CHAPTER 9
Internetwork Printing with TCP/IP
Users on any Microsoft networking computer can print to direct-connect TCP/IP printers or to
printers that are physically attached to UNIX computers if at least one Windows NT computer
has Microsoft TCP~IP~/lP printing installed.
Microsoft TCP~/IP printing conforms with Request for Comment (RFC) 1179.
This chapter describes how to create a TCP~IP~/lP printer when TCP~/IP is installed on ~1~a
Windows NT computer and how to print to a Windows NT print server from a UNIX computer.
The topics in this chapter include:
~1~'_Overview of TCP~/IP printing
~1~l_Setting up Windows NT for TCP/IP printing
~1~l_Creating a printer for TCP~/IP printing
~1~l_Printing to Windows NT from UNIX clients
For complete information about working with printers, see Chapter 6, "Print Manager," in the ~Windows~
Vwndows NT System Guide.
Overview of TCPnP Printing
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In a Windows NT internetwork with multiple kinds of computers and operating systems, users
can take advantage of Microsoft TCP/IP to easily print to computers that are connected
through a UNIX computer or that are connected directly to the network (via ~abuilt~a built-in network
adapter card or through a serial/parallel ethernet print server).
Such an internetwork might ~include~inciude computers running Windows NT Workstation and
Windows NT Server, plus computers with only Microsoft Windows for Workgroups 3.11 or
MS-DOS with ~IAN~LAN Manager networking software.
To take advantage of the printing capabilities of Microsoft TCP/IP, only the single Windows NT
computer that defines ~aTCP~a TCP/IP printer needs to have TCP/IP installed. The other client
computers do not need to have TCP/IP installed. All other computers can print to the TCP/IP
printers over any protocol they share with the Windows NT TCP/IP print server. That is, the
computer acting as the Windows NT TCP/~IP~lP print ~server~sen/er must be configured with all protocols
used by any clients that will be printing to the TCP~/IP printer.
Any Windows NT computer with TCP/IP printing ~installed~instalied can print directly to these ~kinds~Kinds of

printers and can function as a gateway for other network users.
In the following sample configuration of a Microsoft network, all computers can connect to
printers named \\nt\~~pl~~p1 and \\nt\p2 on the network. The Windows NT computer with Microsoft
TCP/~~IP~~lP installed created these TCP/IP printers, which consist of a direct-connect printer and a
printer connected to a UNIX computer. The Windows NT computer with TCP/IP is named nt in
this example, and the printers are named ~~pl~~p1 and p2, respectively.
p1 printer
~~11.101.9.99~~

~~Windows for~~
~~Workgroups 3.11~~
~~NetBEUI~~
~~NWI..ink~~
~~Macintosh~~
~~AppletaM!~~
11.101993
{<3E=~1
W0|'kgDLp83.11 11.101.1411
He1BEUl '*~+/
N'U`ll'l-1nk UWrdDv8l|T
H&iBEU|
N'UU'Li k TCP.fPpa%I M8 938 Ma__ Osh
cl
8 Prin'er jclb pppiatg;
Printing to TCP~~+~~/IP or UNIX Printers Using Microsoft TCP/IP
~~Chapter 9 Internetwork Printing with TCPnP~~
lnternetwork Printing with TCP/IP
Ovewiew of TCP/IP Printing
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Ms~u6`éf
LN! Mmaga'
Wir'\dowa HT
mnith TG PMP
TCPH P
NMEEUI
Nw' Link
p2 printer
48:4
N36 EU! NV'
Wrndovxs for
'm 1
"**~» 8 2 'um |}{

Setting Up Windows NT for TCP/IP Printing
Any Windows NT computer can be used to create ~~aTCP~~a TCP/IP printer if Microsoft
TCP~~+~~/IP is
installed with TCP~~+~~/IP printing support.
~~.__~~To configure a Windows NT computer for TCP/IP printing
1.   Start the Network option in Control Panel. When the Network Settings
dialog box appears,

choose the Add Software button to display the Add Network Software dialog box.
2.   Select TCP~~+~~/IP Protocol And Related Components in the Network Software list box, and
then choose the Continue button.
3.   In the Windows NT TCP~~+~~/IP ~~Installation~~Instailation Options ~~dialog~~diaiog box, check the TCP/IP Network
Printing Support option.
If Microsoft ~~TCPIIP~~TCP/IP is not already installed on this ~~computer~~Computer, check the other options you
want, as described in Chapter 2, "Installing and Configuring Microsoft TCP/IP and SNMP."
4.   Choose the OK button. Windows NT Setup displays a message asking for the full path to
the Windows NT distribution files. Provide the appropriate location, and ~~choose~~Choose the
Continue button.
All necessary files are copied to your hard disk.
5. ~~Ifthe~~lf the Enable Automatic DHCP Configuration option is not checked in the Windows NT
TCP/IP ~~Installation~~installation Options dialog box, you must complete all the required procedures for
manually configuring TCP/IP as described in "Configuring ~~TCPliP~~TCP/lP" in Chapter 2.
When the Network Settings dialog box reappears after you finish configuring TCP/IP,
choose the Close button, and then restart your computer for the changes to take effect.
You can now create a TCP~~+~~/IP printer on this Windows NT computer.
~~Creating aPrinter for TCPnP~~lnternetwork Printing with TCP/IP 3of5

Printer game:
Qriver:
Dgscription:
Print to:
Qhare this
»' . =s . .
i*iiizi" 24£i¥?;,
i aei:4zi=azri.
SUNUS_LPR
Adobe LaserJet II Cartridge V52.3
LPT3:
C0 M1
COM 2
C0 M3
CO M4
FILE:
| | -
You can use Print Manager to create ~~aTCP+~~a TCP/IP printer in the same way that you create any
printer to be used on a Windows NT network. You need the following information to create a
TCP~~+IP~~/lP printer:
•

l The IP identifier of the host where the printer is connected. This can be the DNS name or
the IP address. A direct-connect printer has its own IP identifier. For a printer connected to
a UNIX computer, this is the computer's IP identifier.

l The printer name as it is identified on the host. This is the name defined on the UNIX
computer or the name defined by the manufacturer for the direct-connect printer.
The computer where you create the TCP/IP printer must have TCP/IP installed and configured
with the TCP/IP Network Printing Support option, as described in Chapter 2.
To create a ~~TCP/IP~~TCPIIP printer
1. From the Printer menu in Print Manager, choose Create Printer.
~~D!Scription:~~
~~Print !o:~~
~~LPT3:~~

~~0 Share tla COM1:~~
~~COM2:~~
~~COM3:~~
~~Sh·e Name: COM4:~~
~~location: FILE:~~
2.   In the Printer Name box of the Create Printer dialog box, type a name of up to 32
characters. This name appears in the title bar of the printer window, and Windows NT
users see this name when connecting to this printer if it is shared.
This name can be the same as the printer name as it is identified on the printer's UNIX
host, but it does not have to be.
For a direct-connect printer, see the hardware documentation to find the name by which
the network printer identifies the print queue.
3.   In the Driver list, select the appropriate driver and, optionally, type text to inform network
users about the printer in the Description box.
4.   In the Print To box, select Other to display the Print Destinations dialog box.
lnternetwork Printing with TCP/IP
Creating a Printer for TCP/IP Printing

~~, Print Destinations~~
1 -4 |4l=\M¢¥*lnMYWr:PHm1m'*A| n mm
I
~~Available~~gyailable Print Monitors~~:~~
~~H·····dN·Poo~~
~~LocaiPoo~~
Hewlett-Packard Network Port
Local Port
~~LPRMoritor~~ LPR M onitor

Other...
! l ame or address of host providing lpd:
Name of pginlel on that machine:
.1mu1mu1al an manuals |.|1||11m1|1|| | * " "
koti.microsoft.com
SUN_LASEF!
5.

