



VSI OpenVMS

TCP/IP User's Guide

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This document describes how to use the VSI TCP/IP user commands. Included are easy to follow instructions for beginning users and command pages for advanced users.

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TCP/IP User's Guide:



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Preface	ix
1. About VSI	ix
2. Intended Audience	ix
3. Typographical Conventions	ix
4. VSI TCP/IP Support	x
5. VSI Encourages Your Comments	x
6. How to Order Additional Documentation	xi
Chapter 1. Using VSI TCP/IP	1
1.1. Specifying Remote Hosts	1
1.1.1. Displaying Names of Other Users	1
1.1.2. Displaying Host Information	1
1.1.3. Displaying User Information	2
1.1.4. Interacting with Another User	3
1.1.4.1. Sending Reminders to Yourself	4
1.1.4.2. Restrictions for Using TALK	4
1.2. Using DECwindows with VSI TCP/IP	5
1.2.1. Running DECwindows Applications	6
1.2.2. Authorizing Remote Systems	6
1.3. Sending and Receiving Electronic Mail	6
1.3.1. Specifying Addresses	6
1.3.2. Specifying a Host Alias	8
1.3.3. Specifying Individual Aliases	8
1.4. Using Kerberos Authentication	9
1.4.1. Understanding VSI Kerberos for OpenVMS	9
1.4.2. Making Sure Kerberos is Available	10
1.4.3. Acquiring and Deleting Tickets	10
1.4.3.1. Obtaining Tickets Under Another User Name	10
1.4.4. Using Kerberos with the RCP, RLOGIN, RSHELL, and TELNET Com- mands	10
1.4.5. Checking Ticket Status	11
1.4.6. Changing Your Kerberos Password	11
Chapter 2. Accessing Remote Systems (RSHELL, RLOGIN, TELNET)	13
2.1. Executing Commands on a Remote System Using RSHELL	13
2.1.1. Using and Terminating RSHELL	13
2.2. Logging Into a Remote System with RLOGIN	14
2.2.1. Using and Terminating RLOGIN	14
2.2.2. "R" Services Authentication	14
2.2.3. Host Equivalences	15
2.2.4. User Equivalences	15
2.2.4.1. Cautions Concerning Use of Equivalences	16
2.3. Logging Into a Remote System with TELNET	16
2.3.1. Starting a TELNET Connection	16
2.3.2. Using TELNET Commands	17
2.3.3. Using TELNET Control Sequences	18
2.3.4. Running Applications over TELNET Connections	19
2.3.5. Accessing IBM Hosts with the TELNET Command	20
2.3.6. Starting and Stopping an IBM Terminal Emulator Using TELNET	20
2.3.7. IBM 3278 Models	21
2.3.8. Mapping Your Keyboard	21
2.3.9. Displaying the Current Keyboard Mapping	21
2.3.10. Keyboard Mapping File Format	23

2.3.10.1. Functions	23
2.3.11. Specifying Multiple Keystrokes	24
2.3.12. TN3270 Function Key Mapping	24
2.3.13. TN5250 Function Key Mapping	25
2.3.14. Editing the Keyboard Mapping File	27
2.3.15. Capturing Screen Output and Printing Screen Captures	27
2.3.16. Using Transparent Mode	28
2.3.17. Application Keypad Access for TN3270 and TN5250	28
2.3.18. TN3270 Emulation	28
2.3.19. TN3270 Translation Table Mapping	28
2.3.20. Kerberos V5 Authentication and Encryption	30
2.3.21. Troubleshooting TELNET	30
2.3.21.1. Connection Problems	30
2.3.21.2. Problems Logging In	30
Chapter 3. Remote File Access (RCP, FTP, TFTP)	33
3.1. Requirements for RCP	33
3.2. Using RCP	33
3.3. Copying Files Using RCP	34
3.4. Inhibiting Output from SYLOGIN.COM and LOGIN.COM	34
3.5. Accessing Files with FTP	34
3.5.1. Requirements for Using FTP	35
3.5.2. Invoking FTP and Logging In	35
3.5.3. Using FTP Commands	36
3.5.4. Getting FTP Command HELP	37
3.5.5. Using Basic FTP Commands	37
3.5.6. Specifying TCP Window Size with FTP	37
3.5.7. File Name Translations	38
3.5.8. Listing the Contents of a File	40
3.5.9. Working with Directories	40
3.5.10. Commands for Copying Files	41
3.5.11. Parameters for Copying Files	41
3.5.12. FTP OpenVMS Structure	42
3.5.13. FTP Commands While a Transfer is in Progress	42
3.5.14. Issuing FTP Commands From the DCL Command Line	43
3.5.15. FTP Command Scripts	43
3.5.16. Ending an FTP Session	43
3.5.17. Using FTP over TLS (FTPS)	44
3.5.18. FTP Log Files	44
3.5.19. Anonymous FTP	45
3.5.20. Transferring Files From Behind a Firewall	46
3.5.21. FTP Initialization File	46
3.6. Troubleshooting FTP	47
3.6.1. General Troubleshooting Tips	47
3.6.2. Transmitted Files Are Corrupt	47
3.7. Copying Files Using TFTP	47
3.7.1. Requirements for TFTP	48
3.7.2. Using TFTP	48
Chapter 4. Accessing Remote Systems with the Secure Shell (SSH) Utilities	51
4.1. SSH Protocol Support	51
4.2. SSH Client Return Status Codes	51
4.3. Secure Shell Client (remote login program)	52

4.4. Initial Server System Authentication	53
4.5. Hostbased Authentication	53
4.6. Publickey Authentication	54
4.7. Password Authentication	55
4.8. Using Publickey Authentication with SSH	56
4.9. Break-in and Intrusion Detection	56
4.10. Session Termination	56
4.11. X11 Forwarding	56
4.12. Configuring the SSH Client	57
4.12.1. Authorization File Options	60
4.13. SSH Client/Server Authentication Configuration Examples	61
4.13.1. Hostbased Authentication Example	61
4.13.2. Publickey Authentication Example	63
4.13.2.1. SSH1 Example	64
4.13.2.2. SSH2 User Authentication Using Certificates	65
4.13.2.3. SSH2 Hostkey Authentication Using Certificates	66
4.14. Hostkey Verification Using DNS	67
4.15. Port Forwarding	67
4.15.1. Other Files	69
4.16. SSHKEYGEN	71
4.16.1. SSH1	72
4.16.2. SSH2	72
4.17. SSHAGENT (authentication agent)	74
4.18. SSHADD	75
4.19. CERTTOOL	76
4.20. CERTVIEW	78
4.21. CMPCLIENT	78
4.22. Public-key Subsystem	80
4.23. Publickey Assistant Commands	80
4.23.1. Publickey Assistant Qualifiers	80
Chapter 5. Secure File Transfer	83
5.1. SCP-SERVER1	83
5.2. SCP2	84
5.2.1. Usage	84
5.2.2. Qualifiers	84
5.3. File Specifications	85
5.3.1. Qualifiers	85
5.4. Logicals	88
5.5. SFTP2	91
5.5.1. File Specifications	91
5.5.2. SFTP2 Command Syntax and Qualifiers	91
5.5.2.1. Usage	91
5.5.2.2. Qualifiers	91
5.5.3. SFTP2 Commands	96
5.5.3.1. Logicals	96
5.6. Configuration File Parameters	97
5.7. FTP over SSH	97
Appendix A. DCL User Commands	99
IP DECODE	99
IP FINGER	100
IP FTP	101

IP RCP	104
IP REMIND	107
IP RLOGIN	108
IP RSHELL	110
IP RUSERS	111
IP SEND	112
IP TALK	113
IP TELNET	114
IP TFTP	120
IP WHOIS	120
Appendix B. FTP Command Reference	123
ACCOUNT	126
AGET	127
APPEND GET	127
APPEND PUT	127
APPEND RECEIVE	128
APPEND SEND	128
APUT	129
ASCII	129
ATTACH	129
BELL	129
BINARY	130
BLOCK	130
BYE	130
BYTE	130
CD	131
CDUP	131
CLOSE	132
CONFIRM	132
CONNECT	133
CPATH	133
CREATE-DIRECTORY	133
CWD	134
DELETE	134
DIRECTORY	135
DISCONNECT	135
EXIT	136
EXIT-ON-ERROR	136
FACT	137
GET	137
HASH	138
HELP	139
LCD	139
LDIR	140
LIST	140
LOCAL-CD	141
LOCAL-DIRECTORY	141
LOCAL-PWD	141
LOGIN	141
LPWD	142
LS	142
MDELETE	143

MGET	143
MKDIR	143
MODE	144
MPUT	144
MULTIPLE DELETE	144
MULTIPLE GET	145
MULTIPLE PUT	146
MULTIPLE RECEIVE	146
MULTIPLE SEND	146
OPEN	147
PASSIVE	147
PASSWORD	148
PORT	149
PROMPT-FOR-MISSING-ARGUMENTS	149
PROMPT-ON-CONNECT	150
PUSH	150
PUT	150
PWD	152
QUIT	152
QUOTE	152
RECEIVE	152
RECORD-SIZE	153
REMOTE-HELP	154
REMOVE-DIRECTORY	154
RENAME	155
RETAIN	155
RM	156
RMDIR	156
SEND	156
SET	157
SHOW-DIRECTORY	158
SITE	158
SPAWN	159
STATISTICS	160
STATUS	160
STREAM	161
STRUCTURE	161
TAKE	162
TENEX	162
TYPE	163
USER	163
VERBOSE	163
VERSION	164
WINDOW-SIZE	164
Appendix C. TELNET Command Reference	167
ABORT	168
ATTACH	168
ATTN	169
AYT	169
BINARY	170
BREAK	170
BYE	170

CLOSE	170
CONNECT	171
CREATE-NTY	172
DEBUG	172
ECHO	172
EXIT	173
HELP	173
LOG-FILE	174
PUSH	174
QUIT	174
SET ABORT-OUTPUT-CHARACTER	175
SET ARE-YOU-THERE-CHARACTER	175
SET AUTO-FLUSH	176
SET BREAK-CHARACTER	176
SET DEBUG	177
SET ERASE-CHARACTER-CHARACTER	177
SET ERASE-LINE-CHARACTER	178
SET ESCAPE-CHARACTER	178
SET EXTENDED	179
SET INTERRUPT-PROCESS-CHARACTER	179
SET LOCAL-FLOW-CONTROL	180
SET LOG-FILE	180
SET REMOTE-USERNAME	181
SET UNIX-LINE-TERMINATOR	181
SPAWN	182
STATUS	182
TERMINAL-TYPE	183
VERSION	183
Appendix D. TFTP Command Reference	185
CONNECT	185
GET	186
PUT	186
QUIT	187
REXMT	187
STATUS	187
TIMEOUT	188
TRACE	188
Appendix E. Trademark and Copyright Notifications	191

Preface



1. About VSI

VMS Software, Inc., (VSI) is an independent software company licensed by Hewlett Packard Enterprise to develop and support the OpenVMS operating system.

VSI seeks to continue the legendary development prowess and customer-first priorities that are so closely associated with the OpenVMS operating system and its original author, Digital Equipment Corporation.

2. Intended Audience

This manual is intended for anyone who will be using VSI TCP/IP. It provides an overview of VSI TCP/IP and contains information about:

- Exploring your network environment including email and secure file transfer
- Accessing remote systems
- Using DECwindows with VSI TCP/IP

The appendices in this document contain command reference for DCL user, FTP, TELNET, and TFTP commands.

3. Typographical Conventions

The following conventions are used in this manual:

Convention	Meaning
Ctrl/x	A sequence such as Ctrl/x indicates that you must hold down the key labeled Ctrl while you press another key or a pointing device button.
PF1 x	A sequence such as PF1 x indicates that you must first press and release the key labeled PF1 and then press and release another key (x) or a pointing device button.
Enter	In examples, a key name in bold indicates that you press that key.
...	A horizontal ellipsis in examples indicates one of the following possibilities:- Additional optional arguments in a statement have been omitted.- The preceding item or items can be repeated one or more times.- Additional parameters, values, or other information can be entered.
:	A vertical ellipsis indicates the omission of items from a code example or command format; the items are omitted because they are not important to the topic being discussed.
()	In command format descriptions, parentheses indicate that you must enclose choices in parentheses if you specify more than one. In installation or upgrade examples, parentheses indicate the possible answers to a prompt, such as:

Convention	Meaning
[]	Is this correct? (Y/N) [Y] In command format descriptions, brackets indicate optional choices. You can choose one or more items or no items. Do not type the brackets on the command line. However, you must include the brackets in the syntax for directory specifications and for a substring specification in an assignment statement. In installation or upgrade examples, brackets indicate the default answer to a prompt if you press Enter without entering a value, as in: Is this correct? (Y/N) [Y]
	In command format descriptions, vertical bars separate choices within brackets or braces. Within brackets, the choices are optional; within braces, at least one choice is required. Do not type the vertical bars on the command line.
{ }	In command format descriptions, braces indicate required choices; you must choose at least one of the items listed. Do not type the braces on the command line.
bold type	Bold type represents the name of an argument, an attribute, or a reason. In command and script examples, bold indicates user input. Bold type also represents the introduction of a new term.
<i>italic type</i>	Italic type indicates important information, complete titles of manuals, or variables. Variables include information that varies in system output (Internal error <i>number</i>), in command lines (/PRODUCER= <i>name</i>), and in command parameters in text (where <i>dd</i> represents the predefined code for the device type).
UPPERCASE TYPE	Uppercase type indicates a command, the name of a routine, the name of a file, or the abbreviation for a system privilege.
Example	This typeface indicates code examples, command examples, and interactive screen displays. In text, this type also identifies website addresses, UNIX command and pathnames, PC-based commands and folders, and certain elements of the C programming language.
-	A hyphen at the end of a command format description, command line, or code line indicates that the command or statement continues on the following line.
numbers	All numbers in text are assumed to be decimal unless otherwise noted. Non-decimal radixes-binary, octal, or hexadecimal-are explicitly indicated.

4. VSI TCP/IP Support

VSI supports VSI TCP/IP running on VSI OpenVMS Integrity Version 8.4-2L1 (or higher) only. Please contact your support channel for help with this product. Users who have OpenVMS support contracts through VSI can contact support@vmssoftware.com [mailto:support@vmssoftware.com] for help with this product. Users who have OpenVMS support contracts through HPE should contact their HPE Support channel for assistance.

5. VSI Encourages Your Comments

You may send comments or suggestions regarding this manual or any VSI document by sending electronic mail to the following Internet address: [<docinfo@vmssoftware.com>](mailto:docinfo@vmssoftware.com).

6. How to Order Additional Documentation

For information about how to order additional documentation, email the VSI OpenVMS information account: <info@vmssoftware.com>. We will be posting links to documentation on our corporate website soon.

Chapter 1. Using VSI TCP/IP

This chapter provides an introduction to VSI TCP/IP and covers the following topics:

- Displaying host information
- Interacting with other users including using Talk and electronic mail
- Using DECwindows for VSI TCP/IP
- Setting up Kerberos Authentication

1.1. Specifying Remote Hosts

Most VSI TCP/IP applications allow you to specify a remote host by either name or Internet address. To access a host by name, the remote host must either be listed in the local system's host database or registered with a DNS (Domain Name System) server accessible from the local system. If you have difficulty accessing a remote host by its host name, contact your system manager or network administrator.

1.1.1. Displaying Names of Other Users

You can display a list of users on your system or on a remote system with the **RUSERS** command. For example:

```
$ IP RUSERS
SURETE RICK PATRICK
MIFIVE MATT MATT MATT MATT
KGB KEN KEN GIGI KEN JOEL JOEL JOEL JOEL
SCIENCE RICK RICK RICK RICK
WHO PATRICK PATRICK PATRICK PATRICK PATRICK PATRICK ROB ROB
DESIGN BRUCE BRUCE BRUCE BRUCE BRUCE
CHAZ GEORGE GEORGE GEORGE RICK RICK RICK GEORGE GEORGE GEORGE
```

The **RUSERS** utility uses the **RUSERS** Remote Procedure Call (RPC) service to display information about users logged into the local system or a remote system. It can display information about a particular system, or, if supported by the network hardware, use broadcasts to display information about all remote systems on directly connected networks. **RUSERS** uses UDP/IP (User Datagram Protocol/Internet Protocol) as the transport mechanism for the RPC services it calls. When using **RUSERS**, the command can appear to hang, but is in fact waiting for a timeout period to ensure that the last packet is received.

