid putting special software on every Macintosh.

File Server

The file server resides on the VAX and is implemented on the Macintosh through a desk accessory. The file server on the VAX is activated when you start your system. CPU time is not used unless someone is accessing the server. On the Macintosh, server volumes are mounted and dismounted with the AlisaTalk desk accessory; they look and act like normal Macintosh disks. Other users on the AppleTalk network can also mount any volumes. However, only one user at a time can write to any given file, unless you are using multiuser applications. File operations are transparent. They look and act like a standard Mac.

Every user connected to the server can connect to a remote volume that resides on the VAX. Once the volume is mounted, each user has a private Scrapbook file, Clipboard file, and Desktop file, all controlled by the server. Therefore, a network user need not lose these standard features when connected to the VAX host. The file server does *not* support the Macintosh HFS features. You do not lose HFS capabilities on your Mac except when you are connected to AlisaTalk. The VAX file server uses the older “flat” Macintosh File System (MFS).

LaserWriter Print Spooler

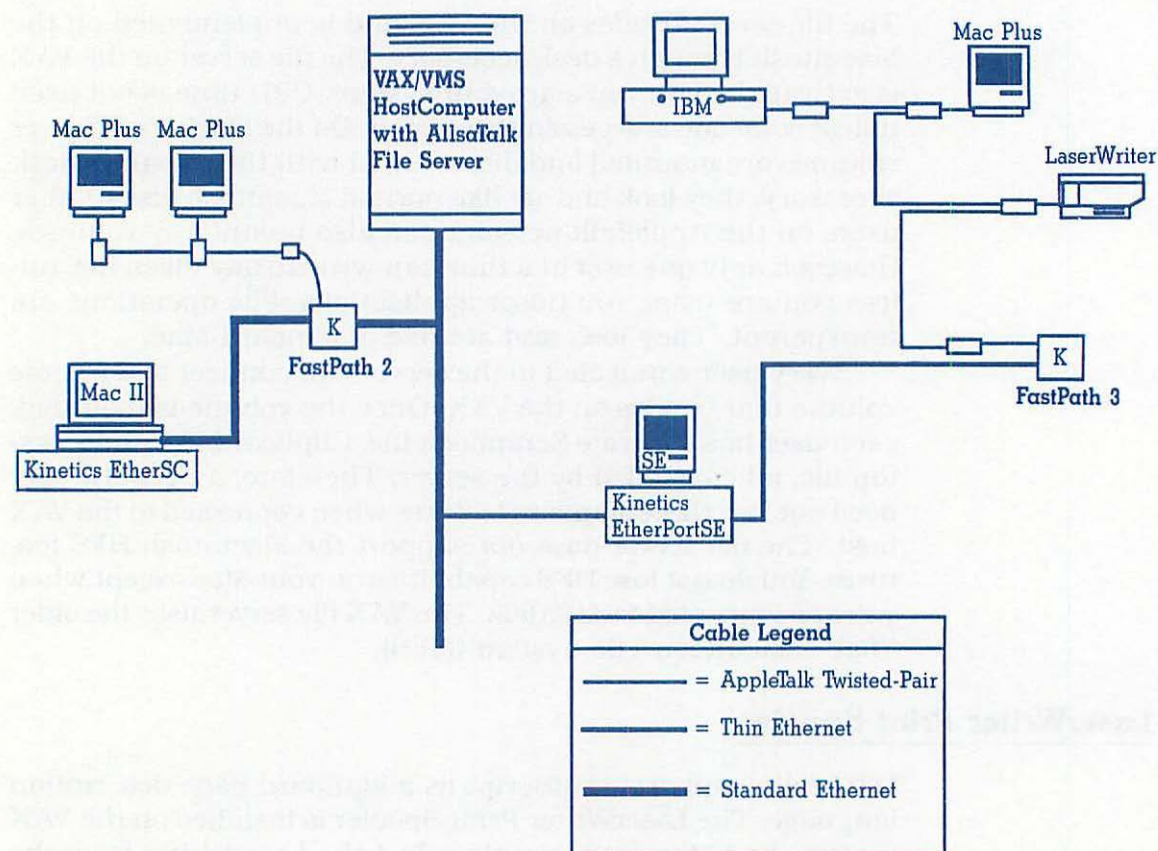
DEC fully supports PostScript as a standard page description language. The LaserWriter Print Spooler is installed on the VAX system, and Mac users simply select the LaserWriter from the

Chooser desk accessory. This is standard procedure. The print spooling is handled by the VAX. When a PostScript file is received by the VAX, it is processed and sent to the LaserWriter for printing, leaving the Mac user free to return immediately to previous tasks.

SETUP AND INSTALLATION

A typical APN and VAX network looks like the one in Figure 4.7.

FIGURE 4.7 APN-to-VAX connection



As mentioned, AlisaTalk is primarily a VAX/VMS product. Other than the desk accessory to access the file server, the file server and LaserWriter print spooler software is installed on the VAX system. It is strongly suggested that someone familiar with VAX/VMS command language do the installation. The AlisaTalk manual spells out the VAX/VMS installation process step by step.

Here is what you need to get started with AlisaTalk:

1. An Ethernet controller (DEUNA, DEQNA, DELUA, etc.) for your VAX system
2. Cabling and transceivers
3. Kinetics FastPath bridge
4. AlisaTalk Personal Network connectors and cable for each Mac
5. AlisaTalk software for your particular VAX system

AlisaTalk is a powerful file server option for an APN network. The VAX/VMS system is fast and powerful. For companies using the VAX/VMS systems and Macintoshes, AlisaTalk is one of the best ways to go. With AlisaTalk supporting AppleShare, it is possible to have several APNs running AppleShare; then one or more nodes on any given APN can connect to a VAX via AlisaTalk.

The desk accessory approach used by AlisaTalk simplifies the VAX file server connection. AlisaTalk adheres well to the Mac interface. Once connected to the VAX host, files maintain their icons and the standard Mac interface is kept intact because AlisaTalk implements the AppleTalk protocol on the VAX system. Even new Macintosh users should find using the connection to the VAX a simple and straightforward process that reduces training time.

At this point, AlisaTalk does not support HFS on the VAX. Consequently, it could be time-consuming to scroll through a large number of Macintosh files on the VAX. Very busy networks trying to access the AlisaTalk file server can really slow things down. Also, when they try to use the print spooler, printing takes much longer than normal.



PRODUCT PRICE(S)

AlisaTalk (per CPU, including clusters):

MicroVAX II, 11/730, 11/750.....	\$3,750
11/780, 8200.....	\$4,750
11/785, 8300.....	\$6,500
8500, 8550, 8600, 8650, 8700.....	\$8,500
8800.....	\$11,500



MAC MENLO

Company name: Menlo Business Systems, Inc.

Company address: 334 State St.
Los Altos, CA 94022
(415) 948-7920

Product name(s): MAC MENLO™
MAX™
FOUNDATION™ Graphics Toolbox Module

LAN quality: Excellent. MAC MENLO should fit very well into any LAN scheme where at least one Macintosh can be connected to a Tandem for a host session. If you use Switcher™, data can be immediately selected from the host session, switched over to a LAN session, and then either made available for network use or transferred to another user.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
Tandem Mainframes

PRODUCT DESCRIPTION

MAC MENLO links Macintosh to Tandem computers. However, MAC MENLO provides much more than simple terminal emulation. MAC MENLO is an application that allows your Mac to function as a full-featured Tandem workstation. MAC MENLO supports Tandem 6520 and 653x terminal processing. Such Tandem features as Protect Mode, Conversational Mode, Block Mode, Programmed Function Keys, and Control Characters are fully supported with a Macintosh interface. In addition, MAC MENLO is also a full-featured Macintosh product. MAC MENLO supports cut, copy, paste, and other standard Mac procedures. Support of these standard features along with support for Switcher allows you to integrate information from the Tandem host with any other Macintosh application.

Other MAC MENLO features include a file transfer utility that provides transfer of text and graphic files between the Mac and its Tandem host. Another feature allows the Mac to use graphics stored on the Tandem via Menlo's Graphic Toolbox™ application, a Tandem application that stores and retrieves Macintosh graphics.

In working with the Tandem, Menlo Business Systems has added special features to both MAC MENLO and the Macintosh User Interface, features that augment the standard Tandem terminal functions.

The MAC MENLO and Macintosh User Interface

MAC MENLO has modified elements of the standard Mac interface, the cut/copy/paste, graphics window, and file transfer, separating it from the standard terminal emulation program.

Cut/Copy/Paste

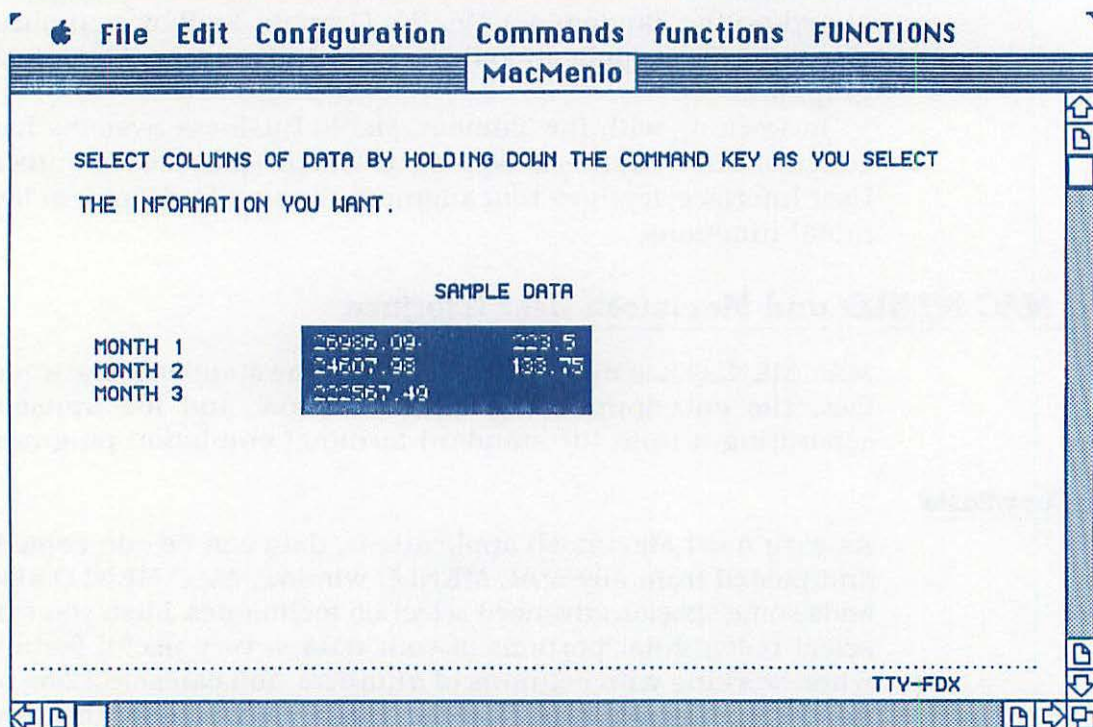
As with most Macintosh applications, data can be cut, copied, and pasted from any MAC MENLO window. MAC MENLO also adds some special, advanced selection techniques. First, you can select rectangular portions of your data, a very useful feature when working with columns of numbers. You can select one or more columns at a time. You don't have to copy data that you

won't need. By holding down the Command key and then selecting your data, the selection is confined to a rectangular area. (See Figure 4.8)

Once an area is selected, you have three methods for copying and pasting. These features are selected from the Edit menu and they are:

- **Copy with Returns.** This places a return at the end of each line field selected. If you select a block of names from a data base and then want to paste them as a block, use Copy with Returns.
- **Copy Tables.** This selection places a tab at the end of each line or field. Use this feature for placing tabular data from the Tandem into a spreadsheet or database.

FIGURE 4.8 Selecting data as a block



- **Paste as Block.** This feature allows you to paste information retaining the data's original dimensions, a very nice feature for dealing with large tables of information.

Information copied with returns or tabs can also be copied into the Scrapbook. Once in the Scrapbook, the data can be copied and then pasted again using the Paste as Block function.

The Graphics Window

The graphics window with MAC MENLO requires the Tandem to have the FOUNDATION™ Graphics Toolbox module added to the FOUNDATION application. The FOUNDATION application is Menlo Business System's on-line Tandem application development product. The Graphic Toolbox is an additional module that provides a graphics window during a MAC MENLO session. Even though FOUNDATION is not a Macintosh-specific application, the addition of the FOUNDATION Graphics Toolbox provides another powerful addition to your Mac-to-Tandem connections.

All Mac windows, including graphics, in MAC MENLO can be sized, resized, and moved according to standard Macintosh conventions. Graphics can be cut, copied, and pasted to and from the graphics window. Graphic drawings can be "object" oriented drawings, bit-mapped drawings, or text. If a graphic element is cut from the graphics window, it can then be pasted into MacDraw or some other Macintosh graphic application.

File Transfer

File transfer options are under the Configuration menu. Options are selected from the File Transfer Options window. MAC MENLO provides the standard file transfer options such as setting line and character delays and line wrap. You can determine if carriage returns and/or line feeds should be kept. MAC MENLO supports three methods of file transfer: MAC MENLO Binary, XModem, and Text-Only.

MAC MENLO Binary This protocol allows for transfer of Macintosh binary files to and from the Tandem. Binary files are usually associated with Macintosh graphics, allowing them to be stored on the Tandem and then transferred to any Macintosh workstation. This is a very valuable feature for those with graphic-

intensive needs such as CAD/CAM professionals, architects, engineers, or graphic artists.

XModem XModem is a standard file transfer protocol, the most widely used in the business. The XModem protocol available with MAC MENLO includes the standard Mac Binary protocol for use in transmitting nontext Macintosh files. This should not be confused with standard Macintosh files. These are files such as Word or Excel documents. When a Macintosh document is transferred with an XModem that has MacBinary capabilities, a file type and creator are also sent for each file. This information is what gives the Mac file its unique icon and allows the file to be opened by the appropriate application.

Text-Only Text-Only file transfer can send and receive any unformatted text. Files to be sent should be initially saved as "text-only" documents.

Another type of file transfer that is unique to the MAC MENLO program is Menlo's Advanced Exchange (MAX) product for the Tandem. MAX is a unique method for transferring information between the Mac and the Tandem. First, it is *not* a Macintosh application. That is, MAX does not run on the Mac. MAX is a Tandem application. It simplifies file transfers between the Mac and its Tandem host. The most obvious advantage of MAX is batch file transfer, the ability to transfer more than one file at a time. MAX also detects and corrects transmission errors.

MAX also allows you to modify your data during file transfer. You can select specific elements of a TANDEM file, such as sales figures, determine data delimiters, and transfer this data directly into an Excel spreadsheet maintaining the specified delimiters.

Macintosh to Tandem Terminal Features

These features augment the existing ones found in other Tandem terminals. With the addition of the Macintosh interface, these features add significant power along with ease of use. Frequently used commands and terminal functions can be added as Command or Function menu options by the user. These features are:

■ **Configuration control.** All the settings configured under the Configuration menu can be saved for future use. You don't have to go back and redefine your function keys and command macros each time you start a host session.

■ **Commands.** The MAC MENLO commands allow you to define various macros, or data strings. Once defined, these can be added to the Command menu. Selecting "Edit Commands" from the Configuration menu brings up a screen like the one shown in Figure 4.9.

You need to know basic Tandem command data syntax. Each macro can be given a command mnemonic. If this mnemonic is followed by a / and a specific letter, then the macro will have a command key shortcut. You do need to be sure to use keyboard equivalents that are not currently in use by MAC MENLO. To use the macro commands, simply

FIGURE 4.9 Edit Commands screen

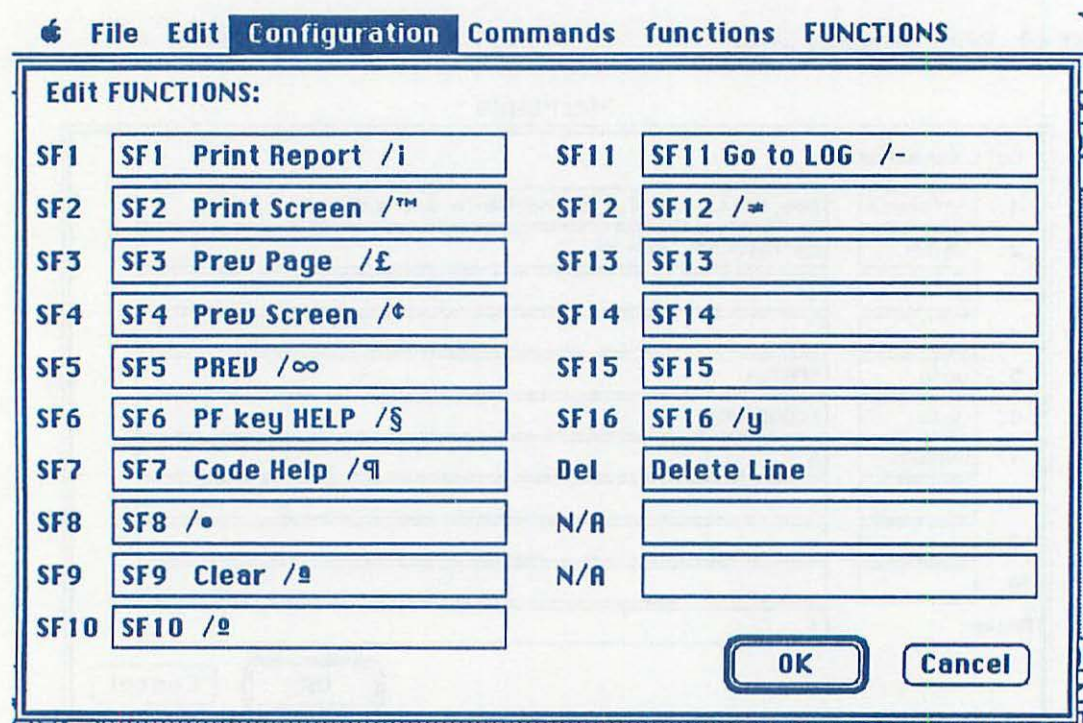
MacMenlo

Edit Commands		
1:	Informat	See Section 2.4.3 of MacMenlo Users Guige. \$
2:	ENTER	PATHCOM \$P; RUN P\$
3:	EXIT	
4:		
5:	goto	^MAIL:
6:	goto	^CODEINQ:
7:	HOME/H	^
8:		
9:		
10:		
Enter:		1

pull down the Command menu. You should see a list of your macros. Selecting a menu item initiates that macro command.

■ **Programmable function keys.** Function keys can be programmed like commands. On a standard Tandem terminal there are 16 function keys that perform specific tasks. Holding the shift key provides an additional 16 functions. Both levels of function keys are programmable with MAC MENLO. The standard function key set is labeled "functions," in lowercase. The shift-functions are labeled "FUNCTION" in uppercase letters. Selecting "Edit functions" or "Edit FUNCTIONS" from the Configuration menu presents a screen like the one in Figure 4.10.

FIGURE 4.10 Edit FUNCTIONS



In the same way you edit commands, you can add keyboard shortcuts to the function key menus. Be careful not to add ones that are already in use.

■ **Session Recording.** Host sessions can be recorded and saved as a text file for future use.

Overall, MAC MENLO represents an excellent example of what can be done to provide terminal emulation and still retain significant Macintosh features.

MAC MENLO represents the second generation of Mac-to-Mainframe connections. Menlo Business Systems have made every effort to make MAC MENLO very Mac-like. The effort shows. While MAC MENLO works best with Mac to Tandem connections, there are still some advantages to using MAC MENLO as a stand-alone terminal communications package. MAC MENLO even includes a file called MacEM3270, a configuration file that allows Tandem users to pass through a Tandem to an IBM 3270. The function menus are oriented to 3270 operations.