~~6.~~

~~7.~~

~~8.~~

~~Chapter 9 - Internetwork Printing with TCPnP 18i~~ In the Available Print
Destinations ~~list~~iist, select LPR Print Monitor, and then choose OK.
~~Add lPR compallltla printer~~

~~!!. 01 addren ol host PfOViding lpd: ._lkot_i._lllic_ro_solt_._cDII_____.~~
~~I oa I~~
~~NaM ol P!:inler on thai 11achine: ISUN_l.ASER   I c..~. ·1~~
~~I t1e1J I~~
6. In the Name Or Address Of Host Providing LPD box of the Add LPR Compatible
Printer
dialog box, type the DNS name or IP address of the host for the printer you
are adding.
This can be the DNS name or ~~1P~~IP address of the direct-connect TCP~~+~~/IP printer
or of the
UNIX computer to which the printer is connected. The DNS name can be the name
specified for the host in the HOSTS ~~tile~~file.
LPR stands for Line Printing utility, and LPD stands for Line Printing Daemon,
which is how
these elements are known on UNIX.
7. In the Name Of Printer On That Machine box, type the name of the printer
as it is identified
by the host, which is either the direct-connect printer itself or the UNIX
computer.
For example, you might have a UNIX computer running the print server component
(~~lpd~~Ipd)
with which the TCP~~+~~/IP printer you are creating will interact. ~~H~~If lpd
recognizes a printer
attached to the UNIX computer by the name Crisp, the name you should type in
this box is
Crisp.
For ~~adirect~~a direct-connect printer, this is whatever name was used to create
the ~~printe~~printer while
running ~~lpd.~~ Ipd.
8. When the Create Printer dialog box reappears, check the Share This Printer
On The
Network option if this definition is being created on a Windows NT computer
that will serve
as a print server for other users to access this printer.

Create Printer

Printm M.~: ._jsu_N_os__LPR_____.l l till· I
'JAOObe Las erJ_et_II_Car tridge_v5_2_.3   ,J .}.1 I ·.'J
Q.rive1:
I Set!l)i;; I

D~scription:
I Detaift.~)
y-
L

Printer l;l_ame:
_D_.river:
Dgscription:
Print !o: IKDTIMICROSOFTCOM SUN LASER 1!1 ISl!ti!ttttt J to:
rzl £8 5 hare this printmprinter on the network ---, I 11● I
Sh~e Na~~e: ILPR_pmt
~=========~
Shqre Name:
Lpcanonz
SUNOS_LPH
Adobe_LaserJet_II_Cartridge_V52.3
K0T|.w1|m:H0s0FT.c0M;suN_msEH
LPH_pmt
!,ocation: ._/Bklg-=--2_Rm_1_27_8_____J Bldq2FIm1278
9.   By default, in the Share Name box, Printer Manager creates ashareda shared resource name that
is compatible with MS-DOS basedDOSbased computers. You can edit this name, which users willwiii see
when browsing to find this printer on the network.
10. Optionally, in the Location box, you can type information about where this printer is located.
Users can see this location information when they connect to the printer.
11. Complete any other configuration information in the Create Printer dialog box, as described
in Chapter 6 of the WindowsVwndows NT System Guide, and then choose the OK button.
In Print Manager, the printer name you specified in the Create Printer dialog box appears in the
title bar of the printer's window. For client computers configured with Microsoft Network Client
version 2.0 for MS-OOSDOS, users willWill see only the shared name, not the printer name. Users who
connect to this TCP⁺/IP printer can select it and print to it from applications like any other printer.
Users and administrators can use Print Manager to secure and audit the use of the printer and
change its properties.

4.
Erinter Qucument Qptions §ecurity indow Help
3lJF\lOS   F'Fi Ready Ducuments wait
8 ql! 8 Default SUN|]S_LPH 2

U U Status Priority
..U...3.9.no|.a.m9....I5.a|.m.tbr.u.3h..-....Ur*1t.|.te=d]...........£'u3
m|.n|s.tr.a.|...5...2.?.t5tv1. 1 .1 .
D ocumenl N ame Owner Printed at Pages Size
Tip
You can use the lpr connectivity utility at the command prompt to print ~~afile~~a file to a host running
an LPD server. You can also use the lpq diagnostic utility to obtain the status of a print queue
on a host running the LPD server. For information, see the entries for lpr and ~~lpq~~Ipq in
Chapter 11, "Utilities Reference."

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Printing to Windows NT from UNIX Clients
The Lpdsvc service is the server side of TCP/IP printing for UNIX clients. ~~If~~lf any UNIX clients on
the network want to print to a printer connected to a Windows NT computer, this service needs
to be running on the Windows NT computer so it can accept requests from the UNIX clients.
The Lpdsvc service supports any print format, including plain-text. It does not perform any
additional processing.
~~II>~~ To start or stop the Lpdsvc service
• At the command prompt, type net start ~~lpdsve~~Ipdsvc or net stop ~~lpdsve~~Ipdsvc and press ~~ENTER~~Enter.
—Or—
In Control Panel, choose the Services option. Then select ~~Lpdsve~~Lpdsvo in the Service list and
choose the Start button.
On the UNIX computer, you can use the Windows NT printer by typing a command such as the
following:
lpr -S ~~NTHost -P LpdPrinter myfile.txt~~ NTHosf -P LpdPrinfer myHle.fxf
Where:

• ~~NTHost~~l NTI-lost is the Windows NT Server running the Lpdsvc service. This Windows NT
computer should be listed in the HOSTS file on the UNIX computer or on the DNS server.

• ~~LpdPrinter~~l l_pdPrinfer is the name of the printer created on ~~NTHost~~NTHosf.

• ~~myfile. txt~~l myHle.fXf is the file to be printed.
The Lpdsvc service is independent of the Lprmon service. The Lprmon service runs
automatically to allow a Windows NT computer (and all clients who can access this computer)
to print to a printer connected to a UNIX system, as described in the previous section.