Note

If the system you are querying does not support the **RUSERS** RPC service, you will not receive any response (the RPC call times out silently).

1.1.2. Displaying Host Information

Use the **WHOIS** command to display information about a user, host, or domain accessed from the Internet's repository of information. The **WHOIS** command sends your request across the Internet to the NIC (at the RS . INTERNIC . NET host) and displays the information returned.

For example:

```
$ WHOIS ULANOV
Ulanov, V.I. ulanov@abc.COM
ABC, Incorporated
100 Nevsky Street
Anytown, CA 95060
(408) 555-1212Record last updated on 31-May-17.
```

The InterNIC Registration Services Host contains only Internet information (Networks, ASN's, Domains, and POC's).

Because RS. INTERNIC.NET is heavily used, you may receive a message stating that "the network is busy, try later". As an alternative, you can ask your system manager about possibly selecting another **WHOIS** server.

1.1.3. Displaying User Information

You can display information about a domain, host, IP address, or single user. The **FINGER** utility accesses information on your local system or on a remote system.

You can display information about your host, as shown in the following example:

```
$ IP FINGER/NOCLUSTER
Monday, May 15, 2017 7:59PM-EST Up 1 10:33:01
nn+0 Jobs on CHUCKO Load ave 0.02 0.01 0.02
User   Personal Name   Job       Subsys Terminal  Console Location
BROWN  John Brown       40A0022C MM        6.FTA13
        40A0022D EMACS    1:20.FTA14
        40A0022E *DCL*   22.FTA15
        40A0025F *DCL*   3:46.FTA23
        40A00260 *DCL*   3:33.FTA24
        40A00261 FINGER   .FTA25
SYSTEM System Manager 23000120 *DCL*   BIRD$RTA1 KARLA::PIPER
        23000121 *DCL*   BIRD$RTA2 KARLA::PIPER
```

If you want to display **FINGER** information about every node in a OpenVMScluster, omit the **/NOCLUSTER** qualifier. To display information about another host, add its name to the end of the command:

```
$ IP FINGER
Monday, May 15, 2017 7:59PM-EST Up 1 10:33:01
nn+0 Jobs on CHUCKO Load ave 0.02 0.01 0.02
User   Personal Name   Job       Subsys Terminal  Console Location
BROWN  John Brown       40A0022C MM        6.FTA13
        40A0022D EMACS    1:20.FTA14
        40A0022E *DCL*   22.FTA15
        40A0025F *DCL*   3:46.FTA23
        40A00260 *DCL*   3:33.FTA24
        40A00261 FINGER   .FTA25
SYSTEM System Manager 23000120 *DCL*   BIRD$RTA1 KARLA::PIPER
        23000121 *DCL*   BIRD$RTA2 KARLA::PIPER
RICH   I. M. Rich       23200227 *DCL*   CODEZ$NTY1 Rich.ABC.COM
POOR   U. R. Poor       2280027B *DCL*   4$FTA4
JONES  Mary Jones       21C00C04 EMACS    SYS1$NTY5 BigBird.ABC.COM
```

You can only display information about another system if a **FINGER** server is running there and if the system permits it (some do not). The information you receive can vary depending on the **FINGER** server in use.

To display information about users at a specific IP address, use this command format:

```
$ IP FINGER @192.192.192.1
Monday, May 15, 2017 7:59PM-EST Up 1 10:33:01
nn+0 Jobs on CHUCKO Load ave 0.02 0.01 0.02
User   Personal Name   Job       Subsys Terminal Console Location
BROWN  John Brown       40A0022C MM        6.FTA13
        40A0022D EMACS     1:20.FTA14
        40A0022E *DCL*    22.FTA15
        40A0025F *DCL*    3:46.FTA23
        40A00260 *DCL*    3:33.FTA24
        40A00261 FINGER   .FTA25
SYSTEM System Manager 23000120 *DCL*    BIRD$RTA1 KARLA::PIPER
        23000121 *DCL*    BIRD$RTA2 KARLA::PIPER
```

The load average information displayed at the beginning of the **FINGER** output is the average number of processes waiting for the CPU for the last one, two, and five minutes. For more information, ask your system manager.

To display information about a single user, use this command format:

```
$ IP FINGER BROWN
BROWN  John   40A0022C MM        11.FTA13
        40A0022D EMACS     .FTA14
        40A0022E *DCL*    27.FTA15
        40A0025F FINGER   .FTA23
        40A00260 *DCL*    3:39.FTA24
        40A00261 *DCL*    2.FTA25
Mail from firefly@marx.edu (Rufus T. Firefly) at Mon 15-Mar-2017 7:53 PM-EST
Last read on Mon 15- May -2017 7:59 PM-EST
Plan: At the beach today. The higher, the fewer!
-- Alexander in the colony of free spirits (ST-TNG)
```

If you want specific information to be available when someone seeks information about you with **FINGER**, create a **PLAN.TXT** text file in your login directory. If you want to have a plan file on a UNIX system, create a **.plan** file in your login directory.

The information in this file is available even when you are not logged in. When you create this file, ensure the file has World Read access (W:R) and your login directory has World Execute permissions (W:E). You can insert any text (except control characters which are filtered out), and the file can be any length you want.

- On a OpenVMS system running VSI TCP/IP, if you execute the **FINGER** command for a single user, the utility looks for a file named **PLAN.TXT** in that user's login directory. If that file does not exist, it looks for a file named **.PLAN**.
- On a UNIX system, if you execute the **FINGER** command a single user, the **FINGER** utility looks for a file named **.plan**.

1.1.4. Interacting with Another User

You can communicate with another user over the network using the **TALK** utility. **TALK** is similar to the OpenVMS **PHONE** utility except **TALK** can work with some non-OpenVMS operating systems.

TALK divides the screen into two sections; it displays text you enter in one section, and text entered by the other user in the other. You can then converse with each other until one of you presses **Ctrl/C** to end the session.

Use the following keystrokes during a **TALK** session:

Press...	To...	Press...	To...
Delete	Delete the last character typed	Ctrl/L	Redraw the screen
Ctrl/C	Exit and return to DCL command mode	Ctrl/W	Delete the last word typed

1.1.4.1. Sending Reminders to Yourself

You can send reminders with the **REMINDE** utility, as shown in the following example:

```
$ REMIND
REMINDE Version V5.5(nn), 15-MAR-2015
There are no reminders in your remind file.
REMINDE>CREATE
Time of first reminder? 22:45
Expiration count? 1
How should I send it? SEND
Addresses? ME
Subject? Testing
Text (end with ^Z)
This is a test.
^Z
REMINDE>exit
  [Entering your changes...]
```

When **REMINDE** starts, it checks to see if any reminders are pending. It then displays the **REMINDE>** prompt. Use the **CREATE** command to start a new reminder. The time of the reminder can be in 12-hour or 24-hour time and can also be a special name. The expiration count is the number of times you want the message sent. You can specify that the message be sent by mail, broadcast to the terminal ("send"), or both. You can enter details in much the same way as a mail message with the address of the recipient, the subject, and the text. When you press **Ctrl/Z**, the message is queued.

If you request reminders by mail, the information you specify is used to construct an electronic mail message. If you request reminders by broadcast to the terminal, **REMINDE** sends a message like the following:

```
[REMINDE(10:50PM): subject Message text]
```

For help, enter a question mark (?) at any prompt. For example, at the "Time of first reminder?" prompt, the following help appears:

```
Time of first reminder? ?
date and time or one of the following:
FRIDAY MONDAY SATURDAY SUNDAY THURSDAY TODAY TOMORROW TUESDAY WEDNESDAY
```

or one of the following:

```
APRIL-FOOLS          BASTILLE-DAY          BEETHOVENS-BIRTHDAY
BLBOS-BIRTHDAY       CHRISTMAS              COLUMBUS-DAY
FLAG-DAY             FRODO'S-BIRTHDAY     GONDORIAN-NEW-YEAR
GROUND-HOG-DAY       GUY-FAWKES-DAY       HALLOWEEN
INDEPENDENCE-DAY     LEAP-DAY              LINCOLNS-BIRTHDAY
```

1.1.4.2. Restrictions for Using TALK

The following restrictions apply when using **TALK**:

- You and the person with whom you wish to **TALK** need to be on systems with the same byte-ordering scheme (either "Big Endian" or "Little Endian").

For example, if the other person is using a Sun workstation or a terminal connected to one, they cannot use the **TALK** command. Sun users need to use the **NTALK** command. **NTALK** is provided in the [CONTRIBUTED-SOFTWARE.APPLICATIONS.NTALK] directory, or elsewhere as public domain software. Your system manager can provide more information.

- Both of your terminals must be able to accept broadcasts. Use these commands to enable broadcasts but suppress mail broadcasts:

```
$ SET TERMINAL /BROADCAST
$ SET BROADCAST=NOMAIL
```

- Your terminal type must be listed in the OpenVMS `TERMTABLE.TXT` database. As shipped with OpenVMS, this database includes all VSI VT-series terminals. Check with your system manager if you have a VSI terminal.
- The other person's system must be known to your system. **TALK** must be able to translate the remote system's IP address into its name. Your system must be using the Domain Name System (DNS) or have the remote system recorded in its host tables.

When a user uses **TALK** to call you, a message of the following form appears on your terminal:

```
Message from TALK-DAEMON@FLOWERS.COM at 1:53 PM-PDT
Connection request by username
[Respond with: TALK username@hostname]
Type a TALK command to start the conversation:
$ TALK username@hostname
```

Once communication is established, you and the other user can type simultaneously, with your output appearing in separate windows.

If you try to **TALK** with a user who has disabled reception of broadcast messages, this message appears:

```
[Your party is refusing messages]
```

The **TALK** Server uses the **PHONE** operator class.

Note

To prevent users from attempting to **TALK** with you, use the **SET BROADCAST=NOPHONE** command.

1.2. Using DECwindows with VSI TCP/IP

VSI TCP/IP supports running DECwindows applications over TCP/IP. This feature provides the ability to run X Windows applications between OpenVMS and other systems that support X Windows (for example, UNIX workstations, Apple Macintosh systems, PCs, and so on). For more information about running DECwindows applications over a network, see the *VMS DECwindows User's Guide*.

For information about Running DECwindows applications over VSI TCP/IP, see the Section 1.2.1.

For information about Authorizing remote systems to access the local display see the Section 1.2.2.

1.2.1. Running DECwindows Applications

To run a DECwindows application on an OpenVMS system over TCP/IP using VSI TCP/IP, you must first use the DCL command **SET DISPLAY** to indicate to DECwindows which system display it should use for the application's user interface.

Note

If you are accessing a remote system using **TELNET**, **RLOGIN**, or **RSHELL**, **SET DISPLAY** is performed automatically.

Use the **/NODE** qualifier to specify the remote host name or IP address, and the **/TRANSPORT** qualifier to specify "TCPIP" transport. The following example shows how to run the application `SYS$SYSTEM:DECW$PUZZLE.EXE` on the local OpenVMS system, and direct the output to a host named `ZEPHYR.FLOWERS.COM`.

```
$ SET DISPLAY /CREATE /NODE=ZEPHYR.FLOWERS.COM /TRANSPORT=TCPIP
$ RUN SYS$SYSTEM:DECW$PUZZLE
```

1.2.2. Authorizing Remote Systems

Before running a DECwindows application on a remote system and directing the user interface to an OpenVMS workstation running VSI TCP/IP, you must authorize the remote system to have access to the local display. Under the DECwindows Session Manager Customize menu, select the Security option. When the Customize Security dialog box appears, specify TCPIP for the Transport, the Internet host name of the remote host for the Node, and a question mark (?) for the Username for each host you wish to grant access to the local display.

EACH user on a workstation who wishes to allow access to the local display from a remote system must specify the remote system under the Customize Security dialog box. A different list is maintained for each user.

1.3. Sending and Receiving Electronic Mail

This section describes how to use OpenVMS MAIL with VSI TCP/IP.

VSI TCP/IP enhances OpenVMS Mail so you can send and receive mail across the network.

1.3.1. Specifying Addresses

When you use OpenVMS Mail to send mail to a host outside your OpenVMScluster, the message is sent via SMTP (Simple Mail Transfer Protocol). For this reason, you must specify the address so that SMTP accepts the mail correctly. The format for the address is:

```
To: SMTP%recipient@destination
```

The string SMTP and the destination system name are not case-sensitive; that is, you can type them in either uppercase or lowercase letters. The destination recipient specification may be case-sensitive, however, depending on the destination system's software. On some UNIX systems, ROOT and root specify two different user names (and hence different electronic mail addresses).

If the address contains an apostrophe, enter the address with either `\'` or `\s` as shown in the following example formats:

```
To: SMTP%"Thomas.O\'Malley@alley.cat.net "  
To: SMTP%"Thomas.O\sMalley@alley.cat.net "
```

For the address <Thomas.O'Malley@alley.cat.net>.

```
To: SMTP%\recipient@destination
```

or

```
To: SMTP%\srecipient@destination
```

If the address is on a local DECnet network, use this format:

```
To: SMTP%nodename::username
```

If the address is on a remote DECnet network, you may use this format:

```
To: SMTP%'nodename::username '@destination
```

Note

VSI TCP/IP assumes that an address containing a double colon (::) is a DECnet address. If an address contains a double colon and is not a DECnet address, SMTP does not handle it correctly.

If you know the recipient's IP address, but not the host name (or if the host name is not registered in the Domain Name System), specify the recipient address as follows:

```
To: SMTP%recipient@[aa.bb.cc.dd]
```

aa.bb.cc.dd is the destination system's IP address in dotted-decimal form. You must specify the IP address in square brackets.

The OpenVMS Mail utility also allows you to specify an addressee on the command line:

```
$ MAIL filename addressee
```

To use this form of the command with VSI TCP/IP, you must enclose the address in quotes (and you must double all existing quotes), as follows:

```
$ MAIL filename  
SMTP%"recipient@destination"
```

The following example shows the user sending mail using the OpenVMS MAIL utility to a user named John Smith with a user name of "johns" on system SALES.FLOWERS.COM.

```
$ MAIL  
MAIL>SEND  
To: SMTP%johns@sales.flowers.com  
Subj: This is a test message.  
Enter your message below. Press Ctrl/Z when complete, or Ctrl/C to quit:  
Hi John, this is a test of the VSI TCP/IP extension to the OpenVMS MAIL  
utility.  
Ctrl/Z  
MAIL>EXIT  
$
```

You receive network mail as you would all other mail in the OpenVMS MAIL utility. The following example shows the user "CHARLES" reading an SMTP mail message sent by the user "johns."

```
$
New mail on node KAOS from SMTP%"johns@sales.flowers.com" "John Smith"
$ MAIL
You have 1 new message.
MAIL>READ/NEW
#1          05-15-2017 10:05:40.79
From:       SMTP%johns@sales.flowers.com [mailto:johns@sales.flowers.com]
  "John Smith"
To:         CHARLES
CC:
Subj:       Re: This is a test message.
Date:       Mon, 15 May 2017 10:04:50 EST
From:       johns@sales.flowers.com (John Smith)
Message-Id: <891120100450.77@SALES.FLOWERS.COM>
Subject:    Re: This is a test message.
To:         charles@flowers.com
X-Vmsmail-To: SMTP%"charles@flowers.com"
Glad to see your test worked.
This is my response.
MAIL>EXIT
```

1.3.2. Specifying a Host Alias

VSI TCP/IP allows a system to have multiple names-or host aliases-with respect to electronic mail delivery. You can specify the host alias you want to use by defining the `IP$SMTP_FROM_HOST` logical name. The alias you choose must be one of the SMTP host name aliases registered on the system (see the translation of the logical name `IP$SMTP_HOST_NAME` and the contents of the file `IP$HOST_ALIAS_FILE`). If the alias you use is unknown, the setting of `IP$SMTP_FROM_HOST` is ignored.

The host alias feature allows users from different administrative units within an organization to have their return address reflect the name of their unit, even though mail for all units is handled by one system.

Note

You can control the envelope by using the `IP$SMTP_ENVELOPE_FROM_HOST` logical. In VSI TCP/IP this can be configured via **IP CONFIGURE/MAIL**.

1.3.3. Specifying Individual Aliases

VSI TCP/IP supports both *system-wide* and *per-user* mail aliases. Using these aliases, you can refer to electronic mail addresses with names that are meaningful to you. Per-user mail aliases are kept in the file `SMTP_ALIASES`. in your login directory.