For Mac users needing to connect to or through Tandem mainframes, MAC MENLO is a must. Being able to use the Tandem to store and retrieve Macintosh graphics makes MAC MENLO perfect for those users who need mass storage for their graphics. The availability of the graphics window during a host session provides the Mac user with a distinct advantage beyond that of the traditional Tandem terminal.

Considering what MAC MENLO can do, there are not many generalized "cons." MAC MENLO has not been in the marketplace long enough for users to get a good feel for all the idiosyncrasies of the product. One complaint has been that to take full advantage of the MAC MENLO product, users need to add additional elements to their Tandem, including MAX and the FOUNDATION Graphics Toolbox module. Adding these two programs means factoring in additional costs. But without these two additional features, MAC MENLO is simply a better-than-average communications application.

PRODUCT PRICE(S)

MAC Menlo.....\$395.00



Company name: Pacer Software, Inc.

Company address: 7911 Herschel Ave.
Suite 402
La Jolla, CA 92037
(619) 898-3300

Product name(s): pcLINKTM

LAN quality: Good to excellent. pcLINK provides numerous Mac-to-mainframe links, so the LAN quality depends on the host system and the type of connection used. Ethernet connections should provide you with the best LAN support. Direct-connect RS-232 may not be quite as flexible.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
DEC VAX/VMS
StratusTM
PrimeTM
ATT 3B2TM
CrayTM (via UNIX)
SunTM
EncoreTM
ConvexTM
Other UNIX systems

PRODUCT DESCRIPTION

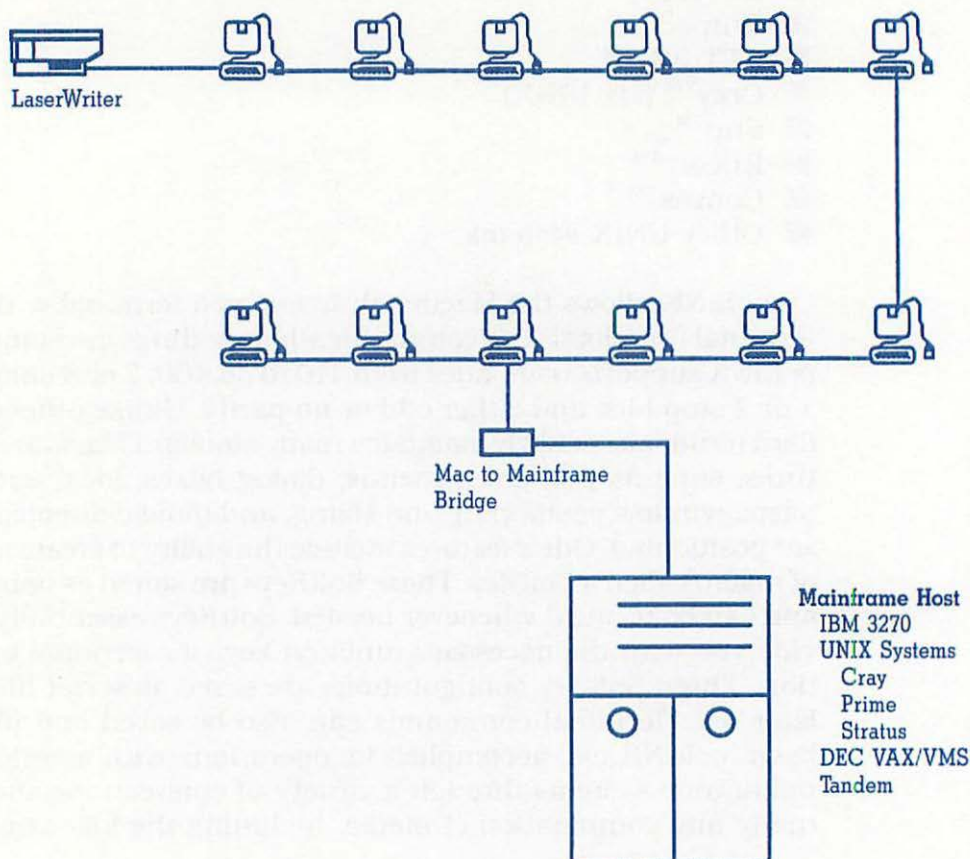
pcLINK provides asynchronous connections from the Macintosh to any number of mini or mainframe systems. Currently supported host systems include:

- DEC VAX/VMS
- StratusTM
- PrimeTM
- ATT 3B2TM
- CrayTM (via UNIX)
- SunTM
- EncoreTM
- ConvexTM
- Other UNIX systems

pcLINK allows the Macintosh to act as a terminal with full terminal functions. The communications settings are standard. pcLINK supports baud rates from 110 to 38,400, 7 or 8 data bits, 1 or 2 stop bits, and either odd or no parity. Unlike other standard terminals, pcLINK maintains many standard Macintosh features, such as pull-down menus, dialog boxes, local cut and paste, window positioning and sizing, and mouse-directed cursor positioning. Other features include the ability to create a type of macro called a SoftKey. These SoftKeys are stored as data files and can be recalled whenever needed. SoftKeys essentially provide you with the necessary function keys for terminal operation. These SoftKey configurations are saved as script files for later use. Terminal commands can also be saved and played back. pcLINK can accomplish its operations with a variety of mainframe systems through a variety of connections and virtually any combination of media, including the following:

- RS-232 (direct-connect or dial-up)
- EthernetTM (direct to VMS, TCP/IP to UNIX systems)
- AppleTalkTM (using Kinetics FastPathTM)
- OmninetTM

You can mix and match direct-connect RS-232 async lines with Ethernet connections. With this depth of flexibility, most existing topographies can be easily modified to accommodate small networks of Macs. A typical Macintosh-to-host topography with pcLINK might look like Figure 4.11.

FIGURE 4.11 Mac-to-Mainframe host topography


Along with the variety of connections and host system compatibility come four important features.

1. Virtual Disk Support
2. Terminal Emulation Mode
3. Print Spooling
4. File Transfer

These features and others add up to a strong Mac-to-mainframe product. Let's take a look at each of the features.

■ **Virtual Disk Support.** pcLINK's Virtual Disk Support is a program that creates a file on the host that acts like a Macintosh disk. Mac users simply double-click on the MountVDrive™ icon. The MountVDrive icon is shown in Figure 4.12. With a virtual disk mounted, Mac users can store files as if the virtual disk were a hard disk connected to their Mac. Once mounted, the Virtual Disk icon looks like the one in Figure 4.13.

Creating a virtual disk is not quite as easy as it sounds. First, a separate application called "MiniMac" must be installed on the host system. MiniMac allows users to create virtual disks and serves as a bridge between the host and the Macintosh disk file system. Virtual disks can range in size from 200K to 10Mbytes. The default size is 400K. The following command lines are an example of how a virtual disk is created on the host and then mounted on a Macintosh (user input is underlined):

FIGURE 4.12 MountVDrive icon



FIGURE 4.13 Virtual Disk icon



MiniMac

[MiniMac version 1.0 Alpha test]

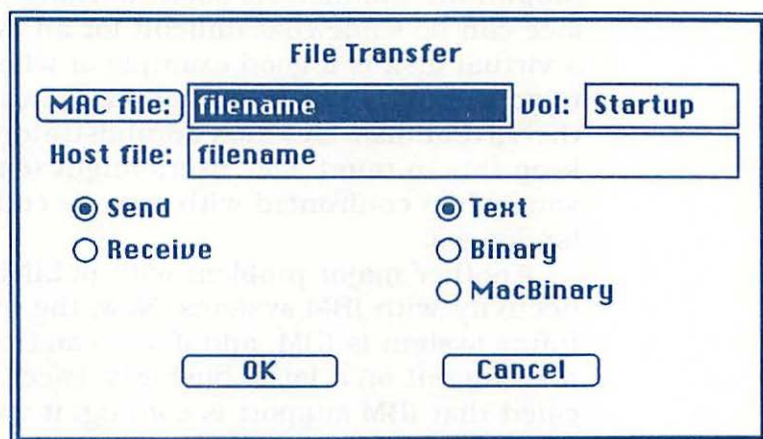
```
<none>: create disk1.mvd
Enter Macintosh volume name [Untitled]: Volume1
Initializing disk (400K) . . .
Disk created
Volume1: cr disk2.mvd 1.6MB
Enter Macintosh volume name [Untitled]: Another
volume
Initializing disk (1.6MB) . . .
Disk created
Another volume: quit
```

As you can see, user input is kept to a minimum. Once you have created the virtual disk, it is mounted on your remote Mac. Files can be “Imported” from the host to the Mac or you can “Export” files to the host from your Mac. Files can be stored on your Mac as ASCII text, binary, or MacBinary. With these options, Mac users can store “virtually” (pun intended) any Macintosh files on the host system.

■ **File Transfer.** Files are transferred from Mac to host or from host to Mac. The files can be ASCII text or binary. In either case, pcLINK provides standard error detection. MacBinary files can be stored on the host and then transferred back to your Macintosh. MacBinary transfer is necessary if you are using your host to store your Mac files. It's a relatively painless operation. The dialog box in Figure 4.14 illustrates how to transfer a file from the Mac to your host.

■ **Terminal Emulation.** All terminal functions are configured and saved as Terminal definition files. (See Figure 4.15.) SoftKey files contain user-defined terminal features such as function keys. Virtually all standard terminals can be configured and used.

■ **Print Spooling.** Selecting “Spool to Host . . .” from the File menu begins the print spooling process. Either a Mac

FIGURE 4.14 File Transfer dialog box screen**FIGURE 4.15** Terminal files icons

VT100



PT200



ADDS60



TV950

file or a host file can be sent to the spooler to be printed on the host printer, either a laser printer or some other printer on the network.

These are just a few of the major features of pcLINK. There are others that depend upon the host system used. In fact, it's the flexibility of pcLINK that is one of its most attractive features.

pcLINK provides power along with excellent flexibility. The number of host systems and network mediums supported make pcLINK usable in many business environments. Even though pcLINK is primarily a mainframe product, Pacer has done a fairly good job of maintaining the Macintosh interface.

It's important to remember that pcLINK is primarily a mainframe product. As such, working with the user interface can be somewhat difficult for an average user. Creating a virtual disk is a good example of what a user would have to go through in order to import or export files to or from the virtual disk. Systems administrators would do well to keep this in mind. Mac users might tend to get a bit nervous when confronted with strange codes and command languages.

Another major problem with pcLINK is the lack of connectivity with IBM systems. Now, the number one mainframe system is IBM, and if you can't connect to it, you're missing out on a lot of business. Pacer, however, has indicated that IBM support is coming; it will be a welcome addition when it is introduced.

PRODUCT PRICE(S)

Pacer does not charge for the Macintosh part if pcLINK. It licenses only the host portion. Pacer's pricing depends upon the number of concurrent users.

5 concurrent users.....	\$2,000.00
20 concurrent users.....	\$5,000.00
50 concurrent users.....	\$10,000.00
100 concurrent users.....	\$15,000.00

NETWAY 1000A

Company name: Tri-Data

Company address: 505 East Middlefield Rd.
Mountain View, CA 94043-4082
(415) 969-3700

Product name(s): NETWAY 1000A

LAN quality: Excellent. The NETWAY 1000A provides *multiple* IBM 3270 connections while still connected to a LAN. Users can operate host sessions while using Switcher™, giving additional flexibility to those who need to connect to a 3270 system and still stay on-line with their LAN. File conversion program allows downloaded files to be easily converted to a variety of formats.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Several years ago, Apple recognized the need to connect Macintosh to the IBM 3270 series of mainframes. In order to fill the need, Apple created their AppleLine product, including the physical wiring, hardware, and software. The hardware was called the Cluster Controller, and the software used was MacTerminal. The Cluster Controller was large and expensive. MacTerminal did an adequate job of establishing a connection, but it was a first-generation communications program and lacked some advanced features. Needless to say, Apple did not sell a great many AppleLine products. The folks at Tri-Data saw the continuing need for IBM 3270 connections and filled the gap with the NETWAY 1000A.

The NETWAY 1000A is defined to the IBM 3270 system as an IBM 3274-51C or 61C controller. It connects to a host through a modem or a direct connection. Most cabling needs can be handled by Tri-Data. The NETWAY 1000A supports 2400, 4800, 9600, and 19200 baud rates.

The NETWAY 1000A provides a variety of features that are not found in other Mac-to-mainframe connections. The unique features include:

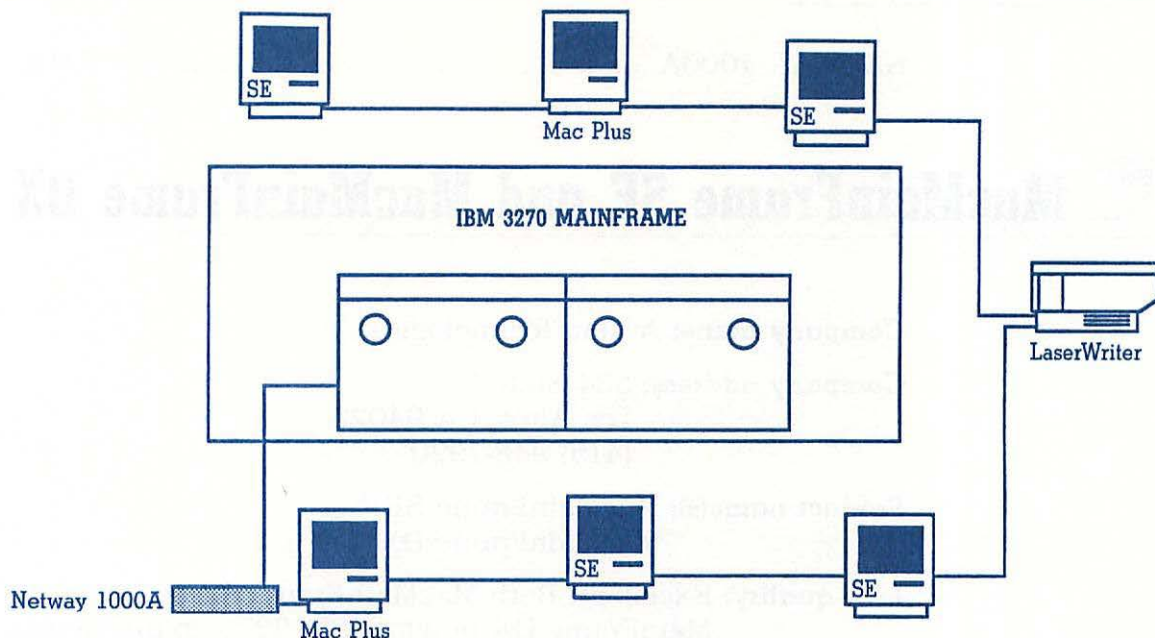
■ **3274 Gateway for AppleTalk.** The gateway is an opportunity for the NETWAY 1000A to become another node

on the network. This feature allows network users to access a host session while connected to the LAN. AppleTalk network users with MS-DOS computers can also communicate with the host over the AppleTalk network. Tri-Data has co-developed a 3278 terminal emulator for MS-DOS computers connected to an AppleTalk network through a Centram Systems TOPS™ card for the PC. With this addition, the NETWAY 1000A provides a complete solution for mainframe connections and the AppleTalk network.

■ **Multisession 3278 terminal emulation.** Tri-Data's MacWindows™ allows you to window up to four host sessions at a time. These sessions can be from the same host or multiple hosts with the addition of a NETWAY for each host computer. This is one of the most powerful features of the NETWAY 1000A. Multiple host sessions mean additional access to mainframe applications and data.

■ **File transfer and file conversion software.** The file transfer and file conversion software is a modified version of MacMainFrame™. MacMainFrame was developed by Avatar Technologies. The file transfer software allows binary and text files to be transferred to and from the IBM host while in an IBM host session. An additional enhancement allows WKS (Lotus 1-2-3) spreadsheet files and Document Content Architecture (DCA) text files to be transferred between Macs and MS-DOS microcomputers via the IBM mainframe host. With the import-export capabilities of Excel, Jazz (Import only), and Word 3.0, WKS and DCA files are easily converted to their appropriate format.

The NETWAY 1000A works well with Switcher. You can easily switch between your host session(s) and a Mac application. Tri-Data has added a unique feature to the Switcher function called "pseudo multitasking." The NETWAY 1000A software allows host screen updates and file transfer to continue in the background after you have switched to another Macintosh application.

FIGURE 4.16 Netway/Mac topography

A sample network configuration that includes the NETWAY 1000A might look like the one in Figure 4.16.

Once in a host session, the NETWAY 1000A offers the standard Macintosh interface. You can cut and paste between host sessions and between a host session and a Mac application. Pull-down menus provide 3270 function key mapping and file transfer. File conversion, via a desk accessory, allows you to download files, quit the host session, enter any application that is appropriate, and have access to converting your host files from within the application.

With a single NETWAY 1000A, up to 16 users can simultaneously communicate with your host system. In a network environment, multiple user support is important. But trying to manage 16 users at a time dramatically slows network activities down. As with any network product, preplanning will provide the maximum benefit to the most users.

PRODUCT PRICE(S)

NETWAY 1000A.....\$3195

MacMainFrame SE and MacMainFrame DX

Company name: Avatar Technologies.

Company address: 334 State St.
Los Altos, CA 94022
(415) 948-7920

Product name(s): MacMainFrame SE™
MacMainFrame DX™

LAN quality: Excellent. Both MacMainFrame SE and MacMainFrame DX provide IBM 3270 connections while still connected to a LAN. Users can also operate either program under Switcher™. This provides additional flexibility for those needing to connect to a 3270 system.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
IBM 3270 Mainframe

PRODUCT DESCRIPTION

Both MacMainFrame SE and MacMainFrame DX link the Macintosh Plus and Macintosh SE with an IBM 3270 mainframe system. Both products operate on the Macintosh as a desk accessory. The products are a combination of hardware and software and reside on both the Macintosh and the IBM 3270. Both

products provide full 3278 terminal emulation as well as standard file transfer capabilities. MacMainFrame SE and MacMainFrame DX offer a complete solution to connecting your Macs to a 3270 system. With MacMainFrame SE and MacMainFrame DX, any Macintosh running a host session with either of these two products can remain connected to a LAN. Once 3270 data is transferred, the Macs can quickly rejoin network activity.

MacMainFrame SE

MacMainFrame SE is an internal card for the Macintosh SE that works in conjunction with Avatar's Host File Transfer (HFT) software. MacMainFrame SE is a *direct* connect to a 3270 network. The MacMainFrame SE card plugs directly onto the Mac SE expansion port and provides a coaxial connection that attaches directly to an IBM 3174/3274/3276 control unit.

The software comes in two forms—Macintosh and mainframe. The software on the mainframe uses Avatar's HFT software. CICS, TSO, or CMS environments are also supported. Because these operating environments support MS-DOS computers connected to the same mainframe, users can access any of the files transferred to the mainframe from the Macintosh. An important compatibility feature of MacMainFrame SE is the Applications Program Interface. This feature allows software developers access to driver-level code for developing specialized IBM 3270 links.

MacMainFrame SE Macintosh software provides full 3278 terminal emulation. There is a 3278 function key menu providing access to all of the standard 3278 function keys. Simple cut, copy, copy table, and pasting of on-screen data are supported. MacMainFrame SE operates under Switcher, allowing you to maintain your host connection while switching back and forth from a Macintosh application.

The file transfer capabilities—both ASCII and binary—are fairly standard. The binary transfer supports transfer of non-Macintosh binary files to and from IBM mainframes. When used in conjunction with Avatar's PA100G or IBM's PC 3270 product, MacMainFrame SE allows Lotus 1-2-3 WKS files, Document Content Architecture (DCA) files, and Microsoft's SYLK files to be shared by both the Macintosh and MS-DOS computers.

