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Chapter Overview

This chapter contains information for system administrators (and other experienced users) to use in installing and customizing a telnet system. It describes how to install NCSA Telnet, change the configuration file, the domain name lookup, how to protect FTP transfers with passwords, and discusses compatibility issues.

Installing the Distribution Files

Three files are required for the standard configuration of NCSA Telnet. The combination of these with the use of the DOS path command allows you to call up NCSA Telnet from any subdirectory on your PC.

TELNET.BAT

This batch file begins the execution of NCSA Telnet. It must be in a directory that is in your DOS path. It contains the locations of the TELBIN.EXE and CONFIG.TEL files. You must update this batch file (with any standard editor) when you change the location of TELBIN.EXE or CONFIG.TEL.

TELBIN.EXE

This file is the program itself. You can place it in any directory. The TELNET.BAT file calls up this program when it runs.

CONFIG.TEL

Config.tel is the configuration file that contains your PC's IP address, the kind of Ethernet hardware that you are using, and other information about your network. Gateways, nameservers, and setup information are stored here. The TELNET.BAT file tells TELBIN.EXE where it can find this file on your disk.

Sample Configuration

Suppose you want to install NCSA Telnet in a directory called `\ncsa` on your hard disk drive, drive C. Copy the TELBIN.EXE and CONFIG.TEL files to `C:\ncsa`. Suppose also that you have a particular directory `C:\bat`, which you use to store commonly used batch files. Your DOS path (see DOS manual) contains an entry for `C:\bat` already. Copy the TELNET.BAT file into `C:\bat`. You must now edit the TELNET.BAT file to update the locations of the TELBIN.EXE and CONFIG.TEL files. When finished, it should look something like this:

```

if .%1 == . goto defh
c:\ncsa\telbin -h c:\ncsa\config.tel %1 %2 %3 %4 %5
goto exith
:defh
c:\ncsa\telbin -h c:\ncsa\config.tel ncsab
:exith

```

This batch file calls up TELBIN.EXE at a known location and passes it the `-h` parameter, indicating the location of the CONFIG.TEL file. In addition to the file locations, the fifth line indicates which machine NCSA Telnet should connect to by default.

Required Configuration Information

To set up a new configuration file, you will need a standard text editor. The template provided with NCSA Telnet is set up to reflect commonly used default values. It may be worth the time to go through the list of configuration options in this chapter and fine-tune your configuration to match your local computing situation more closely. In the meantime, you *must* install the following fields in the configuration file for NCSA Telnet to operate.

<u>Field</u>	<u>Meaning</u>
myip=192.17.20.10 network. IP computer.	You must provide a unique IP address for each machine on your addresses must be installed in the configuration file of each computer.
netmask=255.255.255.0 using subnets on	This field is the subnet mask, (in decimal), and is required if you are using subnets on your network.
hardware=3C501 adapters. the for a be	NCSA Telnet can support several different brands of Ethernet adapters. Each brand has its own unique identifier which you must set for hardware parameter. See the hardware section in this chapter for a complete list of settings. Most brands also require address and ioaddr to be set.
video=ega provide the NCSA Telnet.	If you wish to use the Tektronix graphics options, you must correct screen type. Incorrectly installed, this option can crash NCSA Telnet. The alternative is to install the tek=no option. Legal types are cga, ega, hercules, no9, mono, ega43, vga50.
gateway=1 one option	If you are going to be using gateways to reach other networks, at least one machine must be designated as a gateway, using this gateway option after the name field. The entry for each

gateway must include a hostip field, according to the configuration file directions in this chapter.

The TELNET.BAT File

The actual .exe file that the PC executes is not named telnet.exe. A batch file called TELNET.BAT loads the software in several steps that are normally transparent to you. Here is a typical entry in TELNET.BAT:

```
C:\>\apps\telbin -h c:\apps\config.tel %1 %2 %3 %4
```

The TELNET.BAT file, which must be in the DOS path, specifies completely where the program is and where the configuration file is found. If you do not explicitly specify a machine name, the system connects to a previously assigned default machine name.

