*Making the
Transition to
SR10 TCP/IP*

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apollo

Making the Transition to SR10 TCP/IP

Order No. 011717–A00

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Preface

Making the Transition to SR10 TCP/IP outlines changes in TCP/IP at Software Release 10 for those familiar with the pre–SR10 implementations, Domain TCP/IP and Domain/IX BSD4.2 TCP/IP. New users may also find this manual useful as an introduction to SR10 TCP/IP.

We've organized this manual as follows:

Introduction   Describes the major changes in TCP/IP at SR10.

Chapter 1   **Domain/IX TCP/IP Transition Issues** summarizes changes for Domain/IX TCP/IP users.

Chapter 2   **Domain TCP/IP Transition Issues** summarizes changes for Domain TCP/IP users.

Chapter 3   **Installing TCP/IP at SR10** provides an overview of the SR10 TCP/IP software installation.

Chapter 4   **TCP/IP Administration at SR10** discusses issues concerning network and host administration.

Chapter 5   **Other SR10 Changes Affecting TCP/IP** describes changes in the pre-SR10 socket call interface and additions made to the 4.3BSD UNIX network extension.

Related Manuals

For general information about installing software at SR10, see

*   *Installing Software with Apollo's Release and Installation Tools* (008860)

*   *Making the Transition to SR10 Operating System Releases (011435)*

For information about installing, configuring, and managing TCP/IP at SR10, see

*   *Configuring and Managing TCP/IP* (008543)*

*   *Planning Domain Networks and Internets* (009916)

For information about programming and applications, see

*   *Using TCP/IP Network Applications* (008667)

*   *BSD Programmer's Reference* (005801)

*   *Domain/OS Programming Environment Reference* (011010)

For summary information about TCP/IP files and programs, refer to the BSD and SysV on-line Manual Pages.

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* The pre-SR10 version of this manual also is named *Configuring and Managing TCP/IP*. When ordering manuals, check the price list carefully to make sure you use the correct order number for the version you want.

Problems, Questions, and Suggestions

We appreciate comments from the people who use our system. To make it easy for you to communicate with us, we provide the Apollo Product Reporting (APR) system for comments related to hardware, software, and documentation. By using this formal channel, you make it easy for us to respond to your comments.

You can get more information about how to submit an APR by consulting the appropriate Command Reference manual for your environment (Aegis, BSD, or SysV). Refer to the **mkapr** (make apollo product report) shell command description. You can view the same description online by typing:

   $ **man mkapr** (in the SysV environment)

   % **man mkapr** (in the BSD environment)

   $ **help mkapr** (in the Aegis environment)

Alternatively, you may use the Reader's Response Form at the back of this manual to submit comments about the manual.

Documentation Conventions

Unless otherwise noted in the text, this manual uses the following symbolic conventions.

literal values

Bold words or characters in formats and command descriptions represent commands or keywords that you must use literally. Pathnames are also in bold. Bold words in text indicate the first use of a new term.

user-supplied values

Italic words or characters in formats and command descriptions represent values that you must supply. Italics within text indicate emphasis.

sample user input	In examples, information that the user enters appears in color.
`output`	Information that the system displays appears in `this typeface`.
——— ▦ ———	This symbol indicates the end of a chapter.

Contents

Introduction

Chapter 1   Domain/IX TCP/IP Transition Issues

Chapter 2   Domain TCP/IP Transition Issues

Chapter 3   Installing TCP/IP at SR10

Chapter 4   TCP/IP Administration at SR10

Chapter 5   Other SR10 Changes Affecting TCP/IP

Index

Tables

Procedures

Introduction

This section summarizes the new features of TCP/IP available at SR10 and also indicates changes to the implementation of our TCP/IP product that will affect current TCP/IP users. At the end of the section, we suggest which chapters new and current TCP/IP users should read.

Overview of SR10 TCP/IP

Current users of TCP/IP will notice a number of changes in the product. We have listed the major areas of change below.

Single Implementation of TCP/IP

At SR10, TCP/IP is completely restructured into a single implementation that follows the 4.3BSD UNIX* model. Previously, we offered two TCP/IP products, Domain TCP/IP for the Aegis environment, and Domain/IX 4.2BSD TCP/IP for the Domain/IX environment. While these products provided the same basic capabilities, they differed in their configuration processes and application programs. The products also differed because Domain TCP/IP was an optional software package for Aegis users and Domain/IX 4.2BSD TCP/IP was bundled with Domain/IX operating system software.

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*UNIX is a registered trademark of AT&T.

At SR10, programs and utilities associated with the Domain TCP/IP product have been *replaced* with their 4.3BSD counterparts. For Domain TCP/IP users, this means following new TCP/IP configuration procedures and learning a slightly different user interface for TCP/IP application programs. For Domain/IX users, the transition is to the 4.3BSD model.

Support In All Environments

SR10 continues to support TCP/IP operations in the Aegis, BSD, and SysV environments. The 4.3BSD socket interface is available for programming in all environments. The 4.3BSD network application programs (the 4.3BSD *network extension*) are ported to the following system directories:

- /bin and /usr/ucb for BSD users

- /usr/bin for SysV users

- /com for Aegis users

Supplied With Standard Software

TCP/IP is now resident in standard software. All TCP/IP software, including the 4.3BSD network extension, is included in SR10. The TCP/IP layered products are *not* supported under SR10. However, you can operate a mixed network of SR10 and pre–SR10 TCP/IP hosts. (Chapter 3, "Installing TCP/IP at SR10," and Chapter 4, "TCP/IP Administration at SR10," discuss issues associated with operating in a mixed network.)

Device Driver Support

All Domain network controllers support TCP/IP host and gateway operations. The device drivers for these controllers are resident in standard software. The EtherController–MB, a special–purpose controller which operates through a GPIO interface, also supports TCP/IP host and gateway operations. The driver for the EtherController–MB is available in the COM_ECMB optional software package.

Other Enhancements and Features

Pre–SR10 TCP/IP enhancements, such as support for raw sockets, have been carried forward to preserve functionality. Other upward-compatible enhancements, such as new switches for standard BSD utilities, have been introduced to improve TCP/IP performance and administration. In addition, SR10 TCP/IP incorporates numerous bug fixes which are identified in the software release document.

How to Use This Manual

Current users of Domain/IX TCP/IP: Read Chapter 1 first, then read Chapters 3 through 5.

Current users of Domain TCP/IP: Read Chapter 2 first, then read Chapters 3 through 5.

New users of TCP/IP: Read only Chapters 3 through 5, since the information in Chapters 1 and 2 is not relevant to you.

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Chapter 1

Domain/IX TCP/IP
Transition Issues

This chapter provides information to help Domain/IX BSD4.2
TCP/IP users make the transition to the new system. Included are
tables which relate pre-SR10 files, commands, and utilities with
their SR10 replacements and which indicate file locations for SR10.

New Files and Programs

Domain/IX TCP/IP users will notice two major changes at SR10:
the /etc directory now is local to each host and has been expanded
to include a number of new programs and files, and the /sys/tcp di-
rectory is obsolete. The files and utilities formerly in /sys/tcp have
been replaced by their BSD counterparts. TCP/IP data files in the
/etc directory are either local host data files or links to files on a
TCP/IP administrative node.