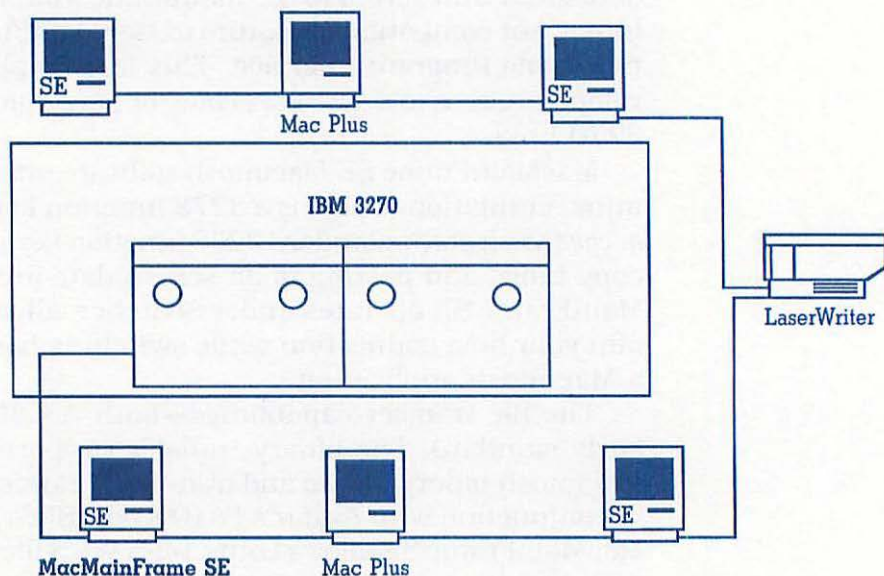
An important feature of the file transfer functions is "Text File Filtering." Text File Filtering consists of variable tab expansion and special character insertion. These two features allow you to convert host files into documents that can be read by various Macintosh applications.

A typical MacMainFrame SE configuration is shown in Figure 4.17.

MacMainFrame DX

MacMainFrame DX is essentially the same as the MacMainFrame SE. The difference is in the basic connection. MacMainFrame SE is an add-on card for the Macintosh SE. MacMainFrame DX is hardware that connects the Macintosh Plus or Macintosh 512K to the mainframe. Its file transfer, file filter, and terminal emulation capabilities are similar to those of MacMainFrame SE. However, there are some differences.

FIGURE 4.17 MacMainFrame SE

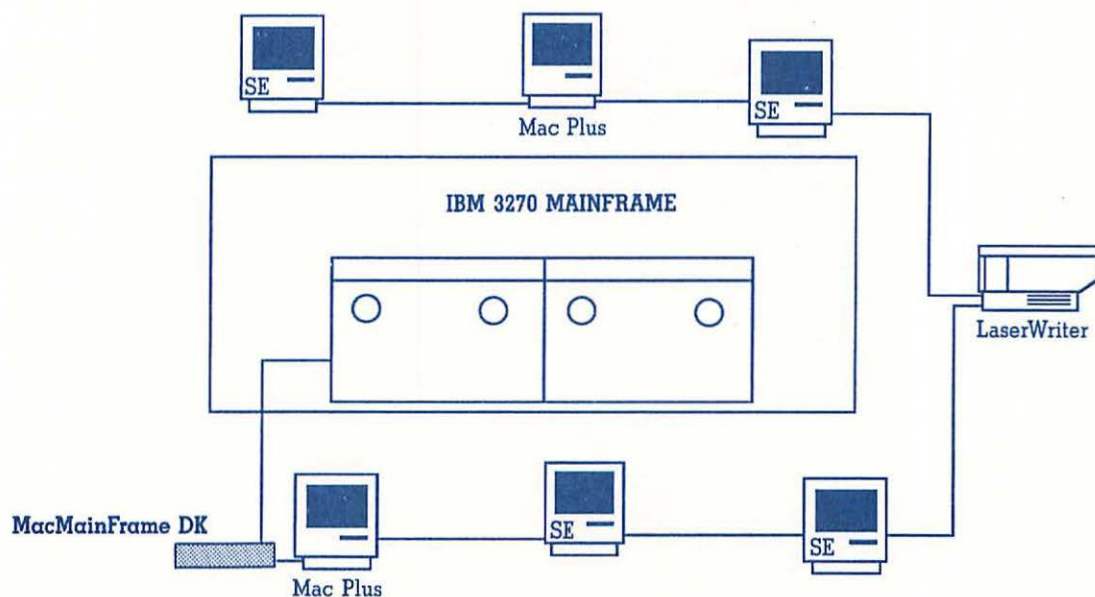


MacMainFrame DX has an extra RJ45 port with terminal passthrough providing asynchronous communications capabilities that allow connection to a VAX/VMS system. There is a software-selectable switch that provides dual-host capabilities, the ability to run both 3270 and ASCII sessions simultaneously. Not only can you run both sessions at the same time, but data can be shared between the two hosts, via the text and binary file transfer operations.

Another unique feature of MacMainFrame DX is the capability of accessing the host via a remote connection, either directly through a serial cable connected to the Macintosh's modem port or remotely through a modem connection.

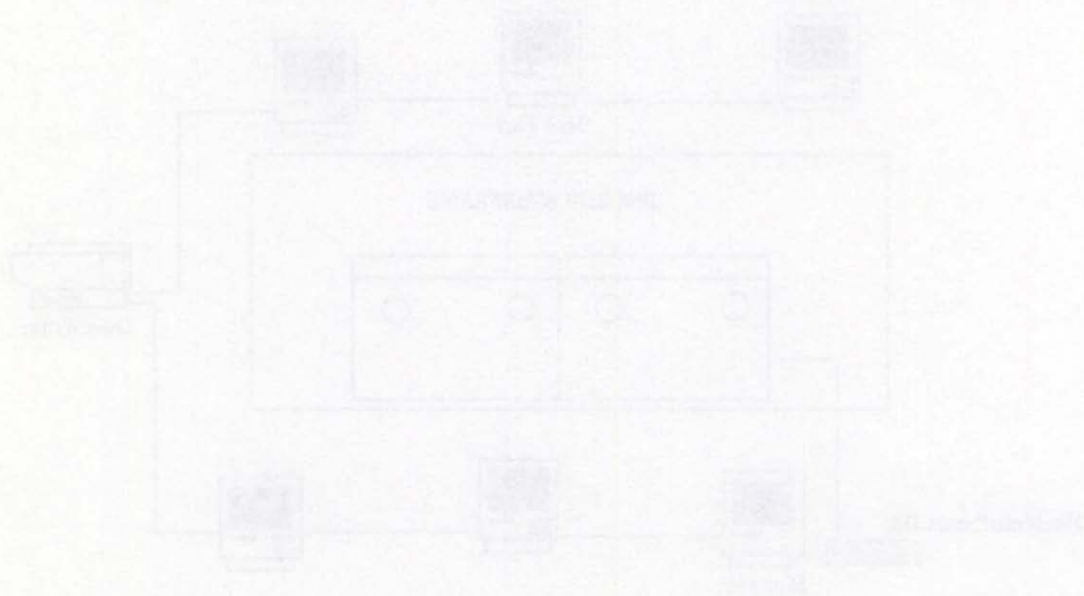
A typical MacMainFrame DX configuration is shown in Figure 4.18.

FIGURE 4.18 MacMainFrame DX



 **PRODUCT PRICE(S)**

MacMainFrame SE.....	\$795
MacMainFrame DX.....	\$795



More Peripherals: Utilities and Software

Peripherals consist of more than just add-on cards and hard disks, or even hardware in general. After all, what good is any of the hardware without software? This chapter describes two kinds of software products for LANs—utilities and multiuser applications. Utilities are fun and maybe the more useful of the two, but multiuser applications provide users with access to the same file at the same time. Not many multiuser applications are yet available for the Macintosh. This is sure to change, because both these areas of software development are growing by leaps and bounds. The Macintosh has always spawned unique and valuable utilities, most of them in the form of desk accessories (DAs). Although these DAs are not multiuser products, a server with multiple DA utilities can provide an adequate source of useful tools for LAN users.

■ **Utilities.** Utilities are fun programs. They help us print, back up our data, and send electronic mail. But utilities are not limited to these few applications. Guide™ from OWL, International, provides one example—a tool to create customized, on-line help, either in the form of simple lists of keyboard shortcuts or complex on-line manuals. Overall, a variety of utilities are available to expand and enhance our ability to get the job done.

■ **Multiuser software.** LAN software consists primarily of multiuser applications, including databases and accounting packages, that offer substantial support of the Apple File Protocol standards. At the present, there are no multiuser word processing or graphics programs for the Mac. This is

sure to change—we hope! To be fair, although some of the programs listed are not multiuser, they do support the AFP standards and lend themselves well to a network environment. PageMaker 2.0™ and Microsoft Word 3.0™ are two good examples. Some developers are beginning to work on multiuser word processing and graphics applications. The new Graphics Interchange Format (GIF) used on CompuServe shows promise for the development of multiuser graphics programs.

The structure of this section is the same as Chapter 4. Coverage includes the company's name and address, the product's LAN quality, the computers supported, a product description, and the price. If you need more information about the product, call or write the company. Any company not willing or able to answer end-user questions may have trouble supporting its product in the future.

All the companies developing Macintosh LANs are pioneers. Likewise, the companies developing LAN software are exploring new territory. Many of the companies are familiar to the Macintosh community; others are newcomers. Whatever their status, these developers are creating innovative and "friendly" software that is taking Mac users into a third generation of communications, software that is helping make LANs the popular solution for improving communications within the business community.

PageMaker 2.0

Company name: Aldus Corporation

Company address: 1411 First Ave. S.
Suite 200
Seattle, WA 98104
(206) 662-5500

Product name(s): PageMaker 2.0™

LAN quality: Fair to good. PageMaker 2.0 is not a multiuser application, but it does support the AFP standards. This means that the first user to access PageMaker 2.0 or a PageMaker file gets Write privileges. PageMaker 2.0 files can also be shared with the MS-DOS version of PageMaker over a LAN.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

PageMaker 2.0 is an updated version of PageMaker 1.2. Aldus has added many new features that make PageMaker 2.0 the premier desktop publishing program (DTP). Some of them are:

- Automatic hyphenation and justification
- Kerning (the adjustment of space between characters)
- Larger document size
- Interactive facing pages

In a network environment, PageMaker 2.0 provides users the opportunity to compile data from many sources. Once compiled on the server, by using 2.0 these elements can be combined into a company newsletter, a training manual, or any other type of publication.

Word Processing Imports

These elements come from a number of network sources. Documents are created by any user with standard Macintosh applications. PageMaker 2.0 goes beyond the competition with its ability to utilize different types of files. PageMaker 2.0 is the first desktop publishing program that supports Microsoft Word 3.0 formatted files. Other DTP programs can accept only formatted MacWrite or Word 3.01 files. In addition, PageMaker 2.0 has built-

in translation filters for third-party Macintosh and MS-DOS word processors. With PageMaker 2.0, you can import files from the following word processors and maintain most of your formatting:

- WordPerfect
- WordStar 3.3
- Xywrite
- Word processors that support the IBM Document Content Architecture (DCA), including DisplayWrite 4 and WordStar 2000.

The ability to import a large variety of MS-DOS based files makes PageMaker 2.0 a good network product. Users do not have to give up their favorite word processors just so their files will be acceptable to PageMaker.

Graphics Imports

PageMaker 2.0 excels at importing a variety of graphic files. It fully supports imported PostScript files, such as those created with Adobe Illustrator™. PageMaker 2.0 also reproduces high-quality images from scanners that support the gray-scale Tag Image File Format (TIFF). This is a significant feature for users who need to produce images with multiple shades of gray and then print them on electronic typesetters such as the Linotronic 100/300 imagesetter.

PageMaker 2.0 also imports the traditional bit-mapped and PICT-formatted graphics found in MacPaint and MacDraw. With the plethora of CAD applications supporting the PICT format, engineers, architects, and designers may find PageMaker 2.0 a valuable network tool.

PC to Mac

Aldus delayed the release of PageMaker 2.0 in order to add one very important feature, the ability to open a document created with the MS-DOS version of PageMaker. With TOPS, MacServe or some other distributed file server system, the transfer is easy. Simply open a new Macintosh PageMaker 2.0 window. Close the window and select "Open" from the File menu. If your PC-

PageMaker document is on the server or in a volume that has been published, you should see the PC PageMaker document listed. Select it and open it. This is a one-way conversion, however; you cannot open a Macintosh PageMaker 2.0 file with the MS-DOS PageMaker, nor can PageMaker 2.0 read graphics created with MS-DOS draw-type applications.

Kerning and Hyphenation

Two of the most-requested features added to PageMaker 2.0 were hyphenation and kerning. PageMaker's automatic hyphenation is based upon a 110,000-word dictionary plus a supplementary dictionary of 1,300 user-selected words. In addition to hyphenation, you can automatically or manually control word, letter, and paragraph spacing as well as kerning. Kerning, accomplished with any downloaded font on the system, allows users to professionally fine-tune any publication.

The Printed Page

All the advanced page layout features of PageMaker 2.0 are useless unless you can print them out. Aldus has added some additional printing functions that lend themselves well to a LAN. Some of these printing features come up when you first begin a new document. Your screen will look like the one in Figure 5.1. New printing features include:

- Automatic tiling (overlapping of pages) for larger documents
- Crop marks
- Page collation
- Optional printing of pages in reverse order

PageMaker 2.0 can also create mirror-images, useful when you're printing directly to film. Along with these features come improved LaserWriter speed as well as support for printing to several high-resolution typesetting printers.

Like other desktop publishing programs, PageMaker 2.0 provides the user with a variety of electronic layout tools. The basic PageMaker tools are displayed in Figure 5.2.

FIGURE 5.1 New Document screen

Page setup:

Page size: ☒ US letter ☐ US legal ☐ Tabloid
☐ A4 ☐ A3 ☐ A5 ☐ B5
☐ Custom: by inches

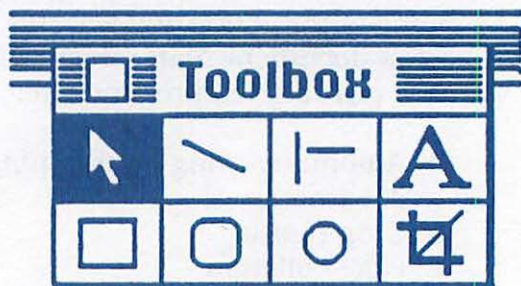
Orientation: ☒ Tall ☐ Wide Options: ☒ Double sided
☒ Facing pages

Start page #: # of pages:

Margin in inches: Inside Outside
Top Bottom

OK Cancel

FIGURE 5.2 Toolbox screen



Unlike earlier versions of PageMaker, the 2.0 version allows you to instantly stretch text blocks to fit a specific space without having to reflow the text. The number of on-screen columns has increased from 10 to 20 and keyboard shortcuts permit easy selection of tools from the Toolbox.

PageMaker 2.0 is a significant improvement over the earlier version. Aldus has worked closely with Apple, continuing its sup-

port of the AFP standards. This single-user application has the network capabilities that make it an acceptable LAN product.

PRODUCT PRICE(S)

PageMaker 2.0.....\$495.00/single-user

dBase Mac

Company name: Ashton-Tate

Company address: 20101 Hamilton Ave.
Torrance, CA 90502-1319
(213) 329-8000

Product name(s): dBase Mac™

LAN quality: Good. dBase Mac is *not* a multiuser database (yet). It does, however, adhere well to AFP standards. File accesses are handled on a first-come, first-served basis. That is, the first user gets read-write privileges. But other read-only users can save the file under a different name using the "Save as . . ." feature. They may then write changes to the file.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

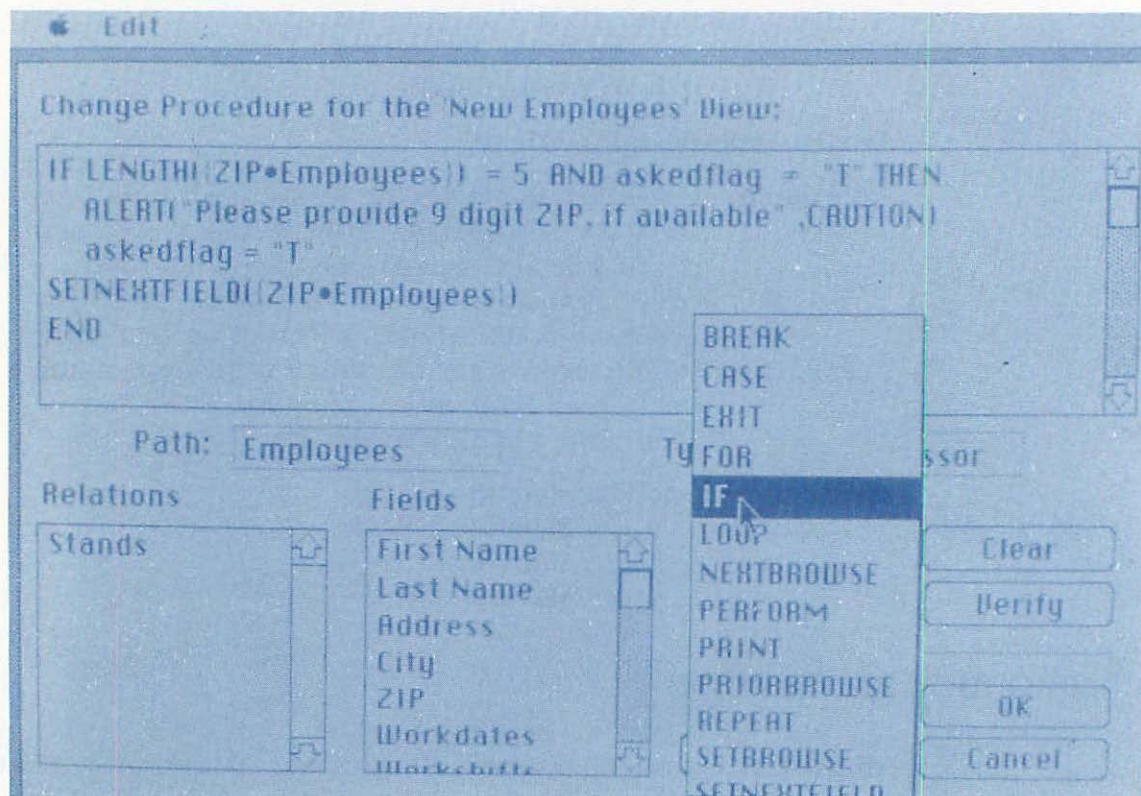
PRODUCT DESCRIPTION

dBase Mac is the long-awaited relational database management program from Ashton-Tate, the makers of dBase Mac II/III/III Plus. Even though it's not a multiuser database, it contains many fea-

tures that make it an excellent choice for use in a LAN environment.

Besides the standard database functions, dBase Mac provides you with a number of unique, Macintosh-specific features. Its key element is a procedural language that allows you to create turnkey applications with ease. For example, you can create customized dialog boxes, buttons, and pull-down menus by selecting specific functions (similar to selecting functions in Excel) and inserting them in your procedure code. This feature offers top-down programming of your turnkey applications. Figure 5.3 shows a sample screen of the procedural language functions.