Command Line Options

NCSA Telnet goes through two stages as you load it. The program first finds the TELNET.BAT. (This file must be in the DOS path so it can be found first.) Secondly, in the batch file, the location of the TELBIN.EXE file and any command line defaults are used to call up the program. We've included many command line arguments for you in the batch file, TELNET.BAT; you can add others when you run the telnet batch file. This following command gives a full description of those options. The syntax for loading NCSA Telnet with options is:

```
C:\> telnet [options] [machine1 machine2 ...]
```

The options must precede the list of machine names on the command line. You may order the options in any way, but you must include the parameters for each option. Include one space between the options and between each option and the parameter for that option. The options are:

<u>Option</u>	<u>Function</u>
? summary version	Shows command line options. This option causes NCSA Telnet to display a summary version of the command line options instead of initiating the program.
-c colorcode and follows the	Sets the default color for screens. The colorcode string is six digits long and follows the coding scheme documented later in this chapter.
-h filename TELNET.BAT, configuration file there or on the default directory, or you must	Specifies where to find the configuration file. Normally, this option is included in TELNET.BAT, and you never have to use it explicitly. If you do not specify the command line, there must be a file named CONFIG.TEL in the default directory, or you must set an environment variable named CONFIG.TEL

according to	to your configuration file. If a suitable configuration file cannot be found these rules, NCSA Telnet terminates.
file resided in the AUTO.EXEC.BAT file:	<p>For example, if you name your configuration file directory C:\APPS, you would put the following "TELNET.CFG", and the command in your</p> <pre>"set CONFIG.TEL=C:\APPS\TELNET.CFG"</pre> <p>NOTE: <i>filename</i> should include a pathname. For example,</p> <pre>C:\bat\config.tel</pre>
filename isn't available, it the directories specified	<p>NCSA Telnet uses the filename specified for the -h parameter first. If that first looks in an environment variable, then the current directory, then all by the "PATH" environment variable in order to find the filename.</p>
-s allows you to	<p>Enters server mode. NCSA Telnet waits for external FTP and rcp requests. It leave your PC and access files there from a remote machine.</p>
-t to screen speed, but makes windowing programs, use the -t the CONFIG.TEL file	<p>Disables direct writes to the screen. Without the -t option, NCSA Telnet defaults writing directly to screen memory. This option greatly enhances the NCSA Telnet incompatible with Topview, Microsoft Windows, and other systems. To make NCSA Telnet completely compatible with BIOS-level option. You can install this option permanently in the TELNET.BAT file or (bios option).</p>

The Configuration File

Overview

The configuration file contains information on local operating parameters (such as which type of graphics screen your PC has, and your IP number), plus a list of commonly accessed hosts and optional network tuning parameters for each of those hosts.

The configuration file is accessed once when the program is initiated and is not used again. The program reads all of the machine names into memory, so it may save memory to limit the number of computers you specify in the file.

The configuration file is typically named CONFIG.TEL. If this file is in the default directory, it will be found automatically, but the use of the -h flag in the TELNET.BAT file is recommended.

Syntax for Entries

The configuration file is a list of keywords and values for those keywords. The one overall requirement for the entries in the file is that they alternate, keyword then value, keyword then value, and so on. There are many different formats possible using any of the allowable delimiters. The delimiters are the colon (:), semicolon (;), equal sign (=), and any of the whitespace characters. To include delimiters in a value field, enclose the field in double quotes. Quotes cannot be a part of the actual data field. Wherever a pound sign (#) is found, everything from there to the end of line is a comment. Though you can use multiple formats in the same file, you will probably want to find and keep a consistent format. For example, each of the entries in Figure 7.1 specify the same information.

Note that Figure 7.1.c is not a recommended format, but is included to show how strange an entry may look.

Figure 7.1.a **Displaying the Same Information in Different Entry Formats**

```
name=nic      # comment field to end of line ->
host=sri-nic.arpa
hostip=10.0.0.51
scrollback=300
contime=60
```

Figure 7.1.b

```
name=nic; host=sri-nic.arpa; hostip="10.0.0.51"; scrollback=300; contime=60
```

Figure 7.1.c

```
name
nic
host sri-nic.arpa : hostip=10.0.0.51; scrollback=300; contime:60
```

PC Information Entries

The first entries in the configuration file are the PC environment entries. They specify what types of hardware are to be used, the names of graphics output files, and the network configuration information. Following is a list of these entries:

Entry

Meaning

address=d000

entered as four hex digits, address=d000, is the segment address of the Ethernet board's shared memory. The address only applies to boards that have jumpers or registers which can be used to set the shared memory address. After setting the board's jumpers to a particular value, use the address parameter to configure NCSA Telnet with the same setting. d000 (hex) is a common address to use and it rarely conflicts with other boards.