Table 1-1 lists the tasks required to configure and manage TCP/IP
hosts and compares the Domain/IX and SR10 files and utilities re-
quired to perform those tasks. Table 1-2 lists the TCP/IP data files
required for SR10 and indicates their suggested locations. Table
1-3 lists the SR10 TCP/IP programs and utilities used for manage-
ment and configuration.

Table 1-1. Comparing Domain/IX and SR10 TCP/IP
Files and Utilities, by Functional Task

Functional Task	Domain/IX BSD TCP/IP Files and Utilities	SR10 TCP/IP Files and Utilities
Assign internet name to node.	Edit local file `node_data/thishost to add internet name.	Invoke command /etc/hostname and specify name.
Define local node's physical interfaces and their Internet addresses.	Edit local file `node_data/network to add interfaces and their addresses.	Invoke command /etc/ifconfig and specify interfaces and their addresses.
Add non-ARP hosts to host mapping table (usually done only for gateway nodes).	Edit file /sys/tcp/host_addr. Then use /sys/tcp/maphost command to add information to host mapping table.	Invoke command /etc/arp and specify hostname and Ethernet address.
Specify all TCP/IP hosts accessible by local node.	Edit file /etc/hosts.	Edit file /etc/hosts. Or use /etc/named.
Specify all Internet networks accessible by local node.	Edit file /etc/networks.	Edit file /etc/networks Or use /etc/named.
Add static routing information to gateway routing tables.	Invoke /etc/route to add static routes. Or edit /etc/gateways file.	Invoke /etc/route to add static and priority routes. Or edit /etc/gateways file.
Start TCP/IP protocols on local node.	Start TCP/IP server process, /sys/tcp/tcp_server.	Invoke tcp daemon, /etc/tcpd.

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*Table 1-1. Comparing Domain/IX and SR10 TCP/IP Files
and Utilities, by Functional Task (Cont.)*

Functional Task	Domain/IX BSD TCP/IP Files and Utilities	SR10 TCP/IP Files and Utilities
Specify equivalent hosts for log-in purposes for local node.	Edit local file /etc/hosts.equiv.	Edit local file /etc/hosts.equiv.
Edit local node's startup file(s) to add TCP/IP requirements.	Edit local file 'node_ data/startup and also edit local file /etc/rc.	Edit local file /etc/rc.local, if necessary. Add files to the /etc/daemons directory for **tcpd, routed, inetd, named, rwhod.**
Set up administrative files.	Create /etc/hosts, /etc/networks, and /etc/gateways. Or Run /etc/gettable and /etc/htable, then edit files to add local information.	1. Create **/etc/localhosts, /etc/localnetworks, /etc/localgateways** files. 2. Use program **/etc/gettable** to create file /etc/hosts.txt. 3. Run **/etc/htable** to create **/etc/hosts, /etc/networks, /etc /gateways** from /etc /hosts.txt and other /etc/local... files.
If you use the name server /etc/named, create the files required for its operation.	Utility not available before SR10.	Run the command /etc/hostns on file /etc/hosts to create database files required by /etc/named.

Table 1-2. SR10 TCP/IP Information Files and Their Locations

File	Location	Description
/etc/hosts	On administrative host, with links to local hosts.	Relates host names to their Internet addresses.
/etc/networks	On administrative host, with links to local hosts.	Associates Internet network numbers with network names for all accessible networks.
/etc/gateways	On gateway hosts. Or on administrative host with links to gateways.	Contains static routes to be loaded into routing table.
/etc/hosts.equiv	On administrative host, with links to local hosts.	Lists equivalent hosts for log-in purposes.
/etc/inetd.conf	On each TCP/IP host.	Contains configuration information used by /etc/inetd.
/etc/protocols	On each TCP/IP host.	Contains valid proto-cols used by services.
/etc/services	On each TCP/IP host.	Contains valid services for local host.
/etc/rc.local	On each TCP/IP host.	Startup file for local host.
/etc/resolv.conf	On administrative hosts, with links on local hosts.	Contains information used by **named.**
Other named server database files.	On each TCP/IP host.	Contain information used by **named.**

More detailed information about using these files can be found in *Configuring and Managing TCP/IP* and in the 4.3BSD Manual Pages.

Programs & Utilities	Description
/etc/tcpd	TCP/IP server process. Replaces /sys/tcp/tcp_server.
/etc/arp	Address resolution display and control program which displays and modifies Internet–to–Ethernet address translation tables. Replaces /sys/tcp/maphost.
/etc/gettable	Program to obtain NIC standard host tables.
/etc/htable	Program to convert NIC standard host tables to format required by network library routines. I.e., /etc/hosts, /etc/networks, /etc/gateways.
/etc/hostns	Program to convert /etc/hosts to format required by name server /etc/named.
/etc/nshost	Program to convert name server config files to /etc/hosts format.
/etc/ifconfig	Program to configure host network interfaces and to assign internet addresses to interfaces. Replaces /sys/tcp/tcpinit and file 'node_data/thishost.
/etc/route	Program to manually manipulate the network routing tables.
/etc/routed	Server process which manages the network routing tables.

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Programs & Utilities	Description
/etc/mkhosts	Program to generate hashed host database used by network library routines if /etc/named is not used.
/etc/named	Name server process that provides name–address resolution. Replaces /etc/hosts lookup.
/etc/ping	Utility that allows TCP to determine which hosts and gateways are still operative.
/etc/hostname	Utility to display and modify host name. File 'node_data/thishost no longer needed.
/etc/inetd	Program to invoke other server processes as necessary.
/etc/ftpd	Server process that accepts FTP connections, services FTP requests. Invoked by /etc/inetd.
/etc/telnetd	Server that accepts telnet connections. Invoked by /etc/inetd.
/etc/rexecd	Process that services requests from rexecd library function. Invoked by /etc/inetd.
/etc/rlogind	Process that services requests from rlogin program. Invoked by /etc/inetd.

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*Table 1-3. SR10 TCP/IP Programs and Utilities Used
for Management and Configuration (Cont.)*

Programs & Utilities	Description
/etc/rshd	Program that services requests from **rsh** program and **rcmd** library function. Invoked by /etc/inetd.
/etc/tftpd	Server process that listens for and accepts TFTP requests. Invoked by **/etc/inetd**
/etc/rwhod	Internet system status server. Maintains database of status information used by **/etc/rwho** and **/etc/ruptime**.

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Chapter 2

Domain TCP/IP
Transition Issues

This chapter provides information to help Domain TCP/IP users make the transition to the new system. Included are tables that relate pre-SR10 files, commands, and utilities with their SR10 replacements and that indicate file locations for SR10.

New Files and Programs

At SR10, the changes to TCP/IP from a Domain TCP/IP users point of view, are extensive. The /sys/tcp directory is obsolete; the files and utilities in /sys/tcp have been replaced by their 4.3BSD counterparts. The **tcp_server** program has become **tcpd** to conform to the naming convention for UNIX daemons (servers). The /sys/tcp/hostmap directory, including the **local.txt** file, has been replaced by the /etc/hosts and /etc/networks files.

Table 2-1 lists the tasks required to configure and manage TCP/IP hosts and compares Domain TCP/IP and SR10 files and utilities needed to perform those tasks. Table 2-2 lists the TCP/IP data files required for SR10 and shows their recommended locations. Table 2-3 lists the SR10 TCP/IP programs and utilities used for host and network management and configuration.

