

PATHWORKS for Macintosh

digital

MacTCP Administrator's Guide

Order Number: AA-PCT5B-TE

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About This Guide

This guide contains instructions for installing and configuring MacTCP™, Apple Computer's implementation of the protocol suite known as Transmission Control Protocol/Internet Protocol (TCP/IP).

Who Should Read This Guide

This guide is intended for the network administrator who is responsible for network maintenance. The major part of administering a MacTCP network involves using the Control Panel to configure MacTCP for network users. Before you start, you must determine how much you want network users involved in the configuration process; for instance, you can set up the Control Panel so the user must enter all the configuration information or none at all. See the section "Configuration Scenarios" in Chapter 5 for more information.

You should be familiar with Macintosh® computer operation and general networking concepts. However, it is not necessary to be a TCP/IP expert; Part I of this guide provides conceptual information if you need to learn more about it. Appendix B points you to other documentation that might be useful.

How to Use This Guide

This guide begins with basic concepts in Part I and proceeds to explicit instructions in Part II. If you are an experienced network administrator, you may want to spend less time on introductory chapters and move quickly to operating instructions. However, it is important to understand TCP/IP concepts, such as IP addressing, in order to configure the system correctly.

After you install and configure MacTCP, you must distribute the software to network users who in turn install and configure MacTCP for their individual machines. Instructions have been provided that you can copy and distribute to users.

To get MacTCP up and running you need to follow the instructions in Part II of this guide, as described here:

- Create a master disk as described in *PATHWORKS for Macintosh Planning and Installation Guide*.
- Configure MacTCP on the master disk using the instructions in Chapter 5.
- Give each network user a copy of the master disk along with a copy of the user installation instructions in *PATHWORKS for Macintosh Planning and Installation Guide* and the configuration instructions in Chapter 6.
- If you give users full configuration power you must provide them with a copy of Chapter 5.

Conventions Used

Terms that appear in **boldface** type also appear in the glossary. The glossary also defines other terms that are related to your use of MacTCP.

***Note** Text set off in this manner presents sidelights or interesting points of information.*

***Important** Text set off in this manner—with the word Important—presents important information or instructions.*

What You Need

To use MacTCP for network communication, you need the following hardware and software:

- An Ethernet interface card in a Macintosh SE, Macintosh SE/30, or any Macintosh II-family computer connected to an Ethernet network, or a Macintosh 512K enhanced, Macintosh Plus, Macintosh SE, Macintosh SE/30, or any Macintosh-family computer connected to a LocalTalk™ network.

***Important** If your Macintosh computer is using an Ethernet interface card, make sure the card's software is installed. If you are using an Apple EtherTalk™ Interface Card, make sure the software is installed according to the instructions in the*

EtherTalk User's Guide. *After the software is installed, refer back to this manual to configure MacTCP.*

- On a LocalTalk network, a Datagram Delivery Protocol-Internet Protocol (DDP-IP) gateway.
- Macintosh System file version 6.0.3 or later for the Macintosh Plus, Macintosh SE, Macintosh SE/30, or any Macintosh II-family computer. Macintosh System file version 3.4 for the Macintosh 512K enhanced computer.
- MacTCP software.

Associated Documents

For additional information about MacTCP networks, see the *Apple MacTCP Programmer's Guide*. This guide is for third-party developers creating application programs for the MacTCP driver.

You might also find it useful to refer to *Inside AppleTalk* for a complete description of the AppleTalk® network system.

Part I

Concepts

About MacTCP

MacTCP™, Apple Computer's TCP/IP product, increases the Macintosh® computer's ability to operate in a heterogenous computer environment. MacTCP allows the Macintosh computer to talk to such diverse systems as IBM, DEC, Sun, and Apollo computers. This chapter describes the features and operation of MacTCP.

Overview

MacTCP is a software driver for the Macintosh Operating System that implements the following TCP/IP protocols:

- Internet Protocol (IP)
- Internet Control Message Protocol (ICMP)
- User Datagram Protocol (UDP)
- Address Resolution Protocol (ARP)
- Reverse Address Resolution Protocol (RARP)
- Routing Information Protocol (RIP)
- Bootstrap Protocol (BootP)
- Transmission Control Protocol (TCP)

These protocols provide core transmission services that are used by third-party products such as electronic mail, remote login, file transfer, remote printing, and database access. Chapters 2, 3, and 4 describe these protocols and the services they provide.

MacTCP conforms to Internet Request for Comments (RFC) and Military Standards (MIL-STD), ensuring interoperability with systems on the Defense Advanced Research Projects Agency (DARPA) Internet.

The Control Panel is used to configure MacTCP, simplifying installation and setup procedures. Chapters 5 and 6 of this guide describe how to use the Control Panel to configure MacTCP. The MacTCP driver includes these features:

- C and assembly language interfaces that provide programmers with a familiar development environment.
- A domain name resolver that maps domain names to internet addresses. The domain name resolver is compatible with domain name server implementations that comply with RFC 1034 and 1035.

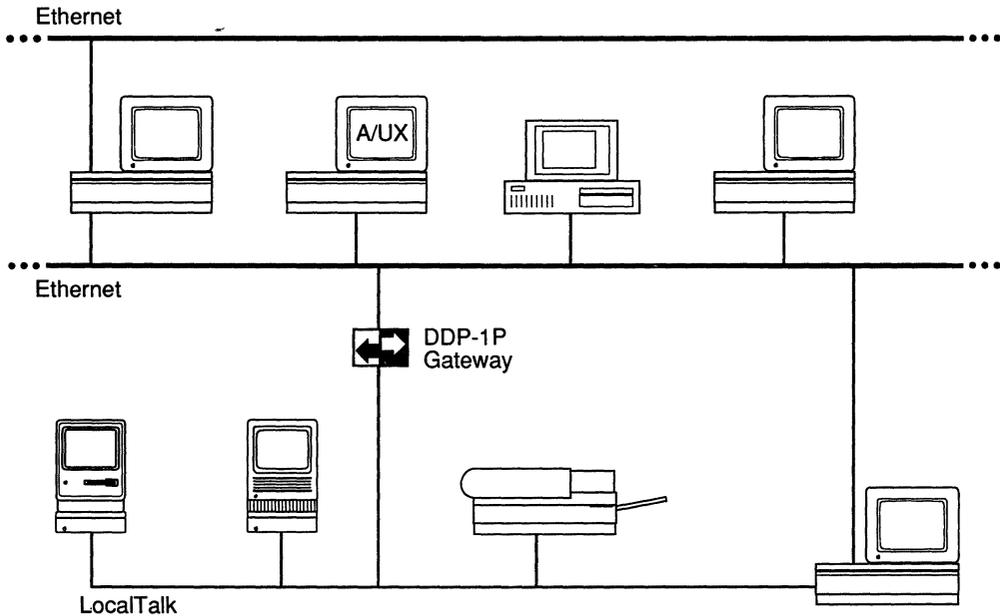
Network Environment

MacTCP runs over both Ethernet and LocalTalk™-compatible cabling systems. A Macintosh 512K enhanced, Macintosh Plus, Macintosh SE, Macintosh SE/30, or any Macintosh II-family computer can run MacTCP on LocalTalk-compatible cable. A Macintosh SE, Macintosh SE/30, or any Macintosh II-family computer with an Ethernet interface card can run MacTCP on Ethernet.

MacTCP is coresident with AppleTalk® protocols so there can be concurrent TCP/IP and AppleTalk operation. For example, MacTCP can be run while a print job goes out to an Apple® LaserWriter® printer over LocalTalk cabling. AppleTalk and MacTCP can run over the same medium, or one protocol can run over one medium while the other protocol runs over a different medium.

Figure 1-1 shows a typical MacTCP network configuration.

Figure 1-1 MacTCP Network Configuration



DDP-IP Gateway

To run MacTCP on LocalTalk cable (or any other AppleTalk-compatible media), you need a Datagram Delivery Protocol-Internet Protocol (DDP-IP) gateway. This device takes a TCP/IP packet that is encapsulated in DDP, an AppleTalk protocol, and converts it to Ethernet format. DDP-IP gateways can also assign addresses to MacTCP nodes and handle routing to other networks.

If MacTCP is running on LocalTalk, a DDP-IP gateway must be provided on the network as shown in Figure 1-1. By default, the DDP-IP gateway should be located in the same AppleTalk zone as the Macintosh computer running MacTCP. Alternatively, a single DDP-IP gateway can support Macintosh computers in multiple AppleTalk zones; in this case, the zone where the DDP-IP gateway resides must be selected by the user using the MacTCP Control Panel.

About TCP/IP

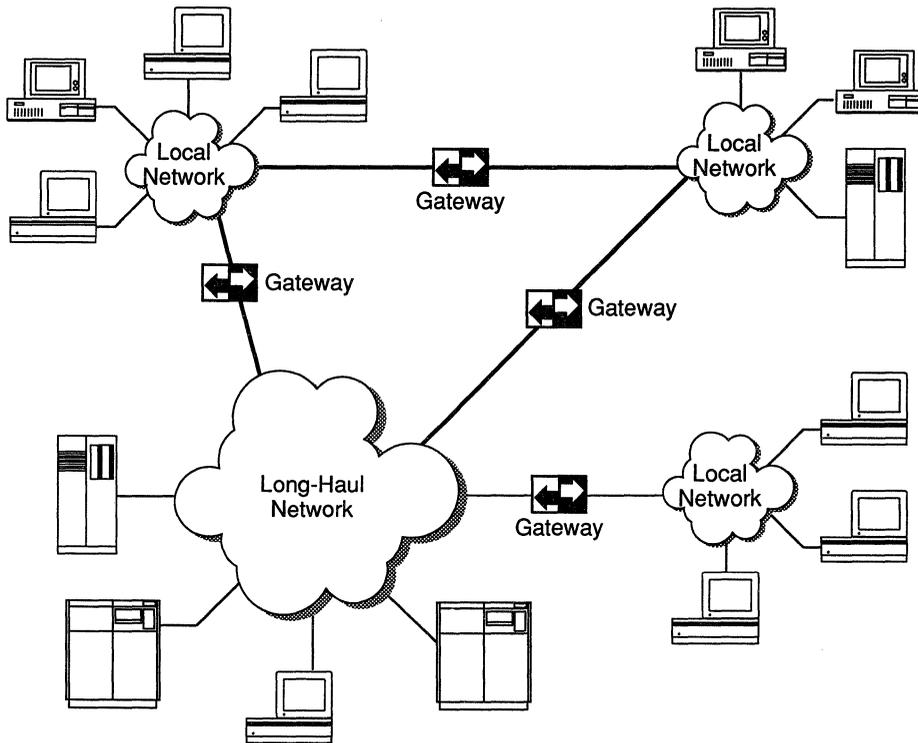
The transmission control protocol/internet protocol (TCP/IP) is a widely used industry standard for connecting multivendor computers. The TCP/IP protocol layers are fully compatible across all implementations on different hardware platforms, allowing different vendors' computers that run TCP/IP to interoperate and share data and services.