The format for alias entries is:

```
alias: real_address[,...];
```

`alias` is an alphanumeric string and *real_address* is an electronic mail address. You can specify multiple addresses by separating them with commas (.). The alias definition may span multiple lines, if needed, and must always be terminated with a semicolon (;).

For example, a local user may have a user name of JB134A, but you want to send mail to him as john. Add the following line to your `SMTP_ALIASES`. file:

```
john: jbl34A;
```

Aliases are repeatedly translated until no more translations are found. You can circumvent the repeated translations by including a leading underscore (`_`) in the *real_address*. For example, this definition causes mail to be forwarded and delivered locally:

```
fnord: fnord@somewhere.else.edu, _fnord;
```

1.4. Using Kerberos Authentication

This section explains how to use the Kerberos authentication system.

1.4.1. Understanding VSI Kerberos for OpenVMS

Kerberos provides a secure way of proving a user's identity across an unsecure network. It does this without transmitting passwords where an intruder could see them. VSI TCP/IP has several enhanced or *Kerberized* commands including RCP, RLOGIN, RSHELL, and TELNET.

The process of proving one's identity is called *authentication*. Deciding whether or not to allow access to a resource is called *authorization*. Kerberos is an authentication system. Because authentication is a prerequisite to authorization, an application can make an authorization decision (for example, deciding to permit you to log in) based on your identity as authenticated by Kerberos.

Kerberos maintains a list of users and their encrypted passwords. Before you can use Kerberized commands, your system manager must have added your name to this list. You can only use Kerberized commands if you have a ticket for the command you wish to use. Analogous to the tickets you purchase when you go to a movie, Kerberos tickets permit you to invoke Kerberized utilities while you are logged in.

To use Kerberos, you must first:

- Acquire an initial ticket when you log in. This initial ticket, known as a *ticket-getting ticket* (or TGT), enables you to automatically get other tickets you will need to access application servers. You may also need to acquire another TGT when a previous one expires.
- Delete tickets before you log out. *It is very important to remember to delete your tickets any time you leave your terminal!* If another user "borrows" your tickets, you can be locked out of the network or impersonated by the intruder.
- Always run Kerberized utilities with the `/AUTH` qualifier. (The full form of the qualifier is `/AUTHENTICATION=KERBEROS`.)
- Change your Kerberos password at least once a month.

Note

The instructions in this section are applied to Kerberos V4. VSI TCP/IP has added Kerberos V5 functionality to the TELNET and SSH applications only. Kerberos V5 database and ticket management functionality can be obtained with the VSI Kerberos for OpenVMS product.

Kerberos security helps protect you and other users from data theft and other possible security breaches. You are the ultimate security element in making sure your files are safe; it is up to you to choose a password that is not easily guessed, and delete your tickets before you log out.

1.4.2. Making Sure Kerberos is Available

Before continuing with this section, make sure Kerberos is available on your system by asking your system manager these questions:

1. Is Kerberos enabled?
2. Has a Kerberos principal been created for me?
3. Do I need to get and delete Kerberos tickets?
 - If the answer to all three questions is yes, read this section.
 - If Kerberos is not enabled, skip to the next section.
 - If no Kerberos principal exists, your system manager must add one for you before you can use Kerberos.
 - If you answered no only to question 3, and yes to questions 1 and 2, you only need to read the section on "*Changing your Kerberos password*" for information on changing your Kerberos password. All other commands are handled automatically on your system.

1.4.3. Acquiring and Deleting Tickets

To acquire your initial ticket-getting ticket, enter this command from the DCL command line:

```
$ IP KERBEROS INIT
This node is: holmes.flowers.com
Kerberos Initialization for "john"
Password: password
```

If you need to be authenticated as another user, use the `/USERNAME` qualifier. Use the `/REALM` qualifier to be authenticated in another realm. (A *realm* is an administrative name for a site, system, or other organizational entity.)

You can delete tickets with this command:

```
$ IP KERBEROS DESTROY
```

1.4.3.1. Obtaining Tickets Under Another User Name

You can use the `IP KERBEROS INIT` command with the `/USERNAME` qualifier to obtain tickets under another user name. For example, if you gained access to the system through a GUEST login, but you want to continue access to the network as yourself, you could use the `/USERNAME` qualifier with the `IP KERBEROS INIT` command to specify your own user name. When you issue this form of the command, you are prompted for the other user's Kerberos password.

To access a remote system as another user, use both the `/AUTH` and `/USERNAME` qualifiers with the `RCP`, `RLOGIN`, `RSHELL`, and `TELNET` commands.

1.4.4. Using Kerberos with the RCP, RLOGIN, RSHELL, and TELNET Commands

The `RCP`, `RLOGIN`, `RSHELL`, and `TELNET` commands all support the `/AUTHENTICATION=KERBEROS` qualifier (specify this qualifier first before any other qualifiers). You can shorten this qualifier to `/AUTH` as in the following example:

```
$ RLOGIN/AUTH FLOWERS.COM
```

You can use the `/USERNAME` qualifier with the `/AUTH` qualifier to specify the user name you want to use logging into the remote system.

1.4.5. Checking Ticket Status

You can check the status of your tickets with the `IP KERBEROS LIST` utility. For example, to test the status from the command line, enter:

```
$ IP KERBEROS LIST
Principal:          john@FLOWERS.COM
Issued             Expires             Principal
June 13 16:16:47  June 14 00:16:47  krbgt.TROIKA.FOO@TROIKA.FOO
$
```

The utility also provides the `/CHECK_TGT` qualifier so you can test whether your ticket-getting ticket has already expired. If the ticket has expired, run `IP KERBEROS INIT` again. The following command procedure tests your ticket status:

```
$! Test ticket status
$!
$ IP KERBEROS LIST /CHECK_TGT
$ IF $STATUS THEN WRITE SYS$OUTPUT "Okay"
```

If the tickets are valid, `$STATUS` is true. If the tickets have expired, `$STATUS` is false.

1.4.6. Changing Your Kerberos Password

You can change your Kerberos password with this command:

```
$ IP KERBEROS PASSWORD
Old password for holmes: password
New password for holmes: password
Verifying, re-enter New password for holmes: password
$
```

Use these guidelines for selecting a Kerberos user password:

- Kerberos passwords are case-sensitive so if you press the **SHIFT** key when you create the password, you must always press the key at the same point when entering the password.
- Kerberos passwords can be up to 64 characters long.
- Spaces and control characters are not permitted. In addition, you cannot use the **DELETE** key to correct a misspelling when entering a password.

Chapter 2. Accessing Remote Systems (RSHHELL, RLOGIN, TELNET)

This chapter describes how to execute commands on remote systems using the RSHHELL utility, and how to log into remote systems using the RLOGIN and TELNET utilities.

2.1. Executing Commands on a Remote System Using RSHHELL

The RSHHELL utility lets you execute commands on remote hosts. RSHHELL connects to the specified host and creates an RSHHELL server process to execute the commands you enter. If the remote command requires input, data is read from SYS\$INPUT and sent over the network to the remote process. Output from the remote command is copied back over the network and displayed on SYS\$OUTPUT.

2.1.1. Using and Terminating RSHHELL

Before you can execute a remote command successfully, the remote system must determine that you are allowed to do so. The RSHHELL server checks the "R" services equivalence files to determine whether or not you are authorized to execute commands remotely. RSHHELL uses the same authentication scheme as other "R" services. See Section 2.2.2.

The following example shows how to use RSHHELL to get a directory listing on the UNIX system UNIX.FLOWERS.COM from a local OpenVMS system:

```
$ RSHHELL UNIX.FLOWERS.COM ls -l
```

This command assumes that the remote user name is the same as the local user name. To specify a different remote user name, use the /USERNAME qualifier as shown in the following command:

```
$ RSHHELL /USERNAME=zeno UNIX.FLOWERS.COM ls -l
```

If "R" services equivalence files are not set up, you can still use the RSHHELL command by specifying the /PASSWORD qualifier. When a password is specified, rather than connecting to the RSHHELL server, the RSHHELL client connects to the REXEC server on the remote system. REXEC is identical in function to RSHHELL, except that it uses a user name and password to perform authentication rather than equivalence files. The command format for specifying a password is as follows:

```
$ RSHHELL /USERNAME=zeno /PASSWORD=race UNIX.FLOWERS.COM ls -l
```

If you specify /PASSWORD without a value, you are prompted for the password.

You can modify where the remote command standard input is read and where standard output and standard errors are written. Normally, RSHHELL uses SYS\$INPUT, SYS\$OUTPUT, and SYS\$ERROR for input, output, and error. You can redirect the input, output, or error streams using the /INPUT, /OUTPUT, or /ERROR qualifiers, respectively.

If you want to execute a command with RSHHELL, but do not want your terminal to be tied up during the remote command execution, include the qualifier /INPUT=NLA0: on the RSHHELL command to specify a null device. The remote command will see an end-of-file if it attempts to read from standard input.

Note

You can use the SYSMAN parameter DELPRC_EXIT to stop the display of the SYSTEM-F-EXIT-FORCED message. When left at the default value of 5 after an RSHELL command is executed, the message “%SYSTEM-F-EXITFORCED, forced exit of image or process by SYS\$DELPRC” is displayed. This does not interfere with the execution of the command on the remote system. Setting SYSMAN dynamic parameter DELPRC_EXIT to 0 (zero) stops the display of this message.

Normally, RSHELL terminates when the remote command terminates. However, if you press **Ctrl/C** while RSHELL is running, the interrupt is sent to the remote process. If the remote command is being executed on a UNIX system, the **Ctrl/C** is perceived as an interrupt signal.

Note

The execution of a remote command using the Unix equivalent RSH command is not supported in VSI TCP/IP. When issued from a Unix host, the Unix RSH command can only be used to initiate a terminal session.

2.2. Logging Into a Remote System with RLOGIN

The RLOGIN command lets you interactively log into a remote system from your local system. RLOGIN is similar to TELNET, except that support for RLOGIN is not as widespread, and the authentication method relies on equivalence files that identify trusted hosts rather than passwords.

2.2.1. Using and Terminating RLOGIN

If your user name is the same on the local and remote systems, or the "R" services equivalence files are set up appropriately, you can use the following command format to log in:

```
$ RLOGIN hostname
```

To use a different remote user name, use the following command format:

```
$ RLOGIN hostname /USERNAME=remote_user
```

Once an RLOGIN session has been established, the following character sequences typed at the beginning of a line have the effect described:

~.	A tilde followed by a period disconnects the session and exits RLOGIN.
~ Ctrl/Z	A tilde followed by Ctrl/Z creates and connects you to a subprocess on the local system. When you log out of the subprocess, you return to your RLOGIN session.
~~	Two consecutive tildes transmit a single tilde to the remote system.

You terminate your session with the remote host by logging out as you normally would.

2.2.2. "R" Services Authentication

The "R" services RLOGIN, RSHELL, RCP, and RMT use *trusted users* and *trusted hosts* listed in two files on the destination system for access control: IP\$:HOSTS.EQUIV and SYS\$LOGIN: .RHOSTS.

2.2.3. Host Equivalences

The `IP$:HOSTS .EQUIV` file (`/etc/hosts.equiv` on UNIX systems) provides a list of hosts to receive access on a system-wide basis. All users on the specified hosts can access the target system without specifying a user name or password. Each entry in this file consists of a host name.

Note

You cannot use the `IP$:HOSTS .EQUIV` file to allow access to an individual user; user names specified in this file are ignored.

The following example shows a sample `HOSTS .EQUIV` file.

```
localhost
sales.flowers.com
flowers.com
bubba.flowers.com
```

If the `HOSTS .EQUIV` file shown in the previous example exists on the system such as the example `SALES .FLOWERS .COM`, the following statements are true:

- Users on `SALES .FLOWERS .COM` will have `RLOGIN`, `RCP`, and `RSHELL` access to their own accounts on the system. (Allowed by the first two entries.)
- `FLOWERS .COM` and `BUBBA .FLOWERS .COM` are identified (in the last two entries) as trusted hosts, allowing any user on either of these systems to have `RLOGIN`, `RCP`, and `RSHELL` access to their own user name on `SALES .FLOWERS .COM` without specifying the user name or a password.

2.2.4. User Equivalences

The `SYS$LOGIN : .RHOSTS` file (`~/rhosts` on UNIX systems) allows remote users access to your user name. The format of an entry in this file consists of a host name and an optional user name:

```
Hostname [username]
```

Each entry specifies that *username* on system *hostname* can access your user name on the target without specifying a password (you may omit *username* if your user names are identical on the two systems).

The following example contains an example `.RHOSTS` file.

```
flowers.com system
unix.flowers.com root
```

If the `.RHOSTS` file shown in the previous example belongs to the user `FNORD` on `SALES .FLOWERS .COM`, the following statements are true:

- The first entry grants access to user name `FNORD` on `SALES .FLOWERS .COM` from user `SYSTEM` on host `FLOWERS .COM`.
- The second entry grants access to user name `FNORD` from user `ROOT` on host `UNIX .FLOWERS .COM`.

Hence, either of these two remote users can use `RLOGIN`, `RCP`, or `RSHELL` to access `FNORD`'s account on `SALES .FLOWERS .COM` without specifying a password.

2.2.4.1. Cautions Concerning Use of Equivalences

The following cautions apply when using "R" services equivalence files:

- When specifying a user in any authentication file (particularly on UNIX systems), make sure to specify the user name in the correct case. "ROOT" and "root" are treated as different user names on case-sensitive systems.
- The host initiating the RLOGIN, RCP, or RSHELL request must be listed in the destination host's host name database by DNS, or its name must be resolvable by DNS (if domain name service is enabled). If the destination host cannot determine the initiating host's name from the IP address in the connection request, it rejects the request.
- The resolved host name must be an exact match. For example, if the IP address resolves to `FNORD.FOO.COM`, it is not correct to put only `FNORD` in the `HOST.EQUIV` or `.RHOSTS` file. In addition to being fully qualified, entries must be of the same case.
- The VSI TCP/IP RLOGIN, RCP, and RSHELL servers cache the contents of the `.RHOSTS` and `HOSTS.EQUIV` files in memory for ten minutes to improve performance. This means changes to the `.RHOSTS` and `HOSTS.EQUIV` file may not be noticed by the network immediately. Your system manager can use the following command to flush the cache before the timeout period:

```
$ IP NETCONTROL RLOGIN FLUSH
```
- Access control requirements differ between RLOGIN and other "R" services. RLOGIN requires both `NETWORK` and `LOCAL` access, while RSHELL, RMT, and RCP only require `NETWORK` access.

2.3. Logging Into a Remote System with TELNET

The VSI TCP/IP TELNET utility uses the standard Internet TELNET protocol to establish a virtual terminal connection between the interactive session on your OpenVMS system and a remote host. You can connect to any remote host on the network that supports the TELNET protocol, and perform any operation as if you were using a terminal physically connected to the remote host.

Refer to the Section 2.3.5 for information on using the TELNET TN3270 and TN5250 features for accessing IBM hosts.

2.3.1. Starting a TELNET Connection

You can start TELNET and establish a connection to a remote host in either of two ways:

- From the DCL prompt
- Interactively from within the TELNET utility

The following example shows how to run TELNET and connect to a host in a single step.

```
$ TELNET remote_host
Trying...
Connected to remote_host, a host_type running os_type
```

In the next example, you invoke the TELNET utility. Once TELNET starts, you specify the remote host to which you want to connect.

```

$ TELNET
SIMPLE.EXAMPLE.COM VSI TCP/IP for OpenVMS TELNET-32 10.5(103)
TELNET>connect remote_host
Trying...
Connected to remote_host, a host_type running os_type

```

In either case, TELNET informs you of the CPU type and operating system software on the remote host (if that information is available from DNS or the host table).

Once you have logged in, proceed as though you were connected to the remote host via a locally attached terminal. Use the command syntax conventions native to the remote host.

2.3.2. Using TELNET Commands

You can only execute TELNET commands in command mode; that is, when you see the TELNET> prompt (before a connection is established) or the *host*> prompt (after a connection has been established).

You can force TELNET into command mode by entering the current escape character followed by an X. The default **ESCAPE** character is **Ctrl/^** (control-caret).