Functional Task	Domain TCP/IP Files and Utilities	SR10 TCP/IP Files and Utilities
Assign internet name to node.	Edit local file 'node_data/thishost to add internet name.	Invoke command /etc/hostname and specify name.
Define local node's physical interfaces and their Internet addresses.	Edit local file 'node_data/network to add interfaces and their addresses.	Invoke command /etc/ifconfig and specify interfaces and their addresses.
Add non-ARP hosts to host mapping table (usually done only for gateway nodes).	Edit file /sys/tcp/host_addr. Then use /sys/tcp/maphost command to add information to host mapping table.	Invoke command /etc/arp and specify hostname and Ethernet address.
Specify all TCP/IP hosts accessible by local node.	Edit /sys/tcp/hostmap /local.txt and /hosts.txt. Then run /sys/tcp/hostmap /makehost.sh.	Create /etc/hosts manually or use /etc/htable. Or use /etc/named.
Specify all Internet networks accessible by local node.	Edit /sys/tcp/hostmap /local.txt and /hosts.txt. Then run /sys/tcp /hostmap/makehost.sh.	Create /etc/networks manually or use /etc/htable. Or use /etc/named.
Update routing tables for local node.	Edit file /sys/tcp/gateways, then run /sys/tcp/makegate. Or run /sys/tcp/setroute to specify static routes.	Invoke /etc/route to add static and priority routes.
Start TCP/IP protocols on local node.	Start TCP/IP server process, /sys/tcp/tcp_server.	Invoke tcp daemon, /etc/tcpd.

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*Table 2-1. Comparing Domain and SR10 TCP/IP Files and
Utilities, by Functional Task   (Cont.)*

Functional Task	Domain TCP/IP Files and Utilities	SR10 TCP/IP Files and Utilities
Relate internet addresses to physical interfaces.	/sys/tcp/tcpinit is run as part of /sys/tcp/tcp_server process.	Invoke command /etc/ifconfig and specify interfaces and their addresses.
Edit local node's startup file(s) to add TCP/IP requirements.	Edit local file 'node_data/startup	Edit local file /etc/rc.local. Add files to /etc/daemons directory for tcpd, routed, etc.
Manage TCP routing tables.	Run process /sys/tcp/rip_server.	Run routing server /etc/routed.
Set up administrative files.	1. Create file /sys/tcp /hostmap/local.txt. 2. Run /sys/tcp/hostmap /makehost.sh to create /sys/tcp/hosts.hst, /sys/tcp/gateways, from /local.txt.	1. Create files /etc/localhosts, /etc/localnetworks, /etc/localgateways. 2. Use /etc/gettable to create file /etc/hosts.txt. 3. Run /etc/htable to create /etc/hosts, /etc/networks, /etc/gateways from /etc/hosts.txt and other /etc/local... files.
If you use the name server, named, create the files required for its operation.	Utility not available before SR10.	Run the command /etc/hostns on file /etc/hosts to create database files required by named.

Table 2-2. SR10 TCP/IP Information Files and Their Locations

File	Location	Description
/etc/hosts	On administrative host, with links to local hosts.	Relates host names to their Internet addresses.
/etc/networks	On administrative host, with links to local hosts.	Associates Internet network numbers with network names for all accessible networks.
/etc/gateways	On gateway hosts. Or on administrative host with links to gateways.	Contains static routes to be loaded into routing table.
/etc/hosts.equiv	On administrative host, with links to local hosts.	Lists equivalent hosts for log-in purposes.
/etc/inetd.conf	On each TCP/IP host.	Contains configuration information used by /etc/inetd.
/etc/protocols	On each TCP/IP host.	Contains valid protocols used by services.
/etc/services	On each TCP/IP host.	Contains valid services for local host.
/etc/rc.local	On each TCP/IP host.	Startup file for local host.
/etc/resolv.conf	On administrative host, with links on local hosts.	Contains information needed by **named.**
Other name server database files.	On each TCP/IP host.	Contain information needed by **named.**

More detailed information about using these files is available in *Configuring and Managing TCP/IP* and in the BSD Manual Pages.

Table 2-3.   SR10   TCP/IP   Programs   and   Utilities   Used   for   Management   and   Configuration

Programs & Utilities	Description
/etc/tcpd	TCP/IP server process. Replaces /sys/tcp/tcp_server.
/etc/arp	Address resolution display and control program that displays and modifies Internet-to-Ethernet address translation tables. Replaces /sys/tcp/maphost.
/etc/gettable	Program to obtain NIC standard host tables.
/etc/htable	Program to convert NIC standard host tables to format required by network library routines. I.e., /etc/hosts, /etc/networks, /etc/gateways.
/etc/hostns	Program to convert /etc/hosts to format required by name server /etc/named.
/etc/nshost	Program to convert name server config files to /etc/hosts format.
/etc/ifconfig	Program to configure host network interfaces and to assign internet addresses to interfaces. Replaces /sys/tcp/tcpinit and file '/node_data/thishost.
/etc/route	Program to manually manipulate the network routing tables. Replaces /sys/tcp/makegate and /sys/tcp/setroute.
/etc/routed	Server process which manages the network routing tables. Replaces /sys/tcp/rip_server.

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Programs & Utilities	Description
/etc/mkhosts	Program to generate hashed host database used by network library routines if /etc/named is not used.
/etc/named	Name server process that provides name–address resolution. Replaces /etc/hosts lookup.
/etc/ping	Utility that allows TCP to determine which hosts and gateways are still operative.
/etc/hostname	Utility to display and modify host name. 'node_data/thishost file no longer needed.
/etc/inetd	Program to invoke other server processes as necessary.
/etc/ftpd	Server process that accepts FTP connections, services FTP requests. Invoked by /etc/inetd. Replaces /sys/tcp/ftp_server.
/etc/telnetd	Server that accepts telnet connections. Invoked by /etc/inetd. Replaces /sys/tcp/telnet_server.
/etc/rexecd	Process that services requests from rexecd library function. Invoked by /etc/inetd.
/etc/rlogind	Process that services requests from rlogin program. Invoked by /etc/inetd.

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Programs & Utilities	Description
/etc/rshd	Program that services requests from rsh program and rcmd library function. Invoked by /etc/inetd.
/etc/tftpd	Server process that listens for and accepts TFTP requests. Invoked by /etc/inetd.
/etc/rwhod	Internet system status server. Maintains database of status information used by /etc/rwho and /etc/ruptime.

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Chapter 3

Installing TCP/IP
at SR10

This chapter provides information to help system administrators install TCP/IP on their networks at SR10. Before you install SR10 and TCP/IP, you should read *Making the Transition to SR10 Operating System Releases* and also *Installing Software with Apollo's Release and Installation Tools*. Both books are shipped with the SR10 media and contain general information about installing SR10 software.

Installation

At SR10, all the TCP/IP software, including the 4.3BSD network extension, is included in standard software. Therefore, when you install SR10 you also install TCP/IP. In addition, all Domain network controllers support TCP/IP host and gateway operations and the device drivers for these controllers also reside in standard software.

Before you begin the actual installation process, there are two transition issues that you should consider: compatibility between SR10 and pre–SR10 software releases, and the choice of a main environment for TCP/IP nodes.