TCP/IP development began when the Defense Advanced Research Projects Agency (DARPA) wanted more reliable communication protocols on the ARPANET, its packet-switched wide area network. DARPA initiated a research project to define and implement a suite of protocols, and the researchers developed TCP/IP. Eventually TCP/IP became the standard protocol suite used on the DARPA Internet, a collection of networks that includes the ARPANET, Military Network (MILNET), National Science Foundation Network (NSFnet), and networks at universities, research institutions, and military installations. Since then, hundreds of vendors have developed products that support TCP/IP and all kinds of networks use it.

TCP/IP supports an architecture of multiple networks interconnected by gateways. This interconnected set of networks is called an internetwork or **internet** (the term *internet* refers to the DARPA Internet). Figure 2-1 shows an example of an internet.

For example, TCP/IP protocols can be used to connect networks on a college campus as well as geographically distant sites on a wide area network.

Figure 2-1 An Internet



The Family of Protocols

TCP/IP is a family of protocols named after the best known protocols in the suite, the Transmission Control Protocol (TCP) and the Internet Protocol (IP). The protocols described in this guide are the ones most commonly supported by computers attached to TCP/IP networks.

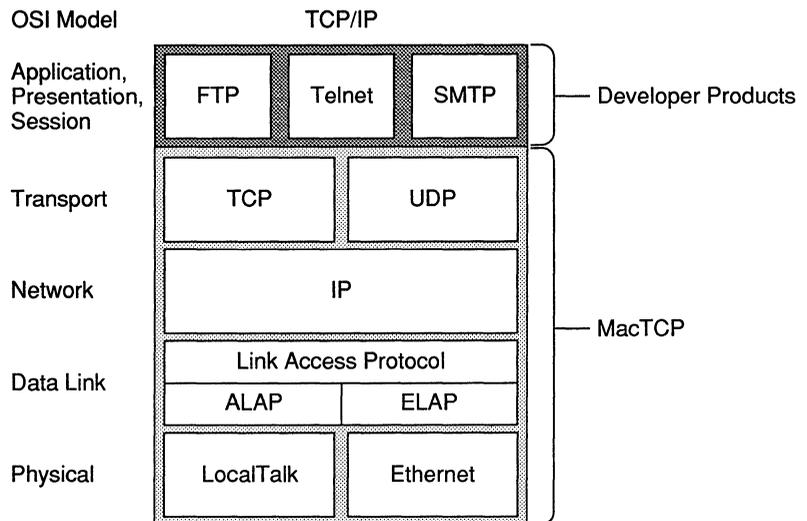
TCP, IP, and the User Datagram Protocol (UDP) provide basic transmission facilities that are augmented by application services in higher-level protocols such as Telnet, the File Transfer Protocol (FTP), and the Simple Mail Transfer Protocol (SMTP).

Other protocols in the TCP/IP family are described in later chapters of this manual. The Address Resolution Protocol (ARP), the Reverse Address Resolution Protocol (RARP), and the Bootstrap Protocol (BootP) are described in Chapter 3. The Routing Information Protocol (RIP) and the Internet Control Message Protocol (ICMP) are described in Chapter 4.

Although TCP/IP was designed and tested before the International Standards Organization (ISO) defined the Open Systems Interconnection (OSI) Reference Model, it partially conforms to the OSI layers of networking functionality. Figure 2-2 shows a comparison of the OSI and the TCP/IP communications architecture.

The TCP/IP protocols shown in Figure 2-2 are described in the following sections.

Figure 2-2 Comparison of OSI and TCP/IP



Internet Protocol (IP)

The **Internet Protocol (IP)** is responsible for sending data across multiple networks. IP accepts segments of data from TCP or UDP, places the data in packets called datagrams, and determines the correct path for the datagram to take. The datagrams are sent across the internet, through as many gateways as needed, until they reach the destination host.

IP provides an addressing mechanism that allows routing between networks. The header of an IP datagram contains source and destination internet addresses so that any host in a network can route a packet to a destination, either directly or through a gateway.

IP has the ability to fragment a datagram as it is transmitted across a network. Since IP can be used with many different physical network implementations that specify different sizes for physical data frames, datagrams can be fragmented to fit into a small data frame. Fragments are reassembled as they arrive at the destination.

IP is often referred to as an unreliable delivery system because it makes a best-effort attempt to deliver all datagrams, but delivery is not guaranteed (TCP guarantees delivery). It is also called a connectionless delivery system because it routes each datagram separately. When IP receives a sequence of datagrams from TCP or UDP, it routes each datagram in the sequence individually and each datagram may travel over a different path to the destination.

Transmission Control Protocol (TCP)

The **Transmission Control Protocol (TCP)** provides reliable transmission of data between processes. (Processes are application programs that communicate; for instance, a file transfer process on one host talks to a file transfer process on another host.) It ensures that data is delivered error-free, without loss or duplication, and in sequence.

Upper-layer protocols such as Telnet pass data to TCP for delivery to peer processes. TCP encapsulates the data into segments and passes the segments to IP, which puts the segments into datagrams and passes them across the internet. TCP at the receiving end checks for errors, acknowledges error-free segments, and reassembles the segments for delivery to upper-layer protocols. If a segment is lost or damaged, it will not be acknowledged, and the sending process will retransmit.

TCP has a flow control mechanism so that computers of different speeds and sizes can communicate. When TCP at the receiving end sends an acknowledgment, it also advertises how much data it is prepared to accept on the next transmission.

User Datagram Protocol (UDP)

The **User Datagram Protocol (UDP)** provides unreliable transmission of data between processes. UDP's transport of data is unreliable because, unlike TCP, it does not provide error checking, it does not acknowledge that data has been successfully received, and it does not order incoming messages. UDP messages can be lost, duplicated, or arrive out of order. Like TCP, UDP messages are encapsulated in IP datagrams for delivery.

The advantage of UDP is that the overhead associated with establishing and maintaining an error-free TCP session is avoided. Upper-layer protocols that don't require reliability use UDP to transmit data. For instance, the domain name system uses UDP because reliability is not critical; if there is no response to a domain name query, the resolver simply retransmits. (The domain name system is described in Chapter 3.)

Telnet

Telnet is a remote access protocol that allows a terminal on one host to appear as if it were directly connected to a remote host on an internet. Telnet also makes a personal computer act like a terminal. It is usually implemented as user software that initiates sessions to a remote location and server software that listens for connections from remote users.

File Transfer Protocol (FTP)

The **File Transfer Protocol (FTP)** is used to transfer files across an internet. A host can connect to a remote host on an internet and send or receive files, list directories, and execute simple commands. Like Telnet, FTP is usually implemented as user and server software. The user software interacts with the user at a terminal and the server software receives requests from remote users to store or retrieve files.

Simple Mail Transfer Protocol (SMTP)

The **Simple Mail Transfer Protocol (SMTP)** transfers electronic mail messages from one host to another, across an internet. SMTP specifies the commands necessary to send mail and is used with a standard that specifies the general structure of a mail message.

TCP/IP Addressing Conventions

In order for computers on the internet to be able to refer to each other, each machine must be assigned a universal address. This chapter describes the addressing scheme that was developed to allow each TCP/IP host on the internet to be uniquely identified.

Internet Addresses

Each host on a TCP/IP internet is assigned a unique 32-bit **internet address**. The address is divided into two fields, called the network field and the host field. The network field identifies a network on the internet to which the host attaches (so that all hosts on the same network share the same network field) and the host field identifies a particular host attached to that network.

The network field is assigned by a central authority, the Network Information Center (NIC) located at SRI International. Local administrators assign the host field of the address. (Note that only networks that might attach to the DARPA Internet need to obtain the network address from the NIC.)

Three IP address classes—A, B, and C—provide for the following network configurations:

- Class A addresses are used for a few networks with many hosts; for instance, the ARPANET.
- Class B addresses are used for medium-sized networks; for instance, a university network.
- Class C addresses are used for a large number of small networks; for instance, an Ethernet local area network (LAN).

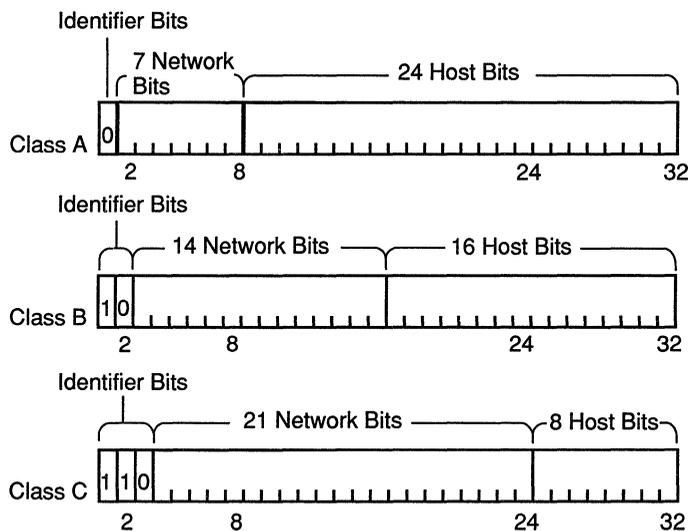
The first bits of the address identify the address class, and the number of bits assigned to the network and host field of the address differs for each class. For instance, Class A addresses have 1 class identifier bit, 7 network identifier bits, and 24 host identifier bits. This allows for 128 Class A networks, where each network can support up to 16 million hosts. Figure 3–1 shows the class identifier bits and the number of bits allocated to the network and host fields for each address class. To make the addresses easier to work with, the addresses are written in dotted decimal notation. Each octet of the 32-bit address is assigned its decimal equivalent, and decimal points separate the integers. For example, the 32-bit address

10000100 00001101 00000010 00011110

is written in dotted decimal notation as

132.13.2.30

Figure 3–1 IP Address Structure



Subnetwork Addressing

The internet addressing scheme, designed for a few hundred networks, did not anticipate the proliferation of LAN technology. Organizations created large networks consisting of many LANs connected by gateways and there was an explosive growth in the

number of networks on the internet. Assigning every LAN on the internet its own address created two problems:

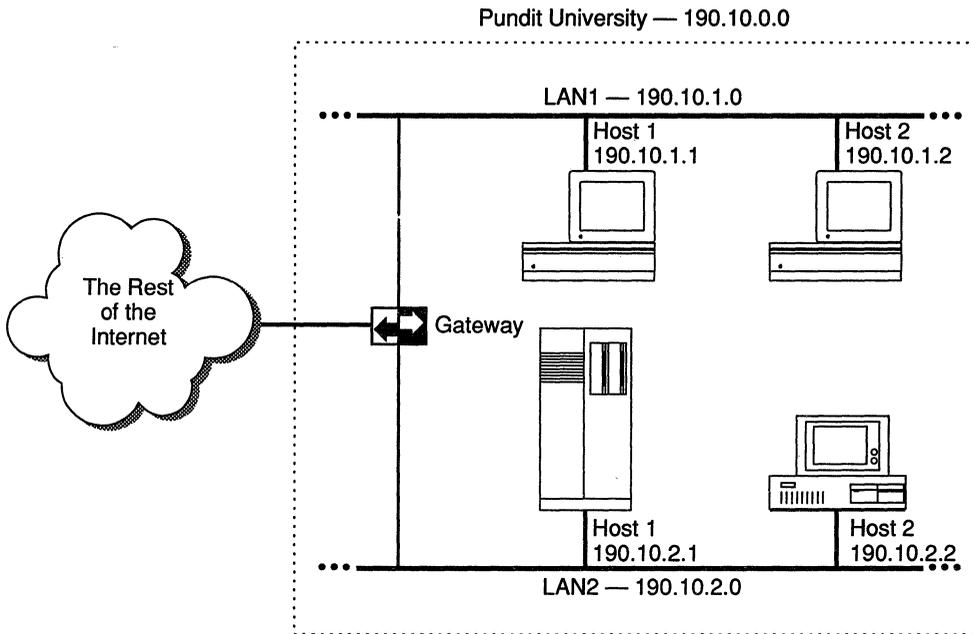
- Immense administrative overhead is required to manage the addresses.
- Internet routing tables cannot accommodate many network addresses.