Troubleshooting TCP/IP
The following diagnostic utilities included with Microsoft TCP/~~IP~~lP can be used to ~~tind~~find solutions to
TCP/IP networking problems.
Utility Usage
~~arp View the ARP (address resolution protocol) table on the local computer to detect invalid entries.~~
~~hostname Print the name of the current host.~~
~~ipconfig Display current TCP/IP network configuration values, and update or release TCP/IP network configuration values.~~
~~nbtstat Check the state of current NetBIOS over TCP/IP connections, update the LMHOSTS cache, and determine the registered name and scope ID.~~
~~netstat Display protocol statistics and the state of current TCPIIP connections.~~
~~ping Verify whether TCP/IP is configured correctly and that a remote TCP!IP system is available.~~
tracert Check the route to a remote system.
For complete details about the utilities included with Windows NT, see Chapter 11, "Utilities
Reference." See also the online Command Reference.
These other Windows NT tools can be used for TCP/IP troubleshooting:
~~1~~l Microsoft SNMP service, to supply statistical information to SNMP management systems,
as described in Chapter 2, "Installing Microsoft TCP~~!IP~~/lP and SNMP."
~~1~~l Event ~~Viewf;!r~~Viewer, to track errors and events, as described in ~~the~~tne
Event Viewer chapter in the
System Guide.
~~1~~l Performance Monitor, to analyze TCP/IP, FTP, and WINS server performance, as
described in Chapter 8, "Using Performance Monitor with TCP/IP Services." (Microsoft
SNMP must be installed if you want to monitor TCP/IP.)
~~1~~l Registry Editor, to browse and edit Registry parameters, as described in
~~README.WRI in your \systemroot directory.~~ README WRI in
your \sysfemroot directory.
Chapter 10 1of9
arp View the ARP (address resolution protocol) table on the local computer to
detect invalid entries.
hostname Print the name of the current host.
ipconfig Display current TCP/IP network configuration values, and update or release
TCP/IP network configuration values.
n btstat Check the state of current NetBIOS over TCP/IP connections, update the
LMHOSTS cache, and determine the registered name and scope ID.
netstat Display protocol statistics and the state of current TCP/IP connections.
ping Verify whether TCP/IP is configured correctly and that a remote TCP/IP system is available.

Troubleshooting IP Configuration
If you have trouble installing Microsoft TCP/IP on your computer, follow the suggestions in the
error messages. You can also use the ping utility to isolate network hardware problems and
incompatible configurations, allowing you to verify ~~aphysical~~a physical connection to a remote computer.
Use the ping utility to test both the host name and the IP address of the host. For the syntax
and description of the ping command, see Chapter 11, "Utilities Reference."
~~Ill>~~ To test TCP/IP using the ping utility
1. ~~Ifthe~~lf the computer was configured using DHCP, use ipconfig to learn the IP address.
2.   Use ping to check the loopback address by typing ping 127.0.0.1 and pressing ENTER at
the command prompt. The computer should respond immediately.
~~If~~lf ping is not found or the command fails, check the event log with Event Viewer and look
for problems reported by Setup or the TCP/IP service.
3.   To determine whether you configured IP properly, use ping with the IP address of your
computer, your default gateway, and a remote host.
If you cannot use ping successfully at any point, check the following:
1
~~The computer was restarted after TCPJIP was installed and configured~~
1
The ~~local~~!ocaI computer's IP address is valid and appears ~~correctly~~correcdy in the TCP/IP Configuration
dialog box 1
The IP address of the default gateway and remote host are correct
1
IP routing is enabled and the link between routers is operational
~~Ifyou~~If you can use ping to connect to other Windows NT computers on a different subnet but
cannot connect through File Manager or with net use ~~I\server~~\\se/ver\share, check the following:
1
The computer is WINS-enabled (if the network includes WINS servers).
1
~~The~~Tne WINS server addresses are correct, and ~~the~~tne WINS servers are functioning.
1
The correct computer name was used.
1
The target host uses NetBIOS. ~~Ifnot~~If not, you must use FTP or Telnet to make a connection~~;~~. in
this case, the target host must be configured with the FTP server daemon or Telnet server
daemon, and you must have correct permissions on the target host.
~~Chapter 1 0 Troubleshooting TCPnP~~
~~1~~ The scope ID on the target host is the same as the local computer.
~~1 Arouter~~A router exists between your system and the target system.

1 LMHOSTS contains correct entries, so that the computer name can be resolved. For more
information, see "Troubleshooting Name Resolution Problems" later in this chapter.
1 TheTlwe computer is not configured to use WINS. W|NS

Troubleshooting IP Configuration
Troubleshooting Name Resolution Problems
Iflf the IP address responds but the host name does not when you use ping, you have a name
resolution problem. In this case, use the following lists of common problems in name resolution
to find solutions.
Name Resolution Problems in HOSTS
These problems can occur because of errors relatedre!ated to the HOSTS file:
1l The HOSTS file or DNS do not contain the particular host name.
1' The host name in the HOSTS file or in the command is misspelled or uses different
capitalization. (Host names are case-sensitive.)
1l An invalid IP address is entered for the host name in the HOSTS file.
1' The HOSTS file contains multiple entries for the same host on separate lines.
1
Amapping' A mapping for a computer name-to-IP address was mistakenly added to the HOSTS file
(rather than LMHOSTS).
Name Resolution Problems in LMHOSTSLNIHOSTS
These problems can occur because of errors related to the LMHOSTS file:
1' The LMHOSTS file does not contain an entry for the remote server.
1' The computer name in LMHOSTS is misspelled. (Notice that LMHOSTS names are converted to uppercase.)
1l The IP address for acomputera computer name in LMHOSTS is not valid.
Troubleshooting TCP/IP 3of9

ra
Troubleshooting IP Configuration
Troubleshooting Other Connection Problems
In addition to ping, the other diagnostic utilities such as netstat and nbtstat can be used to
find and resolve connection problems. Although this is not a complete list, these examples
show how you might use these utilities to track down problems on the network.
... 8* To determine the cause of Error 53 when connecting to a server
1.   If the computer is on the local subnet, confirm that the name is spelled correctly and that
the target computer is running TCP/IP as well. If the computer is not on the local subnet,
be sure that its name and IP address mapping are available in the LMHOSTS file or the
WINS database.
Error 53 is returned if name resolution fails for a particular computer name.
2.   If all TCP/IP elements appear to be installed properly, use ping with the remote computer
to be sure that its TCP/IPlP software is working.

... * To determine the cause of long connect times after adding to LMHOSTS
- Because this behavior can occur with a large LMHOSTS file with an entry at the end of the
file, mark the entry in LMHOSTS as a preloaded entry by following ~~the~~tne mapping with the
#PRE tag. Then use the nbtstat -R command to update the local name cache immediately.
—Or—
Place the mapping higher in the LMHOSTS file.
As discussed in Chapter 6, the LMHOSTS file is parsed sequentially to locate entries
without the #PRE keyword. Therefore, you should place frequently used entries near the
top of the file and place the #PRE entries near the bottom.
... 9 To determine the cause of connection problems when specifying a ~~server~~sewer name
- —' Use the nbtstat -n command to determine what name the server registered on the
network.
The output of this command lists several names that the computer has
registered. ~~Aname~~ A name
resembling the computer's computer name should be present. If not, try one of the other
unique names displayed by nbtstat.
The nbtstat utility can also be used to display the cached entries for remote computers
from either #PRE entries in LMHOSTS or recently resolved names. ~~If~~lf the name the remote
computers are using for the server is the same, and the other computers are on a remote
subnet, be sure that they have the computer's mapping in their LMHOSTS files.
~~Chapter 10 Troubleshooting TCPnP~~
~~Ill>~~ * To determine why only IP addresses work for connections to foreign systems but not
host names
~~I.~~ 1. Make sure that the appropriate HOSTS file and DNS setup have been configured for ~~the~~tne
computer by checking the host name resolution configuration using the Network
icon in ~~Control Panel and then choosing the DNS button in the TCP!IP~~
~~Configuration dialog box.~~
Troubleshooting TCP/IP 4of9

2.
3.
Control Panel and then choosing the DNS button in the TCP/IP Configuration
dialog box.
If you are using a HOSTS file, make sure that the name of the remote computer is spelled
the same and capitalized the same ~~in~~ln the file and by the application using it.