Compatibility Issues

Compatibility between SR10 and pre–SR10 nodes is relevant to network installations that continue to run several different software release levels of TCP/IP at the same time. Compatibility between software release levels affects your choice of administrative nodes.

Nodes running SR10 can communicate with and access files on nodes running all previous releases. A program at a node running SR10 can copy files to or from a node running any previous release. Nodes running SR9.7 can communicate with and access files on nodes running all previous releases and on SR10 nodes. Nodes running pre–SR9.7 software releases cannot access files on SR10 nodes.

If you choose to upgrade your administrative nodes to SR10, all other nodes running TCP/IP must be running at least SR9.7. If you have TCP/IP nodes running at earlier software release levels, do not upgrade your administrative nodes to SR10 until all other nodes are upgraded to at least SR9.7. Procedure 3–4 below describes how to manage administrative nodes in a mixed software release environment.

Selecting A Main Environment

The system administrator sets a network–wide default environment (Aegis, BSD, or SysV) on the first node where SR10 is installed. You can change that default environment for individual nodes during the installation procedure.

TCP/IP will run in any environment. The BSD network extension, which includes **telnet** and **ftp,** is installed automatically in all three environments on a node when the installation query about TCP/IP Internet utilities is answered affirmatively. Even if you choose not to install the TCP/IP Internet utilities, the node will be able to run TCP/IP and any applications that use internet sockets, such as X–windows, NFS, or NCS. The BSD socket call interface is available for writing network applications in all three environments.

Procedure 3–1 below outlines the steps you should follow to install TCP/IP on your network at SR10. Note that this procedure does not include specific information about installation script prompts or the responses you can make to them. Such information is available

the responses you can make to them. Such information is available from the installation tool and in *Installing Software with Apollo's Release and Installation Tools*. Procedures 3–2 and 3–3 describe how to update network administrative files, depending on your previous environment. Procedure 3–4 describes how to maintain TCP/IP administrative files in a mixed SR10/pre–SR10 environment.

Procedure 3–1. *Installing TCP/IP at SR10*

1. **Select Internet Addresses**
    (New installations only.)

    Select Internet Addresses for all the TCP/IP hosts and gateways on your networks.

    See Chapter 2 of *Configuring and Managing TCP/IP*.

2. **Select TCP/IP Administrative Node(s)**

    In a mixed SR10/pre–SR10 environment, select the TCP/IP administrative node(s) based on the type of TCP/IP layered product running on the pre–SR10 nodes.

    -   Domain TCP/IP (Aegis–only environment):

        Since Domain TCP/IP uses the name–address mapping information in the /sys/tcp directory, you will need **two** administrative nodes. Select one pre–SR10 administrative node to support the pre–SR10 Domain TCP/IP nodes and select one SR10 administrative node to support the SR10 TCP/IP nodes.

    -   Domain/IX BSD4.2 TCP/IP (UNIX environment):

        Since both pre–SR10 Domain/IX and SR10 TCP/IP nodes use the name–address mapping information in /etc/hosts and /etc/networks, you need only **one** administrative node. Select either an SR10 node or an SR9.7 node. We recommend that you do not use a node running an operating system software release earlier than SR9.7.

3. **Back Up TCP/IP Administrative Files**
    (Existing installations only.)

    Copy your existing TCP/IP administrative files. The choice of files to back up depends on your previous environment.

    Domain TCP/IP: **/sys/tcp/hostmap/local.txt**, and **/sys/tcp/hostmap/hosts.txt**.

    Domain/IX TCP/IP: **/etc/hosts, /etc/networks, /etc/gateways**, and **/etc/hosts.equiv**.

4. **Initialize Disks**

    On nodes that will run SR10, initialize their disks, using the SR10 Domain **invol** utility.

5. **Install the SR10 software**

    Install the SR10 software on nodes selected to run it. Refer to *Installing Software with Apollo's Release and Installation Tools* for information about installing SR10 software.

    During the installation you should:

    - Respond "yes" to the query asking if the 4.3BSD TCP/IP Internet utilities should be installed.

    - Enter the pathname to the TCP/IP administrative node you selected in Task 3 above, when prompted. If the administrative node is running at SR9.7, add the **/bsd4.2** directory to the pathname. For example:

        SR10 administrative node: *//node_name*
        SR9.7 administrative node: *//node_name/***bsd4.2**

6. **Copy Backed Up Files**
    (Existing installations only.)

    On the TCP/IP administrative node, log in according to the main host environment specified during installation:

- Log in as **root** in the BSD or SysV environments.

- Log in as **sys.admin** in the Aegis environment.

Then copy or restore the old TCP/IP administrative files to any directory on the administrative node.

7. **Update Administrative Files**

   If you are updating all TCP/IP nodes to SR10, the procedure to update your administrative files depends on your previous environment.

   - Domain/IX TCP/IP users: an update is not necessary if the restore is successful and the existing files **/etc/hosts, /etc /networks, /etc/gateways**, and **/etc/hosts.equiv** are correct and complete.

   - Domain TCP/IP users: follow Procedure 3-2.

   - New TCP/IP users: follow Procedure 3-3.

   If you must maintain a mixed environment and support two administrative nodes, follow Procedure 3-4, Managing Administrative Files in a Mixed Environment, to update the administrative files and configure the administrative node.

8. **Configure Administrative Node**

   If the TCP/IP administrative node was upgraded to SR10, do the following on the administrative node:

   - Delete file links to "tcp_admin" for TCP/IP administrative files in **/etc** directory.

   - Copy administrative files to **/etc** directory.

9. **Configure TCP/IP hosts and gateways**

   For each TCP/IP host and gateway upgraded to SR10:

- If necessary, edit file **/etc/rc.local** to start TCP/IP services. File defaults are sufficient for Domain nodes with one network attachment to either an Apollo Token Ring or an Ethernet. TCP/IP gateways always require additional editing of this file.

- Create empty files in **/etc/daemons** directory for every TCP/IP daemon that should run on node.

- Check that link to "tcp_admin" node is correct. If administrative node is an SR9.7 node, link should be to **//***node_name*/**bsd4.2**, where *node_name* is the name of the administrative node.

For each SR9.7 Domain/IX BSD4.2 TCP/IP host and gateway on a network, create links to the TCP/IP administrative files on the administrative node.

10. Recatalog All SR10 Nodes

TCP/IP host and gateways can use their node names as their default IP names, if they are cataloged correctly on the network.

The following procedure, which was referenced in Task 7 of Procedure 3–1, describes how to update the administrative files **/local.txt** and **/hosts.txt** on an SR10 administrative node for installations previously using Domain TCP/IP.

Procedure 3-2. *Updating Domain TCP/IP Administrative Files*

This procedure assumes you are logged in properly on the SR10 TCP/IP administrative node and have restored **/local.txt** and **/hosts.txt** to the administrative node. If your installation does not maintain a **/hosts.txt** file, skip task 1.

1. **Combine Files /local.txt and /hosts.txt**

    Combine the two files, grouping separately all the network, gateways, and host entries. You may give the resulting file any name.

2. **Set Working Directory to /etc**

    Use the appropriate working directory command for your system environment. For example, in the Aegis environment, use the **wd** command; in the UNIX environment, use the **cd** command.