A technique called **subnetwork addressing** (or subnetting) was devised to deal with this problem. Subnetting allows multiple physical networks (called subnetworks) to share the same internet network number. For example, a university with two LANs can use subnet addressing so that both campus subnetworks share a single network number. The subnet structure is not visible to the rest of the internet; the route to the network is the same no matter what subnet the host is on.

The last section stated that the internet address is divided into network and host fields. With subnetting, the address is conceptually divided into a network and local field, and the local field is divided into subnet and host fields. Various schemes (defined by subnet addressing standards) are used to divide the local field of the address into subnet numbers; the internet site determines which scheme is implemented.

Consider how Pundit University has subdivided its assigned Class B internet address, 190.10.0.0, for the two LANs on campus. They divided the local field of the address into an 8-bit subnet identifier and 8-bit host identifier. LAN1 has the address 190.10.1.0 and LAN2 has the address 190.10.2.0. Figure 3–2 illustrates the addressing scheme at Pundit University.

Figure 3-2 Subnetting at Pundit University



In Figure 3-2, the rest of the internet perceives that it is sending data to one network. The gateway routes packets to the appropriate LAN by examining the third field in the address.

Subnetwork Masks

An internet site that has implemented subnet addressing must choose a **subnetwork mask** (or subnet mask), which is used by network software to identify the host number field from the subnet number and network number fields. The portion of the address to be allocated to the subnet is defined (for example, Pundit University used the third octet of the address to identify the subnet). Then bits are set in the 32-bit subnet mask to correspond to the IP address. A subnet mask bit is set to 1 if the corresponding bit in the internet address is part of the network number and subnet number fields, and to 0 if the corresponding bit in the address is part of the host number field. The subnet mask for a Class A address might be

```
11111111 11111111 00000000 00000000
```

(or 255.255.0.0 decimal). Since this is a Class A address, octet 1 identifies the network field and octets 2, 3, and 4 identify the local field. The mask demarcates octets 3 and 4 as the host number field; therefore, the system knows that octet 2 of the address identifies the subnet number.

In theory, each LAN at the internet site could have a different number of bits allocated to its subnet field, and therefore have different subnet masks. However, it is generally recommended that a given network have a single subnet mask that is the same for all of its component LANs.

The Domain Name System

Because users would rather refer to machines using meaningful, symbolic names rather than long strings of numbers, the **domain name system** was created to map internet addresses to names.

The hierarchical naming scheme accommodates a large set of names and allows local autonomy in assigning names. A domain name is divided into subnames (called *labels*), separated by periods, for instance

english.pundit.edu

In this example, edu is the top-level domain and each label further specifies a subdomain. The Network Information Center (NIC) administers the top-level domains and is responsible for assigning subdomains. Table 3–1 shows the top-level domains specified by the NIC.

Table 3–1 Top-level Domains

Domain Name	Meaning
COM	Commercial organization
EDU	Educational institution
GOV	Government institution
MIL	Military group
NET	Major network support centers
ORG	Organizations other than above
ARPA	Temporary ARPANET domain
ISO country code	Countries other than USA

After an organization obtains authority for a domain from the NIC, it can assign subordinate domain names. For instance,

Pundit University obtained authority for the domain pundit.edu and the English Department at Pundit University obtained authority for the domain english.pundit.edu.

The organization with authority over a domain must maintain a domain name server that maps domain names to internet addresses. If the English Department at Pundit University obtained a new computer, Hamlet, the name

`hamlet.english.pundit.edu`

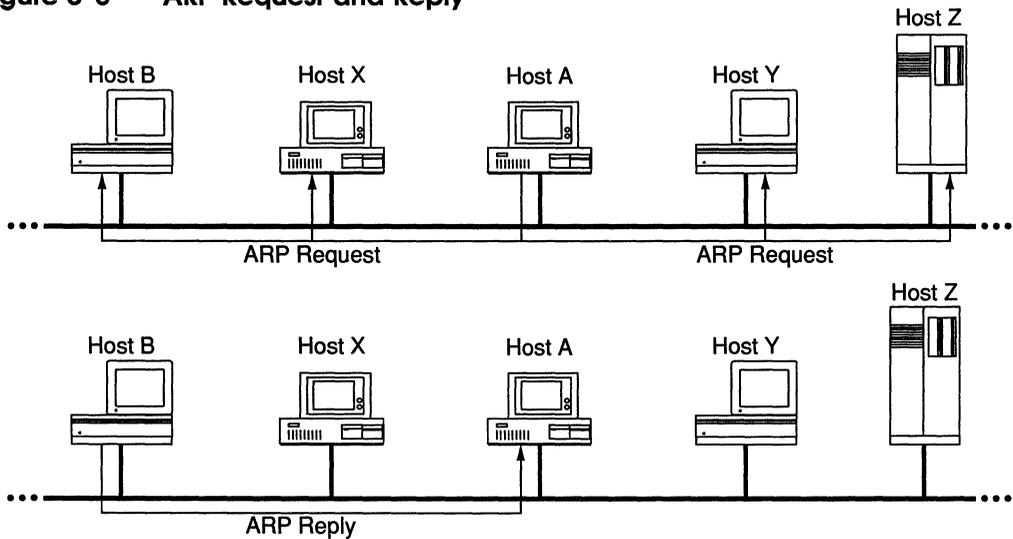
would be added to a domain name server's database, along with the computer's internet address.

Hosts participating in the domain name system must have **domain name resolvers** that request domain name information from **domain name servers**. The name resolver contacts a local name server to obtain the internet address associated with the domain name. The local name server may need to contact other domain name servers to obtain the internet address.

Address Resolution Protocol (ARP)

The **Address Resolution Protocol (ARP)** is a protocol in the TCP/IP protocol suite that maps internet addresses to physical network addresses. If Host A wants to communicate with Host B and it only knows B's internet address, it can use ARP to obtain B's physical address. Host A broadcasts an ARP request that contains Host B's internet address. All hosts on the network receive the request, but only Host B recognizes the internet address and replies with its physical address. Host A receives the reply, learns B's physical address, and delivers its packet directly to B. Figure 3-3 shows an ARP request and reply.

Figure 3-3 ARP Request and Reply

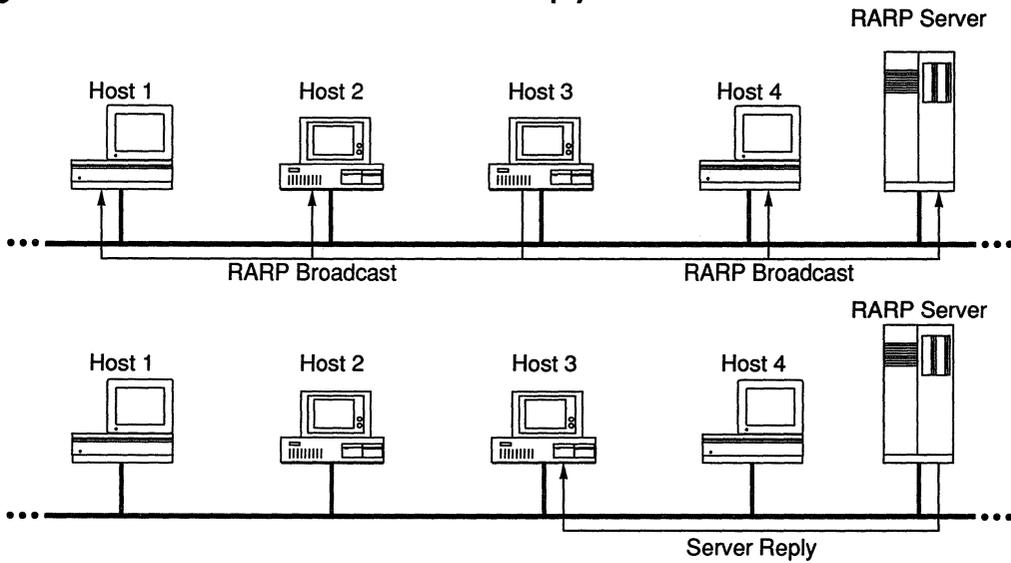


Reverse Address Resolution Protocol (RARP)

The **Reverse Address Resolution Protocol (RARP)** maps physical network addresses to internet addresses (the opposite function of ARP).

RARP provides a way for a host to obtain its internet address. The host broadcasts a RARP request that contains its physical network address. All hosts on the local network receive the request; however, only RARP servers can process the request and provide the internet address (RARP will work only if there's a RARP server on the network). The RARP server consults its database of internet addresses, then sends the information back to the host that made the request. Figure 3-4 shows a RARP broadcast and a RARP server reply.

Figure 3-4 RARP Broadcast and Server Reply



Bootstrap Protocol (BootP)

The **Bootstrap Protocol** (BootP), like RARP, provides a way for a host to find its internet address. A host running BootP broadcasts a BootP request. A BootP server returns a response that contains the host's internet address, the address of a bootserver, the address of an intervening gateway (if present), and other useful configuration information such as the subnet mask and addresses of domain name servers.