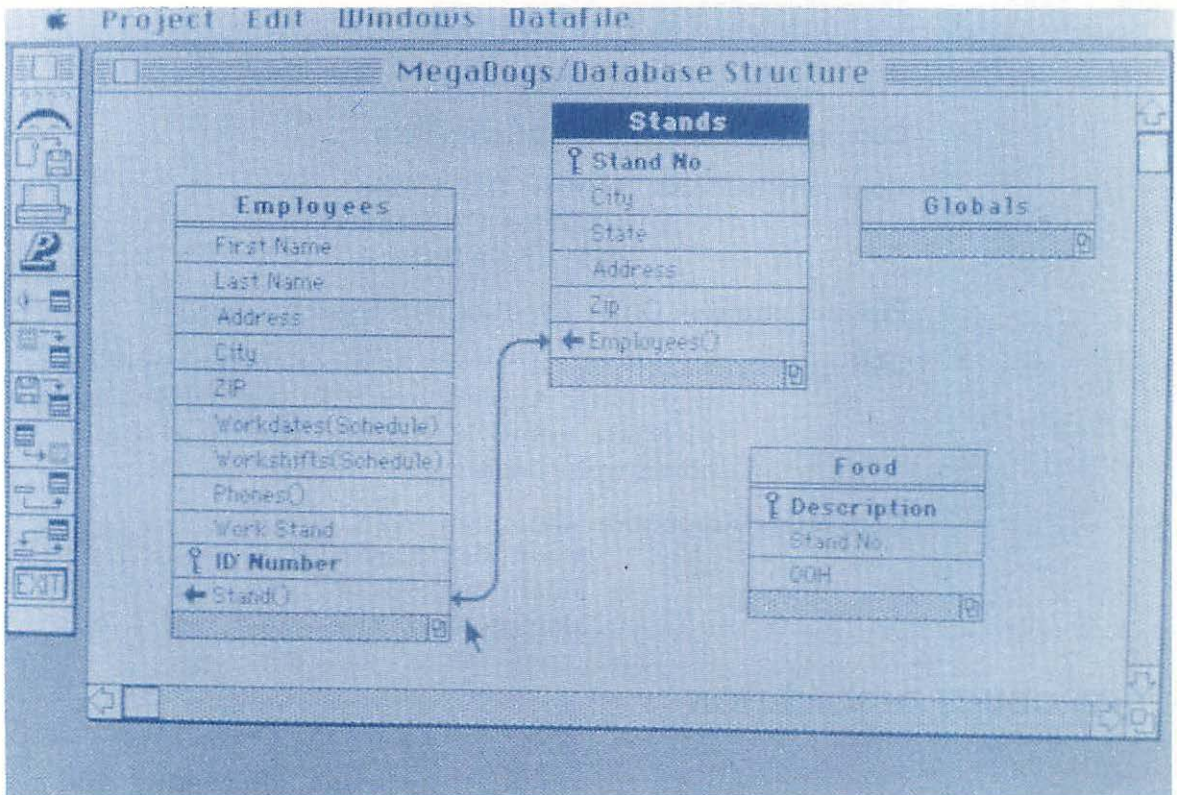
FIGURE 5.3 Procedural language screen



Another powerful feature of dBase Mac is a visual method of creating relations between files. Various files with fields can be displayed on your screen. Relations are created by dragging a field from within one data file into another file and releasing it. Figure 5.4 shows the visual representation of this procedure. The arrow visibly illustrates the link between the files, and multiple files can be linked in this manner, showing the relationships between them.

Another important feature of dBase Mac is the file compatibility with IBM-dBase II and III data files. dBase Mac can directly access these IBM dBase files from MS-DOS computers. This is a necessary function in any LAN.

FIGURE 5.4 Field relationship screen



Very sophisticated forms and reports can be created with dBase Mac. You have professional and customized data entry screens in a "page layout" environment and full use of the Mac's fonts, type styles, and graphics. Once data elements are incorporated into your form or report, you can output them to a Laser-Writer.

Overall, dBase Mac should prove to be an excellent network database. The ability to write turnkey applications is a powerful feature, one that many network users need.

PRODUCT PRICE(S)

dBase Mac.....\$495

Office Productivity System

Company name: Applied Micronetics

Company address: 3 Burnt Oak Circle
Lafayette, CA 94549
(415) 283-4498

Product name(s): Office Productivity System (OPS)TM

LAN quality: Excellent. OPS runs as a concurrent application under AppleShareTM. In fact, OPS uses AppleShare to provide for and control multiple concurrent users.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

OPS is an integrated, multiuser invoicing, job costing, and accounts receivable package designed for architects, engineers,

consultants, accountants, and any other professionals who bill for their services based on time expenditure. Included in the many invoicing options are the following features:

- Billing for time and expenses
- Fixed fees
- Fixed fees based on percentage
- Fixed fees plus reimbursable
- Cost and budget tracking

While OPS is not an accounting program, data generated with OPS can be integrated with a general ledger program.

PRODUCT PRICE(S)

Office Productivity System (OPS).....\$475

Omnis 3 Plus

Company name: Blyth Software

Company address: 2929 Campus Dr.

Suite 425

San Mateo, CA 94403

(415) 571-0222

Product name(s): Multiuser Omnis 3 Plus™

LAN quality: Excellent. The multiuser version of Omnis 3 Plus runs as a concurrent application with AppleShare. It also supports other LAN configurations, including TOPS, MacServe, HyperNet 2.0, Keeper Plus and the Nucleus, and the 3+ LAN. Support for a variety of LAN systems provides users with the flexibility of using multiple LANs in one large network.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Omnis 3 Plus is actually a more powerful version of the original Omnis 3 relational database. This multiuser version allows users to access over 1,400 fields and supports up to 64 users accessing the same database, while permitting full file locking, record locking, and password protection. Data files can be as large as 160 megabytes.

The main power of Omnis 3 Plus is the ability it gives users to create sophisticated turnkey applications. With Omnis 3 Plus an application can be created on a single-user system and then transferred to a multiuser system. Omnis 3 Plus users access to menus, dialog boxes, buttons, and error messages. Having access to the ToolBox offers developers the opportunity to do limited "top-down" programming, that is, to create the user interface first and then code the application around the user interface. Thus, users can customize their applications with all the familiar Macintosh features.

With its support for a variety of LAN systems, Omnis 3 Plus offers companies both power and flexibility when creating a company database. Omnis 3 Plus runs as a concurrent application when operating with AppleShare. With another LAN system, Omnis 3 Plus becomes an application residing on the system. If you are setting up a Macintosh LAN for the first time and need a relational database, Omnis 3 Plus offers power, speed, and multiuser operation.

PRODUCT PRICE(S)

Multiuser Omnis 3 Plus.....\$495.00



Company name: Microfinancial Flexware

Company address: 15404 East Valley Blvd.
City of Industry, CA 91746
(818) 961-0237

Product name(s): FlexServe™
MacFlexware™

LAN quality: Excellent. Flexware applications, a full range of multiuser applications, offer high-end accounting for Macintosh LANs. FlexServe is the database engine that is needed to run MacFlexware.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

MacFlexware is multiuser accounting software that is considered a high-end application not intended for a small business. The modules include:

- Accounts Receivable
- Accounts Payable
- General Ledger
- Inventory
- Payroll
- Purchasing
- Order Processing
- Job Costing

MacFlexware applications utilize the FlexServe database engine, both of which run concurrently with AppleShare. MacFlexware

also has full connectivity with MS-DOS and VAX computers. Users on any of these different computers can run the same application at the same time using Flexware. MacFlexware and FlexServe operate on MS-DOS computers having Apple Computer's AppleTalk PC board, Tangent Technologies PC-MacBridge/ATB, or Centram's TOPS card, thus giving a company an extremely flexible accounting package. The VAX Connection is supported by Kinetics and Alisa Systems.

PRODUCT PRICE(S)

MacFlexware.....\$795.00/module

Great Plains Accounting Series

Company name: Great Plains Software

Company address: 1701 S.W. 38th St.
Fargo, ND 58103
(701) 281-0550

Product name(s): Great Plains Accounting Series™ with the Network Manager™

LAN quality: Good to excellent. With the addition of the Network Manager, the Great Plains Accounting Series becomes a multiuser accounting program. Without it, it's a single-user system. The Network Manager provides file and record locking with full AFP support. It does not run concurrently with Appleshare™.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

The Great Plains Accounting Series has been around for some time. Now, Great Plains has added the Network Manager for multiuser support. The Network Manager provides the database engine needed for multiuser access to the various accounting modules, including:

- General Ledger
- Accounts Receivable
- Accounts Payable
- Payroll

Inventory, order entry, and point-of-sale invoicing are not currently supported as multiuser modules by the Network Manager.

Some of the features provided by the Network Manager are,

- Program file and record locking
- Conformation to AFP standards
- Password protection
- On-line help

Even though the accounting series and Network Manager do not run concurrently with AppleShare, other LAN systems are supported, such as MacServe, TOPS, PC-MacBridge, and The Keeper/Nucleus system. There is no internetwork connectivity, however, with the The Great Plains Accounting Series and Network Manager; the Great Plains system is a Mac-only application. While the series is available for MS-DOS computers, Great Plains has not yet bridged the gap between the two operating systems.

PRODUCT PRICE(S)

Great Plains Accounting Series™.....	\$695/module
Network Manager™.....	\$395

Insight

Company name: Layered Software

Company address: 85 Merrimac St.
Boston, MA 02114
(800) 262-6620

Product name(s): Insight™

LAN quality: Excellent. Layered has finally released their multiuser version of the Insight accounting series. Insight will run as a concurrent application with AppleShare.

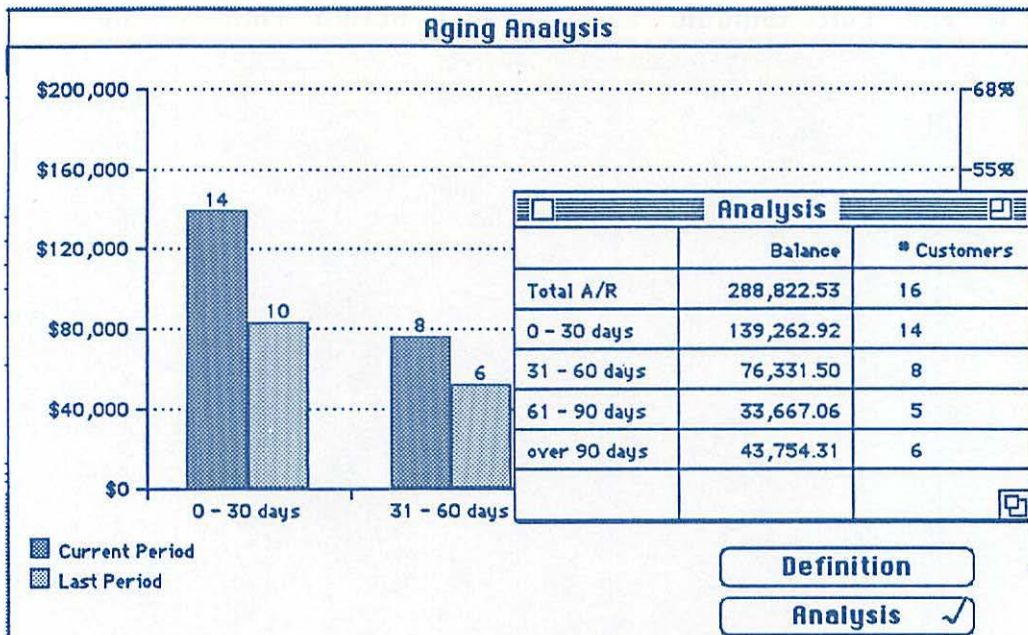
Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Insight is not just another accounting package. Since its introduction, it has become one of the leading accounting packages for the Macintosh. It has done this by creating an accounting package that is an "expert system," a program with the built-in capabilities of expert accounts. To some degree, Insight can learn your methods of doing business, based upon your own input to the program. It can then generate expert reports that offer the user "insight" into current financial methods. The expert report can generate several different views of a given financial situations, such as:

- A graphic or tabular analysis
- A comparison of current totals to previous periods
- The ability to zoom to more collection detail totals, such as a list of customers and their associated outstanding balances, or an individual ledger card.

FIGURE 5.5 Expert Report screen

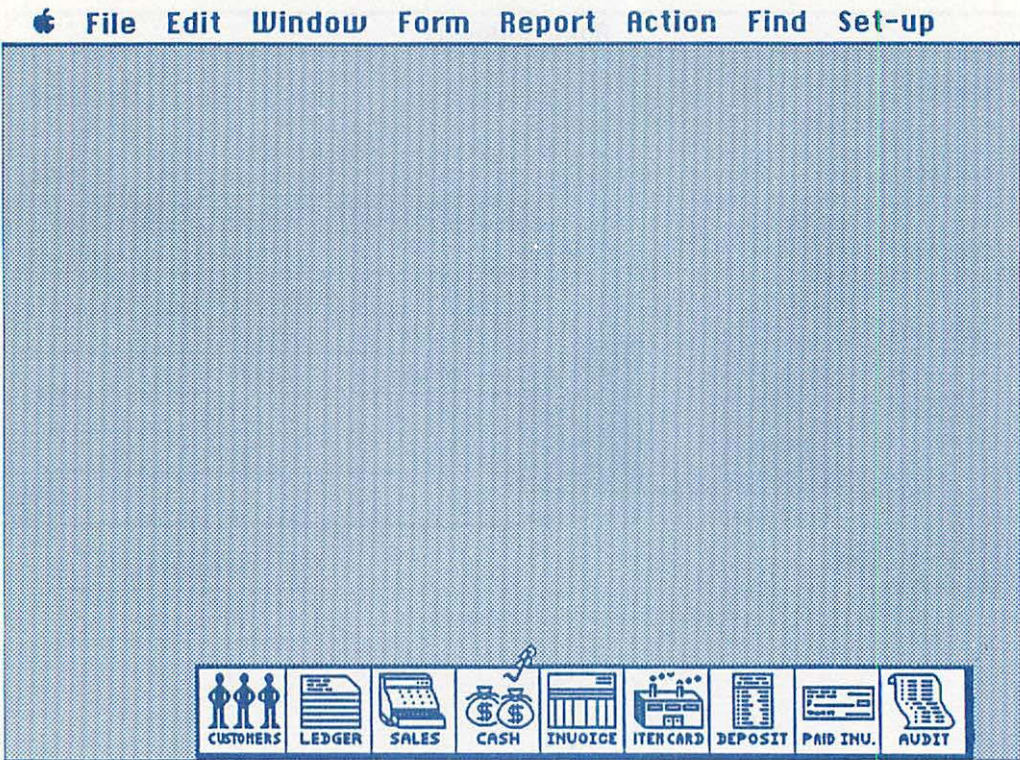


A sample expert report screen might look like the one in Figure 5.5.

Insight doesn't just stop there. In addition to generating expert reports, creating and selecting data entry forms is as simple as clicking on a palette of choices (see Figure 5.6).

The Insight accounting series consists of modules for General Ledger, Accounts Receivable, Accounts Payable, Inventory Control, and Payroll. All are available as single-user or multiuser applications. In an AppleTalk network, Insight runs as a concurrent application with AppleShare. There are full file and record locking features as well as password protection. All users have simultaneous access to the same files, but write-access is restricted to one user at a time. Unlike other multiuser accounting programs, Insight allows all users to see up-to-the-minute information on all transactions, even those posted by others.

FIGURE 5.6 Palette of choices



All Insight modules work together as a multiuser accounting solution or as single-user applications. Combined with the expert system, Insight is an excellent multiuser accounting program for a medium to large company.

 **PRODUCT PRICE(S)**

Insight..... \$595.00/module

 **ReadySetGo**

Company name: Letraset USA

Company address: 40 Eisenhower Dr.
Paramus, NJ 07653
(201) 845-6100

Product name(s): ReadySetGo™

LAN quality: Fair. ReadySetGo (RSG) does not follow the AFP standards very well. The program is designed to be a single-user application only. However, files created on the network can easily be incorporated into an RSG document that can be used by single users responsible for the design and pasteup of company documents.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

 **PRODUCT DESCRIPTION**

As a desktop publishing program, ReadySetGo is the closest competitor to PageMaker. While not designed as a multiuser program, ReadySetGo has network potential as a single-user application. Network users can create the various elements of a publication and store them in a specific folder. A layout specialist can then use the contents of that folder to create the publication using ReadySetGo. ReadySetGo can handle a one-page document or a 500-page book.

Some of the powerful desktop publishing tools in ReadySetGo are:

- Hyphenation
- Text runarounds
- Kerning
- Word processing with a 60,000-word spelling dictionary

Even though ReadySetGo has its own word processor, it reads files created by Word 1.0X and MacWrite. Besides importing word processing files, ReadySetGo can also import graphics from any application that supports bit-mapped or PICT files. Useful graphics programs include MacPaint, SuperPaint, MacDraw, MacDraft, and others.

One of ReadySetGo's more powerful features is the variety of ways in which it can do text and graphics. With ReadySetGo you can run text around any object on the ReadySetGo screen, toggling this capability on or off depending upon your layout needs. It can create "blocks" to define an object's space on the layout. These blocks can hold text, pictures, or geometric figures. Any blocks that have the "runaround" feature turned on will repel text. When a runaround object is placed in the middle of text, that text is automatically reformatted to accommodate it.

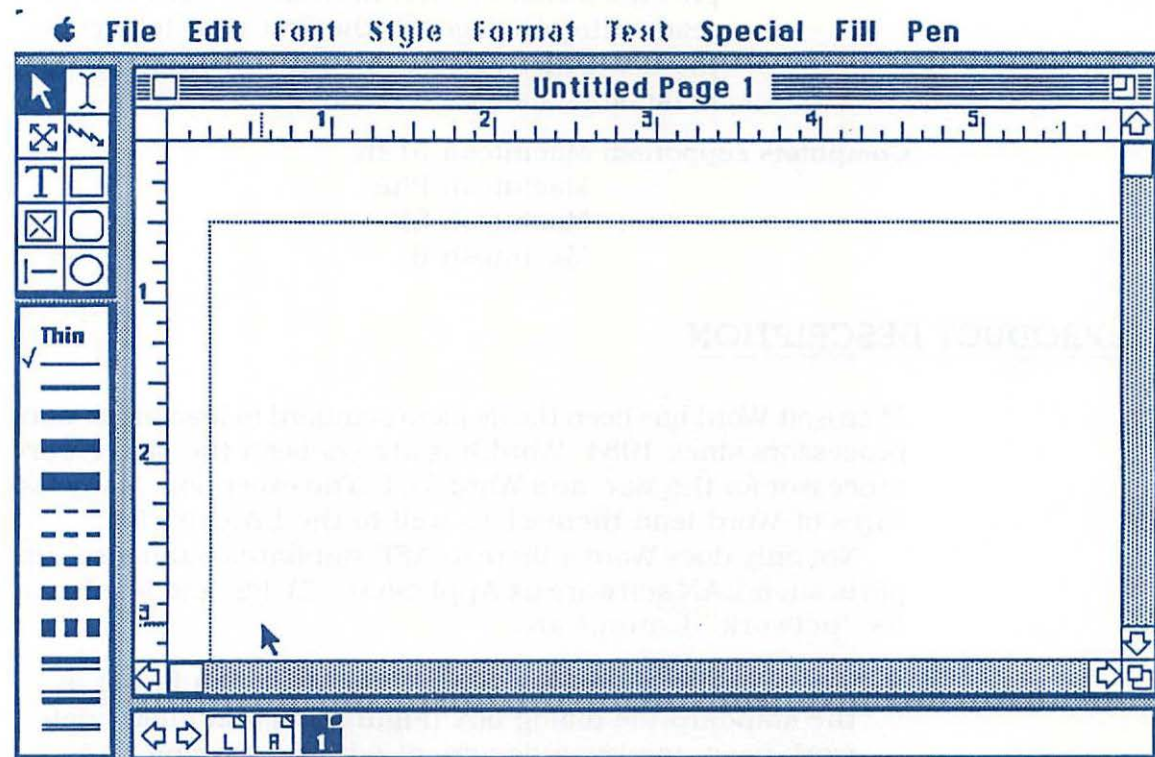
ReadySetGo's opening screen offers the user a palette of tools for electronic layout. The opening screen is shown in Figure 5.7. As you can see, the tools look similar to other desktop publishing and graphics programs.