3. **Run /etc/htable**

    Run the command **/etc/htable** on the file created when you combined **/local.txt** and **/hosts.txt** in Task 1 above. If you skipped Task 1, run **/etc/htable** on **/local.txt**.

    $ **/etc/htable** *file_pathname*

    The command **/etc/htable** creates **/etc/hosts**, **/etc/networks**, and **/etc/gateways**.

    Because your local administrative information was contained in **/local.txt**, you did not need to create three files that **/etc/ htable** looks for; **/localhosts**, **/localnetworks**, and **/local-gateways**. Therefore, when you run **/etc/htable**, you will see the following messages, which you can ignore:

```
Warning, no localhosts file.
Warning, no localgateways file.
Warning, no localnetworks file.
```

4. **Create /etc/hosts.equiv**

   Create the administrative file **/etc/hosts.equiv** manually. See
   Chapter 3 of *Configuring and Managing TCP/IP* for a descrip-
   tion of this and other file formats.

Procedure 3–3 describes, in general steps, how administrative files
may be created for new installations of TCP/IP.

If your installation will not connect to the DARPA Internet, skip tasks 3 and 4.

1. **Set Working Directory to /etc**

   Use the appropriate working directory command for your system environment. For example, in the Aegis environment, use the **wd** command; in the UNIX environment, use the **cd** command.

2. **Create Administrative Files**

   See Chapter 3 of *Configuring and Managing TCP/IP* for more information about these files, including their formats.

   Create the following files:

   /(local)hosts: Contains the name and Internet address of every host on your network system.

   /(local)networks: Contains the name and Internet address of every network within your network system.

   /(local)gateways: Contains static routing information.

   If your installation will **not** connect to the DARPA Internet, name the files /**hosts**, /**networks**, and /**gateways**. Do not perform tasks 3 and 4 below.

   If your installation will connect to the DARPA Internet, name the files /**localhosts**, /**localnetworks**, and /**localgateways** and perform tasks 3 and 4 below.

3. **Create /hosts.txt File**

Create **/hosts.txt** file with the **/etc/gettable** command. See the
BSD Programmers Reference for a description of the **gettable**
utility. Run **gettable** with the host name SRI.NIC.ARPA, as
follows:

$ **/etc/gettable SRI.NIC.ARPA**

The output file from **gettable** is **/hosts.txt**. This file contains
the latest Stanford Research Institute (SRI) Network Informa-
tion Center (NIC) standard host tables in standard file format.

4. **Run /etc/htable**

Run **/etc/htable** on the file **/etc/hosts.txt**.

$ **/etc/htable /etc/hosts.txt**

The command **htable** operates on the input file, **/hosts.txt**,
and also on **/localhosts**, **/localnetworks**, and **/localgateways**,
if they exist, to create three of the TCP/IP administrative files:
/etc/hosts, **/etc/networks**, and **/etc/gateways**.

In mixed network environments where the pre–SR10 nodes are us-
ing the Domain TCP/IP layered product, two administrative nodes
are required. The following procedure describes how to manage
and update the TCP/IP administrative files when you must maintain
two different sets of files.

Procedure 3-4. *Managing Administrative Files in a Mixed Environment*

Domain TCP/IP nodes use files in the **/sys/tcp** directory for name-address mapping. Domain/IX BSD4.2 and SR10 TCP/IP nodes use **/etc/hosts** and **/etc/networks** for name-address mapping. This procedure is designed to help you keep both sets of files current and consistent.

This procedure assumes that Domain TCP/IP is installed and running on an existing network and that only selected TCP/IP nodes are running SR10. For information about configuring and managing pre-SR10 TCP/IP nodes, see the pre-SR10 version of *Configuring and Managing TCP/IP*.

1. **Designate /sys/tcp/hostmap/local.txt as Master Database**

    Use this file on the pre-SR10 Domain TCP/IP administrative node as the master source of all name and address information about nodes on your network. Make all changes to this file only.

2. **Regenerate Pre-SR10 Domain TCP/IP Database**

    Use the **/sys/tcp/hostmap/makehost.sh** Shell script to create the files required by the Domain TCP/IP nodes. These files must reside on the pre-SR10 TCP/IP administrative node and are linked to by pre-SR10 Domain TCP/IP nodes.

3. **Generate SR10 TCP/IP Database**

    Use the **/etc/htable** utility on the SR10 TCP/IP administrative node to create **/etc/hosts** and **/etc/networks** from **/local.txt**. Procedure 3-2 above describes how to do this.

    Create **/etc/hosts.equiv** manually. See Chapter 3 of *Configuring and Managing TCP/IP* for a description of this and other file formats.

4. **Check TCP/IP Nodes' Links**

    Check that the SR10 TCP/IP hosts and gateways have their
    "tcp_admin" link pointing to the SR10 administrative node and
    that the pre–SR10 Domain TCP/IP hosts' and gateways' links
    point to the pre–SR10 administrative node.

    If you also have Domain/IX BSD4.2 TCP/IP nodes on the net-
    work, they should be linked to the administrative node used by
    the SR10 nodes.

5. **Maintain Required Databases**

    When changes must be made to the database, edit only the
    /sys/tcp/hostmap/local.txt file. Do not edit **/etc/hosts** and
    /etc/networks directly.

    Then use **/sys/tcp/hostmap/makehost.sh** to update the pre–
    SR10 Domain TCP/IP database files and **/etc/htable** to update
    the **/etc/hosts** and **/etc/networks** files required by SR10 TCP/
    IP nodes.

Structure of the SR10 TCP/IP Installation

The data files and programs associated with TCP/IP are installed as part of the standard SR10 software installation process. Some of the files usually associated with TCP/IP are always installed, while others are installed only if you request the BSD network extension.

The core TCP/IP subsystem consists of

- **/etc/tcpd**, the TCP/IP server

- **/sys/mgrs/global/tcp**, the loadable TCP/IP trait manager

The remainder of the TCP/IP software is application code. The TCP/IP software is divided into four parts:

- Common to all environments

- BSD environment only

- SysV environment only

- Aegis environment only

The following lists show the common files installed for all three environments, the files installed for the BSD environment, the files installed for the SysV environment, and the files installed for the Aegis environment.

Application programs, such as **ftp** and **telnet**, that are installed for all three environments are functionally identical.

> **NOTE:** In the following lists, the commands and utilities that are always installed as part of the standard software, whether or not you request installation of the BSD network extension, are marked with an asterisk.