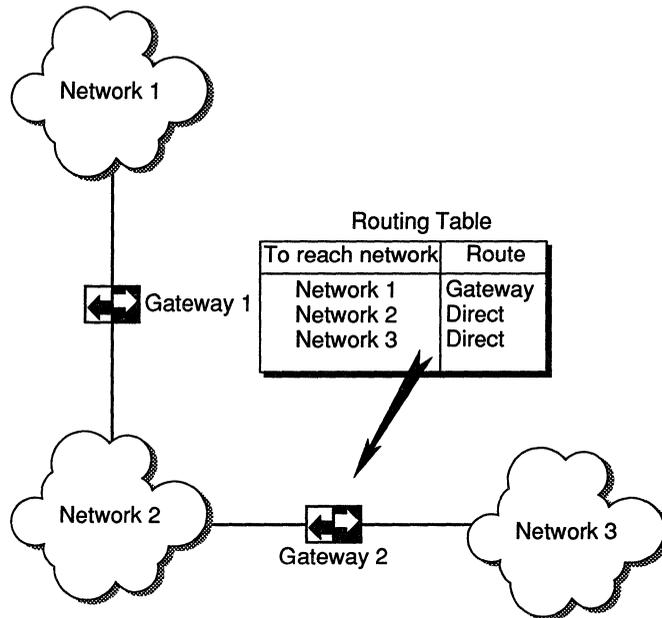
A packet transmitted by a host on the internet may only need to take a short jaunt across the local network or it may have to cross many gateways and networks to reach its destination. The process of finding a path over which the packet can travel to reach its destination is called **routing**. This chapter describes how TCP/IP handles routing.

Gateways

If a host is transmitting to a destination on its own network, routing a packet involves finding the destination host's physical address (using the Address Resolution Protocol) and sending the packet over the physical network to its destination. When the destination is on a different network, the packet is routed to the nearest gateway. A **gateway** is a machine that interconnects two networks and passes packets from one network to another. In Figure 4-1, three networks are interconnected by two gateways.

If the local gateway is not connected to the destination, the packet is forwarded to other gateways until it reaches a gateway that is directly connected to the destination network.

Figure 4-1 Gateway Routing Table



Routing Tables

All gateways in the internet have **routing tables** that contain pairs of network addresses and gateway addresses. Each network address is linked with the gateway address of the gateway to be used to get to that network. Routing decisions are based on the network number of the destination address rather than the host number to keep routing tables small. Figure 4-1 shows an example gateway routing table.

Routing Protocols

Routing protocols provide a way for gateways to find each other, keep up-to-date routing information, and report communication problems.

Routing Information Protocol (RIP)

Some gateways use the **Routing Information Protocol (RIP)** to exchange network routing information. Gateways broadcast their routing tables to neighboring gateways. If a RIP message contains new information, gateways update their routing tables.

RIP is intended for low-delay local area networks (although it is used in wide area networks). The most widely used version of RIP is the **routed software** that is released with the 4.3BSD UNIX system.

RIP can also be used to locate gateways on a LAN. Any computer broadcasting RIP packets is likely to be a gateway.

While other routing protocols are used by gateway manufacturers, RIP is by far the most common protocol found in gateways.

Internet Control Message Protocol (ICMP)

Gateways and hosts use the **Internet Control Message Protocol (ICMP)** to report communication problems. For instance, if a packet cannot be delivered because the destination host is disconnected from the network, an ICMP message may be returned to the sending host stating that the destination is unreachable. ICMP is primarily used by gateways to notify the source host of delivery or routing problems.

ICMP is an integral part of the Internet Protocol (IP). Successful IP routing requires ICMP services to report error conditions. ICMP messages are encapsulated in IP datagrams, transmitted to the destination gateway or host, and processed by IP software.

Part II

Procedures

MacTCP Configuration

This chapter describes how to configure MacTCP for your network users. Read the section "Configuration Tools" before you start because this section provides an overview of the MacTCP Control Panel and the Administrator dialog box, the two tools that are used to configure MacTCP.

You can set up MacTCP in several ways, depending on how much of the configuration you want to leave up to your network users. Read the section "Configuration Scenarios" to determine your strategy.

The master disk's System Folder contains two files, MacTCP and AdminTCP. When you configure MacTCP, the AdminTCP file modifies resources in the MacTCP file and the MacTCP Prep file. After the configuration session, you throw away the AdminTCP file. You can then distribute the configured master disk to network users.

This chapter assumes that you are bringing up the MacTCP Control Panel screens for the first time. If you have configured the driver once, the values that appear will be somewhat different from those depicted here.

Make sure that you have installed the MacTCP software according to the instructions in *PATHWORKS for Macintosh Planning and Installation Guide* before you proceed with the tasks described in this chapter.

Configuration Tools

There are two MacTCP configuration tools: the MacTCP Control Panel and the Administrator dialog box. The way you use these tools depends on the configuration scenario you choose to implement. (These scenarios are described in the section "Configuration Scenarios" later in this chapter.)

As network administrator, you use the Administrator dialog box to configure MacTCP. In two cases, however, you must use the MacTCP Control Panel:

- If you are configuring MacTCP for a Macintosh 512K enhanced computer, you must set the link level information using this panel.
- If you decide to enter the IP address in decimal notation, you must do so using this panel.

The network user configures MacTCP using the MacTCP Control Panel. The user can view the Administrator dialog box but not change it. However, you can give the user full configuration powers and he or she can use the panels just as you would.

The MacTCP Control Panel

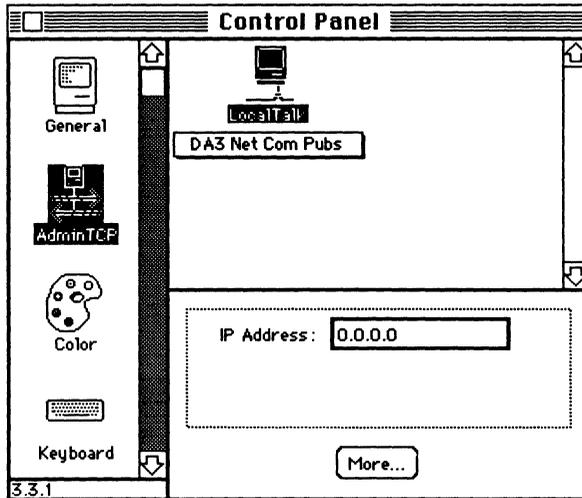
Figure 5-1 shows the MacTCP Control Panel.

The top half of the screen is used to set link level information. Different icons are displayed depending on the user's network configuration. The user selects the link level protocol on which MacTCP is to run.

Note *If you are configuring MacTCP for a Macintosh 512K enhanced computer, you must set the link level information because the user will not have access to this Control Panel.*

The other half of the screen is used to set IP address information.

Figure 5-1 View of the MacTCP Control Panel



If you want to enter the IP address in dotted decimal notation, enter it in the IP Address box. If you enter the address here, portions of the Administrator dialog box are filled out.

The way the user fills in the IP address information depends on how you configured the Administrator dialog box. There are five possibilities:

- You have selected the Manually button in the Administrator dialog box and preconfigured the entire IP address so that the user doesn't have to enter it. The IP Address box appears on the MacTCP Control Panel with the address already set.
- You have not set the IP address in the Administrator dialog box, so that the user must enter the address in the IP Address box on the MacTCP Control Panel. Only the IP Address box appears, and the user must enter the address in this box (in decimal notation).
- You have entered the net and subnet portions of the address in the Administrator dialog box, and the user must enter the node number. Net, Subnet, and Node boxes appear on the MacTCP Control Panel, and the user must enter the node number in the Node box.

- You have selected the Server button in the Administrator dialog box so that the IP address is obtained automatically from a Server. The IP Address box appears on the MacTCP Control Panel with the address already set.
- You have selected the Dynamically button in the Administrator dialog box so that the node portion of the IP address is assigned dynamically from the indicated range. The IP Address box appears on the MacTCP Control Panel with the address already set.

The Administrator Dialog Box

Figure 5-2 shows the Administrator dialog box. You and the user click the More button on the MacTCP Control Panel to display this screen. For the user without configuration power, the screen is displayed with all the fields grayed out; the user can view the screen but not change it.

Figure 5-2 View of the Administrator Dialog Box

The Administrator dialog box is divided into several sections:

- Obtain Address:** Three radio buttons are present: Manually, Server, and Dynamically.
- Routing Information:** A text field for **Gateway Address:** contains the value 0.0.0.0. Below it is a Protected checkbox.
- IP Address:** This section includes:
 - Class:** A dropdown menu showing 'A'.
 - Address:** A text field containing '1.0.0.0'.
 - Subnet Mask:** A text field containing '255.0.0.0'.
 - A visual representation of the IP address and subnet mask as a grid of 32 boxes, with a vertical line separating the first 8 boxes (Net) from the remaining 24 boxes (Subnet and Node).
 - Bits:** A table showing the bit distribution:

	Net	Subnet	Node
Bits:	8	0	24
 - Net:** A text field containing '0' with a Lock checkbox.
 - Subnet:** A text field containing '0' with a Lock checkbox.
 - Node:** A text field containing '0' with a Lock checkbox.
- Domain Name Server Information:** A table with three columns: **Domain**, **IP Address**, and **Default**. The table is currently empty. To the right of the table is a vertical scroll bar with up and down arrow buttons.

At the bottom of the dialog box are two buttons: **OK** and **Cancel**.

Obtain Address Box This is where you select the method in which you want to set the IP address. You have three options:

- If you select the **Manually** button, you must also fill in some or all of the fields in the IP Address box.
- If you select the **Server** button, the IP address is set for you (a network server is queried for the address). A Macintosh computer that has MacTCP configured in this way automatically obtains address information every time it boots up. This is a way to create a master disk that can be distributed to several network users.

If you select this option, there must be a RARP or BootP server on your Ethernet or a KIP-compatible Datagram Delivery Protocol-Internet Protocol (DDP-IP) gateway on your LocalTalk network.

- If you select the **Dynamically** button, the node portion of the IP address is set dynamically. If you use this option, you must also set some of the fields in the IP Address box. A Macintosh computer that has MacTCP configured in this way assigns itself a node number dynamically every time it boots up. This is another way to create a master disk that can be distributed to several network users.

IP Address Box This is where you set the address class, subnet mask, net, subnet, and node numbers. You may fill in some or all of these fields depending on the configuration scenario that you choose to implement.

Routing Information Box This is where you set the gateway address in dotted decimal notation if the Routing Information Protocol (RIP) is not implemented on your network.

Domain Name Server Information Box This is where you enter the IP addresses of domain name servers and the domains for which they have authority.

Protected Button If you select this button, the user will not be able to modify any of the fields on the Administrator dialog box.

Configuration Scenarios

You can configure MacTCP in several ways; you must decide how much of the configuration you want to leave up to network users. The roadmap in Figure 5-3 shows the chapter sections you must refer to in order to accomplish each scenario.

Possible configuration scenarios are as follows:

Scenario 1

Configure MacTCP so that the user does not have to fill in any IP address information in the MacTCP Control Panel. If this is your strategy, you have two options. You can enter the IP address in the MacTCP Control Panel (in decimal notation) and then enter the subnet information in the Administrator dialog box (if appropriate). Or you can enter the address class, subnet mask, net, subnet, and node numbers in the Administrator dialog box. If you select this method, you must create and configure a separate master disk for each network user.

Scenario 2

Configure MacTCP so that the user must fill in the IP address in the MacTCP Control Panel (in decimal notation). If this is your strategy, enter the address class and subnet mask but do not fill in the Net, Subnet, and Node boxes. If you select this method, you can distribute the master disk to several users.