~~3.~~
If you are using DNS, be sure that the IP addresses of the DNS servers are correct and in

the proper order. Use ping with the remote computer by typing both the host name and IP
address to determine whether the host name is being resolved properly.
~~Ill>~~ To determine why a TCP/IP connection to a remote computer is not working properly
• Use the netstat -a command to show the status of all activity on TCP and UDP ports on
the ~~local~~local computer~~.~~,
The state of a good TCP connection is usually established with 0 bytes in the send and
receive queues. ~~If~~If data is blocked in either queue or if the state is irregular, there is
probably a problem with the connection. ~~If~~If not, you are probably experiencing network or
application delay.
~~Troubleshooting Other Problems~~

This section presents some possible TCP~~+~~/IP symptoms with recommendations for using the
diagnostic utilities to determine the source of the problems.
Troubleshooting TCP/IP
Troubleshooting Other Problems
5of ~~the problems.~~ 9

Troubleshooting Other Problems
Troubleshooting the FTP Server Service
~~Ill>~~ To determine whether the ~~FfP Server~~FTP Sewer service is installed correctly
• Use ftp on the local computer by typing the IP loopback address from the command line~~,~~,
for example, type ftp 127.0.0.1 and press ENTER.
The interaction with the server locally is identical to the interaction expected for other
Windows NT (and most ~~UNIX~~UNlX) clients. You can also use this utility to determine whether
the directories, permissions, and so on are configured properly for the FTP Server service.
Troubleshooting TCP/IP 6of9

Troubleshooting Other Problems
Troubleshooting Telnet
~~tJo~~ To determine why the banner ~~displayed~~disdplayed with Telnet identifies a different computer, even
when specifying the correct IP ~~address~~a dress
1. Make sure the DNS name and hosts table are up to date.
2. Make sure that two computers on the same network are not mistakenly configured with the
same IP address.
The ~~ethemet~~ethernet and IP address mapping is done by the ARP (address resolution protocol)
module, which believes the first response it receives. Therefore, the impostor computer's
reply sometimes comes back before the intended computer's reply.

These problems are difficult to isolate and track down. Use the arp -g ~~command~~commend to display
the mappings in the ARP cache. ~~Ifyou~~If you know the ~~ethemet~~ethernet address for the intended remote
computer, you can easily determine whether the two match. If not, use arp -d to delete the
entry, then use ping with the same address (forcing an ARP), and check the ~~ethemet~~ethernet
address in the cache again by using arp ~~-~~-g.
Chances are that if both computers are on the same network, you will eventually get a
different response. If not, you may have to ~~ftlter~~filter the traffic from the impostor host to
determine the owner or location of the system.

Troubleshooting Other Problems
Troubleshooting Gateways
~~tJo~~To determine the cause of the message, "Your default gateway does not belong to one
of the configured interfaces~~•.•~~.." during Setup
~~•~~' Find out whether the default gateway is located on the same logical network as the
computer's network adapter by comparing the network ID portion of the default gateway's ~~IP~~
lP address with the network ~~ID~~lD(s) of any of the computer's network adapters.
For example, ~~acomputer~~a computer with ~~asingle~~a single network adapter configured with an IP address of
102.54.0.1 and a subnet mask of 255.255.0.0 would require that the default gateway be of
the form 102.54.a.b because the network ID portion of the IP interface is ~~102.54.~~10254.
~~Chapter 10 Troubleshooting TCPnP~~
Troubleshooting TCP/IP 8of9

Troubleshooting TCPIIP Database Files
The ~~following~~foliowing UNIX-style database files are stored in the \~~systemroot~~sysfemroot
\SYSTEM32\~~DRIVERS~~DR|VERS\ETC when you install Microsoft TCP/IP:
Filename   Use
~~HOSTS   Provides hostname-to-IP address resolution for Windows Sockets applications~~
~~LMHOSTS   Provides NetBIOS name-to-IP address resolution for Windows networking~~
~~NETWORKS   Provides network name to network ID resolution for TCP/IP management~~
~~PROTOCOLS Provides protocol name to protocoliD resolution for Windows Sockets applications~~
~~SERVICES   Provides service name to port ID resolution for Windows Sockets applications~~
To troubleshoot any of these files on a local computer:
~~•~~

l Make sure the format of entries in each file matches the format defined in the sample file
originally installed with Microsoft TCP/~~IP~~lP.

• ⸻

' Check for spelling or capitalization errors.

• ⸻

l Check for invalid IP addresses and identifiers.

~~II \ I' I I· R l l~~
~~!·~~
7
HOSTS Provides hostname-to-IP address resolution for Windows Sockets applications
LMHOSTS
NETWORKS
Provides NetBIOS name-to-IP address resolution for Windows networking
Provides network name-to-network ID resolution for TCP/IP management
PRQTQCQLS Provides protocol name-to-protocol ID resolution for Windows Sockets
applications
SERWCES Provides service name-to-port ID resolution for Windows Sockets applications

~~Utilities~~Ut|Iities Reference
This chapter is a reference for using Microsoft TCP/~~IP~~lP utilities~~.~~, which provide diagnostic and
connectivity utilities for network and connectivity administration. ~~I'IH:se~~These client utilities ~~are~~are
provided for file transfer~~.~~, terminal emulation~~.~~, and network diagnostics. Besides the connectivity
support built into Windows NT~~.~~, some third~~-~~-party vendors ~~are~~are developing advanced connectivity
utilities ~~such~~sucn as X Window ~~-ervers.~~servers, Network File System (NFS) implementations~~.~~, and so on.
~~l›iagnostic COIIIIIIf11/ils hdp~~Diagnostic commands help you detect TCP/IP networking problems. ~~('onnectirity mnmw1uls~~Connectivity commands
allow users to interact with and ~~use~~use resources on non-Microsoft hosts ~~\UCh~~such as UNIX
workstations. The following commands ~~are~~are included:
• ⸻

l Diagnostic commands: arp~~.~~, hostname~~.~~, ipconfig~~.~~, lpq~~.~~, nbtstat~~.~~, netstat~~.~~, ping~~.~~, route~~.~~, and
tracert

• ⸻

l Connectivity commands: finger~~.~~, ftp~~. lpr. rep~~, Ipr, rcp, rexec~~.~~, rsh~~.~~, telnet~~.~~, and tftp
Important
The ftp~~.~~, ftpsvc~~.~~, rexec~~.~~, and telnet utilities all ~~relv~~rely on password ~~:ntthcntication~~authentication by the remote