The following example shows how to force TELNET into command mode:

```
$ Ctrl/^Xhost>
```

Use the STATUS command to determine the state of all parameters associated with the TELNET session. The following example shows typical STATUS command output.

```

$ Ctrl/^ FLOWERS.COM>status

This is BUBBA.FLOWERS.COM, VSI OpenVMS V8.4-2L1
Connected to host IRIS.COM.
Remote host is echoing
Host is not sending binary
Client is not sending binary
NO Abort Output character set
NO Interrupt Process character set
NO Are-You-There character set
NO Erase Character character set
NO Erase Line character set
Normal End Of Line mapping
Local Flow control
No log file
Remote host status reply:
KAOS::_VTA23: 11:24:21 (DCL) CPU=00.00.10.92 PF=322 IO=78 MEM=218

```

In general, when you type the TELNET ESCAPE character **Ctrl/^**, the next character you type is interpreted as follows:

?	Prints help information on TELNET escape commands.
A	Sends an "Attention" request to the remote host.
B	Sends a "Break" request to the remote host.
C	Closes the connection to the remote host.
O	Sends an "Abort Output" request to the remote host.
P	Spawns a new process (or attaches to a parent process, if there is one).

Q	Quits TELNET.
S	Prints the status of the TELNET connection.
T	Sends an "Are-You-There" request to the remote host.
X	Enters extended TELNET command mode.

To send the **ESCAPE** character itself to the remote host, type the **ESCAPE** character twice.

To change the **ESCAPE** character, use the DCL qualifier `/ESCAPE_CHARACTER`. For example, to change from the default **ESCAPE** character `Ctrl/^` to `Ctrl/A`, type:

```
TELNET>SET ESCAPE "^A"
```

or:

```
$ TELNET /ESCAPE_CHARACTER="^A" FLOWERS.COM
```

You can determine all the available TELNET commands at any time by typing a question mark (?) at the TELNET> prompt.

2.3.3. Using TELNET Control Sequences

You can establish mappings between control characters and certain TELNET control sequences. This can often significantly improve terminal response. These mappings can also be used to provide a certain amount of system independence in the command interface across different systems. Consult the TELNET RFCs (854, 855, 856, 857, 1041, 1073, 1079, 1080, 1091) for additional information on TELNET control sequences (also known as IACs).

Normally, in a TELNET session, all characters typed at the terminal are inserted in the TELNET stream sequentially and interpreted sequentially at the remote system. Hence, even control characters that you want interpreted immediately (like `Ctrl/C` or `Ctrl/O` on an OpenVMS system) are interpreted on the remote system only after all characters that precede them in the command stream.

TELNET control sequences, however, can cause the remote system to perform their function before processing characters already in the input stream.

To specify control characters that map to these commands, specify them from the DCL command line:

```
$ TELNET /ABORT_OUTPUT="^O" flowers.com
```

or, using the SET command from within TELNET; for example:

```
TELNET>set abort-output "^O"
```

The following table summarizes the possible TELNET control sequences:

Table 2.1. TELNET Control Sequences

Sequence Name	Action	Equivalent OpenVMS Function
ABORT-OUTPUT	Cancels any output in progress and sends an Abort Output command to the TELNET server. Additionally, if the AUTO-FLUSH feature is enabled, a Timing Mark command is sent to the TELNET server; the TELNET client begins dis-	Ctrl/O

	carding any buffered output until a Timing Mark command is received in the response.	
ARE-YOU-THERE	Sends an Are You There command to the TELNET server.	Ctrl/T
BREAK-CHARACTER	Sends a Break command to the TELNET server.	BREAK
ERASE-CHARACTER	Sends an Erase Character command to the TELNET server.	</X
ERASE-LINE	Sends an Erase Line command to the TELNET server.	Ctrl/U
INTERRUPT-PROCESS	Sends an Interrupt Process command to the TELNET server.	Ctrl/C

You can also specify control characters from the DCL command line; for example:

```
$ telnet/abort_output="^O" flowers.com
```

2.3.4. Running Applications over TELNET Connections

A TELNET connection normally exists between a remote pseudo-terminal (for example, NTYx:) and the TELNET user program. Characters received from the user's terminal are sent through the network to the remote pseudo-terminal and vice versa. Using the DCL qualifier `/CREATE_NTY` or the TELNET `CREATE-NTY` command, you can also connect the local end of the connection to a pseudo-terminal. Once the local end is connected to a pseudo-terminal, you can run other applications (such as KERMIT) over the TELNET connection.

The `CREATE-NTY` command first attempts to negotiate BINARY mode. BINARY mode ensures the connection is as transparent as possible. Then, a new NTYx terminal is created and the connection attached to it. Finally, the NTYx terminal is allocated to your current process and TELNET exits.

The following example shows how to use the DCL `/CREATE_NTY` qualifier.

```
$ TELNET/CREATE_NTY bubba
Trying... Connected to BUBBA.
Welcome to BUBBA
Username: JOE
Password:
Welcome to VSI OpenVMS V8.4-2L1 on node BUBBA
Last interactive login on Tuesday, 14-MAR-2017 13:34
Last non-interactive login on Wednesday, 15-MAR-2017 13:32
[ Process _VTA13: on BUBBA::VTA13: ]
$ Ctrl/^X
BUBBA>create-nty
TELNET session now connected to _NTY3:
%DCL-I-ALLOC, _NTY3: allocated
$ kermit
VMS Kermit-32 version 3.3.111
Default terminal for transfers is: _TWA2:
Kermit-32>set line nty3:
Kermit-32>connect
[Connecting to _NTY3:. Type ^]C to return to VSI OpenVMS V8.4-2L1]
$
```

The following example shows how to use TELNET `CREATE-NTY`.

```
$ TELNET BUBBA
Trying... Connected to BUBBA.
Welcome to BUBBA
Username: JOE Password:
```

```
Welcome to VSI OpenVMS V8.4-2L1 on node BUBBA
Last interactive login on Tuesday, 15-MAY-2017 13:34
Last non-interactive login on Wednesday, 15-MAY-2017 13:32
[ Process _VTA13: on BUBBA::VTA13: ]
$ Ctrl/^X
BUBBA>CREATE-NTY
TELNET session now connected to _NTY3:
%DCL-I-ALLOC, _NTY3: allocated
$ kermit
VMS Kermit-32 version 3.3.111
Default terminal for transfers is: _TWA2:
Kermit-32>set line nty3:
Kermit-32>connect
[Connecting to _NTY3:. Type ^]C to return to VSI OpenVMS V8.4-2L1]
$
```

2.3.5. Accessing IBM Hosts with the TELNET Command

TELNET provides two IBM terminal emulations for accessing IBM hosts. The /TN3270 and /TN5250 qualifiers provide IBM 3270 and IBM 5250 terminal emulations, respectively. Using TELNET TN3270 and TN5250, you can:

- Log into IBM hosts
- Display and define your own keyboard map
- Capture screen output
- Print screen capture output

Both TN3270 and TN5250 modes use the OpenVMS screen management (SMG) runtime routines to create a full-screen IBM 3270 or 5250 mode display on your terminal. These TELNET modes give the appearance of being logged into the remote host from an IBM terminal.

2.3.6. Starting and Stopping an IBM Terminal Emulator Using TELNET

To start TELNET in TN3270 mode, enter the following command:

```
$ IP TELNET /TN3270
```

To force TN3270 emulation, enter:

```
$ IP TELNET /TN3270=FORCE
```

This qualifier is useful when communicating with a system that supports 3270 mode, but cannot negotiate it automatically, such as IBM mainframes running ACCESS/VMS. To start TELNET in TN5250 mode, enter:

```
$ IP TELNET /TN5250
```

To force TN5250 emulation, enter:

```
$ IP TELNET /TN5250=FORCE
```

Exit a TN3270 or TN5250 session by pressing **Ctrl/C**.

2.3.7. IBM 3278 Models

In TN3270 mode, TELNET emulates an IBM 3278 terminal. The model number depends on the terminal "window" size (page width and length). The terminal (or window on a workstation) on which TN3270 mode TELNET is running must have at least 80 columns and 24 rows. Table 2-2 describes the actual emulation used, based on the terminal/window size.

Table 2.2. 3278 Model Window Size

Minimum Size (Rows x Columns)	Emulated Terminal
24 x 80	3278 model 2
32 x 80	3278 model 3
43 x 80	3278 model 4
27 x 132	3278 model 5

TN5250 TELNET mode emulates a TN5251-11 terminal with 24 rows and 80 columns and has only one screen mode.

2.3.8. Mapping Your Keyboard

TN3270 and TN5250 modes use the OpenVMS SMG runtime routines and the files `IP$:MAP3270 .DAT` and `IP$:MAP5250 .DAT`, respectively, to perform terminal emulation on the local system. These files contain the terminal key sequence to IBM terminal key mappings for a wide variety of terminals. Only those terminals with entries in both `MAP3270 .DAT` or `MAP5250 .DAT` and the OpenVMS SMG terminal definition library (`SYS$SYSTEM:TERMTABLE .TXT`) can use the IBM terminal modes.

2.3.9. Displaying the Current Keyboard Mapping

Press the **HELP** key to display the current key mappings from the current key mapping data file (such as `MAP3270 .DAT`). The help screen reformats and improves readability of the information in the mapping file.

The following is an example help screen for `MAP3270 .DAT`:

```
TN3270 Key Definitions (Press Help to dismiss)
PFK1      = "KP1" or "ESC 1"      PFK22    = "PF2 KP2" or "^F 2 2"
PFK2      = "KP2" or "ESC 2"      PFK23    = "PF2 KP3" or "^F 2 3"
PFK3      = "KP3" or "ESC 3"      PFK24    = "PF2 KP4" or "^F 2 4"
PFK4      = "KP4" or "ESC 4"      PA1      = "ESC PF1" or "^P 1"
PFK5      = "KP5" or "ESC 5"      PA2      = "ESC PF2" or "^P 2"
PFK6      = "KP6" or "ESC 6"      LEFT     = "^H" or "LEFT"
PFK7      = "KP7" or "ESC 7"      RIGHT    = "^L" or "RIGHT"
PFK8      = "KP8" or "ESC 8"      UP       = "^K" or "UP"
PFK9      = "KP9" or "ESC 9"      DOWN     = "^J" or "DOWN"
PFK10     = "PF1 KP0" or "ESC 0"   CLEAR    = "^Z" or "KP_ENTER"
PFK11     = "PF1 KP1" or "ESC -"   ENTER    = "^M"
PFK12     = "PF1 KP2" or "ESC ="   ESCAPE   = "^C"
PFK13     = "PF1 KP3" or "^F 1 3"  CAPTURE  = "^T" or "DO"
PFK14     = "PF1 KP4" or "^F 1 4"  TAB      = "^I"
PFK15     = "PF1 KP5" or "^F 1 5"  BTAB     = "^B"
PFK16     = "PF1 KP6" or "^F 1 6"  INSRT    = "" or "ESC SPACE"
PFK17     = "PF1 KP7" or "^F 1 7"  DELETE   = "^D"
PFK18     = "PF1 KP8" or "^F 1 8"  ERASE    =
```

```

PFK19    = "PF1 KP9" or "^F 1 9"   EOF    = "^E"
PFK20    = "PF2 KP0" or "^F 2 0"   EINP   = "^W"
PFK21    = "PF2 KP1" or "^F 2 1"   HOME   = "KP_PERIOD"

```

The 3270.DAT file viewed without the **HELP** formatting is as follows:

```

vt100|vt200|vt220|vt240|vt200-80|vt300|vt400|vt100nam|pt100| {
enter     = '^m';
clear     = '^z'      | '\EOM'   | '\3M';
help      = '\E[28~' | '\EH'    | '\C28~';
capture   = '^t'      | '\E[29~' | '\C29~';
nl        = '^?';
tab       = '^i';
btabs     = '^b';
left      = '^h'      | '\E[D'   | '\EOD'   | '\3D'   | '\CD';
right     = '^l'      | '\E[C'   | '\EOC'   | '\3C'   | '\CC';
up        = '^k'      | '\E[A'   | '\EOA'   | '\3A'   | '\CA';
down      = '^j'      | '\E[B'   | '\EOB'   | '\3B'   | '\CB';
home      = '\EOn'    | '\3n';
fm        = '^y';
delete    = '^d';
eof       = '^e';
einp     = '^w';
insrt     = '^ '      | '\E ' ;

# pf keys
pfk1     = '\EOq'     | '\E1'    | '\3q';
pfk2     = '\EOr'     | '\E2'    | '\3r';
pfk3     = '\EOs'     | '\E3'    | '\3s';
pfk4     = '\EOt'     | '\E4'    | '\3t';
pfk5     = '\EOu'     | '\E5'    | '\3u';
pfk6     = '\EOv'     | '\E6'    | '\3v';
pfk7     = '\EOw'     | '\E7'    | '\3w';
pfk8     = '\EOx'     | '\E8'    | '\3x';
pfk9     = '\EOy'     | '\E9'    | '\3y';
pfk10    = '\EOP\EOp' | '\E0'    | '\3P\3p';
pfk11    = '\EOP\EOq' | '\E-'    | '\3P\3q';
pfk12    = '\EOP\EOr' | '\E='    | '\3P\3r';
pfk13    = '\EOP\EOs' | '^f13'   | '\3P\3s';
pfk14    = '\EOP\EOt' | '^f14'   | '\3P\3t';
pfk15    = '\EOP\EOu' | '^f15'   | '\3P\3u';
pfk16    = '\EOP\EOv' | '^f16'   | '\3P\3v';
pfk17    = '\EOP\EOw' | '^f17'   | '\3P\3w';
pfk18    = '\EOP\EOx' | '^f18'   | '\3P\3x';
pfk19    = '\EOP\EOy' | '^f19'   | '\3P\3y';
pfk20    = '\EOQ\EOp' | '^f20'   | '\3Q\3p';
pfk21    = '\EOQ\EOq' | '^f21'   | '\3Q\3q';
pfk22    = '\EOQ\EOr' | '^f22'   | '\3Q\3r';
pfk23    = '\EOQ\EOs' | '^f23'   | '\3Q\3s';
pfk24    = '\EOQ\EOt' | '^f24'   | '\3Q\3t';

# program attention keys
pa1      = '\E\EOP'   | '^p1'    | '\E\3P';
pa2      = '\E\EOQ'   | '^p2'    | '\E\3Q';

# local control keys

escape   = '^c' | '^ ^'; # escape to telnet command mode

```

```

master_reset = '^g';

# local editing keys
settab = '\E';
deltab = '\E\';
clrtab = '\E: ';
setmrg = '\E, ';
sethom = '\E. ';
coltab = '\E\E[B' | '\E\E[OB' | '\E\3B' | '\E\CB';
colbak = '\E\E[A' | '\E\E[OA' | '\E\3A' | '\E\CA';
indent = '\E\E[C' | '\E\E[OC' | '\E\3C' | '\E\CC';
undent = '\E\E[D' | '\E\E[OD' | '\E\3D' | '\E\CD';
} # end of vt100, etc.

```

On terminals without a **HELP** key, edit the MAP3270.DAT or MAP5250.DAT file and assign a value to the HELP function. For example, to assign the help function to either **Ctrl/X/H** or **ESC/H**, add this line to the file:

```
help = '^XH' | '\EH';
```

For VT-class terminals without a **HELP** key, TELNET supports **ESC/H** by default. On these terminals, you do not need to modify the MAPxxxx.DAT files.

2.3.10. Keyboard Mapping File Format

The keyboard mapping files contain mappings between characters entered from your keyboard, and 3270 or 5250 keycodes. The first line specifies all of the terminal types supported. For example, these mappings specify HP VT100-VT400 terminals:

```
vt100 | vt200 | vt200-80 | vt220 | vt240 | vt300 | vt400
```

Subsequent lines specify the IBM keycode followed by an equals sign (=) and the keystrokes (in single quotes) you press to send the keycode. Each key definition ends with a semicolon (;). Some reserved characters are:

- Caret (^) begins a **Ctrl** character sequence.
- Backslash and the letter "E" (\E) represents an **ESCAPE** character.
- Caret-question mark (^?) represents rub out.

For example, this key sequence:

```
delete = '^d';
```

sends the IBM DELETE code when you press **Ctrl/D**.

2.3.10.1. Functions

The following is a list of the TN3270 and TN5250 functions that can be used in the MAP3270.DAT and MAP5250.DAT files.

aplend	cursel	escape	left2	right	up
aploff	delete	ferase	lprt	right2	vertical_bar
aplone	deltab	fieldend	master_reset	sethom	werase
attn.	disc	flinp	monocase	setmrg	wordbacktab
btabs	down	fm	nl	ettab	wordend
capture	dp	help	pal-pa3	space	wordtab
centsign	dvcnl	home	pcoff	synch	

```
clear    eof      indent   pcon     tab
clrtab  einp     init     pfk1-pfk36 test
colbak  enter    insrt    reset    treq
coltab  erase    left     reshow   undent
```

2.3.11. Specifying Multiple Keystrokes

You can assign multiple keystrokes to a single code by separating each set of keystrokes with a vertical bar (|) operator. The following example sends the delete keycode to the host when you press either **Ctrl/D** or **Ctrl/?**.

```
delete = '^d' | '^?';
```

2.3.12. TN3270 Function Key Mapping

The following table lists the mappings between 3270 function keys and the keys on HP VT100, VT200, VT300, and VT400 series terminals.