Even though ReadySetGo is a single-user application, it has been tested with Infosphere's MacServe. However, MacServe requires two minor adjustments. First, if you use Switcher, reserve an additional 32K in each memory partition upon installation. Second, MacServe overrides Apple's Chooser desk accessory. On a network this causes some difficulties when selecting a network printer.

 **PRODUCT PRICE(S)**

ReadySetGo 3.0.....	\$295
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FIGURE 5.7 RSG opening screen



Word 3.01

Company name: Microsoft Corporation

Company address: 16011 NE 36th Way
Box 97017
Seattle, WA 98073-9717
(206) 882-8080

Product name(s): Word 3.01™

LAN quality: Fair to good. Like other word processors, Word 3.01 is *not* a multiuser application. However, Microsoft has gone to great lengths to have

Word conform to AFP standards. Like most applications that are not multiuser, Word assigns read-write privileges to the first user to access the file. Other users can read a file but cannot make any changes.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

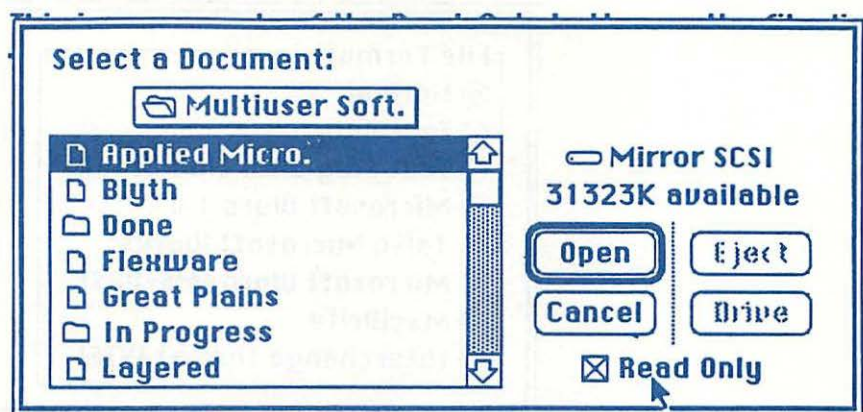
PRODUCT DESCRIPTION

Microsoft Word has been the de facto standard in Macintosh word processors since 1984. Word has always been the power word processor for the Mac, and Word 3.01 is no exception. Many features of Word lend themselves well to the LAN market.

Not only does Word adhere to AFP standards but it also supports such LAN software as AppleShare, TOPS, and MacServe. Its "network" features are:

- **A read-only mode for files.** This mode can be set in the standard file dialog box (Figure 5.8) and allows network users to view a document without altering it. A document can be saved under a different name and then altered, but the altered document cannot be refiled under its original name.
- **Lack of copy protection.** This allows for easy installation on hard disks set up as servers.
- **Shared style sheets, glossaries, and dictionaries.** Users can share style sheets, glossaries, and dictionaries. You can create common formats for interoffice letters, newsletters, memos, and such that can be used by anyone on the network. Glossaries allow users to share frequently used text and graphics. Users can not only share the dictionary, but can customize it, thus creating their own individualized "user dictionary."
- **File formats.** Documents can be saved in a variety of file formats. The file formats screen is shown in Figure 5.9.

FIGURE 5.8 Standard dialog box

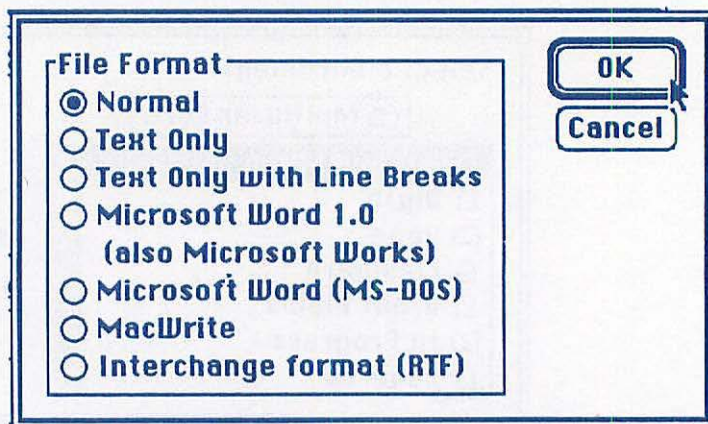


Word has received so many accolades that it seems a bit trite to say once again that Word has some great features. The ease of creating style sheets, glossaries, and page layout makes Word an excellent choice for a LAN word processor. Of course it would be nice to have a true multiuser word processor. But since the Mac does not yet have such an animal, Word 3.01 may be the next best thing.

Most of the bugs in Word 3.01 are well documented. They are worth mentioning again here, though, because at times they can be annoying. For LAN use, the major drawback to Word is the program's inability to accurately save document formats and styles. This error usually occurs after the second or third time a file is saved. When you reopen the file, parts of your document may be in different font or style. Fortunately, you don't always lose your file. But it does occur often enough to become quite irritating. On a network, users having to reformat, change fonts, and redefine styles slows down their productivity.

The spelling checker is another problem that affects network users. Basically, the spelling checker stinks! Once a word is corrected or skipped, it won't globally replace or skip the word. To make it do so, you have to enter the word into a user dictionary, thus creating a rather large dictionary that uses up disk space. To keep the size of these user dictionaries under control, you

FIGURE 5.9 File Formats screen



must constantly add and delete entries depending upon your needs. As you spell-check the document, Word keeps most of the document *and* the spell checker in memory. Large user dictionaries and large documents cause memory problems that usually result in the dreaded "System Error (Bomb Box)."

Microsoft is quite aware of these and other bugs, and if most of the problems are not fixed by now, they soon will be. Overall, Word's problems cause more irritation than anything else.

PRODUCT PRICE(S)

Word 3.01.....\$395

Helix

Company name: Odesta Corporation

Company address: 4966 El Camino Real
Suite 205
Los Altos, CA 94022
(415) 962-8661

Product name(s): Multiuser Helix™
Helix VMX™

LAN quality: Excellent. Odesta has created several versions of Helix, their popular relational database, that lend themselves very well to a network environment. Multiuser Helix runs as a concurrent application with AppleShare. Helix VMX uses a DEC-VAX/VMS system as the database server and the Mac as an intelligent workstation.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II
IBM PC/XT/AT
DEC-VAX/VMS

PRODUCT DESCRIPTION

Multiuser Helix

One of the first pieces of Macintosh software that users clamored for was a relational database. Because of the Mac's unique icon-oriented user interface, the typical relational database program would not cut the mustard for die-hard Macintosh users. A full-featured relational database would have to take supreme advantage of the Mac's operating environment. Enter Odesta Corp.'s Helix. Odesta bills Helix as a data-based information management and decision support system, but it's a different kind of personal computer database system, one that would not be possible without the Mac's pull-down menus, icons, and point-click simplicity. Helix is *not* copy-protected! Odesta knew it would be necessary for users to install the program on hard disk and to make backup copies.

Helix provides the user with all the standard database tools: entering and storing data, sorting, retrieving information, analyzing data, generating reports, and modifying data—all without a complex command structure to memorize or a linear format to follow. Helix performs these tasks through the use of icons.

All of this may sound too good to be true, and there is a catch. There are numerous new icons to learn and Helix's own jargon to contend with. But, the familiar Desktop and pull-down menus are always there to reassure the user. Helix uses icons to create the various building blocks with which the user can create and manipulate a database. There are icons for collections, which are the various databases; icons for arithmetic operations that look like an abacus; and icons for relations. Relations are the foundations for "information and decision support." Other icons include the template icon, used for drawing a database form. The selection icon is for opening the forms that were created with templates so you can display and enter data. The query icon allows you to ask questions about your data, and the index icon covers the indexing and ordering of fields either numerically or alphabetically.

Multiuser Helix runs as a concurrent application with AppleShare. When you first set up AppleShare, you need to tell it that you are running a concurrent application. Helix provides you with an installation process that puts Multiuser Helix on the AppleShare server.

When you first start Helix, the program automatically creates a new collection (database). A collection is created once Helix is loaded and opened. It is within this collection that you will place your data, forms, relationships, and other pertinent information. You now have to open the first relationship. This relationship icon is also called the "icon well" because it contains the icons for templates, selection, fields, query, abacus, and indexing. You then drag a field icon from the "well" into the relation window. You utilize field icons for all the data that you will need—names, addresses, telephone numbers, and so on. Field icons are also used for formatting such information as text, dates, number, etc..

After all your fields have been created and formatted, you drag a template icon into the relationship window and open it. This template icon lets you create and design the layout of your database form by providing horizontal and vertical rulers and many other standard drawing tools to make squares and lines.

Now that your form has been designed, the selection icon is used to define how you will access the form for data entry and

display. Once data has been entered, the rest of Helix's icons can be used to manipulate your data for specific purposes. For example, the abacus icon can be utilized to compute volume discounts related to a specific customer base. The query icon is used to ask more complex questions of Helix, using icon tiles with connecting arrows that show the flow of logic for a particular query.

Although multiuser Helix is very powerful, it does some things very slowly, such as indexing and searching a large file. It helps to index the necessary field as you go along. Helix does some other things very well. Its free-form method for data manipulation makes the program effective for many types of database needs. When it's combined with Double Helix, users can create turnkey applications for either personal or network use. It is Double Helix that provides the procedural language to create your applications.

Helix is useful for individuals in many professions. Helix can spot mistakes that you might make in the design of your form and makes sure that you do not inadvertently destroy or throw away your data. One example is the dialog box that says "Watch out! Stop right there! You are about to erase an entire relation and all of its data." The warning gives you the option to stop and make sure you know what you're doing before you do it. Helix also uses different cursor icons to show you what's taking place. Besides the traditional Macintosh cursor icons like the arrow, wrist watch, and I-beam, there's a small disk that appears when Helix is saving to disk as well as the standard plus sign that shows up when you're drawing forms in the template icon. When Helix is performing an operation that you can stop with a command key sequence, the icon changes into the command symbol. Helix also provides the user with on-screen help and the capability of creating customized help, although these help features are not resident within the Helix program. This ability to customize your help could save you time and increase your productivity.

With its good help, familiar Macintosh interface, and iconographic command structure, Helix becomes a good performer, even though it has some speed problems. Relationships are easy

to create, and data can be easily and efficiently altered to fit whatever needs may arise.

Multiuser Helix provides file- and record-locking capabilities. Each user can access any records and files at any time. Automatic record locking prevents multiple users from changing a particular record. In order to protect sensitive data, users may set up their own "permission" system for record and file access, which can work in conjunction with, or in addition to, the access privileges set up by AppleShare. Permission protects data on a form-by-form basis and governs adding, deleting, importing, and exporting of information.

Just as you can create a variety of relations and ways to manipulate your data, you can also create and manipulate reports. Helix provides the user with as much flexibility with reports as it does with data manipulation. Reports can be created with calculations and multiple formatting capabilities.

The only limitations to Helix's flexibility are those imposed by the user. Despite its slow indexing, Helix is by far the easiest relational database to use for the Macintosh, as well as one of the most powerful. Other databases have been created for the Mac, but to date none have yet achieved the balance of Helix. It's easy enough for new users, yet powerful enough to suit the most experienced.

Helix VMX

Helix VMX is the same multiuser, relational database as the Macintosh version. The difference is that it runs on a VAX! Odesta has added some enhancements to the Macintosh version of Helix, especially by providing MS-DOS support. MS-DOS computers using an AppleTalk card for their PC have distributed processing access to database applications running under Helix VMX.

While Macintosh is basically an intelligent guest of the VAX host, Mac users have complete access to all of Helix's features. MS-DOS users, on the other hand, cannot directly access the Helix program and create databases, but can only access applications created with Helix.

PRODUCT PRICE(S)

Multiuser Helix.....\$695.00
Helix VMX.....Contact Odesta

Project/Legal Billing

Company name: Satori Software

Company address: 2815 Second Ave.
Suite 590
Seattle, WA 98121
(206) 443-0675

Product name(s): Project Billing™
Legal Billing II™

LAN quality: Excellent. These accounting packages offer a much-needed vertical solution. Both Project Billing and Legal Billing II run as concurrent applications with AppleShare™.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Project Billing is a professional time billing application designed for the creative professions: architects, engineers, ad agencies, graphic designers, etc.. Project Billing automatically marks up expenses, tracks the cost and billing rates of employees and expenses, matches budgeted versus current totals, and provides a profitability report for each specific project. The program can also print actual bills, aging reports, and productivity reports.

Running as a concurrent application with AppleShare, Project Billing provides professionals with a multiuser billing tool.

Legal Billing II is a time billing program for attorneys and accountants that tracks time and expenses, prints clients bills, produces productivity reports, and provides aging information. Legal Billing II is useful not only for attorneys and accountants, but for other professionals such as psychologists and consultants. Also, the American Bar Association has approved Legal Billing II for the legal profession. Legal Billing II is the first Macintosh program to be approved by the Legal Technology Advisory Council (LTAC), part of the American Bar Association that offers a software review service for the legal profession. The professional business now has a network solution for its time billing needs. For a small professional organization, Project Billing and Legal Billing II offer a vertical solution that does not require a large, complex, and expensive operation.

PRODUCT PRICE(S)

	<i>Single user</i>	<i>Multiuser</i>
Project Billing.....	\$695.00.....	\$1,095.00
Legal Billing.....	\$895.00.....	\$1,295.00

SoftBackup

Company name: Diversified I/O, Inc.

Company address: 1008 Stewart Dr.
Sunnyvale, CA 94086
(408) 730-2171

Product name(s): SoftBackup™

LAN quality: Excellent. SoftBackup was designed to operate in a network environment. Backing up data is probably the most important task on a LAN. SoftBackup does it in both stand-alone and multiuser versions.

Computers supported: Macintosh 512K
 Macintosh Plus
 Macintosh SE
 Macintosh II

PRODUCT DESCRIPTION

SoftBackup is a utility that allows you to back up data to a tape drive or disk, either as a stand-alone product or as a multiuser application. SoftBackup offers backup at the volume, folder, and finder levels for any volume that is visible on your desktop, including any remote volumes. With AFP servers (like AppleShare), you can back up any folder that has the proper access privileges.

An important feature of SoftBackup is *timed backups*. Being able to specify a time delay for backups eliminates having to spend an extra hour backing up data at the end of the day. After a specified time delay, SoftBackup backs up your *preselected* data. This preselected data is stored as a "script," a previously specified group of files, folders, or volumes. For continued backup, these scripts can be recalled for faster backup operations.

SoftBackup does more than just back up data. It also restores volumes, folders, or files to hard disks, floppy disks, or other tape drives. You can even use the scripts to restore your data.

PRODUCT PRICE(S)

SoftBackup.....	\$69.95—Single user
SoftBackup.....	\$139.95—Multiuser

Edudisc

Company name: Edudisc

Company address: 3501 Amanda
 Nashville, TN 37215
 (615)269-9508

Product name(s): Mentor™
MacVideo™
MacAuthor™

LAN quality: Good to excellent. Like producing a television show, creating an interactive video is a group process. It takes many different talents to create an effective interactive video presentation. With a LAN system, these talents can all be brought together to assemble the many elements necessary for the final production. Mentor, MacVideo, and MacAuthor combine to give network users the tools to create these necessary elements.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

The Mac has ushered in some of the most innovative and creative educational programs ever developed for a microcomputer. One of these quality programs has been created by Edudisc, and it's a product that could change computing in this country. Edudisc has developed, by means of laser disk technology, a series of programs that create interactive video courses. Now individuals not only interact with a course on the Macintosh screen, but also interact with a laser disk. A powerful component has been added to an already powerful tool.

There is a great deal of talk about the technology of laser disk and video disk interfacing with computers. The technology is not really new, but the cost has been prohibitive for most institutions and individuals. Edudisc of Nashville, Tennessee, has developed a multilevel program aimed at closing the price gap while still maintaining power and performance. Its series of programs are designed to integrate optical video disk technology and the Macintosh.

Two programs comprise the Edudisc package—Mentor and MacVideo. Mentor is the courseware authoring program; Mac-

Video is the video disk editing software. Combined, Mentor and MacVideo create interactive courses complete with video disk presentations.

Components of Edudisc

Edudisc may be simple to use, but the way it functions quite complex. Mentor is the primary “authoring” system used to create the actual course material and lessons. MacVideo allows the user to edit video “clips” on video disks. These clips are then integrated into the course created with Mentor. The end result is an interactive video course controlled and monitored with a Macintosh. For example, imagine taking a course in methods of teaching learning-disabled children. Not only can you learn the teaching methods, but you can watch the actual methods being used in a real teaching situation. And that’s not all: you can actually manipulate and interact with the teaching situation on disk.

MacVideo is the unique component of the Edudisc system, connecting the Macintosh to the Panasonic 2023F or 2024F Motion Video-Audio/Still Video Optical Disk Recorder/Player. It allows you to look at the contents of a video disk and select the stills or scenes that you need for your course. Once you have edited your “clips,” you install them in appropriate places in your course. During the running of the course, the Mac is connected to an optical disk player, allowing you to watch while you’re working.

Mentor and MacVideo are not difficult to use, but to dive right into the programs without plotting your course would be a mistake. Above all, it takes detailed *planning* to create a course! The author of a course is not only the writer, but is the director, producer, film editor, and even photographer. All the components should be thought out ahead of time to avoid frustration. Constructing a script design is probably the best method of planning your course. Deciding ahead of time the number and type of video interactions makes it considerably easier to edit and group your various audiovisual elements. MacProject and MORE are extremely useful for creating a visual plan of the project.

Once your project has been plotted out, it’s time to use Mentor and MacVideo. You may create the course first and add the

video component later, or you may find it easier to edit your audiovisual clips first and then integrate them into your course. Either way, the results are the same. The methods depend upon your particular learning style. Breaking your topic down into very specific areas is useful; so is deciding which topics require audiovisual feedback and how you want them presented to your audience.

Mentor provides two methods for presenting the information—relational and linear. The linear format is the easiest to construct, and the method you should choose the first time out with Mentor and MacVideo. As in the traditional approach to teaching, the student (or viewer) is instructed in a sequence of lessons and is expected to master each topic before moving on to the next lesson. Mastery of a topic is determined by some type of test, such as multiple-choice or fill-in-the-blanks. Mentor provides the tools to create both lessons and tests.

Arranging information for a relational presentation is far more complex than ordering a linear format. The relational format allows topics to be detailed, creative, and open-ended. In the relational format, each topic has three concepts associated with it, each with a “relational pointer text” based upon answers that students provide to questions within the various concepts. These answers then take the viewer into other concepts or other areas of the course. There are no right or wrong answers. Each answer takes the viewer deeper into the study of the overall course subject. As you can begin to see, without a master plan you could easily lose your way.

Mentor

When you first open Mentor, you will understand why preplanning is important. The opening menu structure is familiar to Mac users, with its traditional Apple, File, and Edit menus. Selecting “New” from the File menu gets you started with your course. From this point Mentor is straightforward. Mentor provides you the opportunity to determine whether your course should follow a linear or relational format. You can intermix the two formats to create a blend of relational and linear topics—a powerful learning technique. Combining these two formats, however, increases the need for detailed planning.

Once you name your course, selecting "Add New Item" from the Goodies menu allows you to add your topics. At this point you can name the audiovisual clip to be associated with a specific topic. As I said before, you can go back and add the clips later.

From this point you really begin to branch out. Under the File menu there is a feature called "Launch Another Program," that allows you to jump to another application. For example, you could jump from Mentor to MacPaint, copy a graphic, go back to Mentor, and paste that graphic into your course. Any application that supports the clipboard can be used with Mentor.