Scenario 3

Configure MacTCP so that the user must fill in the node portion of the IP address in the MacTCP Control Panel. If this is your strategy, enter the address class, subnet mask, net number, and subnet number but do not enter the node number in the Node box. If you select this method, you can distribute the master disk to several users.

Scenario 4

Configure MacTCP so that the address is automatically assigned. (The user does not have to fill in any IP address information in the MacTCP Control Panel.) If this is your strategy, select the Server button. If you select this method, you can distribute the master disk to several users.

Scenario 5

Configure MacTCP so that the node portion of the address is assigned dynamically. (The user does not have to fill in any IP address information in the MacTCP Control Panel.) If this is your strategy, select the Dynamically button and enter the address class, subnet mask, net, and subnet numbers.

Scenario 6

The user has been granted full configuration power and can use the Administrator dialog box to configure MacTCP.

Figure 5-3 Roadmap to Configuration Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Refer to these sections:						
Bringing up the MacTCP Control Panel	•	•	•	•	•	
Entering the IP Address in Decimal Notation	•					
Bringing up the Administrator Dialog Box	•	•	•	•	•	
Setting the IP Address	•	•	•	•	•	
Setting the Address Manually	•	•	•		•	
Setting the Address Class	•	•	•		•	
Setting the Subnet Mask	•	•	•		•	
Setting the IP Address (Integer Format)	•		•		•	
Entering the Net Number	•		•		•	
Entering the Subnet Number	•		•		•	
Entering the Node Number	•					
Having the Address Set Automatically				•		
Setting the Node Number Dynamically					•	
Setting the Gateway Address	•	•	•	•	•	
Setting Domain Name Server Information	•	•	•	•	•	
Protecting the Configuration	•	•	•	•	•	
Giving the User Full Configuration Power						•

The dots indicate sections you should read to accomplish each scenario.

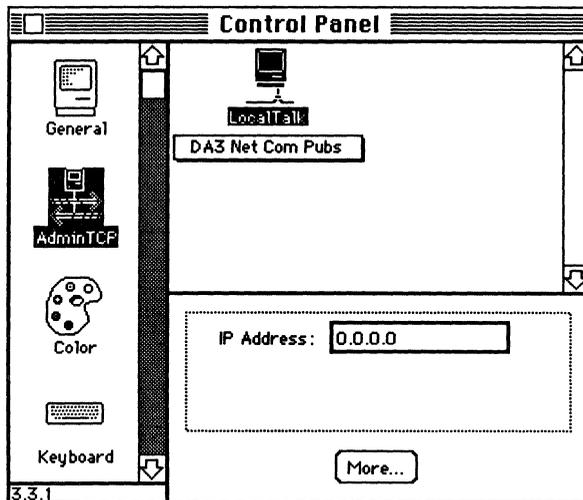
Bringing Up the MacTCP Control Panel

Choose Control Panel from the Apple menu, and the panel appears with a scrollable list of icons in the left quarter of the window.

Click the AdminTCP icon (it may be necessary to use the scroll bar to bring the AdminTCP icon into view). The MacTCP Control Panel appears on the right three-quarters of the window as shown in Figure 5-4.

Important *If you are configuring MacTCP for a Macintosh 512K enhanced computer, you must completely configure the driver, including setting the link level information on this panel as described in Chapter 6. The Macintosh 512K enhanced user cannot access the MacTCP Control Panel because System file version 3.4 does not support an extendible Control Panel.*

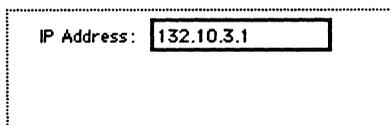
Figure 5-4 The MacTCP Control Panel



Entering the IP Address in Decimal Notation

If you have decided to enter the entire IP address for the user and you prefer to enter the address in dotted decimal notation (for example, 132.10.3.1), enter the address in the IP Address box as shown in Figure 5-5.

Figure 5-5 IP Address Box in the MacTCP Control Panel



When you click the More button and the Administrator dialog box is displayed, the class, address, and net and node numbers are set as shown in Figure 5-6.

Note *Entering the address in the MacTCP Control Panel does not set the subnet mask and subnet number.*

Figure 5-6 IP Address Box in the Administrator Dialog Box

IP Address:

Class: Address: 132.10.3.1

Subnet Mask: 255.255.0.0



	Net		Subnet		Node
Bits:	16		0		16

Net: Lock

Subnet: Lock

Node: Lock

Bringing Up the Administrator Dialog Box

Click the More button to get to the Administrator dialog box shown in Figure 5-7.

This panel is your main tool for configuring MacTCP.

Figure 5-7 The Administrator Dialog Box

Obtain Address:

Manually
 Server
 Dynamically

Routing Information:
Gateway Address:
0.0.0.0

Protected

OK Cancel

IP Address:

Class: **A** Address: 1.0.0.0
Subnet Mask: 255.0.0.0

Net	Subnet	Node
Bits: 8	0	24

Net: Lock
Subnet: Lock
Node: Lock

Domain Name Server Information:

Domain	IP Address	Default
<input type="text"/>	<input type="text"/>	<input type="radio"/>

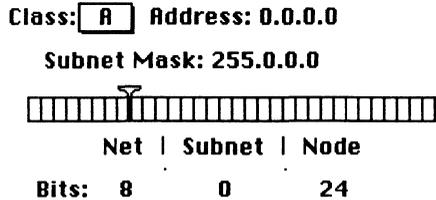
Setting the IP Address

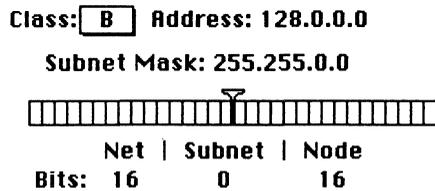
MacTCP provides you with three ways to set the IP address (if you did not enter the decimal address in the MacTCP Control Panel). The Obtain Address box in the upper-left corner of the panel (shown in Figure 5-8) allows you to select your preferred method for setting the address.

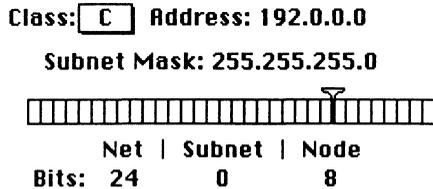
- If you select Manually, you must set the address manually using the fields in the IP Address box. See the next section "Setting the Address Manually".
- If you select Server, the address is set automatically. See the section "Having the Address Set Automatically" later in this chapter.
- If you select Dynamically, you must set the net and subnet portions of the address using the fields in the IP Address box, but the node portion of the address will be allocated dynamically (within the range of node numbers specified). See the section "Setting the Node Number Dynamically" later in this chapter.

Note that changing the class causes the slider on the ruler to move. The address, subnet mask, and bits allocated to net, subnet, and node also change. Figure 5–10 shows the address, subnet mask, position of the slider, and the bit allocation for each class selection.

Figure 5–10 Settings For Classes A, B, and C







Setting the Subnet Mask

Note Perform this step only if you have implemented subnet addressing on your network.

Use the slider on the ruler to set the subnet mask. Each box in the ruler represents one bit of the 32-bit IP address. A dark line on the ruler indicates the number of bits allocated to the net portion of the address (as determined by the class selected).

The slider can be moved anywhere along the ruler to the right of this darkened line. Place the pointer on the slider, hold down the mouse button, and drag the slider to the appropriate location on the ruler. When you move the slider, the subnet mask, the subnet bits, and the node bits change.

If you move the slider all the way to the left, the Subnet box is dimmed.

Setting the IP Address (Integer Format)

Important *If you want the user to enter the IP address in the IP Address box of the MacTCP Control Panel (Scenario 2 in the earlier section "Configuration Scenarios"), skip this step. Continue with the configuration, referring to the section "Setting the Gateway Address" later in this chapter. The user will have to enter the IP address in the MacTCP Control Panel as described in Chapter 6.*

In integer format, the IP address is broken down into bits (four sets with eight bits per set). The bits are allocated to net, subnet, and node according to address class and subnet mask, then converted to a decimal number. For instance, the address 90.25.3.240, broken down into bits, looks like this:

01011010.00011001.00000011.11110000

If the address class is A (8 bits comprise the net portion of the address) and the subnet mask is 255.255.252.0 (or 14 bits of subnet address and 10 bits of node), then the integer form of the address is as follows:

- Net - 90
- Subnet - 1600
- Node - 1008

If you want to enter the IP address in integer format, enter this information in the Net, Subnet, and Node boxes shown in Figure 5–11.

Important *If you are configuring MacTCP so that the user has to enter the node number in the MacTCP Control Panel (Scenario 3 in the earlier section "Configuration Scenarios"), you must enter the net and subnet portion of the address in integer format in the Net and Subnet boxes.*

Entering the Node Number

You now have three choices: enter the node number, leave the Node box at the default and have the user enter the node number, or have the node number assigned dynamically.

If you decide to enter the node number, click the Node box and enter the node portion of the IP address in integer form. If you click the Lock box to the right of the Node box, the node number is protected. The Node box is dimmed and you cannot change the value in the box unless you click the Lock box to unlock it. If you lock the value in the Node box, the user will be unable to change this number on the MacTCP Control Panel.

If you decide to have the user enter the node number in the MacTCP Control Panel, leave the box at the default and do not select the Lock box. Then continue with the configuration, starting with the section "Setting the Gateway Address" later in this chapter.

If you want the node number to be assigned dynamically every time the user starts up, see the section "Setting the Node Number Dynamically" later in this chapter.

Figure 5-11 shows values set and locked in the Net, Subnet, and Node boxes.

Having the Address Set Automatically

If you select the Server button in the Obtain Address box, a network server is queried for the address assigned to your machine. On an Ethernet network, the protocols BootP or RARP are used. On a LocalTalk network, a DDP-IP gateway sets the address.

All you have to do is click on the Server button (when you bring up the Administrator dialog box for the first time, Server is the default setting). There is no need to enter class, subnet mask, or net, subnet, or node numbers; the Server button does it for you. The Macintosh computer that uses this master disk will be assigned an address every time it starts up as long as you have properly configured your server.

After you restart and your configuration changes are saved (see the section "Alert Message" later in this chapter), the class, subnet mask, and net, subnet, and node numbers set by the Server button are reflected in the Administrator dialog box.

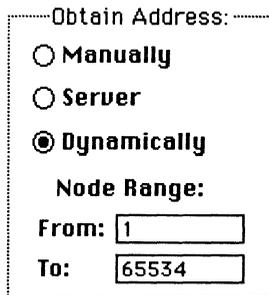
Setting the Node Number Dynamically

You can select Dynamically in the Obtain Address box so that the node portion of the IP address is assigned dynamically when the user boots up.

An IP address has a range of valid node numbers that are determined by the address class and subnet mask. With dynamic addressing, MacTCP randomly selects a node address in that range and broadcasts to other nodes on the network, "Is there anyone out there using this address?" If there is no response, that node number will be used; if there is a response, the computer will rebroadcast until it finds a number that is not being used by other machines on the network.