<u>Entry</u>	<u>Meaning</u>
arptime=3	specifies how long to try to reach a host on the local wire, in ticks, where 18.2 ticks is equivalent to one second. A value of 20 works fine for the network at NCSA, but larger values may be needed for hosts that are slow to respond. Smaller values are more convenient to use.
autoscroll=yes	specifies whether the screen continues to scroll in scrollback mode when the cursor reaches the top of the screen or not. (It will only scroll up one line if this option is off.) Default is yes.
beep=yes	specifies whether the musical note symbol will appear in a session's indicator box when NCSA Telnet receives a "beep" character. This command is useful for alert conditions.
bios=no	indicates NCSA Telnet has two screen-writing modes. One is direct-to-screen (bios=no) which is considerably faster on most machines. The other uses BIOS (bios=yes) and follows the IBM BIOS conventions at all times. BIOS mode makes NCSA Telnet compatible with popular windowing systems and can reduce the amount of flicker and snow on the screens of IBM CGA-equipped systems.
broadcast=255.255.255. messages.	specifies the network address to use 255.255.255.255 for broadcast messages.
capfile=	specifies a name for the capture file. For example, <div style="text-align: center;">capfile ="c:\temp\myfile"</div> When you capture to disk, all data is appended to this file. If no name is included in the configuration file, "capfile" is used by default.
capfile=prn	specifies that the printer device (PRN) should be used for the capture file.
clock=on	specifies that the clock should be displayed on the status line. Default is clock=on.
concolor=431070	specifies the colors used in the console window.

<u>Entry</u>	<u>Meaning</u>
<code>cursorbottom=8</code>	specifies the bottom of the cursor block using a number from 0 to 15.
<code>cursorstop=11</code>	specifies the top of the cursor block using a number from 0 to 15.
<code>domain="ncsa.uiuc.edu"</code>	affects hostname lookups which are sent to the domain nameserver. All names which do not contain a period have the default domain appended before the nameserver request goes out. If the hostname you type contains a period, then the name is unmodified before NCSA Telnet sends it to the nameserver. There is no "ring-down" or multiple lookup feature to try more than one form of the name.
<code>domainretry=4</code>	specifies number of times to query domain nameserver(s). Each time a retry is sent, the timeout value (above) is doubled. Each time a retry occurs, NCSA Telnet tries the next nameserver, wrapping around to the first nameserver when there are no more.
<code>domaintime=20</code>	specifies time in ticks to wait between the first domain lookup and the second. If you only have one nameserver, then this is the same as a simple timeout. If you want to rotate nameservers quickly because the first one may be down, set this to a smaller number. To force a larger number of retries, set this to a smaller number. To wait longer for a domain response, increase this value.
<code>ftp=yes</code>	enables FTP serving by default. Access to your PC can be controlled by the FTP password file. To disable FTP serving completely, change this line to ftp=no .
<code>hardware=3C501</code>	specifies that NCSA Telnet can support several different brands of Ethernet adapters. Each brand has its own unique identifier which must be set for the hardware parameter. See the hardware section in this chapter for a complete list of settings.
<code>hpfile=COM1</code>	sends HPGL plotter codes directly to the plotter, as long as a HP plotter hooked up to your PC. Use the mode command to preconfigure the serial port first.
<code>hpfile=hp.out</code>	dumps Tektronix graphics to a file in several formats from the Graphics menu.