Another use for the "Launch" feature is jumping from Mentor to MacVideo. In MacVideo you can edit your audiovisual clips and then jump back to Mentor. In other words, you can add your audiovisual components "on the fly." This feature is *not* Switcher, but it is very useful.

Besides writing multiple-choice and fill-in-the-blanks questions, the creator of a course can also add a review feature for use when the wrong answer is selected. Reviews serve two purposes: they provide new learning branches by creating new information and topics for the viewer to explore; they also help set up evaluations of viewers' answers. Reviews are useful, too, for establishing summaries. The "Student Summary" feature under the Evaluations menu provides a summary of the viewers' experiences with the course. The summary shows where the viewer went wrong and suggests possible learning alternatives.

The viewer can also take "Excursions," jumping to other topics, valuable because they present "what-if" scenarios, "how-to" procedures, and quick references. As a learning tool, the excursion function prompts the viewer to explore and go beyond a specific topic.

The most powerful aspect of Mentor is not in its authoring capabilities, but rather in its ability to integrate with an optical disk, creating powerful audiovisuals that can enhance the learning of any subject. Integrating audiovisuals with an optical disk is easy. MacVideo is used to accomplish the actual editing of the optical disk. The audiovisual segments are then grouped into "clips" that are called by Mentor. With Mentor's authoring capabilities, you can create interactive video with any or all of your selected segments.

Mentor interfaces with several optical disk playback units. Some of them are: Pioneer 6000 and 6010, Sony 1000 and 2000, Pioneer 4000 and 1000, and the Panasonic TQ-2024F. The Pioneer 4000 and 1000, however, will require an RS232 adapter, available from Edudisc.

MacVideo

MacVideo allows you to edit optical disks and create your own optical disk for use with Mentor. Where does one get optical disks for editing? There are several sources, and a catalog is available. Many of the disks are in the public domain and cost very little, while others are commercial laser disks and cost several hundred dollars. These disks contain many valuable motion and still scenes. Contact Edudisc to find out how to get the catalog.

The equipment needed for recording your own optical disk are an audiovisual/still video optical disk recorder and an optical disk playback unit. There are several brands. Edudisc recommends the Panasonic TQ-2023F Motion Video-Audio/Still Video Optical Disk Recorder and the Panasonic TQ-2024F Motion Video-Audio/Still Video Optical Disk Player. It should be pointed out that the recording capabilities of the Panasonic TQ-2023F are somewhat limited. The Panasonic is referred to as a "WORM" recorder—Write Once, Read Many.

MacVideo has controls for extracting the specific scenes you need for your course. Be sure to write down the names of your clips. You need to use the *exact* name of the clip in Mentor in order to get the correct audiovisual sequence in your course. As with Mentor, editing with MacVideo takes preplanning. It's better to plot your course first and *then* add your audiovisual components. The MacVideo control panel allows you to control the speed of the disk, find the starting and ending points of any chosen clips and specific frames, and edit the clips you created before writing them to the optical disk.

Even though MacVideo is easy to use, you still have to operate whatever optical disk recorder is used. The Panasonic recorder takes input from other sources beside other optical disk players. Video tape can also be used as a source of audiovisual clips. If all of this "video" stuff sounds too confusing, keep in mind that Edudisc will master a video disk for you from a video tape. Since companies and schools have access to video tape

equipment, this is the way to go. Contact Edudisc for information about this service. Another word of caution—optical disk recorders are *expensive*! About \$25,000 and up, they are usually out of the reach of most public schools, but not the universities. The video tape option is more feasible for public schools and small businesses.

Both MacVideo and Mentor are easy to use, but preplanning is essential. The programs adhere well to the Mac interface and utilize Macintosh graphics. This is especially true of MacVideo. Its control panel allows you to “slide” a lever to control the speed of your optical disk. Both programs let you print various reports and useful information and fully support both the ImageWriter and the LaserWriter.

If you have never had any experience in planning a course of any kind, you may want to get some help. Here’s where a network full of creative users comes in handy. Once you have plotted your way and have planned where everything will go, creating your interactive video course is relatively simple with Mentor and MacVideo.

The manuals are fairly well-organized, but the information tends to be a bit cluttered. A better design and layout would improve their readability. They have no documentation for the actual hooking up of the optical disk recorder/player to the Macintosh. Edudisc assures me that this was an oversight and that it will provide detailed instructions for hook-up.

Edudisc has created a series of programs that push the concepts of interacting with our computers to the limit, and they have done it in a very Macintosh way. They have created two of the most powerful tools available on a microcomputer.

Edudisc has also created several other programs aimed at integrating the Macintosh with optical disk technology. One is called ImageMaster™. It records, retrieves, and catalogs single images, much as they do on the six o’clock news. You can think of ImageMaster as an advanced visual database. Another program is a stand-alone authoring system called MacAuthor. It’s Mentor without the optical disk integration. In fact, MacAuthor may be a good way to test out an interactive course before getting into the world of optical disks.

In time, developers will create interactive optical disk programs for many subject areas, but it will take a team effort. With

LANs, team members are brought together in a unique way. The creative process is often very individualistic. Users pool their individual creative endeavors to create a final product. Developing an interactive video becomes a fun process when you bring together the individual creative talents of several people, the Macintosh, and the power and ease of a Macintosh LAN.

PRODUCT PRICE(S)

Mentor and MacVideo.....\$595 (Includes cable to connect to the RS232 port of the optical disk recorder/player)
MacAuthor \$200
ImageMaster \$1,500

Guide

Company name: Owl International

Company address: 14218 NE 21st St.
Bellevue, WA 98007
(206) 747-3203

Product name(s): Guide™

LAN quality: Excellent. Guide was designed with network use in mind. It provides an important element often missing in a LAN—on-line help. Guide was designed along the lines of Hypertext. It provides users with instant on-line assistance in the form of “Electronic Manuals.” It is *not* a multiuser application; the files Guide creates are designed to be *read*, never written to.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

How would you Mac users like a program with text editing like a word processor, text manipulation like ThinkTank, text and graphics manipulation like FileVision, all dynamically linked together to create one single document? Suppose I added that any chosen elements in your document could become “hot” areas and, by simply clicking on these selected areas, files could be dynamically and hierarchically linked together. To top it off, this program can be a desk accessory, available to any and all network users. This program exists *now*! It’s called Guide, created by OWL International. All of the Hypertext components and more are combined in Guide. Most paper manuals come complete with text and pictures. Often the pictures are more exciting than the text. Now imagine this same manual on your Macintosh screen. Your opening screen might be the table of contents. Clicking on any chapter takes you directly to that chapter. Once there you can jump to any other section connected with that chapter. Imagine an on-line manual that allows you to get help on network use or any application simply by clicking your mouse on a table of contents!

Guide presents a new way of viewing and using information quite unlike conventional methods. Computer pundits tell us that in the not-too-distant future we will need to access a great deal of information. Guide effectively represents the next generation of information retrieval, a turning point in the way we view information on our computer screens.

Hypertext and Guide

Guide is based upon a concept called Hypertext, created back in the '60s by the Palo Alto Research group, the same bunch that designed the Xerox Star computer that was the forefather of the Macintosh. Until Guide came along, Hypertext programs ran only on minis and mainframes. Guide allows the user much more freedom than Hypertext does in mixing graphics and text into the same document. The user can create a graphic and then designate that graphic as a button, which can then link the user to more graphics or text.

The features of Guide are as simple as they are complex. Documents can be created with either the Guide word processor or one of your favorites—Word or MacWrite, for example. Guide's word processor is a simple text editor. But with a program such as Word, it's easy to create more complex documents. You can change font and font sizes within Guide; it also supports most Macintosh fonts.

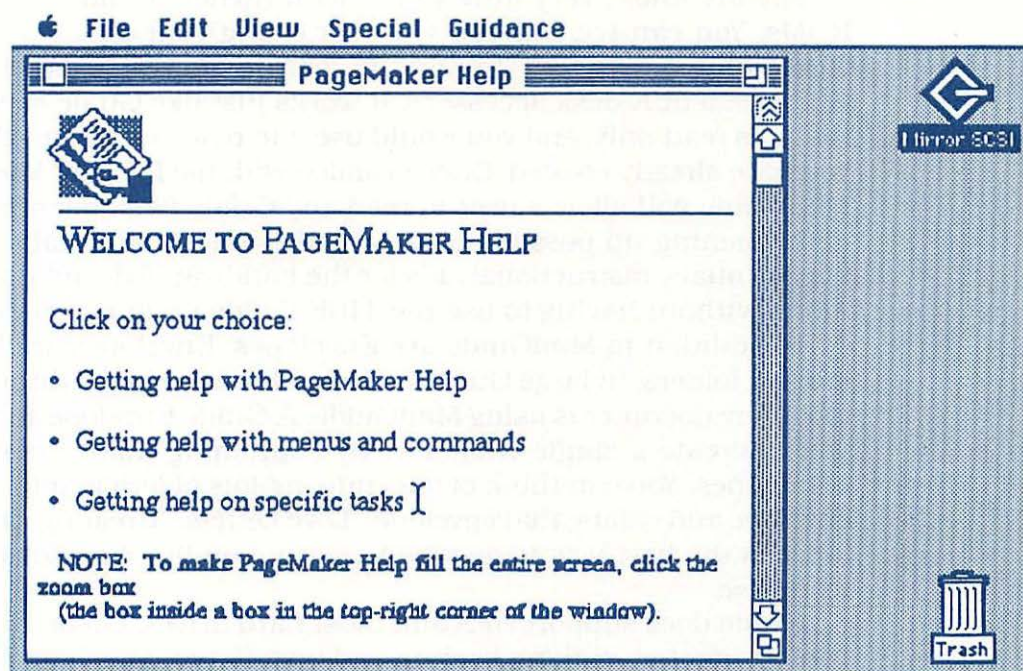
Guide is able to cut and paste documents from any Macintosh program that supports the Clipboard. Beyond its basic text capabilities Guide doesn't offer many "razzle-dazzle" features. You can't create graphics with Guide, but you can use the ones you created in MacPaint, MacDraw, etc. If it sounds as if Guide does not have much going for it, you're wrong. It is not the basic features of Guide that give it its power. It's what Guide can do with the documents you create that is amazing. Guide takes your documents and links them together to create a single file called a "Guideline," which might be a network operations manual, a training manual, instructional aids for network databases, or on-line application tutorials, to name a few. A typical Guide screen might look like Figure 5.10.

The links that Guide creates are also unique. All your files that you used to create your Guidelines are linked via three "buttons." These buttons are associated with specific areas on the screen, thus making sections of your screen "hot." When you move your mouse over one of these hot areas, your cursor changes to one of the three buttons. The three buttons are:

1. Replacement
2. Inquiry
3. Note

The Replacement button jumps you into another section, giving you further information. The Inquiry button allows you to combine several buttons under one Replacement button. The Note button pops up a small window with information or notes. This window stays open as long as you click your mouse. As you can see, you can have buttons within buttons within buttons, thus setting up a hierarchical arrangement with all files linked together.

FIGURE 5.10 Typical Guide screen



With a large Guideline you can get lost. You can get so deep into your document that without clues you can't find your way back. But Guide helps you out. There is a Retrace button that allows you to retrace your last 32 mouse clicks. If that fails, selecting "Top Level" from the Display menu takes you back to the opening screen.

Guide lets you to print out anything that is on your screen but you're limited to a very simple hard copy. Guide was not designed to be a program like MORE, which gives you a great many printing options. There is nothing fancy about your Guide printout. But that's OK! Guide wasn't designed to produce presentation quality charts and graphs. It's the program's ability to create *on-screen* documents with hierarchical linking that makes Guide unique.

Guide can be used with a Mac 512K, Mac Plus, Mac SE, and Macintosh II. In theory, Guide should work with Switcher X.X

(whichever is now the "official" version). However, as most of us already know, very little works with Switcher and the new ROMs. You can try, but you will risk losing your data.

Another small but important feature of Guide is MiniGuide™, a 50K desk accessory. It works just like Guide except that it is read-only, and you would use it to read Guidelines that you have already created. Once installed with the DA/Font Mover, MiniGuide will allow a user to read any Guide files that are on disk, opening up possibilities of creating on-line tutorials, on-line manuals, instructional aids for the handicapped, and much more, without having to use the 110K Guide program on disk.

In addition to MiniGuide are Envelopes. Envelopes are like labeled folders. In large Guidelines, you have to search through too many documents using MiniGuide. A Guide Envelope allows you to create a single Guideline by combining many smaller Guidelines. You can think of it as putting lots of letters into one envelope and calling that envelope "Love Letters." Creating Envelopes is the best way to go when creating on-line help for network use.

Guide does support HFS and most hard drives. Guide is *not copy-protected*, making backup and installation on a hard disk a snap. It's supported by most LAN file servers, and, in fact, Guide works with any LAN system that supports the HFS and AFP standards.

Guide is very easy to learn and use but a bit tougher to master. Creating Guidelines takes preplanning and thought. Using a program like MORE to create the basic structure of your document would be helpful. Once you have created the structure, you are free to use your favorite word processor, graphics program, or clip art. Once your individual pieces have been created, you can use your outline to "guide" you (pun intended) while you are creating your Guideline document.

Guide is the first program for a microcomputer that uses the principles of Hypertext. Although it's considered a Hypertext system, Guide can do much more. The features that let you create graphics, integrate those graphics into your Guidelines, and make your graphics into "hot" buttons place Guide far beyond the original Hypertext.

Even more important is Guide's new way of presenting information. Using a computer instead of paper to communicate

will become more prevalent as technology progresses. We've all heard of the "paperless office." Of course, this is an ideal but Guide brings us closer to it with a tool to enhance the manner in which we view information. No longer are we restricted to the Help files provided by developers or to manuals that are too thick and too complex to tackle in just a weekend.

Guide may not revolutionize the computer industry, but it's a product that will become a forefather to even more advanced Hypertext systems.

PRODUCT PRICE(S)

Guide.....\$295.00

LaserServe

Company name: Infosphere, Inc.

Company address: 4730 SW Macadam Ave.
Portland, OR 97201
(503) 226-3620

Product name(s): LaserServe™

LAN quality: Good to excellent. LaserServe is a print spooler. As such, it can tie up disk space that may be needed for server or application operations. On a network with a large server this would not be a problem. LaserServe is designed to work in conjunction with MacServe.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Network users either love or hate spoolers. Without them, you can lose your computer for hours—not a very productive use of network time. LaserServe is a print spooler for the Apple LaserWriter, but it works with the AppleTalk ImageWriter, too. LaserServe is designed to operate in the background and in conjunction with MacServe. When you start to print, LaserServe captures the file and saves it to disk. It then creates a printing queue and places your document in that queue. You can adjust the printing priority of your files by selecting Priority Service option.

LaserServe works as a stand-alone desk accessory or as part of MacServe. LaserServe manages up to 16 print jobs at a time with queue ordering and individual job control. Once printing begins, no other users on the network can interfere with the printing job. LaserServe also:

- Spools to multiple printers, using the Chooser or MacServe.
- Can save and remember print configurations that are set up to be installed at system startup.
- Contains a printing “fail-safe” feature. All print jobs are saved on your disk until completely printed. In the case of a system crash, files will automatically resume printing upon restart of the system.
- Works with other PostScript printers.
- Is managed and configured from a desk accessory. There's no need to leave your application to manage LaserServe.
- Works with other AFP file servers, such as AppleShare.

LaserServe offers network users excellent print spooling. You know how frustrating network printing can be if you have ever waited 30 minutes or more for your document to be printed. LaserServe leaves your Mac free to continue its application, turning waiting time into productive time.

PRODUCT PRICE(S)

LaserServe.....\$125/workstation

 **MARS 2**

Company name: Micro Dynamics, Ltd.

Company address: 8555 Sixteenth St.
Suite 802
Silver Spring, MD 20910
(800) 634-7638

Product name(s): Multiuser Archival and Retrieval System
(MARS™ 2)

LAN quality: Excellent. MARS was designed to retrieve documents quickly and easily. On large LANs, the ability to do this is invaluable. With the increase of optical disk storage device, MARS is a necessity.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

 **PRODUCT DESCRIPTION**

MARS was primarily designed to work with optical disks called WORM drives. WORM stands for Write Once, Read Many. With MARS you can input, compress, index, format, and store documents. The result of these gyrations is fast and efficient retrieval of your documents. MARS also works with several hard disks. When you're using mass storage devices with capacities in the neighborhood of gigabytes, you appreciate the ability to locate a specific document quickly. Looking for a specific document on a full five-gigabyte WORM drive using the standard HFS filing system could take a long time. MARS reduces your search time from minutes to seconds.

MARS works in a multiuser environment. Any network user can quickly use the indexing services available to the network

with the MARS system. Once a document has been retrieved, it can then be printed, copied, sent to someone else, or trashed.

Because it makes document retrieval so easy, MARS has had to include security features. Three levels of security are available:

- **User access control.** This is a login procedure that allows only designated personnel access to the MARS system.
- **Document assignment.** Each document can be assigned specific directions as to who is allowed to view the document.
- **Data encryption.** Any document to be sent over the network can be encrypted.

As a final feature, the MARS system can be completely customized to fit your company's special data storage requirements.

PRODUCT PRICE(S)

MARS 2.....\$15,000

SmartScrap and the Clipper

Company name: Solutions, Inc.

Company address: Box 989
Montpelier, VT 05602
(802) 229-0368

Product name(s): SmartScrap™
The Clipper™

LAN quality: Fair. Both SmartScrap and The Clipper were designed as stand-alone products. However, as DAs they provide network users with some excellent graphic utilities. There may be some difficulties if more than two or three users at-

tempt to access these DAs at the same time. Some problems can be avoided if users maintain a scrapbook file on their network startup disk.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

Finally someone has come up with some DAs that actually allow you to use your Scrapbook for more than holding “scraps.” SmartScrap™ and The Clipper™ are from Solutions International. These two DAs allow you to locate pictures and text from your scrapbook, trim them to fit your space, and then paste them into your document.

SmartScrap

This DA is essentially a replacement for your old Scrapbook file. When you access SmartScrap, you are presented with a handy table of contents of all of your Scrapbook documents. You can then “page” through your Scrapbook and find the document you need. You can even view the entire document by using the vertical and horizontal scroll bars.

The Clipper

Once a document has been selected from SmartScrap (or your regular Scrapbook), you can use The Clipper to determine the exact dimensions that you want the document to occupy. The Clipper trims or scales the document before you paste, ensuring that the picture is the exact size and shape that you want.

It's easy to install both The Clipper and SmartScrap with the standard DA/Font mover (V 3.2). Both are easy to use. With the new version of MS Word (3.0), the “Insert Graphics” feature performs the same scaling function as The Clipper. With other ap-

plications, The Clipper comes in very handy. For network users, hard disk space can be a premium, and Scrapbook files can become very large. SmartScrap allows network users to maintain large scrapbook files on their system startup disks. With The Clipper, users can quickly scale and crop a graphic. Once properly edited, the graphic can be immediately saved on the server for network access.

PRODUCT PRICE(S)

SmartScrap and The Clipper.....\$49.95

SuperLaserSpool

Company name: SuperMac Software

Company address: P.O. Box 390725
Mountain View, CA 94039
(415) 964-9694

Product name(s): SuperLaserSpool™
DiskFit™

LAN quality: Excellent. Both SuperLaserSpool and DiskFit were designed to operate in a network environment. SuperLaserSpool comes in a multi-user version and provides any network user with a spooler for the LaserWriter. DiskFit creates "Smart" backups on floppy disks.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

SuperMac Technology built their reputation on fast and reliable hard disks for the Mac. Now they have branched into the software market. They have created two products making life in the fast LAN a little bit easier. These two products are SuperLaserSpool and DiskFit.