The TCP/IP files common for all environments are:

/etc/arp *	/etc/ping
/etc/dtcb	/etc/protocols *
/etc/ftpd	/etc/resolv.conf
/etc/gateways	/etc/rexecd
/etc/gettable	/etc/rlogind
/etc/hostname *	/etc/route *
/etc/hostns	/etc/routed *
/etc/hosts	/etc/rshd
/etc/hosts.equiv	/etc/rwhod
/etc/htable	/etc/services *
/etc/ifconfig *	/etc/syslogd *
/etc/inetd	/etc/tcpd *
/etc/inetd.conf	/etc/telnetd
/etc/mbd	/etc/tftpd
/etc/mkhosts	/etc/trpt
/etc/named	/sys/mgrs/global/tcp
/etc/networks	/sys/node_data/etc/inetd.conf
/etc/nshost	

The additional files installed for the 4.3BSD environment are:

bsd4.3/usr/bin/hostid *	bsd4.3/usr/ucb/rsh
bsd4.3/usr/bin/hostname *	bsd4.3/usr/ucb/ruptime
bsd4.3/usr/bin/rcp	bsd4.3/usr/ucb/rwho
bsd4.3/usr/ucb/ftp	bsd4.3/usr/ucb/telnet
bsd4.3/usr/ucb/logger *	bsd4.3/usr/ucb/tftp
bsd4.3/usr/ucb/netstat *	bsd4.3/usr/ucb/whois *
bsd4.3/usr/ucb/rlogin	

The additional files installed for the SysV environment are:

sys5.3/usr/bin/hostid *	sys5.3/usr/bin/remsh
sys5.3/usr/bin/hostname *	sys5.3/usr/bin/ruptime
sys5.3/usr/bin/rcp	sys5.3/usr/bin/rwho
sys5.3/usr/bin/ftp	sys5.3/usr/bin/telnet
sys5.3/usr/bin/logger *	sys5.3/usr/bin/tftp
sys5.3/usr/bin/netstat *	sys5.3/usr/bin/whois *
sys5.3/usr/bin/rlogin	

The additional files installed for the Aegis environment are:

/com/ftp, /com/tcpstat,* and **/com/telnet.**

For information about changes made in the 4.3BSD network extension and utility programs, see Chapter 5 of this manual. For information about using the application programs, see *Using TCP/IP Network Applications.*

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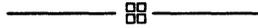
Chapter 4

TCP/IP Administration
at SR10

This chapter discusses issues of network and host administration at
SR10. It also includes a brief description of the name server,
named, and its implications for network administration. The chap-
ter ends with a description of the TCP/IP documentation available
at SR10.

Network Administration

Many aspects of network administration revolve around the types of
administrative files you must maintain and the methods you use to
keep those files accurate and up-to-date. The number of adminis-
trative files required depends on the type of Internet name–Internet
address resolution used by the network system. At SR10, system
administrators can choose one of two systems of name–address
resolution, or they can use a combination of the two. The first sys-
tem, which is familiar to Domain/IX TCP/IP users, is based on the
/etc/hosts file. The second system is based on a name server proc-
ess, **named**, and its related database files.

The following subsections briefly describe the two methods of
name–address resolution and suggest some criteria you can use to
make your choice.

Name–Address Resolution Using /etc/hosts

The **/etc/hosts** file provides host name–Internet address resolution
for network application programs such as **telnet** and **ftp**. The file
/etc/hosts usually is located on the administrative node and is
maintained by the system administrator. Each TCP/IP host then
establishes a link to those files. In the previous chapter, we pro-
vided a procedure for converting your existing **/local.txt** and
/hosts.txt files to **/etc/hosts, /etc/networks,** and **/etc/gateways**
formats.

As the system administrator, you can choose to use **/etc/hosts** as
the source for name–Internet address resolution on your network
system if

- The number of hosts and networks within your network
  system is small enough that maintaining consistency among
  master files across the system is a manageable administra-
  tive task

- Authority for adding, removing, and renaming hosts within
  your system is centralized

Name–Address Resolution Using Named

Named is an implementation of the DARPA Internet Name Resolu-
tion Protocol, which allows distributed authority for accurate nam-
ing information. The name server process provides a mechanism for
translating host and network names into Internet addresses within a
large and loosely related internetwork system and replaces the file
/etc/hosts as the source for name resolution.

Named is designed to simplify internet management since it elimi-
nates the need to maintain an internet–wide **/etc/hosts** file. In-
stead, authority for name/address resolution is distributed across a
system of local databases which **named** can query. **Named** also
solves the problem of managing TCP/IP resources across several ad-
ministratively independent work groups or departments.

When **named** is used, another set of database files is required to provide information to the server about resources in the internet. These files include **/etc/resolv.conf**, which resides on the administrative node, and five other files, which reside on each TCP/IP host and gateway running the name server daemon. More information about these files is available in Chapter 4 of the SR10 version of *Configuring and Managing TCP/IP*. If you decide to run **named**, the utility **/etc/hostns** may be used to convert an existing **/etc/hosts** file into the database files required by the name server.

As the system administrator, you may choose to use **named** as the source for name–Internet address resolution on your network system if

- Users on your network system communicate with remote hosts on ARPANET and/or other DARPA–conforming networks

- The number of hosts and networks within your network system is so large that maintaining consistency among master files across the system is **not** a manageable administrative task

- Authority for adding, removing, and renaming hosts within your system is decentralized

Maintaining Both Systems

Although you can choose **named** as your primary name resolution system, you also need to maintain an **/etc/hosts** file on each local subnet. TCP/IP nodes use **/etc/hosts** when they start up and during operation as a backup for name–address resolution if their name daemon is unavailable. You may also need to maintain a network-wide **/etc/hosts** if you have programs or shell scripts that explicitly reference that file for name–address resolution. The name server conversion utilities **hostns** and **nshost** allow you to maintain current information in either system. **Hostns** converts **/etc/hosts** to the name server database; **nshost** converts the name server database to the **/etc/hosts** format, saving any changes.

Host Administration

Host administration is based on two activities:

1. Editing the TCP/IP portions of the **/etc/rc.local** startup shell script, if necessary, and

2. Creating or deleting daemon files in the **/etc/daemons** directory, which allows users to control which TCP/IP daemons will run on their nodes.

Command lines within **/etc/rc.local** invoke TCP/IP daemons, assign the host's Internet name, and specify the host's network interface(s) and their Internet addresses, among other things. The file is set up so that the default values are sufficient for a TCP/IP host with one network interface and the node can be started without editing its **/etc/rc.local** file. When you are configuring gateways, however, you will have to edit their **/etc/rc.local** files. See Chapter 3 of the SR10 version of *Configuring and Managing TCP/IP* for a complete description of the **/etc/rc.local** file.

The **/etc/rc.local** file is a link to a file of the same name in the 'node_data/etc directory so that diskless nodes can obtain their own files.

By adding or deleting files in the **/etc/daemon** directory, users can control what daemons run on their nodes. See Chapter 3 of *Configuring and Managing TCP/IP* for a description of UNIX daemons and how to invoke and manage them.

Operating in a Mixed SR10 and Pre–SR10 Environment

Hosts running SR10 and those running the pre–SR10 Domain TCP/IP or Domain/IX TCP/IP products can communicate, although there are some compatibility problems, discussed previously in Chapter 3. For example, an SR10 host can establish a **telnet** connection with a pre–SR10 host. However, nodes running software releases earlier than SR9.7 cannot access files on SR10 nodes.

We recommend that you update all your TCP/IP hosts to SR10 because maintaining hosts that start server processes in different ways and that have different sets of utilities and configuration files is likely to be an administrative burden.

In addition, if you choose to run **named** in a mixed SR10/pre–SR10 Domain TCP/IP environment, you will need to maintain three databases: the files **/sys/tcp/hostmap/local.txt** and **/hosts.txt; /etc/hosts, /etc/networks,** and **/etc/gateways;** and the **named** database. To ensure communication between all hosts, these databases must be current and contain consistent information about all hosts.