When you write out HPGL (HP plotter) codes, this file name is used. For example,

```
hpfile="c:\hpgrafts\hp.out"
```

The default is hp.out in the current directory.

interrupt=3	specifies several choices for interrupt vector on the Ethernet board. NCSA Telnet defaults to IRQ3, but can be set to use different interrupts by indicating the interrupt number here. Match this number with the interrupt setting from your Ethernet board.
ioaddr=360	specifies the I/O base address of the Ethernet board in hex. Some Ethernet boards have selectable I/O addresses. These generally range from 200 to 400 (hex) and must be entered as two, three, or four digits.
keyfile=filename	specifies an additional keyboard mapping file to provide move key definitions. This file over-rides the definitions in the telnet.key file.
myip=BOOTP	indicates that this entry is a special form of the myip entry. Setting myip to BOOTP will cause NCSA Telnet to query a BOOTP server to get its IP address.
myip=RARP	indicates that this entry is a special form of the myip entry. Setting myip to RARP will cause NCSA Telnet to query a RARP server to get its IP address. See the section on RARP in this chapter.
myip=10.0.0.51	specifies the IP address to use for the PC. This number must contain all four parts of the IP address. This field is required.
myname="hawkind. ncsa.uiuc.edu"	specifies the network name used to identify the PC on the network.
netmask=255.255.255.0	specifies the subnet mask for your local network. It is optional for networks without subnets.
outputfile=filename	specifies that this entry is the same as keyfile option, except it specifies the output mapping file to over-ride the default telnet.out mappings.

<u>Entry</u>	<u>Meaning</u>
passfile=	<p>specifies the file in which FTP usernames and passwords can be found. For example,</p> <pre style="margin-left: 40px;">passfile="c:\bat\ftppass"</pre> <p>No default name exists for this file. If the file is specified, then FTP will require a username and password for all attempted FTP connections. If the file is not specified, then there is no password checking for FTP. Use the program TELPASS.EXE to encrypt new passwords. See the FTP Password Protection section later in this chapter.</p>
psfile=ps.out	<p>prints PostScript commands to several types of available laser printers. NCSA Telnet's PostScript output has been tested on the Apple (Sun) LaserWriter, which is connected to Sun workstations. The default filename is ps.out in the current directory.</p>
rcp=yes	<p>specifies that rcp serving is enabled by default. To disable rcp serving, change this line to rcp=no.</p>
tek=yes	<p>specifies there is no overhead to unused Tektronix graphics emulation. However, you may wish to disable graphics support. tek=no will disable Tektronix graphics emulation.</p>
tekfile=tek.out	<p>specifies the filename to use when you write Tektronix codes to disk. The default name is tek.out. Tektronix 4014 graphics commands are a very compact way to store a Tektronix graphics image.</p>
video=ega	<p>specifies Tektronix 4014 graphics emulation is included in NCSA Telnet for a variety of video devices. Supported are: hercules (Hercules monochrome graphics), cga (IBM and compatibles original Color Graphics Adapter), ega (IBM Enhanced Graphics Adapter and compatibles), ega 43 (ega 43 - line mode), vga 50 (vga 50 - line mode) and no9 (Number Nine Computer's Revolution 512 x 8 board).</p>
windowgoaway=yes	<p>specifies that a session doesn't wait for a keypress after it has been closed. This defaults to windowgoaway=no.</p>

Entry**Meaning****wire=thin**

specifies which type of ethernet cable to use on the ethernet board. Options are thin and thick. Use this command only for 3Com3C503 ethernet cards.

Host-Specific Parameters

Following the PC configuration options, you may specify zero or more hosts, and host-specific information for each host. By making the host entries in the configuration file, you can specify color, backspace, scrollbar, connection timeout, and several tuning parameters for each host. You may want to have more than one session name associated with a single computer, such as *purple cray* and *red cray* with different screen colors to fit your mood of the day.

Typically, the first host listed will be `name=default`, which stores the default values for the other hosts. Any keyword listed under later hosts will override the default setting for that host session.

NOTE: The keyword `name` is special because it separates entries.

The parameters following `name` up to the next keyword `name` are all associated with the session name. The parameters are installed whenever a connection is opened with that session name.