computer. Passwords ~~arc~~are not encrypted before being ~~\ent~~sent over the network. This allows
another user ~~c4uippcd~~equipped with a network analyzer on the same network to steal a user's remote
account password. For this reason~~.~~, it is ~~1rongly~~strongly recommended that users of these utilities
choose different passwords for their Windows NT workgroup~~. \vorkstation.~~, workstation, or domain from the
passwords used on ~~\ystems~~systems they are connecting to that ~~arc~~are not Microsoft systems. All
passwords used ~~hy~~by Windows networking services are encrypted.
~~.,.~~ To get help on ~~TCP/IP~~TCPIIP utilities
~~•~~' At the command ~~promp~~prompt, type the command name with ~~-~~-?. For example, type nbtstat ~~-~~-? to
get help on this ~~command~~commend.
~~Or~~
1. In the Program Manager Main group, double-click the Windows NT Help icon.
2. In the Windows NT Help window, click the Command Reference Help button.
3. In the Commands window~~, click~~. Click a command name.
~~Or~~
Choose the Search button in the Command Reference window, and then type a command
name in the box or select ~~acommand~~a command name from the list.
Note
Switches used in the syntax for TCP/IP commands are case-sensitive. For example, for nbtstat
, the switch ~~-~~-R ~~has~~Iwes a different effect from the -r switch.
~~arp~~
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This diagnostic command displays and modifies the IP-to-Ethernet or Token Ring physical
address translation tables used by the Address Resolution Protocol (ARP).
Syntax
arp ~~-~~-a ~~{~~{inet_addr] [~~-~~-N [if_addr]] arp ~~-~~-d inet_addr [if_addr] arp ~~-S~~-s inet__addr ether_addr [if__addr]
Parameters
-a
Displays current ARP entries by querying TCP/~~IP. Ifinet_addr~~lP. lfinegaddr is specified, only the IP and
physical addresses for the specified computer are displayed.
~~-~~-d
Deletes the entry specified by ~~inet_addr~~inegaddr.
-s
Adds an entry in the ARP cache to associate the IP address ~~inet~~ine addr with the physical
address ether_addr. The physical address is given as 6 hexadecimal bytes separated by
hyphens. The IP address is specified using dotted decimal notation. The entry is
permanent, that is, it ~~will~~Will not be automatically removed from the cache after the timeout
expires.
-N [if_addr]

Displays the ARP entries for the network interface specified by if_addr.

~~ether~~ efher_addr
Specifies a physical address.
if~~_~~ addr
Specifies, if present, the ~~lP~~IP address of the interface whose address translation table should
be modified. If not present, the first applicable interface will be used.
~~inet~~ine addr
Specifies an IP address in dotted decimal notation.

This connectivity command displays information about a user on ~~aspecified~~a specified system running
the Finger service. Output varies based on the remote system.
Syntax
finger [-I] [user]@~~host~~hosf [...~~]~~ ~~J~~
Parameters
-I
Displays information in long list format~~,~~, not supported on all remote systems.
user
Specifies the user you want information about. Omit the user parameter to display
information about ~~all~~ali users on the specified host.
@~~host~~ hosf
Specifies the host name or the IP address of the remote system whose users you want
information about.

This connectivity command transfers files to and from ~~acomputer~~a computer running an ~~ITP service~~FTP sen/ice. Ftp
can be used interactively or by processing ASCII text files.
Syntax
ftp [~~-~~-v] [~~-~~-n] [~~-~~-i] [~~-~~-d] [~~-~~-g] [host] [-s: ~~filename~~Hlename]
Parameters
-v
~~-V~~Suppresses display of remote server responses.
~~-D~~ -n
Suppresses autologon upon initial connection.
-i
Turns off interactive prompting during multiple file transfers.
-d
Enables debugging, displaying all ftp commands passed between the client and server.

'Q

~~-g Disables~~Dlsables filename globbing, which permits the use of wildcard characters in local file and
path names. (See the glob command in the online Command Reference.)
host
Specifies the host name or IP address of the remote host to connect to.
-s: ~~filename~~Hlename
Specifies a text file containing ftp commands~~,~~, the commands ~~will~~wi!!
automatically run after ftp
starts. Use this switch instead of redirection (>).
The following table shows the ftp commands available when the ~~FfP~~FTP service is installed on a
Windows NT computer. For details about syntax for individual ftp commands, choose the ftp
commands topic in the Commands list in Command Reference.
FTP Commands in Windows NT
Command Purpose
i Runs the specified command on the local computer.
~~?~~ '2 Displays descriptions for ftp commands. ? is identical to help.
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append Appends a local file to ~~afile~~a file on the remote computer using the current file type setting.
ascii Sets the file transfer type to ASCII, which is the default.
bell Toggles a bell to ring after each file transfer command is completed. By default, the bell is off.
binary
bye
cd
Sets the file transfer type to binary.
~~bye~~ Ends the ~~FfP~~FTP session with the remote computer and exits ftp.
~~cd~~ Changes the working directory on the remote computer.
close Ends the ~~FfP~~FTP session with the remote server and returns to the command interpreter.
debug Toggles debugging. When debugging is on, each command sent to the remote computer is printed, preceded by the string --->. By
default, debugging is off~~.~~.

delete ~~Deletes files on remote computers.~~
dir ~~Displays a list of a remote directory's files and subdirectories.~~

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~~-IPCommands in Windows NT (continued)~~
~~Command~~ disconnect
get
glob
hash
help ~~led~~
lcd
literal
~~Is~~ ls
mdelete

```
mdir
mget
mkdir
mls
mput
open
prompt
put
pwd
quit
quote
recv
```
remotehelp
rename
rmdir
send
status
trace
type
user
Deletes files on remote computers.
Displays a list of a remote directory's files and subdirectories.
~~Purpose~~ Disconnects from the remote computer, retaining the ftp prompt.
Copies a remote file to the local computer using the current file transfer type.
Toggles ~~filename~~fiiename globbing. Globbing permits use of wildcard characters in local ~~file~~me or path names. By default, globbing is on.
Toggles hash-sign (#) printing for each data ~~block~~biock transferred. The size of ~~adata~~a data block is 2048 bytes. By default, hash-sign printing is off.
Displays descriptions for ftp commands.
Changes the working directory on the local computer. By default, the current directory on the local computer is used.
Sends arguments, verbatim, to the remote FTP server. ~~Asingle~~A single FTP reply code is expected in return.
Displays an abbreviated list of a remote directory's files and subdirectories.
Deletes files on remote computers.
Displays a list of a remote directory's files and subdirectories. Mdir allows you to specify multiple files.
Copies remote files to the local computer using the current file transfer type.
Creates a remote directory.
Displays an abbreviated list of a remote directory's ~~files~~fiies and subdirectories.
Copies local files to the remote computer using the current file transfer type.
Connects to the specified FTP server.
Toggles prompting. Ftp prompts during multiple file transfers to allow you to selectively retrieve or store files~~,~~, mget and mput transfer all files if prompting ~~is~~ls turned off. By default, prompting is on.
Copies ~~alocal~~a local file to the remote computer using the current file transfer type.
Displays the current directory on the remote computer.

Ends the FTP session with the remote computer and exits ftp.
Sends arguments, verbatim, to the remote FTP server. ~~Asingle~~A single FTP
reply code is expected in return. Quote is ~~identical~~identicai to literal.
Copies a remote file to the local computer using the current file
transfer type. Recv is identical to get.
~~FTP Commands in Windows NT (continued)~~
~~Command   Purpose~~
~~remotehelp~~ Displays help for remote commands.
~~rename~~ Renames remote files.
~~rmdir~~ Deletes a remote directory.
~~send~~ Copies a local file to the remote computer using the current ~~file~~ fue
transfer type. Send is identical to put.
~~status~~ Displays the current status of ~~ITP~~FTP connections and toggles.
~~trace~~ Toggles packet tracing; trace displays ~~the~~tlwe route of each packet
when
running an ftp command.
~~type~~ Sets or displays the file transfer type.
~~user~~ Specifies a user to the remote computer.

verbose Toggles verbose mode. If on, ~~aJI~~all ftp responses are displayed; when
a
file transfer completes, statistics regarding the efficiency of the
transfer are also displayed. By default, verbose is on.