To use dynamic addressing, enter the address class, subnet mask, and net and subnet numbers as described in the earlier section "Setting the Address Manually". Click on the Dynamically button (located in the Obtain Address box). Two boxes appear, illustrated in Figure 5-12, that show the range of valid node numbers (determined by class and subnet mask). After changes made to the Administrator dialog box are saved, a node number is assigned dynamically when the Macintosh computer is started up using this master disk.

Figure 5-12 Node Range Boxes



Obtain Address:

Manually

Server

Dynamically

Node Range:

From:

To:

If you know there are static addresses on your network, you can change the values in the Node Range boxes so the addresses in the static range are not used. To change the minimum range value, double-click the From box and enter an appropriate number. To change the maximum range value, double-click the To box and enter an appropriate number.

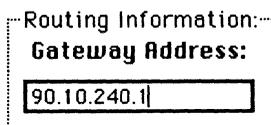
Setting the Gateway Address

MacTCP automatically monitors Routing Information Protocol (RIP) traffic to determine active gateways. If your network does not use RIP, you must manually set the address of a gateway.

Note *The default gateway address can also be configured from a server using BootP.*

To manually set the gateway address, go to the Routing Information section of the Administrator dialog box. Click the pointer in the Gateway Address box and enter your gateway's decimal IP address as shown in Figure 5–13.

Figure 5–13 Routing Information Box



The image shows a dialog box titled "Routing Information:". Inside the dialog, there is a label "Gateway Address:" followed by a text input field. The input field contains the IP address "90.10.240.1" and has a vertical cursor at the end of the text.

Setting Domain Name Server Information

This part of the Administrator dialog box allows you to enter the IP address of domain name servers and the domains over which they have authority. The box allows you to enter this information for your network's domain name server and other domain name servers on the internet.

Click the pointer in the Domain box and enter a domain. Press the Tab key to move the pointer to the IP Address box and enter the address of that domain. As you enter the IP address, boxes appear (shown in Figure 5–14 to allow you to enter more domain name server information.

Click the default button to indicate your default domain name server. Generally, it should be a domain name server that has authority over your domain.

Figure 5-14 Domain Name Server Information

Domain	IP Address	Default
acct.bonzinicorp.com	111.25.13.3	<input checked="" type="radio"/>
		<input type="radio"/>

Protecting the Configuration

To protect your configuration, click the Protected button (shown in Figure 5-15). If you don't select the Protected button, the user who receives the configured master disk will be able to modify any of the fields on the Administrator dialog box.

Figure 5-15 The Protected Button

Routing Information:
Gateway Address:
90.10.240.1

Protected

OK Cancel

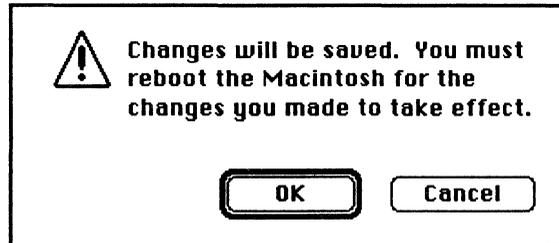
Giving the User Full Configuration Power

Recall the sixth scenario in the section "Configuration Scenarios" earlier in this chapter: you can configure MacTCP so that the user can make changes through the Administrator dialog box, giving him or her full configuration power. To accomplish this, take the AdminTCP file out of the System Folder on the master disk (throw it into the Trash) and distribute the disk along with a copy of this chapter. Since the Protected button has not been selected (see the previous section, "Protecting the Configuration"), the user can access the Administrator dialog box and use it to configure MacTCP. In the other configuration scenarios, you select the Protected button so that the user is not able to make changes through the Administrator dialog box.

Alert Message

After you have filled in all the appropriate information in the Administrator dialog box, click the OK button. The alert message shown in Figure 5-16 is displayed.

Figure 5-16 The Alert Box



This message alerts you that if you click the OK button, you must restart your Macintosh computer from the master disk in order for the configuration changes to take effect. Click the Cancel button if you don't want the changes saved (for instance, if you realize you entered the wrong gateway address).

If you click the OK button, the MacTCP Control Panel is displayed; if you click the Cancel button the Administrator dialog box is redisplayed.

MacTCP Is Configured

You have now configured MacTCP for at least one of your network users. The configuration settings are stored in the MacTCP driver and also in a file called MacTCP Prep.

Click the Close box to close the Control Panel window. Drag the AdminTCP file into the Trash and distribute the software to users as described in *PATHWORKS for Macintosh Planning and Installation Guide*.

User Configuration

This section has been provided to help you describe the steps users must follow in order to configure MacTCP. Copy and distribute it as appropriate.

If you selected the Protected button on the Administrator dialog box when you configured MacTCP, the user can only make changes to the MacTCP Control Panel. If you did not select the Protected button, the user has full configuration power and can use the Administrator dialog box to configure MacTCP; provide him or her with the configuration instructions in Chapter 5.

Bringing Up the MacTCP Control Panel

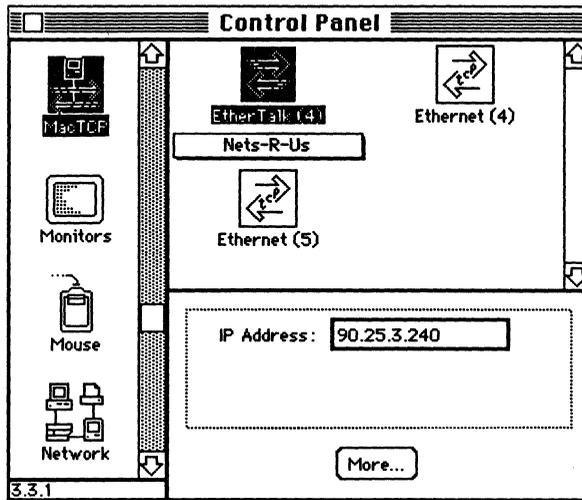
Choose Control Panel from the Apple menu and the panel appears with a scrollable list of icons in the left quarter of the window.

Selecting the MacTCP Icon

Click the MacTCP icon (it may be necessary to use the scroll bar to bring the MacTCP icon into view). A new display appears on the right three-quarters of the window as shown in Figure 6-1.

Unless your network administrator has given you full configuration power, use this Control Panel to configure your system. If you do have full power, the network administrator should provide you with the appropriate instructions.

Figure 6-1 The MacTCP Control Panel



Setting Link Level Information

The top half of the screen displays the available link level protocols on which MacTCP can run. Different icons will be displayed depending on your network configuration.

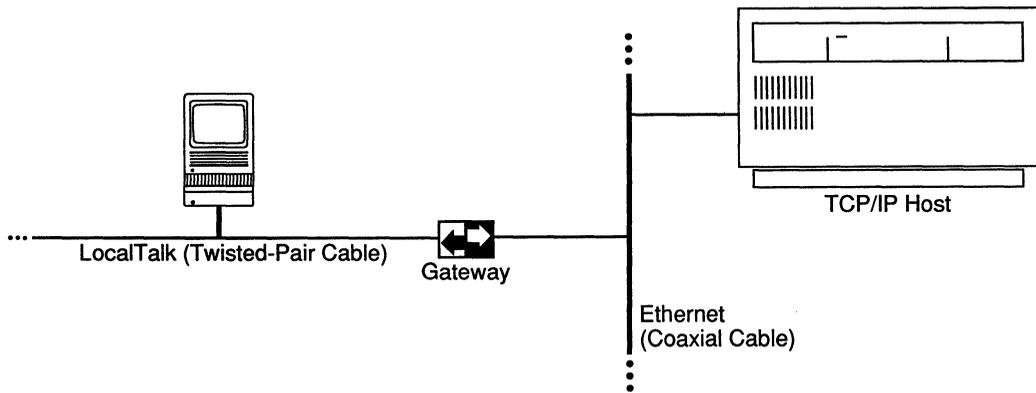
If your Macintosh computer is using an Ethernet interface card, make sure the card's software is installed.

Note You may need to consult your network administrator to determine your network configuration and the zone where your DDP-IP gateway is located.

Network Configuration 1

Figure 6-2 illustrates one possible network configuration: a Macintosh computer on an AppleTalk network using LocalTalk cabling with a gateway to an internet.

Figure 6-2 Network Configuration 1



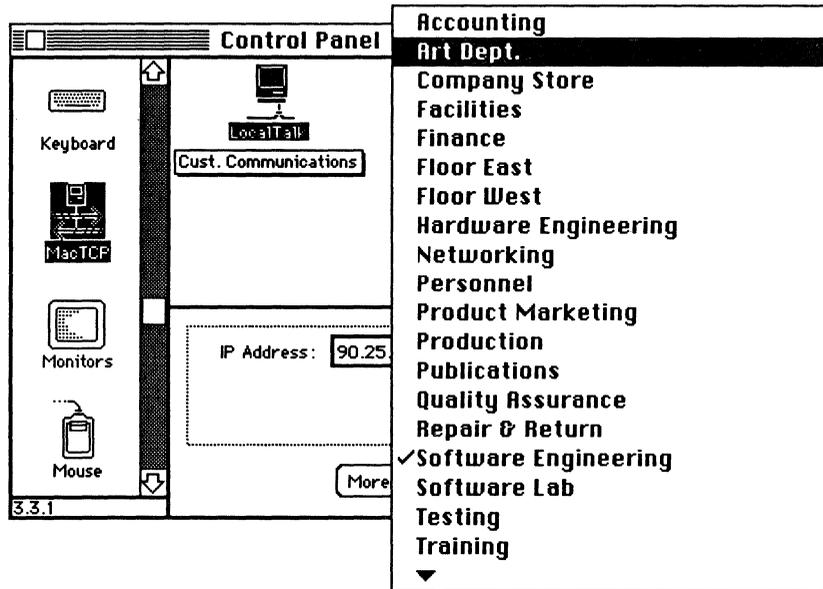
If this is your network configuration, the upper-right section of the MacTCP Control Panel appears as shown in Figure 6-3.

Figure 6-3 Icons Displayed for Network Configuration 1



The box beneath the icon displays your network zone. If your gateway is located in another zone, direct the pointer to the zone box and hold down the mouse button. A pop-up menu appears with a list of zone names as shown in Figure 6-4. Keeping the mouse button down, slide the pointer to the list and highlight the appropriate zone. When you let go of the mouse button, the pop-up menu disappears and the zone name you selected appears in the box beneath the icon.