Entry**Meaning****copyfrom=nic**

copies all unspecified parameters from a previous session name. Note that the session name which you want to reference with `copyfrom` must appear before the session name that uses a `copyfrom` directive. Parameters that are specified for a session name along with a `copyfrom` directive override that `copyfrom` directive.

clearsave=yes

updates scrollbar when the screen is cleared. When clearing the screen, all of the visible lines are saved into the scrollbar region. If you prefer not to have the text saved when the screen clears, set **clearsave=no**. In the case of host programs which clear the screen one line at a time, the lines are never saved into the scrollbar region.

contime=10

gives the connection timeout in seconds. When you are making a connection attempt, after this amount of time has elapsed NCSA Telnet gives up on opening the connection and deletes the window. For congested or slow networks, this value should be made larger.

<u>Entry</u>	<u>Meaning</u>
<code>crmap=4.3BSDCRNUL</code>	specifies a special compatibility option for 4.3 BSD UNIX. Now, a UNIX bug fix to take care of the problem, but some hosts may still want <code>crnul</code> to be used for end-of-line. The default is <code>crmap=crlf</code> , which sends CRLF when you press RETURN. In line mode, CRLF is always used.
<code>duplex=half</code>	applies only to hosts that negotiate non-echoing mode and does not expect local line editing. All character keys are sent and echoed to the screen immediately. This parameter has no effect in echo mode.
<code>erase=delete</code>	sets the backspace translation for this host. Some hosts prefer the backspace key to be DELETE and some prefer the backspace key to be BACKSPACE. Set this value <code>erase=delete</code> or <code>erase=backspace</code> .
<code>gateway=1</code>	specifies the gateway precedence for this host. To reach hosts not connected to your local network, you must have at least one gateway entry. The <code>hostip</code> keyword must be present for this host. Gateway numbers must start at 1 and increase by ones. Gateway 1 has the highest precedence, but the first gateway to respond to an ARP will be used. ICMP redirects can affect how gateways are used, but not permanently.
<code>host=sri-nic.arpa</code>	specifies the hostname or alternate name. If you want to associate both a session name and a hostname with a particular set of parameters, you may include both. Note that the name parameter is required, while the host parameter is optional. The rule of thumb is: When you have only a hostname, insert it as <code>name=hostname</code> . If you have both a session name and a hostname, enter both <code>name=sessionname</code> and <code>host=hostname</code> . When you want to open a new connection, either <code>hostname</code> or <code>sessionname</code> works.
<code>hostip=10.0.0.51</code>	gives the IP address of the host. If this is not present, the domain nameserver must be queried to get the IP number of the host. For efficiency, include the IP addresses of all commonly accessed hosts. IP addresses of gateways and nameservers must be in the configuration file.

maxseg=512	gives a byte count (1-1024) of the largest TCP segment that can be received. This value can control the size of packets that are sent over the connection. Reducing this value can eliminate IP fragmentation that we cannot reassemble. maxseg=512 should force the sending host to never fragment.
mtu=512	specifies a byte count (1-1024) of the largest amount of data to put in the packets that are sent. If you are sending to the ARPANET you should use <code>mtu=512</code> . If you are sending to local hosts, you should use <code>mtu=1024</code> .
name=nic	specifies the name that you want to appear on the bottom line of the screen when the connection opens. It is the primary name associated with a list of parameters. It is common to have more than one session name for a host, each with different parameters, perhaps with different colors or different amounts of scrollbar. This parameter is required because it separates entries.
nameserver=1	specifies the nameserver precedence for this host. NCSA Telnet uses UDP to query domain nameservers for machinenames that are not in the configuration file. Each machine that is to be used as a nameserver must have this keyword listed. The <code>hostip</code> keyword must be present for this host. Nameserver 1 has the highest precedence. Nameserver numbers must start at 1 and increase by ones.
nfcolor=white	specifies a normal, foreground
nbcolor=black	specifies a normal, background
rfcolor=black	specifies a reverse, foreground
rbcolor=white	specifies a reverse, background
ufcolor=blue	specifies a underline, foreground
ubcolor=black	specifies a underline, background

You can use these new color options instead of the more complicated color code from previous versions. For each value, specify a string from the following list of colors available on IBM-PC class machines with color displays:

Also for machines with EGA or better graphics adapters, the following colors are available:

BLACK
BLUE
GREEN
CYAN
RED
MAGENTA
YELLOW
WHITE

The colors are in all caps, and for the foreground colors they are the highlighted version of the lowercase colors. For background colors, they make the foreground blink.