SuperLaserSpool

SuperLaserSpool is a print spooler for the Apple LaserWriter. What makes SuperLaserSpool different from other print spoolers is speed. It's 5 to 40 times faster than other spoolers. As with other spoolers, SuperLaserSpool creates a print file and then places it in a print que to await its turn to be printed. You can delete or rearrange (change priority of) files while they're in the print que with this ever-present desk accessory.

SuperLaserSpool gets its speed by creating a very compact spool file. Normal Macintosh printing can create a print file that is two to four times larger than the original material. By compacting the file, SuperLaserSpool ensures that the print file takes up minimum disk space. Another factor that affects a spooler's speed on a LaserWriter is the way it handles downloaded fonts. Most spoolers replace the LaserWriter or LaserPrep system files, thus slowing the printing process. SuperLaserSpool uses these system files, avoiding the system crashes often associated with some downloaded fonts. The result is much faster printing of your document.

DiskFit

DiskFit is a network backup program that backs up data onto floppy disks in a "smart" way. DiskFit creates a series of "smart disks" that it continually updates to reflect changes made to files on the hard disk. DiskFit then revises just the affected *files* on the floppy, saving you large amounts of time. All files are saved in the standard Macintosh format and appear as individual icons on the Desktop.

Files can be saved incrementally or in batch. Once DiskFit sees that a disk is 95 percent full, it automatically prompts you for a new disk. If you're in the middle of copying a very large file, DiskFit moves the entire file to the new disk. Documents that are too long to fit on one disk will be split into two or more parts.

PRODUCT PRICE(S)

SuperLaserSpool.....	\$149.95
DiskFit.....	\$79.95

InBox

Company name: Think Technologies, Inc.

Company address: 420 Bedford St.
Lexington, MA 02173
(617) 863-5590

Product name(s): InBox™ for the Macintosh
InBox™ for the PC

LAN quality: Excellent. InBox was designed to handle the E-Mail duties of any network. In addition to electronic mail service, InBox provides other E-mail features. It works as a concurrent application with AppleShare.

Computers supported: Macintosh 512K
Macintosh Plus
Macintosh SE
Macintosh II

PRODUCT DESCRIPTION

InBox provides electronic mail (E-mail) services to Macintosh LANs that work with any combination of Macs and MS-DOS

computers. In fact, InBox for the PC works with Apple's AppleTalk board for the PC and PC-MacBridge/ATB from Tangent Technologies. In addition to this support for MS-DOS computers is support for internetwork connectivity. InBox can bridge the AppleTalk network to IBM Token Ring™, 3Com's Ethernet™, PC-Net™, and Novell's Netware™. E-mail can be stored or sent from any of these networks.

InBox operates as a desk accessory on any file server. With dedicated file servers like AppleShare, InBox works as a concurrent application. InBox is considered an E-mail application, but there is much more to InBox than just E-mail services. Users can send messages, memos, and files to individuals, groups, or an entire network. The ability to send *files* is one of the more powerful features of InBox.

InBox allows you to send spreadsheets, graphics, and reports to anyone connected to the network, complete with attached memo. Some of the other features of InBox include:

- **Automatic Logon.** InBox is automatically "turned on" when you start up your system and needs no complicated logon procedures.
- **Forwarding and Reply.** Messages can be rerouted automatically to the appropriate person or group. Forwarded messages can also be responded to.
- **File Enclosures.** A feature that allows you to send spreadsheet, graphic, or text files to another user and even attach a memo to the file if you wish.
- **Address Lists.** Maintains a listing of all mailboxes and Message Centers throughout the network. Users can scroll through the list and simply check off who they want mail sent to.
- **Routing Lists.** This allows you to send messages and files to a specific individual or group on the network.
- **Alerts.** No matter what application you are in, InBox alerts you that you have mail by sounding an audible signal and placing a message banner on the top of your screen.
- **Phone Messages.** Phone messages are delivered to a user on the standard pink telephone message slip.

- **Screen Copy.** Screen data can be captured and sent as E-mail.
- **Password Protection.** Mailboxes are protected with user-assigned passwords. Likewise, all messages and files are encrypted both during transmission and while stored in a Message Center.

InBox provides a network with an important component—a way of delivering messages and files quickly and efficiently. Unlike formal file transfer programs that perform some type of file conversion, InBox simply sends or receives data from a Mac or MS-DOS computer. It works with as few as two computers, making it an effective product for both small and large LANs.

PRODUCT PRICE(S)

InBox™ for the Macintosh.....	\$395/starter kit
InBox™ for the Macintosh.....	\$125/connection
InBox™ for the PC.....	\$195/connection

Troubleshooting Guide

As easy as Mac LANs are to set up and use, there are inevitable problems that pop up. Some of them are hardware problems, others are software problems, and yes, some are even *user* problems. Careful planning *before* you install, set up, configure, and use your LAN goes a long way to alleviate difficulties. Also, good network administration is a must. That doesn't mean it's necessary to hire a high-paid micro guru! It does mean someone needs to take the responsibility to administer the network. The bottom line in avoiding problems is **communication**! Communication between users takes two forms, on-line communication and live communication. If your network is down, on-line communication is, of course, impossible; but if you have established a "live" network to handle problems, then user frustration, complaints, and downtime can be kept to a minimum.

This troubleshooting guide is just that, a *guide*! It's not meant to be a comprehensive replacement for your manuals and technical support gurus. But some problems crop up on a regular basis. Many LAN problems can be traced back to a very simple cause—but it can take two or three days to find it. Like the suggestions for setting up your network, problems generally fall into four categories:

- Cable
- Hardware (the computer itself)
- Software
- Users

These four areas represent the most common problem areas in a LAN. Users are included because 80 percent of the trouble you'll have on the network will be user oriented.

Before getting into specifics, there are some general rules to follow that can save you time and money in the long run. These are good rules for a network administrator to follow, and all users of the LAN should understand and follow them as well.

1. **Be sure to check out the problem in person.** Troubleshooting you do in person has two advantages. First, you see firsthand what the problem is. Sometimes, what may seem to be a major problem when explained over the phone turns out to have a simple solution when you view it yourself. Second, a personal appearance always carries more weight than an impersonal phone call. When working with only a computer, especially in a LAN setting, it is easy for a user to feel controlled. People respond better when they can see and talk to real human beings.

2. **Back up your data.** *Always back up your data!* Unless you have totally lost your connection, try to back up your work. Even if you must temporarily use floppies, it's better than losing everything. If you have hit the dreaded "Bomb Box" with the Mac, you're probably out of luck. In this case, join the "I didn't back up, so I lost my data" club.

3. **Check out the most obvious problems first.** Sometimes even the most baffling problem has a simple solution. Check the cable connections at the computer and connector level. Check your users. Has everyone logged off correctly? Check your software. Are users using the "real thing," the right version? Remember, everyone on the network needs to be using the same versions of the system files and applications.

4. **Try to isolate the problem; then replicate it.** Try to find out if it's a cable, hardware, software, or user problem. Isolating the difficulty also helps you find a permanent solution to the problem. Intermittent problems are the worst.

They seem to come and go at will and always occur at the most inconvenient times. Murphy's law is always in effect.

5. Keep a log of problems and solutions. Everyone on the network should have a "problem log book." When problems occur, they should be documented, along with the solution—even if that solution is to trash everything and start over. Writing down those things will save you time later.

These are just some basic ideas to follow. But they'll do no one any good if they're not *communicated* to *all* the network users.

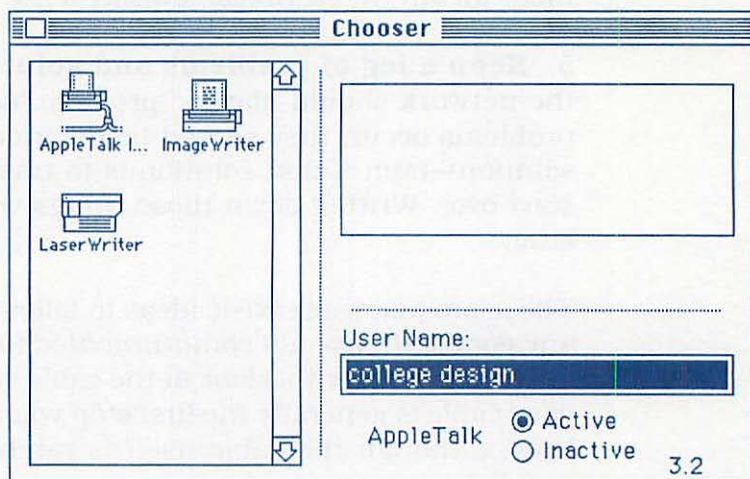
We can start with a look at the cable system, since laying out your cable is generally the first step you take in setting up your LAN, although the cable itself is rarely the source of major problems.

CABLE TROUBLES

1. No indication of network activity. If your computer appears to be connected to nothing except itself, and you don't see any server(s) or other users, there are several possible causes. First, check your connections; make sure each unit on the network has a connector attached to it. And make sure *you* are plugged in! This may seem ridiculous, but it isn't. AppleTalk connectors are famous for being easily "unplugged." Sometimes you think the cable is plugged in, but when you examine it carefully you see the connector is not pushed in all the way. Then check your topography. If you're in a loop configuration, AppleTalk or PhoneNET won't like it. If all connections check out, make sure AppleTalk is turned on. Pull down the Chooser from the Apple menu. Be sure the Active button for AppleTalk is clicked. It looks like Figure 6.1.

Finally, check your cable for breaks or cracks. Check the areas where you had to stretch or bend the cable; a crack or break could be the culprit.

FIGURE 6.1



After inspecting all connections and cable locations, you may have to look at hardware or software to find the source of the problem.

2. Not all servers and/or nodes show up. Make sure everyone is connected to both the connectors and the computer. Sometimes you do not have a good connection to your computer. This can prevent a node and/or server from showing up.

3. Dialog box indicating AppleTalk must be connected. Open the Control Panel from the Apple menu and make sure that the AppleTalk button is connected. Once again, check your connections; if you have disconnected your computer from the network, even for a few minutes, the Mac may disconnect AppleTalk on its own.

4. **Jumbled data and/or garbage characters.** Often interference will cause words to come out looking like this:

Hi Bo(* How Ar(*\$ T598ay

Interference is caused by electrical energy and electromagnetic fields. Make sure your cable is located away from fluorescent lights and heavy power cables. If you are using coaxial, the large telephone cables associated with sophisticated telephone systems will cause interference and create problems on the network.

5. **Sudden loss of network activity.** Look for either a hardware or cable problem. Check connections and cable for breaks, cracks, and loose connections. Someone may have accidentally unplugged a node.

HARDWARE TROUBLES

Hardware problems are usually *very obvious*! When your computer goes down you know it. More than likely you can't even boot up. Your disk is consistently rejected, or more likely, you get the infamous "sad Mac." If you consistently get the sad Mac, be prepared to take your computer in for repair. So that you don't void your warranty or service agreement, have your hardware serviced by an authorized Apple service technician, who has access to special diagnostic software and can pinpoint the hardware problems. Using both Macintosh II and MS-DOS in your network brings up another level of troubleshooting at the add-on boards level.

When you reach the level of having to check your hardware, it is assumed that you have ruled out cable problems. If not, go back and check your cable and cable connections.

The following hardware suggestions are not meant to replace the opinions of a qualified service technician, but to give you a starting point from which to diagnose hardware problems. As I mentioned before, hardware problems are usually quite easy to identify when they occur.

1. **You get the “Sad Mac” when you turn on your computer.** This is almost always an indication of a hardware error. See the Sad Mac in Figure 6.2. The numbers under the Sad Mac are important to the technician. Write them down.
2. **You get the “Serious System Error” bomb.** More than likely this is a software problem. However, some error codes that pop up while you are working can be hardware related.
3. **Servers and/or active users are not listed.** If all cable connections check out, check the hardware. For the Mac 512K and the Mac Plus, checking the hardware can be difficult. If you suspect hardware failure as the cause of this problem, call in an authorized technician to check out the ports and built-in communication controllers. With the Macintosh SE and the Macintosh II, you have an extra hardware level to check, the board level. Like the Mac 512K and Mac Plus, the Mac SE is a “closed” machine. However, because of the addition of a slot, the Mac SE can use an addi-

FIGURE 6.2 Sad Mac



tional communications board. The Mac SE may have to go in to the shop, but if you are using a communications board, check it first. The Mac II uses add-on boards for communication purposes. If you are using a Mac II or Mac SE as your main server and are using a communication board, check the board first. Start with the simple and obvious solutions. Are the boards plugged in correctly? Are they pushed all the way in? A loose board causes all kinds of problems. Is the board in the right slot? This is not an issue with the Mac SE, but the Mac II has six slots available. Pull the board(s) out and physically examine it. Do you see any cracks, broken wires, a misaligned or cracked chip? If you find nothing wrong with the board, put it back in. Now see if the problem is still there. Sometimes an add-on board can be poorly seated in its slot. The software is trying to look for a server or users, but the board is not allowing the signals to get through.

If you integrated MS-DOS computers, follow the same procedure, but check some additional things. Is your MS-DOS computer set for the right speed? Some of the MS-DOS machines allow you to switch between a 4 MHz and an 8 MHz speed. If you are operating your PC at 8 MHz, try switching to 4 MHz.

Another avenue to explore with the MS-DOS computers is really a software problem but one that affects the hardware's function. To be more specific, it's a DOS problem. If users and/or server(s) are not showing up, check your DMA, or Direct Memory Access, channelling. Very simply, MS-DOS computers allocate "channels" that dictate how to communicate through the various ports. MS-DOS computers assign slots as either communication ports or printer ports. AppleTalk cards are designated as COM ports.

Most of the time, the user never has to worry about which ports are assigned to what card. The computer generally takes care of this. Occasionally, if your PC is "loaded" with add-on cards, it becomes confused. A good example of this is the TOPS LAN. Normally, TOPS for the PC sets the DMA channel to = ONE. This simply allows the PC to decide how to handle things. Changing the DMA channel in the CONFIG.SYS file should alleviate any problems. If

servers(s) and users are not showing up and you suspect that it may be DMA problems, change your CONFIG.SYS file to read "DMA=NONE." This may not work with all of the AppleTalk boards and their software. Check the manual or call the company for verification.

4. You are logged into one network but cannot access another. This occurs when you are "bridged" or linked into another network. An example might be linking an AppleTalk network into an Ethernet network via Kinetics FastPath™ bridge. First check *all* your cable connections. Next check out your add-on boards: Are they pushed in all the way? Are they in the right slots? Does your application support Zone Information Protocol (ZIP)?

5. You get "Disk Full" or other disk error messages. If this error occurs, the first thing you need to do is to *back up* everything. If this error happens with the server, back up the entire hard disk. Next, use one of your hard disk utilities to check your disks for errors. For MS-DOS computers, go to the C> and type CHKDSK, a DOS program that checks hard disks. It does *not* work on any hard disk on the network other than the one that is directly connected to the MS-DOS computers. In other words, CHKDSK is not a network utility. Often, a disk gets confused and thinks it's full when it really isn't. After you have checked the disk, try to recover any space you can. Several commercial programs available for the Mac can help you do this. Some of the hard disk utility programs that come with a hard disk include routines that recover disk space.

Many hard disk utilities include an option to repair the disk. This does not mean that your disk is physically damaged; it means that with all the reading and writing a disk does, the information, tracks, and sectors have gotten all screwed up. If necessary, "repair" your disk. After you have backed up *everything* and recovered or repaired your disk, restore your software.

6. The system won't boot up. Check the power supply both at the computer and at the power source. Is there

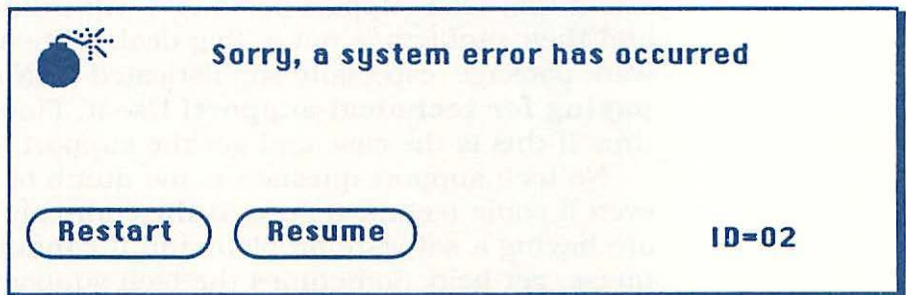
power at the outlet? If you are connected to a surge protector, try plugging something else into it and make sure it's working. If you get a Sad Mac, see the above procedures. After checking out the obvious, have your computer's power supply checked. Computer power supplies do go bad.

SOFTWARE TROUBLES

These are the most difficult problems to diagnose. Often it is easy to tell if the problem is software related. Software usually has built-in dialog boxes that alert you to trouble. But these same wonderful messages do not tell you what to do. You can spend hours with some company's tech support before finding a solution. There are a large number of LAN software packages available, so many variations on the same problem can occur. It would be impossible to list all the possible error messages associated with all the different programs. Error codes are found in the "System Error Has Occurred" dialog box, also known as the dreaded "BOMB BOX." (See Figure 6.3)

Two buttons are associated with this box. One says "Restart" and the other says "Resume." The Resume button is usually dimmed, which leaves only the Restart button to click. This has the same effect as selecting "Shutdown" from the Special menu. Sometimes everything freezes up, and when this happens you have no choice but to turn the Mac off, wait a few seconds, then turn the Mac on again.

FIGURE 6.3 Bomb box



The following guidelines are not final answers to all software-related problems. Instead, they are general suggestions that may help you when you're tech supporting the product yourself or talking to tech support personnel.

1. **Rule out hardware and cable causes.** Have you checked your cable and cable connections? Remember to check out the obvious causes first. Have you ever thought that your lamp was defective and later discovered you had forgotten to plug it in? This may sound dumb, but strangely enough we humans do make errors. Check all your cable connections and wall outlets, look for breaks or cracks in the cable and any possible interference. After ruling out cable and hardware error, start checking out the software.

2. **Keep accurate notes.** Keep a troubleshooting log book at each station. Jot down even the most insignificant detail. Sometimes this little fact can help solve a big problem. Accurate notes can also help to replicate the problem and save you time when the problem occurs again.

When an error occurs with most programs, you get the dreaded BOMB BOX! This usually includes an error ID—02, 21, or some other number. Write this number down. If you have to call the software company for assistance, it helps them if you say, "I get a consistent 02 error every time I . . ." The error code helps to identify the type of error and what can be done about it.

3. **Don't be afraid to call a company for technical support.** You'd be amazed at how many people never call for technical support after they buy a software package. They're afraid that tech support personnel will think they're "dumb" and their problem is not a "big deal." When you buy a software package, especially sophisticated LAN systems, you are **paying for technical support!** Use it. Find out ahead of time if this is the case and get the support you paid for.

No tech support question is too dumb or insignificant, even if some technical guru at the company thinks so. If you are having a software problem and it cannot be corrected in-house, get help. Sometimes the tech support personnel will

give you an answer that sounds more complicated than the problem. If this happens, ask them to explain it in lay terms.

4. Know the version and registration number of your software. Knowing these two facts helps if you have to call a company for assistance. A company may have created an update of your particular application and hasn't notified you. Updates usually fix bugs and add extra features. The problem you are experiencing may be solved in the update. Companies are supposed to notify their customers of updates and fixes, but they don't always do it.

5. Try to be specific about the problem. "My screen does funny things" doesn't tell a technician very much. Saying "There are intermittent garbage characters on my screen whenever I . . ." is more specific. Even more specific would be to indicate the exact steps you took that caused the problem to occur. When you can describe a software problem in terms of specific symptoms, a diagnosis is easier to come up with. Medical doctors say the same thing. Of course, you could just take two aspirin and call in the morning.