In a mixed environment, you should make all edits in **/sys/tcp /hostmap/local.txt** and **/hosts.txt,** and then use the **htable** and **hostns** utilities to convert the new information to the other databases. In addition, each time you edit the **/sys/tcp/hostmap /local.txt** or **/hosts.txt** files, you will need to run the pre–SR10 **/sys/tcp/hostmap/makehost.sh** program to create the **/sys/tcp /hosts.hst** and **/sys/tcp/gateways** files on pre–SR10 hosts.

> **NOTE:** We do not recommend using **named** in a mixed SR10/pre–SR10 network environment.

TCP/IP Documentation at SR10

Planning Domain Networks and Internets

This manual provides network configuration specifications for Apollo Token Ring networks, ETHERNET networks, and Domain internets. This manual includes descriptions of the hardware configurations on which SR10 TCP/IP can run.

Configuring and Managing TCP/IP

This manual describes how to configure the software for a TCP/IP network. The manual includes information about assigning network addresses, creating configuration files, and managing and troubleshooting the network. This version is an extensive revision of earlier versions of the manual because the configuration format has changed dramatically at SR10.

This manual describes the 4.3BSD network applications available to all Domain environments. There are approximately 12 such application programs including **telnet** and **ftp**.

These programs are also documented in the BSD on-line manual pages. However, this manual is geared to Aegis and SysV users who might not have access to the Manual Pages.

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Chapter 5

Other SR10 Changes
Affecting TCP/IP

This chapter describes other software issues that will affect users of TCP/IP at SR10. The discussion includes support for raw sockets and additions made to the 4.3BSD UNIX network extension.

Support for Raw Sockets

We introduced support for raw sockets with pre-SR10 TCP/IP Version 3.1 and carried it through to SR10 TCP/IP. Sockets are communication endpoints between processes. They have one or more processes associated with them and can be either a stream, datagram, raw, or sequenced type of socket.

Raw sockets provide access to underlying protocols. Normally, they are datagram oriented, but their exact characteristics depend on the protocol being accessed. Raw sockets are intended to be used in the development of new communication protocols, for gaining access to some of the more unusual facilities of an existing protocol, and for network monitoring and debugging (through the ICMP protocol).

Sockets provide direct access to protocol interfaces. If a socket is created with the Internet Protocol (IP) specified, the socket will

select the IP protocol to use with a returned socket of the type required. A program using such a socket supplies the other IP family protocol headers, without the IP header, on a write and the socket code adds the IP header before sending the packet. The socket code returns the complete protocol header to the program including the IP header on a read.

If a raw socket is opened with the IP protocol specified, the program must supply the complete protocol header, including the IP header, on a write. Reads on such a socket receive the complete protocol header, just like reads on any IP family raw socket.

For example, to write to a raw socket opened for UDP, a program must supply the UDP header as defined in **/usr/include/netinet/udp.h**. On a read, the raw socket opened for UDP will return the IP and UDP headers as defined in **/usr/include/netinet/in.h** and **/usr/include/netinet/udp.h**. The incoming UDP packet is received by all processes with open UDP raw sockets, as well as by any process with an open normal datagram socket.

To open a raw socket, use the socket(2) system call:

> s = socket (AF_INET, SOCK_RAW, proto)

where **AF_INET** specifies the DARPA Internet communication domain for the address format, **SOCK_RAW** specifies a raw type of socket, and **proto** is the the number for the protocol you want to access. Supplying a protocol number of 0 specifies IP family protocols.

An incoming packet for a particular protocol will be delivered to all processes with raw sockets open for that protocol. A raw socket for IP will receive all incoming packets for IP, UDP, TCP, and the other IP family protocols. If an incoming packet is subject to IP fragmentation, the IP checksum is 0xffff.

> **NOTE:** Our TCP/IP implementation supports the raw socket interface for the Internet Protocol family only.

For more information about raw sockets, see the BSD Manual Pages for socket(2), icmp(4p), inetd(4f), ip(4p), and route(8c). Also refer to the BSD Interprocess Communications chapter in the *Domain/OS Programming Environment Reference*.

Changes to 4.3BSD Network Extension

This section describes upward–compatible changes we have made to the 4.3BSD UNIX network extension. This section also lists changes to standard 4.3BSD programs and describes new utilities.

Program Changes

ftpd   Supports **ftp** request for record–structured file transfer through the .**struct** command.

ping   Generates timeout messages.

route   Contains an additional command, **addp,** to add static and priority routes. Priority routes, when present, are always used over other routes. **Route** also flags static routes with *S* (static). **Routed** will not delete routes flagged in this manner by **route.**

routed   Preserves static routes (added with **/etc/route**) and contains additional switches.

                  The −**n** switch directs **routed** not to install changes to the local routing table but to continue to send and receive broadcasts from other **routed** processes.

                  The −**f** switch flushes the routing table at startup.

                  The −**h** switch signals the process to stop after the routing table has stabilized.

rwhod   Contains an additional switch, −**w,** that allows a host to write to the **/usr/spool/rwho** directory, even if the directory is not physically located on that host. The default condition is not to write to the directory unless it is physically located on the node. This switch benefits large internets because it reduces the number of hosts trying to update the **/usr/spool/rwho** files. Typically, in a large network or internet, one node contains the **/usr/spool/rwho** files and all other nodes link to that node. Using the switch allows one node per subnet to update

the (remote) **/usr/spool/rwho** directory. Hosts will then have access to information about all other hosts on the internet.

tftpd   The trivial file transfer protocol daemon. This program is an adaptation of the MIT Project Athena **tftpd**.

netstat   A 4.3BSD program that symbolically displays the contents of various network–related data structures. A **–g** switch has been added to **netstat** to print the first gateway used on a virtual circuit, and a **–T** switch has been added that allows you to print all the information available from **netstat**.

For more information about **route** and **routed**, see *Configuring and Managing TCP/IP*. For more information about the other programs described, see *Using TCP/IP Network Applications*.

New Utilities

We have added the following utilities *not* found in the standard 4.3BSD UNIX implementation.

/etc/dtcb   The pre–SR10 dump–TCP–control–block program moved to user space. This debugging tool helps identify TCP/IP connection problems.

/etc/hostns   The conversion utility for creating the **named** database. This utility operates on **/etc/hosts** to generate five essential name server files.

/etc/nshost   A conversion utility to convert from the **named** database to **/etc/hosts**, saving changes. It reverses the actions of **/etc/hostns**.

/etc/mbd   The pre–SR10 memory–buffer–dump program moved to user space. This utility helps troubleshoot lost–buffer problems.

/etc/tcpd   The TCP/IP server. This new server enables the TCP/IP socket–call interface but does *not* initialize the network interfaces or the gateway table.

/etc/trpt   The pre–SR10 TCP–remote–packet–trace utility
                moved to user space. This utility can enable the
                debug process on a TCP socket, using the **–d**
                switch.

For more information about these utilities, see *Configuring and
Managing TCP/IP*.