The foreground and background colors are combined to create the text appearance on the screen. You may wish to experiment with the Parameter menu (Chapter 3), which interactively allows you to select a color scheme. The previous version's color= entries are still supported.

retrans=7

gives the initial retransmit timeout in 18ths of a second. Increasing the value of this parameter may help in reducing the initial burst of retries that is typical of connections with high round-trip times.

rwin=512

gives a byte count (1-4096) of the largest size of the TCP window to advertise to other hosts. Unfortunately, some hardware and networks, the 3COM 3C501 Etherlink for example, cannot handle receiving back-to-back packets. This situation requires us to limit the TCP receive window that we advertise to other hosts. For communicating to slower hosts, or when using the other brands of Ethernet boards, a larger window (4096) may work better.

scrollback=100

specifies the number of lines of scrollback for this session. Be aware that scrollback occupies at least 86 bytes per line saved. There can be a different number of lines of scrollback for each session. Plan your use of scrollback wisely unless you have memory to spare.

Converting UNIX /etc/hosts Files

Included with the NCSA Telnet distribution is an `awk` script called `newh`. Used with the following command under 4.X BSD UNIX, it will convert the `/etc/hosts` file format into a format compatible with NCSA Telnet's configuration file. Note that domain name lookup should make this operation obsolete, or apply to only a small subset of your `/etc/hosts` file.

```
% awk -f newh /etc/hosts >config.temp
```

After creating this new file, prepend the PC-specific information and download the file to the PC.

Hardware Options

Combined Ethernet Drivers

Only one distribution program for NCSA Telnet Version 2.3 exists. All of the Ethernet and video device drivers are combined into one executable program. You must use the `hardware` entry in the configuration file to inform NCSA Telnet which Ethernet board you have installed. Choose from the list of supported Ethernet boards in Table 7.1; the value to use is case insensitive. The requirements for `interrupt`, `address`, and `ioaddr` entries in the configuration file are listed.

Table 7.1 Ethernet Boards Supported by NCSA Telnet

<u>Value</u>	<u>Ethernet Board</u>	<u>Requires</u>
For PC bus		
3C501	3COM 3C501 Etherlink	interrupt,ioaddr
3c503 ioaddr, wire	3COM3C503	interrupt, address, ioaddr
3c505 ioaddr	3COM 3C505	interrupt, address, ioaddr
atalk interrupt,	PCAppletalk Card	(software) address, ioaddr
bicc	BICC 411x Ethernet Cards	interrupt, address, ioaddr
decnet ioaddr	DEC Decnet Protocol	interrupt, address, ioaddr
NI5210	MICOM NI5210	interrupt, address, ioaddr
packet **also for PS/2 MCA Bus	Any packet driver	interrupt
PCNIC	Ungermann-Bass PC-NIC or IBM Baseband adapter	address,ioaddr
starlan	AT&T Starlan IO Card	address, oiaddr
WD8003	Western Digital WD8003	address,ioaddr

Table 7.1 Ethernet Boards Supported by NCSA Telnet (continued)

Value	Ethernet Board	Requires
WD8003e	Western Digital WD80033e	address, iaddr
For PS/2 MCA bus		
NICps2	Ungermann-Bass NICps/2	address
3C523	3COM 3C523 Etherlink/MC	address, iaddr
WD8003a	Western Digital WD8003a	address, iaddr

Performance Tuning

The values of `maxseg`, `mtu` and `rwin` in the configuration file must be set correctly to get maximum data transfer throughput between machines. Some rules of thumb to use when setting these values include the following:

- The maximum reasonable values for these parameters are:
`rwin=4096`
`mtu=1024`
`maxseg=1024`
- The best setting for local network use, with a high performance Ethernet board is:
`rwin=4096`
`mtu=1024`
`maxseg=1024`
- The best setting for ARPANET use, or any situation with a lot of unknown gateways, but with a high performance Ethernet board is:
`rwin=4096`
`mtu=512`
`maxseg=512`
- The setting required for the 3COM 3C501, and any other troublesome network situation, also the most conservative setting, is:
`rwin=512`
`mtu=512`
`maxseg=512`

`rwin` specifies what the other computer is allowed to send you at any one time, so it depends mostly upon your local Ethernet board. If the board can handle it, always set `rwin=4096`. `maxseg` is used to avoid fragmentation. If you get fragmented packets, lower the value of `maxseg` for that host until fragmentation stops occurring.