Table 2.3. TN3270 Function Key Mappings

IBM Function	VT Terminal Key Sequences
Enter	Ctrl/M or RETURN
Clear	Ctrl/Z or ENTER
Input Editing Functions	
New line	DELETE
Tab	TAB or Ctrl/I
Backtab	Ctrl/B
Left	Ctrl/H or LEFT ARROW
Right	Ctrl/L or RIGHT ARROW
Up	Ctrl/K or UP ARROW
Down	Ctrl/J or DOWN ARROW
Home	Keypad
Delete	Ctrl/D
Erase to EOF	Ctrl/E
Erase Input	Ctrl/W
Insert	Ctrl/Space or ESC/Space
Attention Keys	
PA1	ESC/PF1 or Ctrl/P/1
PA2	ESC/PF2 or Ctrl/P/2
Local Control Keys	
TELNET Escape	Ctrl/C or Ctrl/[]
Master Reset	Ctrl/G
Local Editing Keys	
Set Tab	ESC/;
Delete Tab	ESC/^\

Clear Tabs	ESC/:
Set Merge	ESC/,
Set Home	ESC/.
Column Tab	ESC/DOWN ARROW
Column Back Tab	ESC/UP ARROW
Indent	ESC/RIGHT ARROW
Unindent	ESC/LEFT ARROW
Function Keys	
PF1	Keypad 1 or ESC/1
PF2	Keypad 2 or ESC/2
PF3	Keypad 3 or ESC/3
PF4	Keypad 4 or ESC/4
PF5	Keypad 5 or ESC/5
PF6	Keypad 6 or ESC/6
PF7	Keypad 7 or ESC/7
PF8	Keypad 8 or ESC/8
PF9	Keypad 9 or ESC/9
PF10	PF1/Keypad 0 or ESC/0
PF11	PF1/Keypad 1 or ESC/-
PF12	PF1/Keypad 2 or ESC/=
PF13	PF1/Keypad 3 or Ctrl/F/1/3
PF14	PF1/Keypad 4 or Ctrl/F/1/4
PF15	PF1/Keypad 5 or Ctrl/F/1/5
PF16	PF1/Keypad 6 or Ctrl/F/1/6
PF17	PF1/Keypad 7 or Ctrl/F/1/7
PF18	PF1/Keypad 8 or Ctrl/F/1/8
PF19	PF1/Keypad 9 or Ctrl/F/1/9
PF20	PF2/Keypad 0 or Ctrl/F/2/0
PF21	PF2/Keypad 1 or Ctrl/F/2/1

Note

Key sequences denoted by Keypad x indicate key x on the VT terminal keypad.

2.3.13. TN5250 Function Key Mapping

Table 2-4 lists the mappings between 5250 function keys and the keys on HP VT100, VT200, VT300, and VT400 series terminals.

Table 2.4. TN5250 Function Key Mapping

IBM Function	VT Terminal Key Sequences
---------------------	----------------------------------

Enter	Ctrl/M or RETURN
Clear	Ctrl/Z or ENTER
Input Editing Functions	
New line	DEL
Tab	TAB or Ctrl/I
Backtab	Ctrl/B
Left	Ctrl/H or LEFT ARROW
Right	Ctrl/L or RIGHT ARROW
Up	Ctrl/K or UP ARROW
Down	Ctrl/J or DOWN ARROW
Home	KEYPAD
Delete	Ctrl/D
Insert	Ctrl/SPACE or ESC/SPACE
Local Control Keys	
TELNET Escape	Ctrl/C or Ctrl/[
Master Reset	Ctrl/G
Function Keys	
CMD1	Keypad 1 or ESC/1
CMD2	Keypad 2 or ESC/2
CMD3	Keypad 3 or ESC/3
CMD4	Keypad 4 or ESC/4
CMD5	Keypad 5 or ESC/5
CMD6	Keypad 6 or ESC/6
CMD7	Keypad 7 or ESC/7
CMD8	Keypad 8 or ESC/8
CMD9	Keypad 9 or ESC/9
CMD10	PF1/Keypad 0 or ESC/-
CMD11	PF1/Keypad 1 or ESC/-
CMD12	PF1/Keypad 2 or ESC/=
CMD13	PF1/Keypad 3 or Ctrl/F/1/3
CMD14	PF1/Keypad 4 or Ctrl/F/1/4
CMD15	PF1/Keypad 5 or Ctrl/F/1/5
CMD16	PF1/Keypad 6 or Ctrl/F/1/6
CMD17	PF1/Keypad 7 or Ctrl/F/1/7
CMD18	PF1/Keypad 8 or Ctrl/F/1/8
CMD19	PF1/Keypad 9 or Ctrl/F/1/9
CMD20	PF2/Keypad 0 or Ctrl/F/2/0
CMD21	PF2/Keypad 1 or Ctrl/F/2/1

Note

Key sequences denoted by Keypad **x** indicate key **x** on the VT terminal keypad.

2.3.14. Editing the Keyboard Mapping File

To customize a keyboard mapping file:

1. Copy the appropriate file (MAP3270.DAT or MAP5250.DAT) from the IP\$: directory to your login directory; for example, USERS: [IGUANA]MAP3270.DAT.
2. Define the MAP3270 or MAP5250 logical name to point to that file instead of the version in the IP\$: directory; for example:

```
$ DEFINE/JOB MAP3270 "@USERS:[IGUANA]MAP3270.DAT"
```

Note

You must use the @ (at-sign) at the start of the file name.

3. Edit the file with any text editor.

To test a particular entry for a terminal in the MAP3270 or MAP5250 file, define the KEYBD logical name for your entry; for example:

```
$ DEFINE KEYBD "my_new_vt420"
```

2.3.15. Capturing Screen Output and Printing Screen Captures

You can press the **DO** key at any time during a TN3270 or TN5250 session to store the contents of the current screen in a file in the current directory (the default directory when the TELNET session started). The output file is named TN3270.LIS or TN5250.LIS and captures only the current screen. Each time you press the **DO** key, a new version of this file is created.

For keyboards that do not have a **DO** key, assign a value to the capture function in the MAPxxxx.DAT file. For example, assign the capture function to accept **Ctrl/T** as follows:

```
capture = '^t'
```

On VT-style keyboards without a **DO** key, TELNET supports **Ctrl/T** by default. For these terminals, you don't need to modify the MAPxxxx.DAT files.

The IP\$TN3270_PRINTER logical name lets you direct TN3270 screen output to a print queue. To use this feature, enter:

```
$ DEFINE IP$TN3270_PRINTER queue_name
```

The IP\$TN5250_PRINTER logical name lets you direct TN5250 screen output to a print queue. To use this feature, enter:

```
$ DEFINE IP$TN5250_PRINTER queue_name
```

2.3.16. Using Transparent Mode

TN3270 supports a transparent mode similar to the transparent mode offered by the IBM 7171 ASCII device controller. This feature is enabled automatically by TELNET when transparent mode information is received from the IBM host. You can disable this feature before entering TN3270 with the following command:

```
$ DEFINE IP$TN3270_TRANSPARENT_MODE DISABLED
```

2.3.17. Application Keypad Access for TN3270 and TN5250

You can enable or disable access to the application keypad in TN3270 mode with the `IP$TN3270_APPLICATION_KEYPAD` logical name. The default value is ON. Disable access by defining the logical name as follows:

```
$ DEFINE IP$TN3270_APPLICATION_KEYPAD OFF
```

You can enable or disable access to the application keypad in TN5250 mode with the `IP$TN5250_APPLICATION_KEYPAD` logical. The default value is ON. Disable access by defining the logical as follows:

```
$ DEFINE IP$TN5250_APPLICATION_KEYPAD OFF
```

2.3.18. TN3270 Emulation

The Yale Improved Null (`/[NO]YALE`) qualifier is enabled by default. Yale Improved Null replaces NULL characters found in fields with spaces when the TN3270 client writes the fields back to the server. Use the `/NOYALE` qualifier to disable this feature.

```
$ TELNET /TN3270/NOYALE
```

To disable text colors, use this command:

```
$ TELNET /TN3270/NOCOLOR
```

Note

You can use `/NOCOLOR` for TN3270 in DPC emulation mode and for TN5250.

2.3.19. TN3270 Translation Table Mapping

TN3270 uses the `IP$TN3270_LANGUAGE` logical to specify the regional language for the international character set translation table. Translation tables are stored in the `TN3270.TRANSLATION` file. When TELNET is invoked, the translation file is searched for in the `SYS$LOGIN` directory. If it is not found, the `IP$:` directory is searched.

An entry in the translation table begins with the name of the language starting in the first column in the line. Use this value to define the `IP$TN3270_LANGUAGE` logical. For example, this command specifies a translation table for a UK English keyboard:

```
$ DEFINE IP$TN3270_LANGUAGE "UK_ENGLISH_DEC_MULTI"
```

The remainder of an entry consists of lines preceded with whitespace (either tabs or spaces). Each line contains these three values:

1. An EBCDIC+ code to be sent to the IBM host
2. The ASCII code to be displayed for that EBCDIC value
3. The ASCII character sent from the keyboard that causes the EBCDIC value to be sent to the host

A pound sign (#) specifies a comment and can appear in any column on a line, including lines containing translation codes. When specified on a line containing a translation code, the comment character must be preceded by at least one whitespace character. An entry is terminated by the first line following the entry that contains a "printable" character in column one. Entry names must start in the first column, and must consist only of uppercase letters, numbers, and the underbar sign. The maximum length of an entry name is 255 characters.

The file name of the translation table can be changed with the IP \$TN3270_TRANSLATION_TABLES logical. For example, to define a translation table named US_FOO.DAT, enter:

```
$ DEFINE IP$TN3270_TRANSLATION_TABLES "US_FOO.DAT"
```

+ EBCDIC stands for Extended Binary-Coded-Decimal Interchange Code.

An error message is issued if either logical name, IP\$TN3270_LANGUAGE or IP \$TN3270_TRANSLATION_TABLES, points to a non-existent entry.

The following example contains a sample translation file. In this example, the first line of the UK_ENGLISH_DEC_MULTI entry indicates that for the EBCDIC character 0x5b, the ASCII character 0xa3 is displayed. When the ASCII character 0xa3 is received from the keyboard, the EBCDIC character 0x5b is sent to the host.

```
#
# UK EBCDIC mapped into The HP Multinational Character Set
# Use following command to specify this table:
# $ DEFINE IP$TN3270_LANGUAGE "UK_ENGLISH_DEC_MULTI"
#
UK_ENGLISH_DEC_MULTI
0x5b 0xa3 0xa3 # British monetary pound sign
0x4a 0x24 0x24 # Dollar sign ($)
#
#
# Austrian German mapped into The HP Multinational Character
# Set. Use following command to specify this table:
# $ DEFINE IP$TN3270_LANGUAGE "AUSTRIAN_GERMAN_DEC_MULTI"
#
#
AUSTRIAN_GERMAN_DEC_MULTI
0x4a 0xc4 0xc4 # A with umlaut
0x5a 0xdc 0xdc # U with umlaut
0x6a 0xf6 0xf6 # o with umlaut
0x79 0x60 0x60 # Grave
0x5b 0x24 0x24 # Dollar sign
0x7b 0x23 0x23 # Hash sign
0x7c 0xa7 0xa7 # Section sign
0x5f 0x5e 0x5e # Carat sign
0xa1 0xdf 0xdf # Beta sign
```

```
0xc0 0xe4 0xe4 # a with umlaut
0xd0 0xfc 0xfc # u with umlaut
0xe0 0xd6 0xd6 # O with umlaut
0x4f 0x21 0x21 # Exclamation point
0x7f 0x22 0x22 # Double quote
```

2.3.20. Kerberos V5 Authentication and Encryption

When a Kerberos V5 ticket has been acquired (for example, from HP's Kerberos for OpenVMS product), a TELNET session can be started with both Kerberos V5 authentication and DES encryption. The following example shows how to specify authentication and DES encryption when logging into a remote host:

```
$ TELNET /AUTH/ENC (REMOTE HOST)
```

Note

The /ENCRYPTION option will function with Kerberos V5 authentication only.

2.3.21. Troubleshooting TELNET

This section describes common problems that can occur when using TELNET to connect to a remote host.

2.3.21.1. Connection Problems

If you cannot connect to the remote host, use PING as follows to discover any network problems. For information about starting PING, refer to the *VSI TCP/IP for OpenVMS Administrator's Reference*.

1. Ping the loopback address of your workstation, 127.0.0.1 to verify that VSI TCP/IP is working properly and that it can send and receive messages.
2. Ping your workstation by its IP address to verify that it is recognized on the network.
3. Ping your workstation by its host name to verify that it is recognized on the network and that its host name is being resolved.
4. Ping the broadcast address on your network to verify that your network can broadcast messages.
5. Ping another host on the same network by IP address to verify that the workstation can communicate with other hosts on the network.
6. Ping another host on the same network by host name to verify that host names are being resolved.
7. Ping a host on a different network, first by IP address and then by host name, to verify the default route is correct and that host names are being resolved.

2.3.21.2. Problems Logging In

If you cannot log into the remote host:

1. Make sure you have a valid user name on the remote host.
2. Make sure you are entering the correct user name and password.

If you still have difficulties logging in, contact your network administrator.

Chapter 3. Remote File Access (RCP, FTP, TFTP)

This chapter describes how to copy files between your local system and a remote system using the RCP, FTP, and TFTP utilities.

The FTP commands for renaming files, deleting files, and creating and deleting directories are described in the FTP command reference in Appendix B.

3.1. Requirements for RCP

The requirements for using the RCP utility are:

- Both the local and remote host must support the RCP protocol.
- You must specify the names of files on the remote host using the file-naming conventions of the remote host.
- If the remote host is an OpenVMS system, you must ensure that neither the system-wide login command procedure nor your local LOGIN.COM file displays any text. See Section 3.4 for more information on inhibiting output from these command procedures.

The "R" services authentication database files on the server system must be configured to allow RCP access from the local system. See the Section 3.2 for additional information on "R" services authentication.

3.2. Using RCP

You can use RCP interactively or via a command file in batch mode.

Before you can copy files using RCP, the remote system must determine that you are allowed to do so. Normally, the remote system's RCP server checks the "R" services host equivalence files to determine whether or not you are authorized to copy files to or from the remote system. RCP uses the same authentication scheme as RLOGIN and RSHELL.

However, if you are using RCP with Kerberos authentication, authentication is handled by acquiring "tickets" that permit access to cooperating systems. (See Chapter 4 for more information.)

The following is an example using RCP to copy the file /etc/hosts from the UNIX system UNIX.SPROCKETS.COM to the user's current default directory on the local OpenVMS system.

Note

The double quotation marks around "/etc/hosts" are necessary to prevent the slashes in the path name from being interpreted by DCL.

```
$ RCP UNIX.SPROCKETS.COM: : "/etc/hosts" [ ]
```

This command assumes the remote user name is the same as the local user name. To specify a different remote user name, use the /USERNAME qualifier as shown in the following command:

```
$ RCP /USERNAME=JETSON UNIX.SPROCKETS.COM: : .cshrc [ .UNIX-FILES ]
```

If the host equivalence files are not set up, you can still use the RCP command by specifying the /PASSWORD qualifier. In that case, REXEC authentication is used instead. The command format for specifying a password is as follows:

```
$ RCP /USERNAME=JETSON /PASSWORD=ASTRO -
_ $ UNIX.SPROCKETS.COM::report.july [.REPORTS]
```

Note

If you specify /PASSWORD without a value, you are prompted for the password with echoing disabled.

To copy files with RCP using Kerberos authentication, use the following format:

```
$ RCP /AUTHENTICATION=KERBEROS UNIX.SPROCKETS.COM::"/etc/hosts" []
```

or

```
$ RCP /AUTHENTICATION UNIX.SPROCKETS.COM::"/etc/hosts" []
```

3.3. Copying Files Using RCP

The VSI TCP/IP RCP utility uses the 4.3 BSD UNIX "rcp" (remote copy) protocol to transfer files between the local host and a remote host. The Kerberos version of RCP also provides authenticated access between the two systems.