This diagnostic command prints the name of the current host.
Syntax
hostname
Troubleshooting TCP/IP
~~This diagnostic command prints the name of the current host. Syntax~~ hostname
~~Chapter 11 Util·ies Reference 205~~
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C=\users\def ault} ipconfig /all

~~1~~
Windows NT IP Configuration Uersion 1.8
Host Name : a-apearsB.microsof t.com
DNS Servers : 8.8.8.8
DNS Lookup Urder
Node Type . : HNode
NetBIOS Scope ID.
IP Routing Enabled... : No
WINS Proxy Enabled.. : Yes
WINS Resolution For Windows Sockets Rpplications
DNS Resolution For Windows Networking Hpplications : Yes
Ethernet adapter Lancelr
Physical Hddress. : 88-88-2B-39-1D-83
DHCP Enabled. : Yes
IP Hddress. 11.183.196.43
Subnet Mask 255.255.8.8
Def ault Gateway 11.183.8.1
DHCP Server 11.1.288.1
Primary WINS Server ' 11.1.288.1
Secondary WINS Server : 11.1.26.38

Lease Obtained. : Wed 18th. May 1994 12:85:12 pm
Lease Expires . : Thu 19th. May 1994 8:85:12 am
=\users\default> 3
This diagnostic command displays all current TCP/IP network configuration values. This
command is of particular use on systems running DHCP, allowing users to determine which
TCP/IP configuration values have been configured by DHCP. With no parameters, ipconfig
displays all of the current TCP/~~IP~~lP configuration values, including IP address, subnet mask, and
WINS and DNS configuration.
~~ws HT IP Configuration Uersion 1.8~~
~~Host Hallie . . . . : a apears6 .111icrosoft .Colli DHS Servers . . . . : 8.8.8.8~~
~~DNS Lookup Order. . Node Type . . . . . : IIIode HetBIOS Scope ID .. I P Routing~~
~~Enabled. : No WINS Proxy Enabled ... : Yes WINS Resolution For Windows Sockets~~
~~Applications DHS Resolution For Windows Networking Applications : Yes~~
~~hernet adapter Lancet:~~

~~Physical Address. : 88 88 2B 39 1D 83 DHCP Enabled .. . : Yes IP Address ...~~
~~. : 11.183.196.43 Subnet Mask . . . : 255.255.8.8 Default Gateway . : 11.183.8.1~~
~~DHCP Server . . . . . : 11.1.288.1 Pri ary WINS Server .. : 11.1.288.1 Secondary~~
~~WINS Server . : 11.1.26.38 Lease Obtained ..•.. : Wed 18th. Kay 1994 12:85:12~~
~~- Lease Expires . . . . . : Thu 19th. Kay 1994 8:85:12 alii~~
Syntax
ipconfig [~~/alii~~lal| | /renew [adapter ~~II~~] [/release [~~adapter II~~adapz'er]]
Parameters
all
Produces a ~~full~~fu!! display. Without this switch, ipconfig displays only the lP address, subnet
mask, and ~~default~~defauit gateway values for each network card.
renew [adapter]
Renews DHCP configuration parameters. This option is available only on systems running
the DHCP Client service. To specify an adapter name, type the adapter name that appears
when you use ipconfig without parameters. For example, in the illustration above, the
adapter name is ~~Lance l~~Lancel.
release [adapter]
Releases the current DHCP configuration. This option disables TCP/IP on the local system
and is available only on DHCP clients. To specify an adapter name, type the adapter name
that appears when you use ipconfig without parameters.
3'
.J
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ipconHq
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lpq
~~Syntax Parameters~~
~~lpr~~

This diagnostic utility is used to obtain status of a print queue on a host running the LPD
server.
Syntax
lpq -SServer -PPrinter [- -SSer\/er -PPrinfer [-I]
Parameters
-SServer SSef\/er
Specifies the name of the host that has the printer attached to it.
-PPrinter
Specifies the name of the printer for the desired queue.
- -I
Specifies that a detailed status should be given.
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This connectivity utility is used to print a file to a host running an LPD server.
Syntax
lpr -SServer -PPrinter [-CC/ass] [-Jlobname]filename SSe/ver -PPri/vfer
[-CClass] [-JJobname] #lename
Parameters
-SServer SSeWer
Specifies the name of the host that has the printer attached to it.
-PPrinter PPrinfer
Specifies the name of the printer for the desired queue.
-CC/ass -CClass
Specifies the content of the banner page for the class.
-J.Jobname JJobname
Specifies the name of this job.
filename
The name of the file to be printed.
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nbtstat
This diagnostic command displays protocol statistics and current TCP/IP connections using
NetBIOS over TCP/IP.
Syntax
nbtstat [- -c] [- -n] [- -R] [- -r] [- -S)-] [- -s] [interval infewal]
Paramete rs
Parameters -c
Lists the contents of the tiwe NetBIOS name cache, giving the IP address of each name.
-0 -n
Lists local NetBIOS names.
- -R
Reloads the LMHOSTS file after purging all names from the NetBIOS name cache.
-r
Lists name resolution statistics for Windows networking. On a Windows NT computer

configured to use WINS, this option returns the number of names resolved and registered
via broadcast or via WINS.
-S
Displays both workstation and server sessions, listing the remote hosts by IP address only.
-s
Displays ~~both~~botiw workstation and server sessions. It attempts to convert the remote host IP
address to a name using the HOSTS file.
~~interval~~infewal
Redisplays selected statistics, pausing interval seconds between each display. Press ~~LIRL~~Ctrl+C
to stop redisplaying statistics. If this parameter is omitted, nbtstat prints the current
configuration ~~infonnation~~information once.
Notes
The column headings generated by the nbtstat utility have the following meanings.
In
Number of bytes received.
Out
Number of bytes sent.
In/Out
Whether the connection is from the computer (outbound) or from another system to the
local computer (inbound).
Life
The remaining time that a name table cache entry will live before it is purged.
Local Name
The local NetBIOS name associated ~~with the~~witrx toe connection.
Remote Host
The name or IP address associated with the remote host.
Type
This refers to the type of name. ~~Aname~~A name can either be a unique name or a group name.

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<03>
Each NetBIOS name is 16 characters long. The last byte often has special significance,
because the same name can be present several times on ~~acomputer~~a computer. This notation is
simply the last byte converted to hexadecimal. For example, <20> is ~~aspace~~a space in ASCII.
State
The state of NetBIOS connections. The possible states are shown in the following ~~list:~~ Iist:
State ~~Meaning~~
Connected
Associated
Listening
Idle
Connecting

Accepting
Reconnecting
Outbound
Inbound
Disconnecting
Disconnected
Meaning
The session has been established
~~Associated Aconnection~~A connection endpoint has been created and associated with an IP
address
~~Listening~~ This endpoint is available for an inbound connection
~~Idle~~ This endpoint has been opened but cannot receive connections
~~Connecting~~ The session is in the connecting phase where the name-to-IP address
mapping of the destination is being resolved
~~Accepting~~ An inbound session is currently being accepted and will be connected
shortly
~~Reconnecting Asession~~A session is trying to reconnect if it failed to connect on the first   attempt
~~Outbound Asession~~A session is in the connecting phase ~~where~~wnere the TCP connection is
currently being created
~~Inbound~~ An inbound session is in the connecting phase
~~Disconnecting Asession~~A session is in the process of disconnecting
~~Disconnected The~~Tne local computer has issued a disconnect, and it is waiting for
confirmation from the remote system