RARP for Dynamic IP Address Assignment

When the following special form of the `myip` entry is used, `myip=RARP`, NCSA Telnet looks up your local machine's IP address with a broadcast request to the network. The "Reverse Address Resolution Protocol" is used to attempt to translate the local machine's assigned 48-bit Ethernet address to a corresponding IP address. From our tests with the RARP server from Sun Microsystems' SunOS 3.X, the RARP lookup takes about 3 seconds. You must install the 48-bit Ethernet address from each PC in the RARP hosts' tables before RARP will work. The value of `arptime`, in seconds, multiplied by three, is used for a timeout value.

NOTE: Sun's RARP lookup will not work if you have a double-zero in your Ethernet address. Other leading zeros can be dropped as well. Use a single zero, i.e. `8:0:20:1:5a:90`, instead of `08:00:20:01:5a:90`.

BOOTP for Dynamic IP Address Assignment

The Bootp process, `myip=RARP`, closely resembles the RARP process. For instance, the former performs the same function as RARP by getting an IP number from a Bootp server which has the PC's Ethernet address registered in the Bootp Host table. Bootp and RARP time-out procedures are also the same.

Appletalk Hardware

Using an Appletalk network involves some special considerations. First, you must load the Appletalk driver into memory. Version 1.0 of the "ATALK.EXE" driver was used in the development of NCSA Telnet.

The second consideration involves the "interrupt=" line. The "interrupt=" line in your CONFIG.TEL line refers to the software interrupt the Appletalk driver is using, not the hardware interrupt the card is set to. For example, if your Appletalk card is set to IRG2, you would not set the "interrupt=" line to "2". Instead, the value should be set to the software interrupt, usually "interrupt=60" or "interrupt=5C".

Static IP addressing does not work at the current time in NCSA Telnet 2.3 using the Appletalk driver. Therefore, NCSA Telnet ignores any IP address you set in your CONFIG.TEL file, and assigns an IP address to your PC by the Appletalk gateway.

There has been no success in getting the Appletalk packet driver to work with NCSA Telnet. In addition, NCSA Telnet has not been tested with Appletalk cards for MicroChannel machines, such as IBM's PS/2 line.

Interrupts

When you configure the 3COM hardware, an important option is the choice of interrupt request number (level). 3COM boards arrive set for IRQ3, which corresponds to the PC-DOS definition of the COM2 communications port. If you have a port configured as COM2, you cannot set your Ethernet board to IRQ3. Another common value to use is IRQ5, which is the same interrupt that DOS uses for LPT2. Make sure that your PC hardware configuration does not conflict in any way.

Interrupt Conflicts

The most common hardware problem is interrupt conflicts. PCs have a limited number of interrupts, and you cannot have two devices which expect to use the same interrupt. PC Ethernet boards almost always consume an interrupt, even though we do not use interrupts for all Ethernet boards. Interrupts are also used by COM ports and LPT ports in your machine. You must check for conflicts.

Intermittant Interrupts

Interrupt conflicts don't always show up right away. They are software controlled. If you do not activate the interrupt on your COM2 port, it may not conflict with a 3C501 board on IRQ3 until next week when you try to use a modem terminal emulator and then switch to NCSA Telnet. NCSA Telnet might work fine until you try to FTP to your hard disk; then disaster strikes.

Interrupts on Hard Disks

Hard disks use interrupts too. We have traced two serious hard disk problems to interrupt conflicts. IRQ2 is the default setting for some Ethernet boards when they come out of the box. On a PC-AT, this interrupt is used for the second drive controller, and a conflict can shut off the whole second controller which includes the hard disk. On the PC/XT and PC compatible computers, IRQ5 is sometimes assigned to the hard disk rather than LPT2. Strange hard disk problems like disk write errors may be caused by the Ethernet conflicting with the hard disk.