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Index

Entries in color indicate task–oriented information.

creating new SR10
    administrative files, 3–9
updating Domain TCP (pre-
    SR10) administrative files,
    3–7 to 3–8
See also **/etc/hosts.txt,**
    /sys/tcp/hostmap/hosts.txt

htable command, *see* **/etc/htable**

I

ifconfig command, *see*
    /etc/ifconfig

inetd utility, *see* **/etc/inetd**

inetd.conf file, *see* **/etc/inetd.conf**

Installing Software with Apollo's
    Release and Installation Tools,
    iv, 3–1, 3–3, 3–4

installing TCP/IP
    at SR10, 3–1
    procedure for, 3–3 to 3–6
    structure of installation, 3–13
        to 3–15

invol utility, 3–4

L

local.txt file
    updating Domain TCP
        (pre-SR10) administrative
        file, 3–7 to 3–8
    See also **/sys/tcp/hostmap**
        /local.txt

localgateways file, *see*
    /etc/localgateways

localhosts file, *see* **/etc/localhosts**

localnetworks file, *see*
    /etc/localnetworks

M

main environment
    choice of, 3–1
    TCP and choice of, 3–2

makehost.sh script, 3–11, 3–12,
    4–5
    See also **/sys/tcp/hostmap**
        /makehost.sh

Making the Transition to SR10
    Operating System Releases, iv,
    3–1

manuals, related
    list of, iv

mbd command, *see* **/etc/mbd**

mixed environment
    operating in, 4–4 to 4–5

mkapr command, v

mkhosts command, *see*
    /etc/mkhosts

N

Name server process, *see*
    /etc/named

Name–address resolution
    methods of, 4–1
    using **/etc/hosts,** 4–2
    using **named,** 4–2

named utility
    criteria for using, 4–1 to 4–3
    database files, 4–3, 4–5
    See also **/etc/named**

netstat command, 3–14
    changes to, 5–4
    See also BSD network
        extension.

network administration, 4–1

'node_data/etc/rc.local
    see **/etc/rc.local**

nshost command, *see* /etc/nshost

P

ping command, *see* /etc/ping
    See also BSD network
        extension

*Planning Domain Networks and
    Internets*, iv

problems, *see* Apollo Product
    Reporting system

Procedures
    Creating New TCP/IP
        Administrative Files, 3-9
        to 3-10
    Installing TCP/IP at SR10, 3-3
        to 3-6
    Managing Administrative Files
        in Mixed Environment,
        3-11 to 3-12
    Updating Domain TCP/IP
        Administrative Files, 3-7
        to 3-8

protocols file, *see* /etc/protocols

R

raw sockets
    support for, 5-1 to 5-2

rc.local file, *see* /etc/rc.local

Reader's Response Form, at back
    of manual

resolv.conf file, *see*
    /etc/resolv.conf

rexecd utility, *see* /etc/rexecd

rlogind utility, *see* /etc/rlogind

route command, *see* /etc/route

See also BSD network
    extension.

routed utility, *see* /etc/routed
    See also BSD network
        extension.

rshd utility, *see* /etc/rshd

ruptime command, *see*
    /etc/ruptime

rwho command, *see* /etc/rwho

rwhod utility, *see* /etc/rwhod
    See also BSD network
        extension.

S

services file, *see* /etc/services

software structure, 3-13
    Aegis environment, 3-15
    BSD environment, 3-14
    common to all environments,
        3-14
    SysV environment, 3-14
    See also main environment

socket
    call interface, iv, 3-2
    raw, 5-1 to 5-2

startup files, *see* /etc/rc.local

suggestions, *see* Apollo Product
    Reporting system, Reader's
    Response Form

/sys/mgr/global/tcp, 3-13

/sys/node_data/network
    Domain TCP functionality vs
        SR10, 2-2
    Domain/IX functionality vs
        SR10, 1-2

/sys/node_data/startup
    Domain TCP functionality vs
        SR10, 2-3

Domain/IX functionality vs
SR10, 1-3

/sys/node_data/thishost, 1-6,
2-6
functionality
Domain TCP vs SR10, 2-2
Domain/IX vs SR10, 1-2
replaced by /etc/ifconfig, 1-5,
2-5

/sys/tcp directory, 1-1, 2-1

/sys/tcp/gateways, 2-2, 2-3
using in mixed environment,
4-5

/sys/tcp/host_addr
Domain TCP functionality vs
SR10, 2-2
Domain/IX functionality vs
SR10, 1-2

/sys/tcp/hostmap directory, 2-1

/sys/tcp/hostmap/hosts.txt
backing up pre-SR10
administrative file, 3-4
input file to makehost.sh, 2-2
using in mixed environment,
3-11, 3-12, 4-5

/sys/tcp/hostmap/local.txt, 2-2
backing up pre-SR10
administrative file, 3-4
Domain TCP functionality vs
SR10, 2-3
input file to makehost.sh, 2-2
using in mixed environment,
3-11, 3-12, 4-5

/sys/tcp/hostmap/makehost.sh,
2-2, 4-5
Domain TCP functionality vs
SR10, 2-3

/sys/tcp/hosts.hst, 2-2, 2-3
using in mixed environment,
4-5

/sys/tcp/makegate, 2-2
replaced by /etc/route, 2-5

/sys/tcp/maphost
functionality
Domain TCP vs SR10, 2-2
Domain/IX vs SR10, 1-2
replaced by /etc/arp, 1-5,
2-5

/sys/tcp/rip_server, 2-3
replaced by /etc/routed, 2-5

/sys/tcp/setroute, 2-2

/sys/tcp/tcp_server
Domain TCP functionality vs
SR10, 2-1, 2-2
Domain/IX functionality vs
SR10, 1-2
replaced by /etc/tcpd, 1-5,
2-5

/sys/tcp/tcpinit, 2-3
replaced by /etc/ifconfig, 1-5,
2-5

T

task comparisons
Domain TCP vs SR10, 2-2 to
2-3
Domain/IX vs SR10, 1-2 to
1-3

TCP daemons, 1-5
and host administration, 4-4

tcpd utility, *see* /etc/tcpd

TCP/IP
changes at SR10, 1, 2, 3
commands, new at SR10, 1-1,
2-1

telnet command, 3-2, 3-13, 4-2,
4-4, 4-6

telnetd utility, *see* /etc/telnetd

tftpd utility, *see* /etc/tftpd
  See also BSD network
      extension.

transition issues
  Domain/IX TCP/IP, 1-1
  Domain TCP/IP, 2-1

trpt command, *see* /etc/trpt

U

UNIX name server, *see*

/etc/named

UNIX network extension, *see*
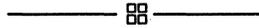   BSD network extension

Using TCP/IP Network
    Applications, iv, 3-15, 4-6,
    5-3

utilities, TCP/IP
    by functional task, 1-2, 2-2
    used for management and
        configuration, 1-5, 2-5

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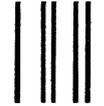   Organization

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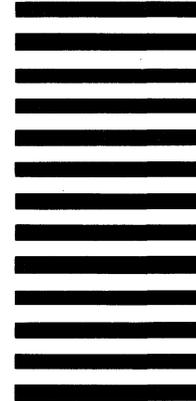
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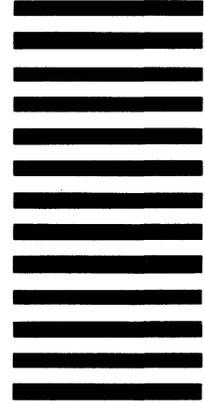   Street Address

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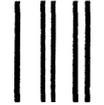section, figure, etc._____
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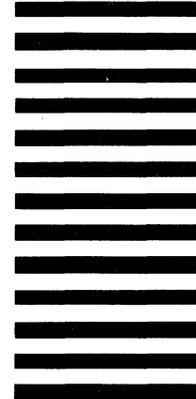
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