~~Chapter 11 Utilities Reference~~
~~netstat~~

This diagnostic command displays protocol statistics and current TCP/IP network connections.
Syntax
netstat [-a] [-e][n][s] [~~-P protocon [• r] [interval]~~-p protocol] [-r] [inte/va/1
Parameters ─
~a
Displays all connections and listening ports~~.~~, server connections are usually not shown.
-e
Displays Ethernet statistics. This may be combined ~~with~~witn the -s option.
~~-D~~-n
Displays addresses and port numbers in numerical form (rather than attempting name
lookups).
~~-P~~-p protocol
Shows connections for the protocol specified by ~~protocol;~~profocol, protocol can be tcp or udp. If
used with the -s option to display per-protocol statistics, ~~protocol~~profoco/ can be tcp, udp, or ip.
-r

Displays the contents of the routing table.
~~-S~~-s
Displays per-protocol statistics. By ~~default~~defauit, statistics are shown for TCP, UDP and IP~~,~~, the
-p option may be used to specify a subset of the default.
~~interval~~infewal
Redisplays selected statistics, pausing interval seconds between each display. Press ~~CfRL~~Ctr|+C
to stop redisplaying statistics. ~~If~~lf this parameter is omitted, netstat prints the current
configuration information once.
Notes
The netstat utility provides statistics on the following network components.
~~Statistic   Purpose~~
Foreign Address   The IP address and port number of the remote computer to which the socket
is connected. The name corresponding to the IP address is shown instead of the number if the HOSTS file contains an entry for the IP address. In cases where the port is not yet established, the port number is shown as an asterisk~~(~~
≤*~~)~~≥.
Local Address   The IP address of the local computer, as well as the port number the
connection is using. The name corresponding to the IP address is shown instead of the number if the HOSTS file contains an entry for the IP address. In cases where the port is not yet established, the port number is shown as an asterisk (*).
~~ping~~

~~Syntax Parameters~~

~~Statistic   Purpose~~
Proto   The name of the protocol used by the connection.
(state) Indicates the state of TCP connections only. The possible states are:
CLOSED ~~CLOSE WAIT ESTABLISHED LAST ACK~~ FIN WAIT 1 ~~FIN WAIT 2 LISTEN~~ SYN RECEIVED
CLOSE WAIT FIN WAIT 2 SYN SEND
ESTABLISHED LISTEN TIMED WAIT
LAST ACK
Troubleshooting TCP/IP
netstat
Statistic Purpose

This diagnostic command verifies connections to one or more remote hosts.
~~ping [·t] [·a] [·D count] [·I length] [-- [·i ttn [·V tos] [·r COUnt] [·S COUnt]~~
~~[[j host list] I [k host list]] [·w timeout] destination list~~
Parameters
-t
~~-t~~Pings the specified host until interrupted.
-a
Resolve addresses to hostnames.
-n count
Sends the number of ECHO packets specified by count. The default is 4.
-I ~~length~~/engfh

Sends ECHO packets containing the amount of data specified by length. The default is 64

bytes~,~ the maximum is 8192.

~.~-f

Sends a Do Not Fragment flag in the packet. The ~packet will~packetwill not be fragmented by

gateways on the route.

-i ~ttl~ ff/

Sets the Time To Live field to the value specified by ~ttl~ffl.

-v tos

Sets the Type Of Service field to the value specified by tos.

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-r count

Records the route of the outgoing packet and ~the~tne returning packet in the Record Route

field. A minimum ~of I~ofi to a maximum of ~9~18 hosts must ~he~be specified ~hy~by count.

~-~-S count

Specifies the timestamp for the number of hops specified by count.

-j ~host list~hosf-lisf

Routes packets via the list of hosts specified by ~host~hosf-list. Consecutive hosts may ~he~be

separated by ~intennediate~intermediate gateways (loose source routed). The maximum number allowed ~hy~

by IP is 9.

-k host-~list~lisf

Routes packets via the list of hosts specified by host-~list~lisf. Consecutive hosts may not be

separated by intermediate gateways (strict source routed). The maximum number allowed

by IP is 9.

~-W timeout~ -w timeouf

Specifies a timeout interval in milliseconds.

destination-~list~lisf

Specifies the remote hosts to ping.

Note

The ping command verifies connections to remote host or hosts by sending ICMP echo

packets to the host and listening for echo reply packets. Ping waits for up to 1 second for each

packet sent and prints the number of packets transmitted and received. Each received packet

is validated against the transmitted message. By default, four echo packets containing 64 bytes

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ping

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Syntax

ping [-t] [-a] [-n count] [-I length] [-f] [-i ff/] [-v fos] [-r count] [-s count]

host-lisf]] [-w Umeouf] destination-list

[[-j host-list] | [-k

of data (a periodic uppercase sequence of alphabetic characters) are transmitted.
You can use the ping utility to test both the host name and the IP address of the host. If the IP
address is verified but the host name is not, you may have a name resolution problem. ~~In~~ln this
case, be sure that the host name you are querying is in either the local HOSTS file or in the
DNS database.
The following shows sample output for ping:
C:\>ping ds.internic.net
Pinging ds. internic.net [~~192.20.239.132~~192.20.239.l32] with 32 bytes of data:
~~Reply from 192.20.239.132: bytes=32 time=101ms TTL=243 Reply from~~
~~192.20.239.132: bytes 32 time=100ms TTL=243 Reply from 192.20.239.132:~~
~~bytes 32 time=120ms TTL=243 Reply from 192.20.239.132: bytes 32 time 120ms~~
~~TTL=243~~
~~rep~~

~~Syntax Parameters~~
Reply from
Reply from
Reply from
192.20.239.132: bytes
192.20.239.132: bytes
19220239.1322 bytes
19220239.1322 bytes~
=32 time=
=32 time=
=32 time=
-32 time=
101ms TTL
100ms TTL
120ms TTL
120ms TTL
=243
=243
=243
=243

This connectivity command copies files between a Window NT computer and a system running
rshd, the remote shell server. The ~~rep~~rcp command can also be used for third-party transfer to
copy files between two computers running rshd when the command is issued from a Windows
NT computer. The rshd server is available on UNIX computers, but not on Windows NT, so
the Windows NT computer can only participate as the system from which the commands are
issued.
Syntax
~~rep~~rcp [~~-~~-a ~~1~~| -b] [~~-~~-h~~)~~] [~~-r] source] source2 ...~~-r] SOL/rce1 soL1rce2
sourceN destination

-a

Specifies ASCII transfer mode. This mode converts the carriage return/~~linefeed~~linefeed characters
to carriage returns on outgoing files, and ~~linefeed~~linefeed characters to carriage ~~return~~return/linefeeds for
incoming files. This is the default transfer mode.

-b

Specifies binary image transfer mode. No carriage return/~~linefeed~~linefeed conversion is performed.

-h

Transfers source files marked with the hidden attribute on the Windows NT computer.
Without this option, specifying a hidden file on the ~~rep~~rcp command line has the same effect
as if the file did not exist.