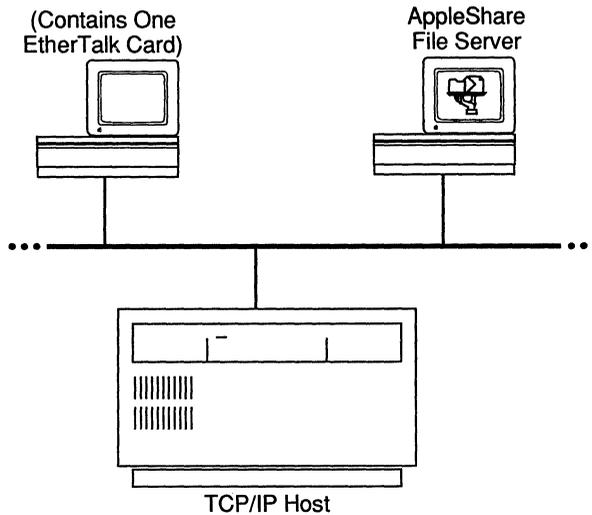
Figure 6-4 Zone Pop-Up Menu



Network Configuration 2

Figure 6-5 illustrates a second possible network configuration: a Macintosh computer with one EtherTalk card on an AppleTalk network using Ethernet cabling.

Figure 6-5 Network Configuration 2



If this is your network configuration, the upper-right section of the MacTCP Control Panel appears as shown in Figure 6-6.

Figure 6-6 Icons Displayed For Network Configuration 2

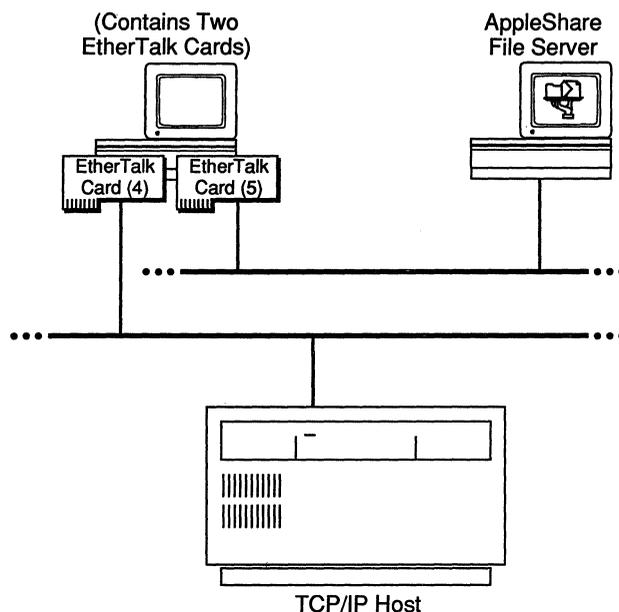


Select the Ethernet icon to enable your Macintosh computer to use TCP/IP to communicate with other TCP/IP hosts on the network. (AppleTalk is already being used to communicate with the AppleShare® File Server and LaserWriter.)

Network Configuration 3

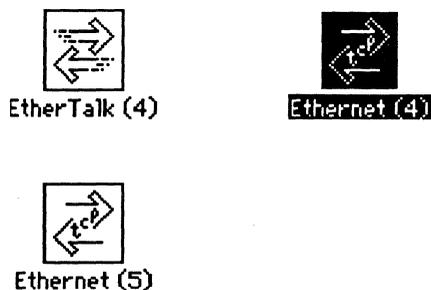
Figure 6-7 illustrates a third possible network configuration: a Macintosh II computer with two EtherTalk cards (located in slots 4 and 5) on an AppleTalk network using Ethernet cabling.

Figure 6-7 Network Configuration 3



If this is your network configuration, the upper-right section of the MacTCP Control Panel will appear as shown in Figure 6-8. (If the EtherTalk cards are located in slots other than 4 and 5, the numbers in the icon names will be different.)

Figure 6-8 Icons Displayed For Network Configuration 3

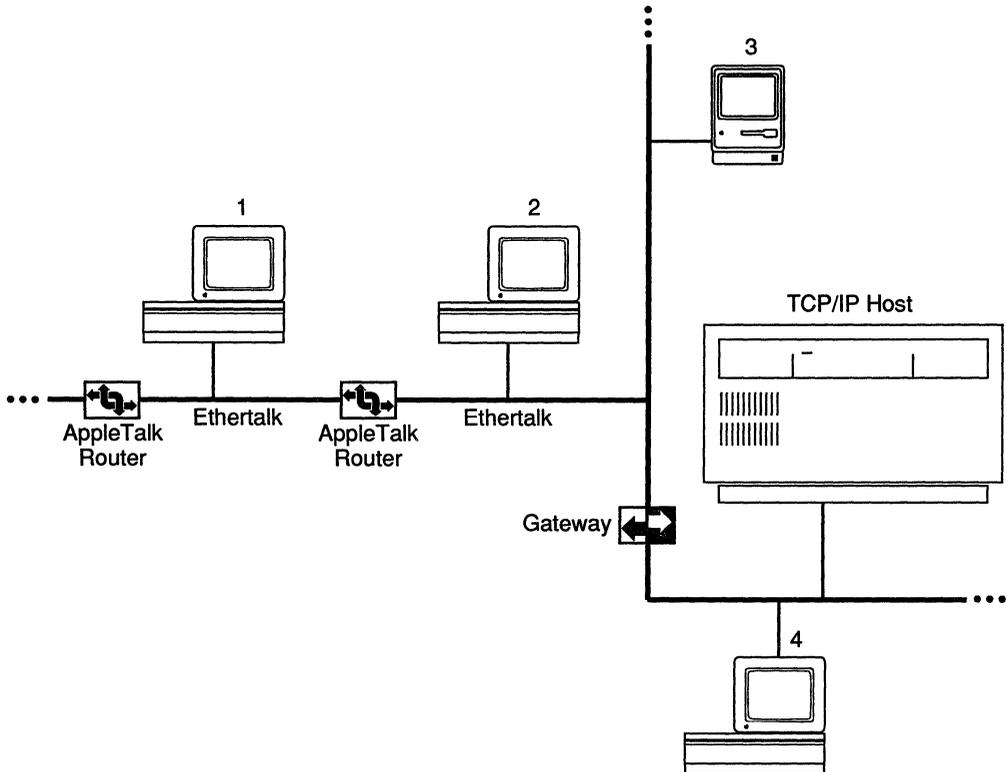


Select the Ethernet (4) icon to enable your Macintosh computer to use TCP/IP to communicate with other TCP/IP hosts on that network.

Network Configuration 4

Figure 6-9 illustrates a fourth possible network configuration. Macintosh computers 1, 2, and 3 are on EtherTalk cable segments separate from the TCP/IP host. These computers use AppleTalk protocols to talk to the gateway and the gateway uses TCP/IP protocols to talk to the TCP/IP host. Macintosh computer 4, on the same Ethernet as the TCP/IP host, uses standard TCP/IP protocols to talk directly to the TCP/IP host.

Figure 6-9 Network Configuration 4



If this is your network configuration, the upper-right section of the MacTCP Control Panel will appear as shown in Figure 6-10.

Figure 6-10 Icons Displayed For Network Configuration 4



If you must go through a gateway to reach a TCP/IP host (as hosts 1, 2, and 3 do in Figure 6-9), make sure the EtherTalk icon is selected. If you are on the same Ethernet as the TCP/IP host (as host 4 is in Figure 6-9), select the Ethernet icon.

Setting the IP Address

The way your network administrator has configured MacTCP determines the information you enter in the IP address portion of the MacTCP Control Panel. You have three possibilities:

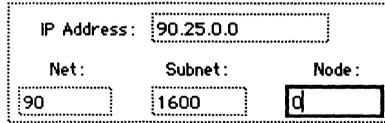
- The administrator has set the full IP address or has configured MacTCP so that the address information is automatically assigned. In this case, you don't have to enter the address and the following sections do not apply to you.
- The administrator has set the net and subnet portions of the address and you must enter the node number.
- You must enter the IP address in decimal notation.

Entering the Node Number

If your administrator has set up MacTCP so that all you have to do is enter the node portion of the address, refer to the part of your screen shown in Figure 6-11. The Net and Subnet boxes contain numbers but the Node box is set to 0. Double-click the Node box and enter the node number (your administrator should provide you with this information).

The address displayed in the IP Address box changes to include the node portion of the address if you select the More button and then return to the MacTCP Control Panel, or if you close the Control Panel and then bring it back up. You cannot change the address in the IP Address box.

Figure 6-11 Entering the Node Number



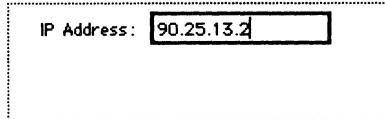
A screenshot of a configuration dialog box with a dotted border. It contains the following fields:

- IP Address:** A text box containing the value "90.25.0.0".
- Net:** A text box containing the value "90".
- Subnet:** A text box containing the value "1600".
- Node:** A text box containing the value "d".

Entering the IP Address

If your administrator has set up MacTCP so that you must enter the IP address in dotted decimal notation, an IP Address box is displayed as shown in Figure 6-12. Click in the box and enter the address (your administrator should provide you with this information).

Figure 6-12 Entering the IP Address



A screenshot of a configuration dialog box with a dotted border. It contains the following field:

- IP Address:** A text box containing the value "90.25.13.2".

Viewing the Administrator Dialog Box

Your system has been set up so that you cannot change the information set in the Administrator dialog box. However, if you want to view this panel, click the More button. The Administrator dialog box appears with all the fields grayed out as shown in Figure 6-13.

Figure 6-13 The Administrator Dialog Box

Obtain Address:

Manually
 Server
 Dynamically

Routing Information:

Gateway Address:
90.10.240.1

Protected

OK

IP Address:

Class: **A** Address: 90.25.0.0
Subnet Mask: 255.255.252.0

Net	Subnet	Node
Bits: 8	14	10

Net: 90 lock
Subnet: 1600 lock
Node: 0 lock

Domain Name Server Information:

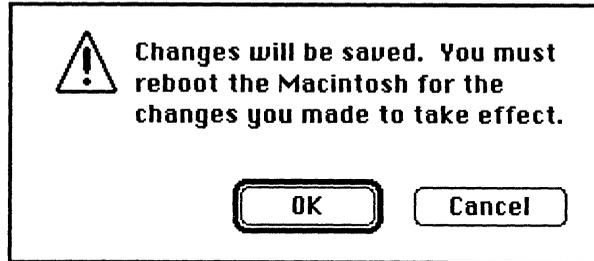
Domain	IP Address	Default
acct.bonzinicornp.com	111.25.13.3	<input checked="" type="radio"/>
		<input type="radio"/>

Click the OK button. If you made changes to the MacTCP Control Panel, the alert message shown in Figure 6-14 is displayed. This message alerts you that you must restart your Macintosh computer in order for the configuration changes to take effect. If you click the OK button on the alert box, the MacTCP Control Panel is displayed. If you click the Cancel button on the alert box, the Administrator dialog box is redisplayed.

Closing the Control Panel

After you enter the appropriate information in the MacTCP Control Panel (and if you didn't already save your changes after you viewed the Administrator dialog box in the previous section), click the Close box to close the Control Panel window. The alert message shown in Figure 6-14 is displayed.