Moral: Set your Ethernet board to an unused interrupt.

Domain Name Lookup

When NCSA Telnet cannot find a name in the configuration file, it can still find the IP number if you are running a domain nameserver. To use the domain system, at least one host must be running the nameserver and the configuration file must have a `nameserver` entry for that host. There may be more than one. If one nameserver fails to respond, the one with the next higher precedence is queried. As soon as a response is received, NCSA

Telnet will add its name to the status line and attempt to open a telnet connection.

When you enter a name to open a connection, NCSA Telnet follows specific search order:

1. It looks up the name as a session name from the configuration file.
2. It looks up the name as a hostname from the configuration file.
3. It sends the name as a domain query to the first nameserver.
4. If the domain request times out, the program repeats the query, but to another nameserver. NCSA Telnet repeats this process until it reaches the maximum number of retries or receives a response.

With the domain nameserver, the number of hosts in the configuration file can be kept to a minimum. Each host in the configuration file will be a commonly used computer that may have special screen color or scrollback requirements. The IP addresses for rarely used hosts will be accessible if the domain name retrieval system can resolve those hosts.

FTP Password Protection

The presence of the `passfile` keyword in the configuration file enables FTP password protection. If you have a password file, FTP will not allow any FTP connections to open without a correct username and password. You can have several usernames and individual passwords for each user. The password file can be easily read by typing out the file. The passwords are encrypted, but not with a secure encryption system. Only trusted users should be allowed access to the password file.

NOTE: Precautionary measures are especially important now that the FTP server allows the person connected to the PC to create and remove directories and files.

To create or change passwords for users, run a separate program called `Telpass`. This program reads in the password file so you can add and change users and passwords. There are no special installation instructions for `Telpass` as it is menu-driven. Start up `Telpass` from DOS with the name of the password file that you wish to edit.

```
C:\ telpass pwfile
```

`Telpass` automatically saves the list of names and passwords when you exit. Just add a `passfile` option to your configuration file to enable FTP passwords.

Compatibility Notes

Ping

NCSA Telnet responds to ping (ICMP echo) requests. Other hosts use this command by other hosts to determine whether your PC is online.

VT102

The VT102 emulator is nearly complete. VT102 features not emulated are double width and double height characters, VT52 mode, origin mode for cursor positioning, and 132 column mode. Included in the emulator are variable spaced tabs, graphics characters, keypad modes, and character attributes.

FTP

The FTP server in NCSA Telnet is close to the DARPA specification of the minimum implementation. Exceptions are the following:

- The command connection does not perform telnet negotiation.
- The block mode of FTP is not supported.
- Some error conditions may display as `command not understood` instead of returning more appropriate messages.

FTP has not been thoroughly tested on low-bandwidth or low-reliability networks. It should be most successful on local networks, with unknown throughput for long-haul or satellite networks.

Terminate and Stay Resident (TSR) Programs

Programs such as SideKick from Borland International Inc. take complete control of the PC when they are initiated with key sequences. The use of these programs does not crash NCSA Telnet, but it suspends the network communications capability while the TSR program is active. When network communications are suspended, whether from the ALT-E DOS escape feature or from using TSR programs, it takes the host approximately one minute to decide that your PC has crashed, and then it cuts you off. As long as these programs are used for short (less than 30 seconds) intervals, you should have no problem.

NCSA Telnet

The standard telnet protocol has several potential options that can be invoked if both parties of the telnet connection agree. NCSA Telnet refuses most of these options, but accepts the following: `echo`, option 1; `suppress go ahead`, option 3; `termtype`, option 24; `NAWS` (Negotiate About Window Size), option 31; and `Linemode`, option 34. Some obscure features of NCSA Telnet are not implemented in this version: out-of-band interrupts are not available, go ahead signals do nothing, and telnet acknowledge signals are not acknowledged. If there are any problems with the limitations of NCSA Telnet, please submit a bug report.

Limitations

There is a 20-session limit for NCSA Telnet. This limit is somewhat arbitrary and may be altered if there appears to be a need for it. NCSA Telnet can run out of memory, often before the 20-session limit. You are notified on the screen if this happens.