-r

Recursively copies the contents of all subdirectories of the source to the destination. Both
the source and ~~destination must~~dest/naflonmust be directories.
source and ~~destination~~destinat/on
Must be of the form [~~host~~hosf[.user]:~~lfilename~~]filename. If the
[~~host~~hosf[.user]:] portion is omitted, the host is
assumed to be the local computer. ~~If~~lf the user portion is omitted, the
currently logged on
Windows NT ~~usemame~~username is used. If a fully qualified host name is used, which contains the
period (.) separators, then the [.~~user~~L/ser] must be included.
~~Otherwise~~Othen/vise, the last part of ~~the~~tne
hostname will be interpreted as the ~~usemame~~username. ~~If~~lf multiple source files are specified, the
destination must be a directory.
~~If~~lf the filename does not begin with a forward slash (/) for ~~UNIX~~UNlX or a backward slash (\) for
Windows NT systems, it is assumed to be relative to the current working directory. On
Windows NT, this is the directory from which the command is issued. On the remote
system, it is the logon directory for the remote user. ~~Aperiod~~A period (.) means the current
directory. Use the escape characters (\ , ~~",~~or ') in remote paths to use wildcard characters
on the remote host.

Notes

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Remote Privileges

The ~~rep~~rcp command does not prompt for passwords~~,~~, the current or specified user name must
exist on the remote host and allow remote command execution via ~~rep~~rcp.
The .rhosts file specifies which remote system or users can assess a local account using rsh
or ~~rep~~rcp. This file (or a HOSTS equivalent) is required on the remote system for access to a

remote system using these commands. Rsh and ~~rep~~rcp both transmit the local username to the

remote system. The remote system uses this name plus the ~~I P~~IP address (usually resolved to a

host name) or the requesting system to determine whether access is granted. There is no

provision for specifying a password to access an account using these commands.
If the user is logged on to a Windows NT Server domain, the domain controller must be

available to resolve the currently logged on name, because the logged on name is not cached

on the local computer. Because the username is required as part of the rsh protocol, the

command will fail if the username cannot be obtained.
The .rhosts File
The .rhosts file is a text file where each line is an entry. An entry consists of the local host

name, the local user name, and any comments about the entry. Each entry is separated by a

tab or space, and comments begin with a hash mark (#), for example:
~~computer~~compute1'5 marie #This computer is in room 31A
The .rhosts file must be in the user's home directory on the remote computer. For more

information about a remote computer's specific implementation of the .rhosts file, see the

remote system's documentation.
Additionally, have your host name added to the remote system's /ETC/HOSTS file. ~~This~~Triis will

allow the remote system to authenticate remote requests for your computer using the Microsoft

TCP/IP utilities.
Specifying Hosts
Use the host.~~user~~L/ser variables to use a user name other than the current user name. If ~~lwst~~hosf.user

is specified with source, the .rhosts file on the remote host must contain an ~~entry~~entw for user. For

example,
~~rep~~rcp rhino.johnb:filel ~~buffalo~~buffa1o.admin:~~file~~iile2
The .rhosts file on BUFFALO should have an ~~entry~~entw for Johnb on RHINO.
If a host name is supplied as a full domain name containing dots, a user name must be

appended to the host name, as previously described. This prevents the last element of the

domain name from being interpreted as a user name. For example,
~~rep~~rcp domain-namel~~.user:johnm~~ .userzjohnm
domain-name2.~~user:billr~~userzbillr
~~214 TCPnP~~
Remote Processing
Remote processing is performed by a command run from the user's logon shell on most UNIX

systems. The user's .profile or .cshrc is executed before parsing filenames, and exported shell
variables may be used (using the escape character or quotation marks) in remote filenames.
Copying Files
If you attempt to copy a number of files to a file rather than ~~a~~ e directory, only the last file is
copied. Also, the ~~rep command~~ rcp commend cannot copy ~~a~~ e file onto itself.
Examples
These examples show syntax for some common uses of ~~rep~~ rcp.
To copy a local file to the logon directory of a remote computer:
~~rep filename remotecomputer:~~ rcpfilename remotecomputer:
To copy a local file to an existing directory and a new filename on a remote computer:
~~rep filename remotecomputer:/directory~~ rcpfilename
remofecomputer:/directory/newfilename
To copy multiple local files to a subdirectory of a remote logon directory:
~~rep filel file2 file3 remotecomputer:subdirectory/filesdirectory~~ rcpfilel
file2file3 remolecomputer.'suba'irectory4'ileSdirectory

To copy from ~~aremote~~ a remote source to the current directory of the local computer:
~~rep~~ rcp remotecomputer~~:filename~~ .fiZeI/Iame .
To copy from multiple files from multiple remote sources to ~~aremote~~ a remote destination with different ~~usemames~~
usernames:
~~rep remotel.userl:~~ rcp remofel.user] .filel ~~remote~~ remoz'e2.user~~2:file~~ 2.jile2
remotedest.~~destuser:directory~~ a'estuser:a'irectory
To copy from a remote system using an IP address to a local computer (where the ~~usemame~~ username
is mandatory because a period is used in the remote system name):
~~rep 11.101.12.l.user:filename filename~~
~~Chapter 11 Utilities Reference~~
~~rexec~~

~~Syntax Parameters~~
~~Notes~~
rcp 11.10 1. 12. 1 .user.j7/enamejilename

This connectivity command runs commands on remote hosts running the rexecd service.
Rexec authenticates the user name on the remote host by using a password, before executing
the specified command.
Syntax
rexec ~~host~~ hosf [-~~lusernameI [- nIcommand~~ I username] [-n] command
Parameters
hosf
~~host~~ Specifies the remote host on which to run command.
-~~lusername~~ I username
Specifies the user name on the remote host.
-~~0~~ -n
Redirects the input of rexec to NUL.
command

Specifies the command to run.

Notes

Rexec prompts the user for a password and authenticates the password on the remote host. If
the authentication succeeds, the command is executed.
Rexec copies standard input to the remote command, standard output to its standard output,
and standard error to its standard error. Interrupt, quit, and terminate signals are propagated to
the remote command. Rexec normally terminates when the remote command does.
Use quotation marks around redirection symbols to redirect onto the remote host. ~~If~~lf quotation
marks are not used, redirection occurs on the local computer. For example, the following
command appends the remote file ~~remotefile~~remofelile to the local file ~~localfile:~~locallilez
rexec otherhost cat remotefile >> localfile
The following command appends the remote file remotefile to the remote file
~~otherremotefile~~ofherrernofe17le:
rexec otherhost cat remotefile ">>" otherremotefile
Using Interactive Commands
You cannot run most interactive commands. For example, vi or emacs cannot be run using
rexec. Use telnet to run interactive commands.

~~route~~

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This diagnostic command manipulates ~~network~~nebwork routing tables.
Syntax
route [-~~.~~f] [command [destination] [MASK netmask~~)~~] [~~gateway~~gafeway]]
Parameters ~~.~~
-f
Clears the routing tables of all gateway entries. ~~Ifthis~~If this parameter is used in conjunction with
one of the commands, the tables are cleared prior to running the command.
command
Specifies one of four commands.
Command Purpose
print ~~add delete change~~

~~destination~~
~~Purpose~~ Prints a route
add Adds a route
delete Deletes ~~a~~e route
change Modifies an existing route
destination
Specifies the host to send command.
MASK
Specifies, if present, that the next parameter be interpreted as the netmask parameter.
~~netmask~~nennask