6. Try to replicate the problem. Intermittent problems cause the most hassle. There is nothing worse than never knowing when, or if, a problem will occur. Try to retrace your steps and make the trouble recur. Often, a software problem is caused by a user error, such as pressing the wrong key combinations or selecting the wrong settings. If you can replicate the problem, **write down exactly what you did!** This makes troubleshooting a lot easier.

7. Find an alternative way of doing a task that will avoid the problem. There's an old Henry Youngman joke that goes, "A man walks into the doctor's office and says, 'Doctor, Doctor, it hurts when I do this.' And the doctor says, 'Don't do that.' " Believe it or not, this works with computers. If you consistently get an error when you do a specific task, you may have hit upon a combination that

causes a problem that not even the beta testers found. Try to find another way to do the same task without causing the error. If you find another way, call the company, let them know *exactly* what the error was, what you did that caused the problem, and how you fixed it. If the bug and the fix you discovered is one the developer never found, hold out for ten million bucks before you give them any details.

USER TROUBLES

Nobody likes to hear about troubles caused by users. Most often these difficulties are avoidable, the result of poor communication. This cause is closely followed by lack of, or poor quality of, training. Many times, hours spent on tech support could have been saved if the user had known what to do *before* using the network. As easy as Macintosh LANs are to use, training is still needed.

1. **Communicate.** This cannot be stressed enough. The concept of “High Tech—High Touch” is very important. LAN users need a lot of human communication and support. Both are essential to the proper operation of a LAN. If you find a new and better way of doing something, tell someone else. Hold regular meetings to discuss LAN concerns and improvements. One of the elements that has made the Mac so successful is its personality. The Mac is a “human” computer. Live communication should *increase* when a Macintosh is connected to a LAN.

2. **Train your staff.** There is nothing worse, and more dangerous, than LAN users who are unfamiliar with its operation. **Train them!** If new software or hardware is added, retrain them. The time spent in training could save thousands of dollars lost in downtime.

3. **Create “cheat sheets.”** Keyboard templates, reference cards, reminder notes, and fact sheets are all examples of “cheat sheets.” Even with a Macintosh LAN, remembering all the commands is hard. Keyboard templates fit over your

keyboard and provide reminders of which keys do what. References cards are unusually plastic-coated (great for coffee drinkers) and provide command highlights. But you don't have to depend on commercial cheat sheets. Make your own. Customize them to the needs of your users.

4. **Communicate.** Keep communicating!

5. **Hold regular meetings to discuss LAN needs (and wants).** This improves communication. With programs such as TOPS, you have any number of file servers (hosts) available on the network at any time. Distributed file serving demands organization. Who is going to publish what, and who can have access? Unless everyone on the network knows what is going on, some user gets burned. A weekly or even daily "publishers' sheet" helps by listing the vital information on what is being published.

6. **Create on-line user help.** Some programs are available that allow you to create your own *customized* on-line help. Guide™ from OWL International is just such a program. It allows you to create an interactive manual that can be customized and changed according to your needs. The manual can be accessed via a desktop accessory called MiniGuide™ and can provide instant help regardless of what you are doing or working on.

7. **Establish a LAN "hot line."** Users need access via computer or phone—or both—to someone who can answer questions and solve problems. To save time and frustration, this hot line should be used for *troubleshooting only!* When users can talk to a human, they may feel less frustrated and angry.

8. **Read the manuals.** As bad as most manuals are, you should read them. Familiarize yourself first with the layout of the manual. Sometimes you can be your own best troubleshooter. Manuals often provide some new and useful insights that just may solve your problems.

9. Check the network periodically. Most LAN software comes with some form of software for monitoring network activity. It allows you to see where heavy usage, printer tie-ups, and snags are. If you don't have access to this software, talk to the person who does.

10. Communicate. Need I say it again? Never stop!

This troubleshooting guide is not meant to be an all-inclusive troubleshooting manual, but a helpful collection of suggestions and tips. By following these suggestions, you can avoid major problems. Of course, there's no accounting for the unexpected, which is always scary when you don't know what is going on. If all else fails, blame it on gnomes!

Wrap-Up

That's it! There you have it. Finito, the end, all done, th . . . th . . . th . . . that's all, folks! LANs have been portrayed as the "end-all" of microcomputer products. In fact, LAN systems just get the ball rolling. Macintosh has opened up the world of the computer to individuals who never dreamed they could, or would, ever use one. LANs, once thought to be the exclusive property of upper-crust corporate America, are being cut down to size. The gap between the user and the "System" has narrowed dramatically.

Remember 1968 and the paranoid fear of "The System?" Today, we have met the System and they are us! With the Macintosh and LANs, anyone can have access to the System. We can derive whatever information we need from the System and use that information for our own purposes. With this freedom comes social responsibility. The computer industry has taken its knocks for the antics of "hackers"—some of whom, having made a few free phone calls, now own (or did own) some of the largest corporations in America. Hackers are the social morons who make a game out of destroying people's bank accounts, stealing government information, and, in general, ripping everyone off! As information becomes more accessible to the average person, societal safeguards need to be developed. As I indicated in the introduction, this book is about more than software, hardware, hard disks, and cable. It is about communication—electronic communication that concerns people.

Since reading George Orwell's *1984*, we have all become cognizant, if not paranoid, of "Big Brother." The fear of Big Brother is the fear of losing all control we do have over our lives. In *1984*, central computers controlled all information and communica-

tion. Even in today's world, LANs can evoke the fear of "Big Brother." Fortunately, we do not live in a world with Big Brother. However, learning to communicate over LANs has been a difficult process. To do so productively has been even more difficult. In the past, it was understood that individuals needed a great deal of technical expertise in order to effectively communicate over a LAN. With this expertise came power! Now, as in other areas, Macintosh and Macintosh LANs have come along to open up communications, to put control of information into the hands of the humans who must use these machines. Some see this as a threatening situation.

In general, LANs represent a new mode of communication. Over the past several years, even the general public has become conditioned to accept communications via LANs of one type or another. Movies and television both have depicted individuals using some form of LAN communication. This exposure is preparing society for LAN use. Young people are entering the workplace already comfortable with communicating over computers. As the "changing of the guard" takes place in the workforce, LANs are sure to become as commonplace as the telephone. Programs developed through the Apple University Consortium (AUC) have served to help this trend along. Schools that are part of the AUC are selling Macintosh computers to thousands of students a year, who are using their Macs to write theme papers, masters' theses, and doctoral dissertations. Some students even develop and sell their own Macintosh products. Once these students leave college with their Macs, what computer do you suppose they'll feel most comfortable using?



US vs. THEM?

Bringing Macs into the workplace is going to have an impact. One question is inevitable: "Which computer is better, IBM or Macintosh?" For some of us, this question brings up memories of childhood arguments: My brother can beat up your brother. My Ford is better than your Chevy.

The comparison of Mac LANs to IBM LANs is inevitable. It has been written that the Mac has excellent *second* generation LANs while some IBM LANs are starting to introduce a *fifth* generation of their LAN products. The comparison is misleading. It implies that the Macintosh LAN is OK but still not in the same league as an MS-DOS-based network. If this is true, why are so many developers turning their attention to developing LAN products for the Macintosh? Apple has taken a different approach to this competition between Macintosh and IBM. Instead of opposing the MS-DOS-based LANs, Apple has decided to embrace the DOS standards—not by creating IBM clones, but by creating the “enabling technology” to communicate with MS-DOS networks. Already we see enabling technology creating Macintosh connections not thought feasible several years ago. A brief breakdown might illustrate this point.

Macintosh Connections

Mainframes

- IBM
- DEC
- Wang
- HP
- Prime
- Unix

LANs

- AppleTalk
- Ethernet
- IBM Token Ring

PCs

- Macintosh to Macintosh
- Macintosh to Apple II
- Macintosh to MS-DOS

Protocols Supported

- AppleTalk
- XNS
- TCP/IP
- NetBios
- SNA
- DCA

Keep in mind this is a partial list. It may take some imagination, some human communicating, but other connections can be made. The key to all of this enabling technology is the Macintosh itself. While this may sound trite, it's an important point.

LANs are difficult enough to use without adding the mumbo-jumbo of new language. When strange and foreign connections are made with Macintosh LANs, users have the security of knowing they are still using a Mac! Icons, point-and-click technology, and the user interface are all there. Apple's plan of creating enabling LAN technology using Macintosh as the hub is paying off.

Companies

The companies presented are just a start. By the time this book reaches the shelves, more and improved products will have been accounted. An important aspect of all LAN products is their adherence to the Macintosh user interface. End users and *their* needs are finally getting the attention of the LAN community. Fortunately, companies such as 3Com and Novell are beginning to turn their attentions to Macintosh. These companies are the major players in the LAN game and will serve to "legitimize" the Macintosh LAN market. After all, if 3Com says Macs are good LAN computers, it must really be true!

WHAT IS NOW—AND WHAT WILL BE

What I hope to have suggested in this book is the potential for Macintosh users in the world of local area networking—what is and what will be available. Half the battle is knowing what is out there. Information is valuable! By the time this book reaches

the shelf, some of this information will be "old news." But that's OK! With the Macintosh, even old news can be useful.

Given the rapid pace of computer technology, predicting the future has at best become a foolhardy venture. New products are being introduced every day. Some make it to market, others do not. Because there are over one million Macs on the market, the future for Mac LANs looks bright. New innovations are coming to solidly establish the Macintosh in the business community.

The very philosophy of the Macintosh promotes creative alternatives. One of these alternatives is based upon the DynaBook theories of Buckminster Fuller. Fuller's ideas were further expanded upon by Alan Kay, former head of the Xerox Palo Alto Research group that designed the Xerox Star computer, forerunner of the Macintosh. The DynaBook was to be a small computer, about the size of a notebook, but with the power of a mainframe. It would be so easy to use that children would carry them to school instead of their traditional books. The DynaBook would be able to link quickly and easily into data information systems all over the world, allowing for instant access to any type or amount of information. Pundits have seen the Macintosh as the first step towards the DynaBook.

Where the technology will lead us is anyone's guess. John Naisbitt points out in his book, *Megatrends*, that our society has moved from an industry-based to an information-based way of life. If this is true, then in the future everyone will need access to more and more information. The truck driver will need information about weather and road conditions in order to plan the best route and speed for the best fuel economy. Will the truck driver have to go back to school to learn about computers? Probably not. The Macintosh, or some future derivation with the same ease of use and standard user interface, will enable truck drivers, busy executives, and even magazine writers to adopt the computer as a handy tool. Will the *Macintosh* become the tool of the future? Who knows?

The communications that Macintosh LANs open to our society are a starting point. We are seeking a metamorphosis of communication that will take place not only in the computer industry, but in society as well. Nicholas Negroponte, Director of The Media Laboratory at MIT, is a pioneer in the field of com-

munication and its effect on society. His vision echoes that of John Sculley, CEO of Apple Computer, Inc. Negroponte has said, "... the way to figure out what needs to be done (in communications) is to explore the human sensory and cognitive systems and the ways that humans most naturally interact. Join this and you grasp the future." The point to be made relates directly to Apple's concepts of creating "enabling technologies" for the computer industry.

It is difficult to describe the relationship between human and computer, and we have not yet coined a word for the interaction. We can use a computer to calculate, create, organize, memorize, and communicate information; but at the same time this complex processing of information has a profound feedback effect, changing our view of the world as well as the way we do our work. More than a passive tool, the computer is an active extension of the human mind and body.

Computer networking adds yet another dimension—and more power—to this interaction. The result should be better human communication. Local Area Networks that are simple to create and easy to use may be leading us closer to a society of the mind, a synergetic community.

Glossary

Architecture How a computer system is put together, how the components fit together, and how the software interfaces with the system. Network architecture describes how all of the LAN components fit together to improve communication.

ASCII Abbreviation for American Standard Code for Information Interchange.

Asynchronous A method of transmitting data. Bits of data are added at the beginning and end of each character that is transmitted. With asynchronous transmission, the receiving and sending nodes do not have to “stay in sync” with each other. Because of the extra bits being sent, asynchronous communication is more prone to errors.

Attenuation The reduction in strength of electrical impulses during transmission. Attenuation is the opposite of gain.

Bandwidth The difference between the highest and lowest frequencies of transmission.

Baseband Baseband is a simpler, cheaper, and less sophisticated broadcast bandwidth than its counterpart, broadband. In baseband, the entire bandwidth of the LAN cable is used to carry the digital signals. A baseband channel can transmit only one signal at a time, and that signal is usually digital.

Baud A measurement of the speed of a signal being transmitted over some form of media, such as LAN cabling or telephone wire.

Bit Actually a contraction of **BI**nary digi**T**. A binary unit has a value of either 0 or 1. Bits are the basic method of storing and transmitting data.

Broadband The counterpart of baseband, broadband is more complex. Baseband can carry only one signal at a time; broadband usually

carries multiple signals simultaneously on a LAN. Not only can broadband transmissions carry digital signals, but video signals as well. The channels on a broadband network are typically kept separate with a technique called "frequency division multiplexing." With this technique local cable TV stations can transmit 50 channels of TV on a single coaxial cable.

Cache A portion of the CPU's RAM that is set aside for memory. The computer can treat the RAM cache like a disk drive. Information is accessed many times faster from a RAM cache than from disk drives.

Coaxial cable A type of electrical cable. The coaxial cable has a solid piece of metal wire covered with insulation and then surrounded by a tubular piece of metal. It is called "coaxial" because the tubular piece of metal has an axis of curvature that coincides with the center of the piece of wire. Coax cable has a wide bandwidth, making it useful for broadband transmissions.

CPU Abbreviation of **Central Processing Unit**, the heart of the computer. It is the CPU that is ultimately responsible for all the magical things your computer does.

Disk server Generally a combination of hard disk and software that allows a user to share the storage space of a mass storage device. The disk server is different from a file server. A disk server allows users to share disk space, while a file server allows users to share disk space as well as files.

DMA Abbreviation for **Direct Memory Access**, a fast method for computers to move data from a storage device directly to RAM in order to speed up processing.

DOS Abbreviation of **Disk Operating System**. A computer uses a DOS to direct and control the operation of many computer resources. The most popular DOS is MS-DOS, which was developed by Microsoft Corporation. This is the DOS that is used in those *other* computers.

Fiber optics A LAN medium that consists of glass fibers. A detector transforms the light signals on a fiber-optic cable into electronic signals that your computer can read. Fiber-optic cable is expensive, but has the largest bandwidth and is impervious to electromagnetic interference. Some say that when the "Big Bomb" drops, fiber-optic LANs will still work. Of course, they might need some living person to operate them.

File server Generally a hard disk with software that allows users to share the same files.

Firmware Firmware is a combination of hardware and software. Add-on cards and Erasable Programmable ROMS (EPROMS) are examples of firmware.

Gateway A device or software that allows two networks with different protocols to communicate with each other. Interbridge, from Hayes Microcomputer products, is an example of a gateway.

GIGO An abbreviation for **Garbage In, Garbage Out**; i.e., if you put garbage into the system, you get garbage out of the system. This is a way of expressing the belief that computers never make mistakes, that it's the human operators who determine the validity of the output.

Host The computer that provides network services to the LAN users. Hosts can be either dedicated or distributed. A dedicated host is "dedicated" to one purpose—acting as the host; all users on the LAN access it. A distributed host system allows multiple users to act as hosts for the LAN, i.e., to determine what is available for network use, who can access the data, and how users can access data.

I/O One of the most widely used abbreviations in the computer industry, it stands for **Input/Output**.

Login The process of signing on to a LAN. Login procedures generally control access to the network.

Modem A device that allows computers to communicate via the telephone system. Modems convert the digital signals of a computer into the analog signals needed by telephones. Modem actually comes from the term, **MOdulator/DEModulator**.

Multitasking The simultaneous performing of two or more tasks by a computer. Multitasking allows you to recalculate a spreadsheet while writing a letter to your parents.

Network A collection of anything that serves a single purpose. Computers hooked together form **Local Area Networks (LANs)**. Most of us have a "network" of friends whom we can depend on for assistance and information. Networks can be as sophisticated as the telephone system or the federal government, or as simple as a person's support group.

Network topography The physical geography of a network: a star, ring, parallel, serial, or combination.

OSI Abbreviation for **Open Systems Interconnection**, which is based on the standards set by the International Standards Organization (ISO). The OSI model provides a set of standards for developing LAN products and is based upon seven layers of operation. Each layer is dependent on the layer above it. They are: physical, data link, network, transport, session, presentation, and application.

Que (or queue) The letter after "P." Actually it's a holding line for data, maintaining it on hold until its turn comes to be sent to a printer or user.

Repeater A device that amplifies a signal's strength from one piece of cable to another. A signal that travels over a LAN cable loses its strength over distance. A repeater intercepts the signal, gives it a kick, and sends it on its way.

Ring A type of LAN topography. Computers are connected in a ring or loop configuration. LAN data is then passed from one computer to another, using the computers as repeaters until the data reaches its destination. IBM uses a token ring topography for one of its network systems. Macintosh cannot use a ring topography, but it does have the capability of connecting and

sharing data with a token ring network.

Star A LAN topography in which all computers on the network are wired directly to a centralized host. If the host goes down, then none of us can live life in the fast LAN.

Synchronous A form of network transmission, the counterpart of asynchronous transmission. Synchronous transmission uses a constant time interval between successive bits, monitored by timing clocks at each end of the transmission. Unlike asynchronous transmission, characters are spaced by time, not by start and stop bits. Because you do not have to add bits, synchronous transmission is much faster. However, because you must use sophisticated timing clocks, synchronous transmission can be quite expensive.

Token What you need to ride the bus. Actually, it is a unique combination of bits sent to a computer on a ring network. When received, the bits give permission to the receiving node to transmit. These unique bits, or tokens, contain the necessary addressing information to determine where the informa-

tion that is being sent needs to terminate.

Twisted-pair Two insulated wires wrapped around each other. They may or may not be surrounded by a shield. The most common twisted-pair network is the telephone system. Twisted-pair is popular for use in LANs for several reasons: 1, It is inexpensive; 2, it is easy to install; 3, it is lightweight; and 4, existing telephone lines can be used.

WAN Abbreviation for **Wide Area Network**. A WAN is designed to connect users who might be

hundreds or thousands of miles apart. Actually, our once national telephone network is a good example of a WAN. WANs are becoming popular with brokerage houses that do a great deal of international trading. Connected with a WAN, they can maintain contact with the stock exchanges throughout the world on a 24-hour basis. For example, when the New York stock exchange goes down, the London exchange is up. When the London exchange is closed, the Tokyo exchange is up. This translates into 24-hour moneymaking.

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MacLANs

Local Area Networking with the Macintosh

"The *definitive* Macintosh LANs book. Mark Veljkov goes far beyond the system interface and reaches into the human interface with machines. The art of communicating by computer is brought to a personal level."

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The decision to network is not an easy one. It takes a lot of planning and communication to make the right buying decisions. MacLANs: Local Area Networking with the Macintosh is a practical resource and guide for setting up and using LANs with Macintosh computers. This compendium of tips, suggestions, and product information will help you make sound decisions as you improve your on-line communication.

MacLANs begins with a discussion of the framework of local area networking, including how the Macintosh fits into the world of LANs. The book goes on to provide:

- Complete information about the companies that manufacture Macintosh LANs—including details about configuration, setup and installation, and the type of hardware and software each company provides.
- Thorough coverage of LAN peripherals including modem servers, hard disks, optical disks, add-on cards, and internet-work bridges.
- A troubleshooting guide that helps you deal with some of the dos and don'ts when configuring LANs.

This easy-to-use, thoughtful guide not only helps you setup and use LANs, but also helps you deal with the impact and implications of LANs in your work environment.

Mark D. Veljkov, Ph.D., is the Communications Editor for *The CAD/CAM Journal for the Macintosh Professional*, Senior Editor for *Computing Today*, and Associate Editor for *PC Publishing*.