When the index file creates new buckets (the space allocated to store units of data) beyond the previous End-Of-File mark, but the End-Of-File is not updated to reflect the new buckets, RCP transfers the allocated buckets to the End-Of-File. You can turn this feature off by defining the logical IP \$RCP_INDEX_UPTO_EOF.

3.4. Inhibiting Output from SYLOGIN.COM and LOGIN.COM

The RCP protocol requires that neither the system-wide login command procedure (SYS\$MANAGER:SYLOGIN.COM) nor users' LOGIN.COM procedures display any output. The following example shows commands to add to your LOGIN.COM and the system-wide SYLOGIN.COM to prevent any output from being displayed when they are executed.

```
$ VERIFY = 'F$VERIFY(0)                ! Turn off verify without echoing
$ IF F$MODE() .EQS. "OTHER" THEN EXIT ! If a DETACHED process (RSHELL)
.
.
.
$ IF VERIFY THEN SET VERIFY            ! If a batch job, may want to turn
                                        ! verify back on.
```

3.5. Accessing Files with FTP

The FTP utility uses the Internet standard File Transfer Protocol (FTP) to transfer files between the local host and a remote host. FTP also allows you to perform directory and file operations, such as changing the working directory, listing files, renaming directories and files, and deleting directories and files.

The FTP utility has a command-line interface. Each action, such as copying files, requires a specific command.

3.5.1. Requirements for Using FTP

Requirements for using the FTP utility include the following:

- Both the local and remote host must support the Internet standard File Transfer Protocol.
- The names of files on the remote host must be specified using the file-naming conventions of the remote host.

3.5.2. Invoking FTP and Logging In

You can use FTP interactively or in batch mode with a command file.

When you invoke FTP, an FTP server process is created on the remote host. You can perform a limited set of operations on the files and directories that you have permission to access. FTP authenticates you on the remote host by checking the user name and password you specify against those in the authorization database on the remote host. For simplicity in this discussion, this verification process is referred to as *logging in*; however, you do not actually log in interactively to the remote host.

To illustrate, assume you are a user on the local system and you want to log into the remote host RESEARCH.FLOWERS.COM. You can log in as yourself (by entering your name) or you can log in as any other user on RESEARCH, for example, "MARK" or "BUBBA," as long as the specified user name is valid on the remote host and you know Mark's or Bubba's password.

Note

Even though logging into another user's account is mentioned in the previous section, sharing passwords with other users is strongly discouraged.

You can connect to RESEARCH either by specifying the host name at the DCL command prompt (see Example 3.1), or by entering the CONNECT command at the FTP prompt (see Example 3.2).

Example 3.1. Specifying Host Name at DCL Prompt

```
$ FTP RESEARCH.FLOWERS.COM
DEVELOPMENT.FLOWERS.COM VSI TCP/IP for OpenVMS FTP user process 10.5(nnn)
Connection opened (Assuming 8-bit connections)
<RESEARCH.FLOWERS.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(nnn)
  at
Tue 14-Mar-2017 7:42am-EST
RESEARCH.FLOWERS.COM>LOGIN MARK
Password: password [not displayed]
RESEARCH.FLOWERS.COM>
```

Example 3.2. Enter Connect Command at FTP Prompt

```
$ FTP
DEVELOPMENT.FLOWERS.COM VSI TCP/IP for OpenVMS FTP user process 10.5(nnn)
FTP>CONNECT RESEARCH.FLOWERS.COM
Connection opened (Assuming 8-bit connections)
<RESEARCH.FLOWERS.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(nnn)
  at
Tue 14-Mar-2017 7:42am-EST
```

```
RESEARCH.FLOWERS.COM>LOGIN MARK
Password: password [not displayed]
RESEARCH.FLOWERS.COM>
```

Note

The initial FTP prompt (before connection to the remote host) is FTP>. After a connection is established, the prompt changes to the name of the remote host and FTP enters command mode.

At this point, you can specify your user name and password on RESEARCH with the FTP LOGIN command. Alternately, you can enter a command such as "LOGIN MARK" to log in as Mark (assuming you know Mark's password). The system then displays the "Password:" prompt. After you enter the password (which is not echoed), the system returns to FTP command mode, displays the prompt, and awaits further input.

Each time you invoke FTP, it checks first for a file called FTP . INIT in your login directory (SYS \$LOGIN) and executes any commands in that file before it prompts you for input. Any commands you want executed at the beginning of every FTP execution can be included in this file. See the Section 3.5.21 for a description of FTP commands commonly used in FTP . INIT files.

Note

Because the FTP server process is started by running SYS\$SYSTEM: LOGINOUT . EXE, both the system-wide login command procedure (SYS\$MANAGER: SYLOGIN . COM) and the specific user's LOGIN . COM are executed. As a result, any customization such as specifying default file protection, or process/job logical name definitions, and so on, are invoked in these command procedures and are available under the FTP server process.

All standard OpenVMS security-checking mechanisms are used to validate the FTP server process creation. If either of these command procedures contain any commands that are specific to interactive jobs (SET TERMINAL commands, for example), the FTP server process may crash. The easiest way to avoid this problem, without altering the functionality of these command procedures, is to use the DCL lexical function F\$MODE together with interactive specific commands. For example:

```
$ IF F$MODE() .EQS. "INTERACTIVE" THEN SET TERMINAL /INQUIRE
```

The Section 3.5.18 provides more information to assist you in determining the cause of any problems with the FTP server.

3.5.3. Using FTP Commands

After you have logged into a remote host, as described in the Section 3.5.2, you can use FTP commands for operations such as copying files between hosts, changing working directories, listing directories, removing files, and renaming files. All FTP commands are described in Appendix B.

The FTP user interface looks very similar to the TOPS-20 command interface. In particular:

- You can type an ESC (ESCAPE character) at any point to attempt to complete (fill in) the current command, parameter (including file names), or qualifier.
- You can type a question mark (?) at any time for help on what to enter next.
- A question mark entered at the current FTP prompt displays the currently available commands. The commands that are available depend on whether or not a connection to a remote server has

been established. Some commands are always recognized; others are recognized only before or after a connection has been made.

3.5.4. Getting FTP Command HELP

The HELP command displays a brief description of a specified FTP command, general help information, or a list of available HELP topics. The format of the HELP command is as follows:

```
FTP>HELP [command]
```

If you specify the command name, HELP displays information for the specified command. If you type a ? in place of a command, HELP displays general help information. If you request HELP without an argument, the HELP facility lists available help topics and instructions for obtaining additional information.

Note

The available commands vary depending on whether you have an open connection to a remote host.

3.5.5. Using Basic FTP Commands

Some commands simply set or reset various FTP options. They can be explicitly set using the ON argument or reset using the OFF argument. The default, if no argument is typed, is TOGGLE. Hence, if an option is on, executing the command controlling the option sets it to off. Executing the command a second time resets it to on. For example, when you first invoke FTP, the VERBOSE option (which gives detailed messages) is off. The following command would toggle VERBOSE on:

```
FTP>VERBOSE
```

You can reset the VERBOSE option to off by executing the above command a second time, hence "toggling" the setting back and forth.

You can display the state of a VSI TCP/IP FTP Server at any given time using the STATUS command. The following example shows the information reported by the STATUS command. Note, however, that some FTP implementations do not support the STATUS command.

```
RESEARCH.FLOWERS.COM>STATUS
<RESEARCH.FLOWERS.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5 (nnn)
User MARK logged into directory USERS:[MARK]
<The current transfer parameters are:
< MODE S
< STRU O VMS
< TYPE A N
<A connection is open to host DEVELOPMENT.FLOWERS.COM
<The data connection is CLOSED.
```

3.5.6. Specifying TCP Window Size with FTP

The FTP Server and Client let you specify the TCP window sizes to use during an FTP transfer. The value to be used is determined as follows:

Table 3.1. TCP Window Size During an FTP Transfer

If...	Then use...
-------	-------------

The logical name <code>IP\$FTP_WINDOW_SIZE</code> is defined	Its equivalence string as the value.
The <code>/WINDOW_SIZE</code> qualifier is specified with <code>FTP [/SERVER]</code>	The value specified with the qualifier.
A value is specified with <code>[SITE] WINDOW-SIZE size</code>	The value specified.

If none of these criteria exist, then use the default value 32768.

In all cases, the value must be between `NET_MIN_TCPWINDOW` and `NET_MAX_TCPWINDOW` (presently 512 and 1073741824, respectively). The size of the send and receive buffers is set to the specified value.

3.5.7. File Name Translations

When you issue an FTP `GET` command to a host running the UNIX Operating System and you do not specify an output file name, the resulting OpenVMS file name can contain unexpected characters. These characters occur because the UNIX Operating System has case-sensitive characters and special symbols that require conversion before they can be used with OpenVMS.

You can use the `/FDL` qualifier with the FTP client `GET` and `PUT` commands for compatibility with HPE TCP/IP Services for OpenVMS (formerly UCX). When you create a file with the `PUT /FDL` qualifier, a file description language (FDL) file is created at the same time as the original file. The contents of the original file are transmitted in `IMAGE` (binary) mode.

The FDL file has the same name except that "FDL" is appended to the file name extension.

An example of the `PUT` command is:

```
HOST>PUT /FDL AFILE.TXT BFILE.TXT
<ASCII Store of USERS:[ME]BFILE.TXTFDL;1 started.
<Transfer completed. 888 (8) bytes transferred.
<IMAGE Store of USERS:[ME]BFILE.TXT;1 started.
<Transfer completed. 6 (8) bytes transferred.
```

This command copies `AFILE.TXT` to `BFILE.TXT` on the system to which you are connected, then creates another file, `BFILE.TXTFDL`.

The `BFILE.TXTFDL` file is in ASCII format and resembles:

```
IDENT " 14-MAY-2017 17:13:24 FDL$GENERATE Routine"
SYSTEM
      SOURCE                OpenVMS
FILE  ALLOCATION              5
      BEST_TRY_CONTIGUOUS   no
      BUCKET_SIZE           0
      CONTIGUOUS            no
      DEFERRED_WRITE        no
      EXTENSION              0
      GLOBAL_BUFFER_COUNT   0
      MT_BLOCK_SIZE         512
      MT_PROTECTION         32
      MAX_RECORD_NUMBER     0
      MAXIMIZE_VERSION      no
      NAME                   "USERS:[ME]AFILE.TXT;1"
      ORGANIZATION          sequential
```

```

OWNER          [ STAFF,ME ]
PROTECTION     ( system:RWED, owner:RWED,group:,world:)
READ_CHECK     no
SUPERSEDE     no
WRITE_CHECK    no
RECORD_BLOCK_SPAN yes
CARRIAGE_CONTROL carriage_return
CONTROL_FIELD_SIZE 0
FORMAT         variable
SIZE          0

```

The newly created BFILE.TXT file is in raw block format which is not easily readable. When you use the GET /FDL command to retrieve the file, the original format is restored using the attributes stored in the FDL file. If you do not use the /FDL qualifier with the GET command, the new raw block format is retained.

In all instances, the FDL file is retained and must be deleted independently.

Notes:

- The FTP server /TYPE=EBCDIC qualifier is no longer supported.
- If you invoke FTP from the DCL command line and a password string is case-sensitive, use the following format for the command:

```
$ FTP /USER=username /PASSWORD=" "MiXedCAsE" "
```

If you do not use quotation marks, VSI TCP/IP converts the password to lowercase.

- If you replaced the FTP_SERVER.COM file, you must add /ACCESS=NOSPAWN on "captive" accounts such as the ANONYMOUS account so that users cannot spawn commands. Spawning commands from such accounts opens a potential security hole.
- When transferring files between OpenVMS systems, do not use the BINARY command except when the desired output requires fixed, 512-byte records; most importantly, do not use BINARY on ECO save sets that you acquired with FTP, if you are using FTP from a VSI TCP/IP system.

The following table shows how UNIX Operating System printable file name characters are translated into OpenVMS file names:

VMS Char.	Server Char.	Hex Value	VMS Char.	Server Char.	Hex Value	VMS Char.	Server Char.	Hex Value
\$4A	^A	1	\$5A	!	21	\$7A	Space	20
\$4B	^B	2	\$5B	“	22	\$7B	;	3B
\$4C	^C	3	\$5C	#	23	\$7C	<	3C
\$4D	^D	4	\$5E	%	25	\$7D	=	3D
\$4E	^E	5	\$5F	&	26	\$7E	>	3E
\$4F	^F	6	\$5G	‘	27	\$7F	?	3F
\$4G	^G	7	\$5H	(28			
\$4H	^H	8	\$5I)	29	\$8A	@	40
\$4I	^I	9	\$5J	*	2A	\$8B	[5B
\$4J	^J	A	\$5K	+	2B	\$8C	\	5C

\$4K	^K	B	\$5L	,	2C	\$8D]	5D
\$4L	^L	C	\$5N	.	2E	\$8E	^	5E
\$4M	^M	D	\$5O	/	2F			
\$4N	^N	E	\$5Z	:	3A	\$9A	'	60
\$4O	^O	F	\$			\$9B	{	7B
\$4P	^P	10	\$6A	^@	00	\$9C		7C
\$4Q	^Q	11	\$6B	^[1B	\$9D	}	7D
\$4R	^R	12	\$6C	^\	1C	\$9E	~	7E
\$4S	^S	13	\$6D	^]	1D	\$9F	DEL	7F
\$4T	^T	14	\$6E	^^	1E			
\$4U	^U	15	\$6F	^-	1F			
\$4V	^V	16						
\$4W	^W	17						
\$4X	^X	18						
\$4Y	^Y	19						
\$4Z	^Z	1A						

- International characters in the range of octal 200 to 377 are translated as a dollar sign (\$) followed by the three-digit octal value for the character.
- Directory names copied to OpenVMS are appended with the ".DIR" suffix.
- The dot (.) character is treated as a special case. The first occurrence in a file name is interpreted explicitly as a dot; the next occurrences are translated into the "\$5N" character sequence shown in the previous table. In a directory name, all occurrences of the dot character are translated into the "\$5N" character sequence.
- A dollar sign followed by a letter indicates that the case should be shifted from its current state.

An example of file name translation occurs when a UNIX file called `foo.bar#1.old` is copied to the OpenVMS system. The resulting OpenVMS file name is `FOO.BAR$5C1$5NOLD`. If the file was a directory, the translated name would be `FOO$5NBAR$5C1$5NOLD.DIR`. If the UNIX file name was `Foo.Bar#1.old`, the translated case-sensitive OpenVMS file name would be `FOO.BARR$5C1$5NOLD`.

3.5.8. Listing the Contents of a File

You can use the GET command to list the contents of a file as follows:

```
$ GET filename TT:
```

This command displays a list of the files on your terminal, and works with all FTP servers.

3.5.9. Working with Directories

When you open a connection to a remote host and log in, your default directory is set to your login directory on the remote system. If you log in as another user, your default directory is set to that user's login directory. You can find out the path name of this directory with the command:

```
FTP>PWD
```

You can list the contents of your current working directory on the remote host with the command:

```
FTP>DIR
```

You can change the working directory on the remote host to `remote_directory` with the command:

```
FTP>CD remote_directory
```

To change the working directory on the local host to `local_directory`, use the command:

```
FTP>LCD local_directory
```

3.5.10. Commands for Copying Files

The GET and PUT commands are the two basic commands for copying files between your system and a remote host. The GET command copies a single file from the remote host to your system. The PUT command copies a single file from your system to the remote host. These commands have the following format:

```
FTP>GET remote_file local_file
FTP>PUT local_file remote_file
```

Under OpenVMS, the GET and PUT commands create new files. For other operating systems, the file is only created if it does not exist; if the file exists, an error displays. The AGET and APUT commands can be used to append to an existing file. These two commands have the following format:

```
FTP>AGET remote_file local_file
FTP>APUT local_file remote_file
```

The GET and PUT commands copy single files. Their counterparts, MGET and MPUT, copy multiple files. The format of these commands is similar, but not identical, to that of GET and PUT:

```
FTP>MGET remote_file
FTP>MPUT local_file
```

In these two commands, you specify the file names with wildcard specifications. For MGET, use the file name wildcard syntax for the remote host. For MPUT, use the OpenVMS file name wildcard syntax. The files retain their original names when they are copied. An MGET to an empty directory returns a status code of 552 from the FTP server.