Figure 6-14 The Alert Box



This message alerts you that you must restart your Macintosh computer in order for the configuration changes to take effect. Click the Cancel button if you don't want the changes saved (for instance, if you realize you entered the wrong node number).

If you click the OK button, the Control Panel closes; if you click the Cancel button, the MacTCP Control Panel is redisplayed.

When you restart, MacTCP is configured on your Macintosh computer.

Note *The configuration settings are stored in the MacTCP driver and also in a file called MacTCP Prep in your System Folder. If you install a later version of the MacTCP driver on your system, configuration settings will be read from MacTCP Prep, eliminating the need to use the MacTCP Control Panel to reconfigure the new driver.*

Part III

Appendixes

Name-to-Address Mapping

MacTCP includes a hosts file that maps machine names to internet addresses, the same service provided by the domain name system. You can use the Hosts file if there is no domain name server on your network. It is also convenient to place frequently used name-to-address mappings in this file.

To use the Hosts file, you must edit the sample file that is included with the MacTCP software and add text that defines name-to-address mappings. Each host on your network that uses Hosts file services must have the file resident on the disk.

This appendix describes the syntax of the Hosts file and how to edit it.

Hosts File Syntax

The Hosts file syntax conforms to the master file syntax specified in Request for Comment (RFC) 1035. Refer to this RFC for more information.

Note *\$INCLUDE has not been implemented.*

The syntax of the Hosts file is as follows:

```
<name> <type> <data> [;<comment>]
```

where

- name** is the name assigned to a host or domain on the internet.
- type** is A (address), NS (name server), or CNAME (canonical name).
- data** is determined by the type specified:
- If type = A, the data field contains an internet address.
 - If type = NS, the data field contains the name of the domain name server that has authority over the domain specified in the name field.
 - If type = CNAME, the data field contains the canonical (or official) name for the name field.
- comment** allows you to comment the entry. A semicolon is used to start a comment.

Any combination of tabs and spaces can be used as a delimiter between each item in a line. Lines end with the characters return and line feed.

Example entries in a Hosts file are as follows:

```
acct.xco.com A      128.8.1.1      ; address of host "acct"
xco.com      NS      server.xco.com   ; name server for domain xco.com
fred.xco.com CNAME  bonzini.xco.com ; canonical name for alias fred.xco.com
```

Editing the Hosts File

MacTCP software includes a sample Hosts file and the TeachText editor. To create Hosts files for network users, modify the sample file using TeachText, adding text that defines name-to-address mappings for your particular network configuration.

To edit the Hosts file, perform the following steps:

- 1 Select the sample Hosts file icon entitled Hosts, included with your MacTCP software, and open it by choosing Open from the File menu or by double-clicking the icon.

Note *You can edit the Hosts file with any word processor as long as you save it as Text Only without formatting commands.*

- 2 Add names and internet addresses in the syntax specified in the previous section. TeachText allows you to use all the usual editing functions.

Important *TCP/IP protocols do not allow the use of International and Graphics characters. Use of these characters is allowed by TeachText; however, using them can cause unpredictable results.*

Getting More Information

This appendix provides an overview of available TCP/IP documentation in case you need more information than has been provided by the scope of this guide.

Books

The following books provide information on TCP/IP:

- *An Introduction to TCP/IP*, by John Davidson, Springer-Verlag.
- *Handbook of Computer-Communication Standards, Volume 3: Department of Defense (DOD) Protocol Standards*, by William Stallings, Macmillan Publishing Company.
- *Internetworking With TCP/IP—Principles, Protocols, and Architecture*, by Douglas Comer, Prentice-Hall.

Request for Comments (RFC)

Request for Comments (RFC) is a series of technical notes used by the Internet community that contain reports of work, proposals, and protocol specifications. Important RFCs include 791 (IP), 768 (UDP), 793 (TCP), 826 (ARP), 903 (RARP), 792 (ICMP), and 951 (BootP). RFCs 999, 1000, and 1012 provide a guide to RFCs. RFC 1011 lists the official protocols.

RFCs are available from the DDN Network Information Center (NIC) at SRI International. That address is:

DDN Network Information Center
SRI International, Room EJ 291
333 Ravenswood Avenue
Menlo Park, CA 94025

You can order hard copies of RFCs by calling 800-235-3155 or 415-859-3695. To obtain an RFC electronically over the Internet, use anonymous FTP from the <RFC> directory on host SRI-NIC.ARPA. If you are outside the Internet and don't have access to FTP, you can receive RFCs by sending electronic mail to SERVICE@SRI-NIC.ARPA. Put the RFC number in the "Subject:" field.

The DDN NIC publishes the *DDN Protocol Handbook*, which contains most important RFCs related to TCP/IP.

Military Standards

The Internet Protocol (IP), Transmission Control Protocol (TCP), File Transfer Protocol (FTP), Telnet, and Mail are described in the five Military Standards (MIL-STD) about TCP/IP protocols. These standards contain errors; when there are discrepancies, RFCs always take precedence over MIL-STDs.

You can obtain MIL-STDs from:

Naval Publications and Forms Center, Code 3015
5801 Tabor Avenue
Philadelphia, PA 19120

Glossary

Address Resolution Protocol (ARP)

A protocol in the TCP/IP protocol suite that maps internet addresses to physical hardware addresses.

AppleTalk network system

The system of network software and hardware used in various implementations of Apple's communications network.

ARPANET

A wide area network that served as a basis for networking research and provided a central backbone during development of the Internet. *See also* **Defense Advanced Research Projects Agency Internet**.

Bootstrap Protocol

A protocol in the TCP/IP protocol suite that allows a host to find its internet address and other useful configuration information.

broadcast

A network transmission technique in which data is sent to all attached hosts.

datagram

A packet of data passed across an internet. IP attaches a header to data received from TCP to make an IP datagram. *See also* **segment**.

Datagram Delivery Protocol-Internet Protocol (DDP-IP) gateway

A gateway that connects AppleTalk networks to TCP/IP networks. This gateway takes a TCP/IP packet that is encapsulated in AppleTalk's Datagram Delivery Protocol (DDP) and converts it to Ethernet format.

Defense Advanced Research Projects Agency (DARPA) Internet

The collection of networks and gateways, including the ARPANET, MILNET, and NSFnet that use TCP/IP protocols to communicate. Also called the Internet. *See also* ARPANET, MILNET, NSFnet.

domain name resolver

Software used by the domain name system to request information from domain name servers.

domain name server

Software used by the domain name system to map domain names to internet addresses.

domain name system

An internet service for mapping a name to an internet address.

dotted decimal notation

The representation for a 32-bit internet address. Each address is written as four decimal integers separated by periods. *See also* **internet address**.

Ethernet

A high-speed local area network that consists of a cable technology and a series of communication protocols. The hardware (cable) provides the physical link to connect systems together.

EtherTalk

A high-speed AppleTalk network system that uses the cables of an Ethernet network.

File Transfer Protocol (FTP)

A protocol in the TCP/IP protocol suite for transferring files across an internet.

fragmentation

The process of breaking an IP datagram into smaller pieces so that it can be transferred over a network that has a small maximum packet size.

frame

A group of bits forming a logical transmission unit that is sent between data-link layer entities.

gateway

A computer that connects two or more networks and routes packets from one to the other.

hardware address

An address used by a physical network. In an Ethernet network, each machine is assigned a 48-bit hardware address.

International Standards Organization (ISO)

An international body that specifies network protocol standards. The ISO developed the Open Systems Interconnection (OSI) model. *See also* **Open Systems Interconnection model**.

internet

An interconnected group of networks. When written as Internet, refers to the DARPA Internet.

internet address

A 32-bit address assigned to every host that wants to use TCP/IP to communicate across an internet. The address consists of a network and host field.

Internet Control Message Protocol (ICMP)

A protocol in the TCP/IP protocol suite that hosts and gateways on an internet use to inform each other of error conditions.

Internet Protocol (IP)

One of the fundamental protocols in the TCP/IP protocol suite, IP is responsible for sending data across multiple networks.

local area network (LAN)

A system that connects computers together within restricted geographical areas.

LocalTalk

A system of cables, cable extenders, and connector boxes that link computers and peripheral devices in an AppleTalk network system.

MILNET (MILitary NETwork)

A wide area network on the DARPA Internet that provides network service to military installations. *See also* **Defense Advanced Research Projects Agency Internet**.

NSFnet (National Science Foundation NETwork)

A wide area network on the DARPA Internet that provides network service to the scientific community. *See also* **Defense Advanced Research Projects Agency Internet**.

octet

8 bits. IP addresses consist of 4 octets. The term octet is used instead of byte because not all hosts use 8-bit bytes.

Open Systems Interconnection (OSI) model

A 7-layer reference model developed by the ISO that is used to describe network systems architecture.

packet

A unit of data transmitted on a network.

process

Programs that communicate; for instance, a file transfer process on one host talks to a file transfer process on another host. A host may be running several processes.

protocol

A set of rules that computers must follow to exchange data over a network.

Request for Comments (RFC)

A series of technical notes used by the Internet community that contain reports of work, proposals, and protocol specifications.

Reverse Address Resolution Protocol (RARP)

A protocol in the TCP/IP protocol suite that maps physical hardware addresses to internet addresses.

route

The path that network traffic takes to get from source to destination.

routed software

The implementation of the RIP protocols for 4.3BSD UNIX.

Routing Information Protocol (RIP)

A protocol in the TCP/IP protocol suite that allows gateways and hosts to exchange network routing information.

routing table

A table maintained in each internet gateway that contains, for each possible destination network, the next gateway to which data should be sent.

segment

A unit of data sent from TCP on one host to TCP on another. Each segment travels across the internet in an IP datagram. *See also* **datagram**.

server

A program running on a host that offers a service to other hosts on the network. For instance, a file server provides access to its files. Computers that run server programs are often referred to as servers. *See also* **domain name server**.

Simple Mail Transfer Protocol (SMTP)

A protocol in the TCP/IP protocol suite that allows electronic mail to be transferred across an internet.

subnetwork address

A technique that allows multiple physical networks to share the same internet network address.

subnetwork mask

Software used to select bits from an internet address for subnet addressing.

Telnet

A protocol in the TCP/IP protocol suite that allows a terminal on one host to appear as if it were directly connected to a remote host on an internet.

Transmission Control Protocol (TCP)

One of the fundamental protocols in the TCP/IP protocol suite, TCP provides for the reliable exchange of data between two processes.

User Datagram Protocol (UDP)

A protocol in the TCP/IP protocol suite that provides unreliable data transmission between two processes.

wide area network

A system for connecting computers over a large geographical area.

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Reader's Comments

PATHWORKS for Macintosh
MacTCP™ Administrator's Guide
AA-PCT5B-TE

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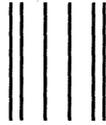
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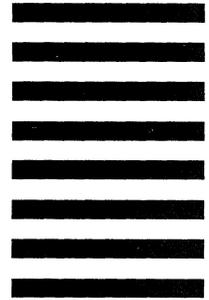
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