3.5.11. Parameters for Copying Files

Transfer parameters define how a file should be copied. The three transfer parameters and their values are described in the following list:

STRUCTURE

Defines the structure of files to be transferred; takes one of the following values:

FILE	An unstructured byte stream. This is the default when communicating with systems that do not understand the OpenVMS structure described in the Section 3.5.12.
RECORD	A file that is partitioned into records.
VMS	An arbitrary OpenVMS file; allows for transparent transfer of any RMS file between cooperating systems.

Note

The "VMS" transfer structure is automatically negotiated between systems that support it. After connecting to a remote system, the VSI TCP/IP FTP utility sends the FTP command `STRU O VMS` to the FTP server. If the server responds positively, both sides use the "VMS" structure to ensure total transparency when transferring files (that is, all RMS record and file attributes are retained). If the server responds negatively, both sides default to the "FILE" transfer structure.

3.5.12. FTP OpenVMS Structure

TYPE

Defines the contents of files to be transferred; takes one of the following values:

ASCII	A file consisting of ASCII characters (the default).
BACKUP	Like IMAGE, but causes the local file to be written with 2048-byte fixed length records; used for transferring OpenVMS BACKUP savesets.
IMAGE	A binary image.
LOGICAL-BYTE	Used for doing binary transfers with TOPS-20 systems.

MODE

Defines how the file should be transferred; takes one of the following values:

COMPRESSED	Run length-encoded compression.
STREAM	Normal data transfer (the default).

FTP commands copy files using the current transfer parameters. When you first start FTP, the default transfer parameters are **FILE** structure, **ASCII** type, and **STREAM** mode. **VMS** structure is used if the FTP Server supports it. Use the following commands to change the transfer parameters from their defaults:

```
FTP>TYPE type_name
FTP>STRUCTURE struct_name
FTP>MODE mode_name
```

There are a number of command synonyms for the TYPE and STRUCTURE commands; see Appendix B for a complete list.

3.5.13. FTP Commands While a Transfer is in Progress

Control characters entered during an FTP file transfer have the following effects:

Press...	To...
Ctrl/G	Send an abort command to the remote server, thus aborting a data transfer.
Ctrl/A	Display the state and progress of the file transfer.
Ctrl/P	Suspend the transfer and spawn a new DCL subprocess. The file transfer will continue upon return to the FTP program from the spawned DCL subprocess.

Aborting a file transfer does not work correctly with servers that do not support the ABOR (abort) command. If attempted, the connection to the server may be lost.

3.5.14. Issuing FTP Commands From the DCL Command Line

You usually run the FTP utility by typing the FTP command then issuing additional commands once the program starts. If you are only interested in transferring one file, or issuing a single FTP command, you can specify the command on the DCL command line. See Appendix A for the complete DCL command syntax.

For example, if you wish to retrieve the file `pub/hack.c` via anonymous login to the host `FLOWERS.COM`, you might issue the DCL command:

```
$ FTP /USER=ANONYMOUS /PASSWORD=GUEST FLOWERS.COM GET pub/hack.c hack.c
```

To get a listing of the `pub` directory on this same system, you would use the command:

```
$ FTP /USER=ANONYMOUS /PASSWORD=GUEST FLOWERS.COM DIR pub
```

If you want to retrieve all files in the `pub` directory and copy them to your current directory on your local system, you might use the command:

```
$ FTP /USER=ANONYMOUS /PASSWORD=GUEST FLOWERS.COM MGET pub/*
```

3.5.15. FTP Command Scripts

FTP commands are usually entered directly from the keyboard. You can, however, execute a predefined sequence of FTP commands by redirecting standard input (`SYS$INPUT`) interactively, or from within a DCL command procedure.

The following example shows an interactive session that uses a predefined command script, in this case in the file `FTP.COM`, to control FTP:

```
$ FTP /TAKE=FTP.COM
```

The following example shows a sample `FTP.COM` file. The italicized comments are provided only to explain each line in the `FTP.COM` file; do not include them in the actual file!

```
SET FLOWERS.COM /USER:BOOJUM /PASS:SNARK Set user & password
CONNECT FLOWERS.COM Open connection
GET FOO.BAR NEWFOO.BAR Execute an FTP command
EXIT Conclude session
```

The following example shows a DCL command procedure that runs FTP to get the file `FOO.BAR` from the remote host `FLOWERS.COM`.

```
$! FTP DCL command procedure
$ FTP
SET FLOWERS.COM /USER:BOOJUM /PASS:SNARK
CONNECT FLOWERS.COM
GET FOO.BAR NEWFOO.BAR
EXIT
$! continue with any other commands
```

3.5.16. Ending an FTP Session

Once you have finished with your FTP session, you can either break the connection with the remote system while still remaining in FTP command mode, or you can log out from the remote host, exit FTP, and return to DCL.

To close the current connection without terminating in FTP, enter the command:

```
FTP>BYE
FTP>
```

To close the connection and return to DCL, enter the command:

```
FTP>EXIT
$
```

3.5.17. Using FTP over TLS (FTPS)

The FTP client can use FTP over TLS (Transport Layer Security) as specified in RFC 4217. Use the AUTHENTICATE command before the USER command to start a session with a secure command stream as follows:

```
FTP> AUTHENTICATE
    <TLS authorization enabled.
FTP> USER <username>
    PASSWORD: <enter_password>
```

The PROTECTION PRIVATE command can then be used to set file transfers to be encrypted as follows:

```
FTP> PROTECTION PRIVATE
    <Data connection is now protected.
```

Entering the CCC command will return the command stream to clear text mode, which is often necessary when traversing a Firewall as follows:

```
FTP> CCC
    <Control Connection is now clear text.
```

By default, the FTP client send the following commands after the user logs in with TLS:

```
PBSZ 0    ! the setting of the Protection Buffer Size is probably not
           documented as the only value to set it to is 0, and it is automatically
           done before setting the transfer protection.
PROT P    ! Private
CCC       ! Clear Command Channel
```

Most customers will prefer to use these default settings when using TLS.

Note

The FTP client can also be started with /AUTHENTICATE=TLS to automatically enter TLS authentication after connection to the remote system.

For more information about TLS, see <https://www.rfc-editor.org/pdf/rfc4217.txt.pdf>.

3.5.18. FTP Log Files

The VSI TCP/IP FTP Server keeps a log of all FTP transactions that occur between the client and server after login in the file FTP_SERVER.LOG in the login directory on the server system. The

following sample log file contains the FTP transactions involved in a user logging in under the user name SMITH, issuing a DIRECTORY command, and then retrieving the file FOO.BAR.

Note

If the VSI TCP/IP FTP server process does not start or mysteriously disappears, examine the beginning of the FTP_SERVER.LOG file for any error messages.

Because the system-wide login command procedure (SYS\$MANAGER:SYLOGIN.COM) and the user's LOGIN.COM are executed as part of the server process creation, any errors in these procedures can cause the server process to die suddenly. In most instances, however, the reason for the process terminating will appear at the beginning of the FTP_SERVER.LOG file.

```
-----
FTP Login request received at Tue Mar 14 15:30:27 2017
from remote IP address 127.0.0.1
-----
>>> 230 User SMITH logged into U1:[SMITH] at Tue 14-May-17 15:30, job 3a.
<<< TYPE A
>>> 200 Type A ok.
<<< STRU F
>>> 200 Stru F ok.
<<< MODE S
>>> 200 Mode S ok.
<<< PORT 127,0,0,1,4,14
>>> 200 Port 4.14 at Host 127.0.0.1 accepted.
<<< LIST
>>> 150 List started.
>>> 226 Transfer completed.
<<< PORT 127,0,0,1,4,15
>>> 200 Port 4.15 at Host 127.0.0.1 accepted.
<<< RETR foo.bar
>>> 150 ASCII retrieve of USERS:[SMITH]FOO.BAR;1 started (210 bytes).
>>> 226 Transfer completed. 210 (8) bytes transferred.
<<< QUIT
>>> 221 QUIT command received. Goodbye.
SMITH job terminated at 14-MAY-2017 15:31:23.08
```

3.5.19. Anonymous FTP

Many system managers use "anonymous FTP" to allow network access to files of general interest on their system, without having to assign a user name to each user who wants access to the files. Anonymous FTP means that the ANONYMOUS login is created on a system to permit anyone access to that system. When using anonymous FTP, connect to the remote system as you would normally, but instead of specifying your user name, specify the user name "anonymous" and the password "guest." In many implementations, you are restricted to read-only access of the files in a certain directory or a certain directory tree.

Note

While many systems allow you to use any password, some systems only allow anonymous FTP access with the password "guest." Many systems prefer you to enter your e-mail address (username@host) instead of the "guest" password; either method works. Also, specify the "anonymous" user name in lowercase, as many systems (primarily those running UNIX) support case-sensitive user names.

Hence, "anonymous" and "ANONYMOUS" are considered different user names, and only the former can be used for anonymous FTP access.

3.5.20. Transferring Files From Behind a Firewall

The VSI TCP/IP FTP Client `PASSIVE` command allows a range of control of the `PASV` directive for transferring files from FTP servers when your system is located behind a "firewall" gateway. The list of parameters and an explanation of how they work follows:

- an `ON` parameter (the default setting)
- an `OFF` parameter
- a `NEGOTIATED` parameter
- a `/PASV DCL` qualifier, allows you to specify the `PASSIVE` command setting as you start up the FTP Client (at the `FTP>` prompt, you may specify either `PASSIVE` or `PASV`; the two are interchangeable).

Note

If the change in the default setting causes you problems or changes the way things have worked for you in the past, you may control the default setting for your site by putting the appropriate `PASSIVE` command in the file `IP$: FTP . INIT`.

With `PASSIVE` mode `ON`, the Client sends the `PASV` directive to the Server, instructing it to wait for the Client to make the data connection. If the Server does not understand the `PASV` command, the connection is aborted. The default for `PASSIVE` is `ON` to help facilitate transfers through a firewall. Under certain conditions, this default might cause problems. Use the VSI TCP/IP FTP client logical `IP$FTP_NONPASV` to turn off the `PASSIVE` mode default or use the `passive` command on the command line. When you define this logical, `passive` mode is not used as the default.

With `PASSIVE` mode `OFF`, the FTP Client expects the FTP Server to establish the connection over which data is transferred. (Note that this may not work through firewalls as some FTP Servers do not support the `PASSIVE` command.)

With `PASSIVE` mode `NEGOTIATED`, the FTP Client sends the `PASV` command as with `PASSIVE` mode `ON`, but switches the mode to `OFF` if the FTP Server generates an error in response.

The `/NONPASV`, `/PASV`, and `/PASV=NEGOTIATE` qualifiers allow you to specify each of the `PASSIVE` mode settings as you start up the FTP Client.

When an IPv6 connection is in use the FTP Client sends the `EPSV` command instead of the `PASV` command. All user commands and behavior described above remain the same.

3.5.21. FTP Initialization File

On startup, FTP executes commands in the `FTP . INIT` file in your login directory (if the file exists), to allow you to customize your FTP sessions. Table 3-2 lists commands you may find useful to have in your `FTP . INIT` file.

Table 3.2. FTP Commands for the `FTP . INIT` File

BELL ON	Rings the terminal bell when a file transfer operation is completed.
---------	--

EXIT-ON-ERROR ON	Causes FTP to exit after any error occurs.
HASH ON	Prints a pound sign (#) for each data buffer transferred.
PROMPT-FOR-MISSING-ARGUMENTS OFF	Disables FTP prompting for missing command line arguments.
PROMPT-ON-CONNECT ON	Automatically prompts for user name and password when a connection to the remote system is established.
SET <i>host</i> /USER-NAME: <i>username</i> [/PASSWORD: <i>password</i>]]	Sets the default user name or default user name and password for the specified host. If you place SET commands containing passwords in your FTP . INIT file, <i>be careful to protect the file from access by others.</i>
STATISTICS ON	Upon completion of file transfers, displays transfer timing statistics.
VERBOSE ON	Displays all responses from the remote FTP server as they are received.

If you invoke FTP with the /NOINITIALIZATION qualifier, the FTP . INIT file is not processed.

The commands in Table 3-2 are more completely documented in Appendix B.

3.6. Troubleshooting FTP

As the first step in any FTP troubleshooting, check the FTP_SERVER_LOG file for error messages.

3.6.1. General Troubleshooting Tips

If the logged information does not help, check the following:

1. Make sure the FTP server is running on the remote system.
2. Ping the FTP server to make sure it is available through the network.
3. If the remote host is on the other side of a firewall, try Passive Mode.
4. Make sure you entered the correct user name and password for the remote system.

3.6.2. Transmitted Files Are Corrupt

If you can copy files, but the files are corrupted after transmission, verify that you are using the correct transfer mode-ASCII or binary. Use ASCII mode for text files and binary mode for executable files, compressed files, graphics files, and any other non-text files. Use Logical-Byte mode if the remote system does not use the standard 8-bit byte.

3.7. Copying Files Using TFTP

Like the FTP, TFTP copies files between your system and a remote host. Unlike FTP, you cannot perform operations other than copying files between your system and a remote one (you cannot list directories, delete files, and so on). Also, TFTP does not perform any authentication when transferring files, so a user name and password on the remote host are not required. In general, only files with world read (W:R) access in certain directories on the remote host are available for reading, and only certain directories are available for writing.

Note

TFTP does not check the permissions of directories before attempting to access them. Because the TFTP protocol does not specify any user login or validation, the remote system will probably have some sort of file-access restrictions. The exact restrictions are site-specific and thus cannot be documented here.

The mail option of TFTP, as defined in RFC-783, is obsolete and not supported under the VSI TCP/IP TFTP server.

3.7.1. Requirements for TFTP

When you copy a file from a remote host, it must be world-readable (W:R). When copying a file to a remote host:

- A file of the same name must already exist on the remote host.
- The file must be world-writable (W:W).

If these two conditions are not met, TFTP will fail.

3.7.2. Using TFTP

To start TFTP, enter the following command:

```
$ TFTP remote_host
TFTP>
```

remote_host is the name of the remote system with which you want to transfer files.

To transfer a file from your system to a remote host, enter a TFTP command in the following format:

```
TFTP>put local_file remote_file
```

<i>local_file</i>	Identifies the file you are transferring.
<i>remote_file</i>	Specifies the name you want the file to have on the remote system. If you specify a file name, it must be an absolute path name (device, directory, and file name). If you do not specify a file name, it defaults to the same name as <i>local_file</i> .

For example, suppose you want to transfer the file `user:[boojum]accts.log` from your system to the file `/x/boojum/accts.log` on the remote host `sales.flowers.com`. To do this, you would enter the following commands:

```
$ tftp sales.flowers.com
TFTP>put user:[boojum]accts.log /x/boojum/accts.log
```

Both the directory `/x/boojum` and the file `accts.log` must already exist on the remote host, and "accts.log" must be world-writable.

To transfer a file to your system from a remote host, issue a TFTP command in the following format:

```
$ tftp sales.flowers.com
TFTP>get remote_file local_file
```

<i>local_file</i>	Specifies the name you want the file to have on your system. If you do not specify a file name, it defaults to the same name as the <i>remote_file</i> .
<i>remote_file</i>	Identifies the file you want to transfer from the remote host. You must supply an absolute path name (device, directory, and file name).

For example, suppose you want to transfer the file `/x/boojum/accts.log` from the remote host `sales.flowers.com` to the file `user:[boojum]accts.log` on the your system. To do this, you would enter the following commands:

```
$ tftp sales.flowers.com
TFTP>get /x/boojum/accts.log user:[boojum]accts.log
The file /x/boojum/accts.log must be world-readable.
```

The file `/x/boojum/accts.log` must be world-readable.

Chapter 4. Accessing Remote Systems with the Secure Shell (SSH) Utilities

The SSH implementation for VSI TCP/IP provides the client software for allowing secure interactive connections to other computers in the manner of RLOGIN/RSHELL/TELNET.

The following topics describe how to configure, maintain, and use the following VSI TCP/IP client and utilities:

- Secure Shell Client (remote login program)
- SSHKEYGEN
- SSHAGENT (authentication agent)
- SSHADD
- CERTTOOL
- CERTVIEW
- CMPCLIENT
- Public-key Subsystem

4.1. SSH Protocol Support

The SSH client software supports both the SSH1 and SSH2 protocols. SSH1 and SSH2 are different, and incompatible protocols. The SSH1 implementation is based on the V1.5 protocol and 1.3.7 F-Secure code base, and the SSH2 implementation is based on the V2 protocol and the F-Secure 3.2.0 code base. While SSH2 is generally regarded to be more secure than SSH1, both protocols are offered by VSI TCP/IP, and although they are incompatible, they may exist simultaneously on server systems, including VSI TCP/IP servers. The SSH client identifies the protocol(s) offered by any given server. If both SSH2 and SSH1 protocols are offered, the client will always use SSH2. Otherwise, the client will use the correct protocol based on the server's capability.

The cryptographic library used by VSI TCP/IP SSH2 (this does not apply to SSH1 sessions) is compiled from unaltered cryptographic source code from F-Secure which is FIPS 140-2 level 2 compliant, as determined by the Computer Security Division of the National Institute of Science and Technology (NIST).

4.2. SSH Client Return Status Codes

In VSI TCP/IP, a logical name may be defined that will cause the SSH clients listed above to use OpenVMS-style return codes. If the logical name is not defined, the default codes will be used. Refer to the *VSI TCP/IP for OpenVMS Messages, Logicals and DECnet Applications* manual for a description of the new status codes.

To enable the new status codes instead of using the previous VSI TCP/IP codes, the logical name `IP $SSH_NEW_STATUS_CODES` must be defined systemwide.

4.3. Secure Shell Client (remote login program)

```
$ SSH hostname[#port] [qualifiers] [command]
```

or

```
$ SSH "user@hostname[#port]" [qualifiers] [command]
```

SSH (Secure Shell) is a program for logging into and executing commands on a remote system. It replaces RLOGIN, RSH, and TELNET, and provides secure encrypted communications between two untrusted hosts over an insecure network. X11 connections and arbitrary TCP/IP ports can be forwarded over the secure channel. SSH connects and logs into the specified hostname.

Table 4.1. SSH Client Command Options and Qualifiers

Qualifier	Description
/ALLOW_REMOTE_CONNECT	Allow remote hosts to connect local port forwarding ports. The default is only localhost; may connect to locally binded ports.
/CIPHER=(<i>cipher-1</i> ,..., <i>cipher-n</i>)	Select encryption algorithm(s).
/COMPRESS	Enable compression.
/CONFIG_FILE= <i>file</i>	Read an alternative client config file.
/DEBUG= <i>level</i>	Set debug level.
/ESCAPE_CHARACTER= <i>char</i>	Set escape character; “none” = disable (default: ~).
/HELP	Display help text.
/IDENTITY_FILE= <i>file</i>	Identity file for publickey authentication.
/IDKEY=(<i>key1</i> , <i>key2</i> ,..., <i>keyn</i>)	Specifies the key(s) to be used for publickey authentication. If specified, the IDENTIFICATION file is ignored.
/IPV4	Use IPV4 protocol to connect.
/IPV6	Use IPV6 protocol to connect.
/LOCAL_FORWARD=(<i>[protocol/]</i> <i>listen-port:host:port</i> ,...)	Causes the given port on the local (client) host to be forwarded to the given host and port on the remote side. The system to which SSH connects acts as the intermediary between the two endpoint systems. Port forwardings can be specified in the configuration file. See the Section 4.15 for more details.
/LOG_FILE= <i>logfile</i>	Log all terminal activity to the specified log file. Defaults to <code>SYSDISK:[]SSH.LOG</code> if <i>logfile</i> name is not specified.
/MAC=(<i>mac-1</i> ,..., <i>mac-n</i>)	Select MAC algorithm(s).
/NO_AGENT_FORWARDING	Disable authentication agent forwarding.
/NO_X11_FORWARDING	Disable X11 connection forwarding.
/OPTION=(<i>option-1</i> ,... <i>option-n</i>)	Gives options in the format used in the configuration file. This is useful for specifying options for which

Qualifier	Description
	there is no separate command-line flag. The option has the same format as a line in the configuration file, and is processed prior to any keywords in the configuration file. For example: <code>/OPTION=(CompressionLevel=6)</code>
<code>/PORT=<i>port</i></code>	Connect to this port on server system. Server must be listening on the same port.
<code>/QUIET</code>	Quiet Mode. Causes all warning and diagnostic messages to be suppressed. Only fatal errors display.
<code>/REMOTE_FORWARD=([protocol/]listen-port:host:port,...)</code>	Forward remote port to local address. This causes SSH to listen for connections on a port and then forward them to the other side by connecting to host port.
<code>USE_NONPRIV_PORT</code>	Use a non-privileged (>1023) source port.
<code>USER=<i>user</i></code>	Log in to the server system using specific user name.
<code>VERBOSE</code>	Display verbose debugging messages. Equal to <code>/DEBUG=2</code> .
<code>/VERSION</code>	Display version number of the client.

4.4. Initial Server System Authentication

When an initial connection is made from the client system to the server system, a preliminary authentication of the server is made by the client. To accomplish this, the server system sends its publickey to the client system.

SSH maintains a directory containing the publickeys for all hosts to which it has successfully connected. For each user, this is the `[.SSH2 .HOSTKEYS]` directory off the individual `SYS$LOGIN` directory¹. In addition, a system-wide directory of known publickeys exists in the system directory pointed to by the logical name `IP_SSH2_HOSTKEY_DIR`, and this may be populated by the system manager. Both directories are searched as needed when establishing a connection between systems. Any new host publickeys are added to the user's `HOSTKEYS` directory. If a host's identification changes, SSH warns about this and disables password authentication to prevent a trojan horse from getting the user's password. Another purpose of this mechanism is to prevent man-in-the-middle attacks that could be used to circumvent the encryption. The SSH configuration option `StrictHostKeyChecking` can be used to prevent logins to a system whose hostkey is not known or has changed.

4.5. Hostbased Authentication

Hostbased authentication relies on two things: the existence of the user's system and username in either `SSH_DIR:HOSTS.EQUIV` or in the individual user's `SYS$LOGIN:.RHOSTS` or `SYS$LOGIN:.SHOSTS` file; and the server system having prior knowledge of the client system's public hostkey.

- For SSH2

¹In this chapter, the `[.SSH]` subdirectory in the user's login directory displays as `SYS$LOGIN:[.SSH]` `[.SSH2]` displays as `SYS$LOGIN:[.SSH2]`

When a user logs in:

1. The server checks the `SSH_DIR:HOSTS.EQUIV` file, and the user's `SYS$LOGIN:.RHOSTS` and `SYS$LOGIN:.SHOSTS` files for matches for both the system and username. Wildcards are not permitted.
2. The server checks to see if it knows of the client's public hostkey (`SSH2_DIR:HOSTKEY.PUB` on OpenVMS client systems) in either the user's `SYS$LOGIN:[SSH2.KNOWNHOSTS]` directory or in the system-wide directory pointed to by the `IP_SSH2_KNOWNHOSTS_DIR` logical name. The key file is named `<FQDN>_<algorithm>.PUB`. For example, if the client system is `foo.bar.com` and its key uses the DSS algorithm, the file that would contain its key on the server would be `FOO_BAR_COM_SSH-DSS.PUB`. This key file must exist on the server system before attempting Hostbased authentication.
3. If the key file is found by the server, the client sends its digitally-signed public hostkey to the server. The server will check the signature for validity.

- For SSH1

This form of authentication alone is not allowed by the server because it is not secure. The second (and primary) authentication method is the `RHOSTS` or `HOSTS.EQUIV` method combined with RSA-based host authentication. This means that if the login is permitted by `.RHOSTS`, `.SHOSTS`, `SSH_DIR:HOSTS.EQUIV`, or `SSH_DIR:SHOSTS.EQUIV` file, and if the client's hostkey can be verified (see `SYS$LOGIN:[.SSH]KNOWN_HOSTS` and `SSH_DIR:SSH_KNOWN_HOSTS`), only then will login be permitted. This authentication method closes security holes due to IP spoofing, DNS spoofing, and routing spoofing.

Note

To the administrator: `SSH_DIR:HOSTS.EQUIV`, `.RHOSTS`, and the `RLOGIN/RSHELL` protocol are inherently insecure and should be disabled if security is desired.

4.6. Publickey Authentication

The SSH client supports DSA-based authentication for SSH2 sessions, and RSA-based authentication for SSH1 sessions. The scheme is based on publickey cryptography. There are cryptosystems where encryption and decryption are done using separate keys, and it is not possible to derive the decryption key from the encryption key.

- For SSH1

SSH supports RSA-based authentication. The scheme is based on publickey cryptography. There are cryptosystems where encryption and decryption are done using separate keys, and it is not possible to derive the decryption key from the encryption key.

RSA is one such system. The idea is that each user creates a public/private key pairing for authentication purposes. The server knows the publickey (`SYS$LOGIN:[.SSH]AUTHORIZED_KEYS` lists the publickeys permitted for log in), and only the user knows the private key.

When the user logs in:

1. The SSH client program tells the server the key pairing it would like to use for authentication.

2. The server checks if this key pairing is permitted.

If it is permitted, the server sends the SSH client program, running on behalf of the user, a challenge (a random number) encrypted by the user's publickey. The challenge can only be decrypted using the proper private key.

3. The user's client then decrypts the challenge using the private key, proving that he/she knows the private key but without disclosing it to the server.
4. SSH implements the RSA authentication protocol automatically.

The Key Identity files are created with SSHKEYGEN. To create the RSA key pair files with VSI TCP/IP:

- Run SSHKEYGEN to create the RSA key pair: `IDENTITY` and `IDENTITY.PUB`. Both of these files are stored in the user's `SYS$LOGIN:[.SSH]` directory. `IDENTITY.;` is the private key; `IDENTITY.PUB` is the publickey.

Once you have created your identity files:

1. Transfer the `IDENTITY.PUB` file to the remote machine.
2. Update the `AUTHORIZED_KEYS` file on the remote machine by appending the contents of the publickey file to the `SYS$LOGIN:[.SSH]AUTHORIZED_KEYS` file on the remote host. The format of the `AUTHORIZED_KEYS` file requires that each entry consists of a single long line.

After this, the user can log in without giving the password. RSA authentication is much more secure than RHOSTS authentication. The most convenient way to use RSA authentication may be with an authentication agent.

- For SSH2

When the user logs in:

1. The client reads possible keys to be used for authentication from its `IDENTIFICATION` file. Note that this file does not contain the actual keys; rather, it contains the name of the key files.
2. The client sends to the server its list of keys.
3. The server compares each key that it received to see if it can match this key with one of those specified in the `AUTHORIZATION` file.
4. The server tells the client the key that was accepted. The client then signs the key with a digital signature specific to the server holding the proper, verifiable key. The client then sends the signature to the server.
5. The server verifies the signature.

4.7. Password Authentication

The password is sent to the remote host for checking. The password cannot be seen on the network because all communications are encrypted. When the server accepts the user's identity it either exe-

cutes the given command or logs into the system and gives the user a normal shell on the remote system. All communication with the remote command or shell will be encrypted automatically.

4.8. Using Publickey Authentication with SSH

When a parameter such as a username or hostname is quoted, it is always passed verbatim to the other side. When it is not quoted, it is lowercased. The username entered is used when constructing the digital signature for a key.

On the host side, the uppercase username will be used, and on the server side, the lowercased username (the default on the server since OpenVMS is not case-sensitive) will be used to generate the digital signature of the publickey that is being used, as shown in the following examples:

```
$ IP SSH2 "XXXXXXXX@HOSTNAME" command
XXXXXXXX is the username that was specified in all uppercase letters.
publickey authentication fails.
$ IP SSH2 "xxxxxxx@HOSTNAME" command
xxxxxxx is the username that was specified in all lowercase letters.
publickey authentication is successful.
```

4.9. Break-in and Intrusion Detection

Care must be exercised when configuring the client to minimize problems due to intrusion records created by OpenVMS security auditing. The SSH user should consult the system manager to determine the authentication methods offered by the SSH server. Examples of such authentication methods include HostBased, PublicKey, and Password. The client should be configured to not attempt any authentication method that is not offered by the server.

If a client attempts authentication methods not offered by the server, the OpenVMS security auditing system may log several intrusion records for each attempt to create a session to that server. This may result in the user being locked out of the server system; which will require intervention from the System Manager.

4.10. Session Termination

The user can disconnect with `~/.` . All forwarded connections can be listed with `~/#`. All available escapes can be listed with `~/?`. A single tilde character can be sent as `~/~` (or by following the tilde with a character other than those described above). The escape character must always follow a carriage return to be interpreted as special. The escape character `~` can be changed in configuration files or on the command line.

The session terminates when the command or shell on the remote system exits, or when the user logs out of an interactive session, and all X11 and TCP/IP connections have been closed. The exit status of the remote program is returned as the exit status of SSH.

4.11. X11 Forwarding

With X11 in use, the connection to the X11 display forwards to the remote side any X11 programs started from the interactive session (or command) through the encrypted channel. Also, the connection to the real X server is made from the local system. The user should not set `DECW$DISPLAY` manually. Forwarding of X11 connections can be configured on the command line or in configuration files.

The `DECW$DISPLAY` value set by SSH points to the server system with a display number greater than zero. This is normal and happens because SSH creates a proxy X server on the server system for forwarding the connections over the encrypted channel.

SSH sets up “fake” Xauthority data on the OpenVMS server, as OpenVMS does not support Xauthority currently. It generates a random authorization cookie, stores it in Xauthority on the server, and verifies that any forwarded connections carry this cookie and replace it by the real cookie when the connection is opened. The real authentication cookie is never sent to the server system (and no cookies are sent in plain text).

4.12. Configuring the SSH Client

The SSH client uses only SSH2 configuration keywords. There are no SSH1-specific configuration keywords for the SSH client.

The SSH client obtains configuration data from the following sources (in this order):

1. Command line options. See Table 4.1 for details.
2. User’s configuration file (`SYSS$LOGIN [.SSH2]SSH2_CONFIG`). See Table 4.2 for details.
3. System-wide configuration file (`SSH2_DIR:SSH2_CONFIG`). See Table 4.2 for details.

For each parameter, the first obtained value is used. The configuration files contain sections bracketed by “Host” specifications. That section applies only for hosts that match one of the patterns in the specification. The matched host name is the one given on the command line. Since the first obtained value for each parameter is used, more host-specific declarations should be given near the beginning of the file, and general defaults at the end.

Table 4.2. SSH2_CONFIG File Configuration Keywords

Keyword	Value	Default	Description
AllowedAuthentications	List	All methods except for hostbased	Permitted techniques, listed in desired order of attempt. These can be the following: keyboard-interactive, password, publickey, <code>kerberos-1@ssh.com</code> , <code>kerberos-tgt-1@ssh.com</code> , <code>kerberos-2@ssh.com</code> , <code>kerberos-tgt-2@ssh.com</code> , and hostbased. Each specifies an authentication method. The authentication methods are tried in the order in which they are specified with this configuration parameter.
AuthenticationSuccessMsg	Y/N	Y	Print message on successful authentication
AuthorizationFile	Filename	Authoriza-tion	Authorization file for Publickey authentication. See below for more information on the contents of this file.
BatchMode	Y/N	N	Do not prompt for any input during session
Ciphers	Cipher list	None	Supported encryption ciphers
ClearAllForwardings	Y/N	N	Ignore any specified forwardings
Compression	Y/N	N	Enable data compression

Keyword	Value	Default	Description
DebugLogFile	Filename	None	Specify the file to hold debug information. If used with the QuietMode keyword turned on as well, only the first part of the log information will be written to <code>SYS\$ERROR</code> , until the DebugLogFile keyword is parsed. If QuietMode is not used, all debug output will go to both <code>SYS\$ERROR</code> and the log file.
DefaultDomain	Domain		Specify domain name
EscapeChar	Character	“~”	Set ESCAPE character (^=Ctrl key)
ForwardAgent	Y/N	Y	Enable agent forwarding
ForwardX11	Y/N	Y	Enable X11 forwarding
GatewayPorts	Y/N	N	Allow connection to locally-forwarded ports
Host	Pattern		Begin the per-host configuration section for the specified host
HostCA	Certificate	None	Specifies the CA certificate (in binary or PEM (base64) format) to be used when authenticating remote hosts. The certificate received from the host must be issued by the specified CA and must contain a correct alternate name of type DNS (FQDN). If the remote host name is not fully qualified, the domain specified by configuration option <i>DefaultDomain</i> is not fully qualified, the domain specified by configuration option <i>DefaultDomain</i> is appended to it before comparing it to certificate alternate names. If no CA certificates are specified in the configuration file, the protocol tries to do key exchange with ordinary publickeys. Otherwise, certificates are preferred. Multiple CAs are permitted.
HostCANoCRLs	Certificate	None	Similar to HostCA, but disables CRL checking for the given ca-certificate.
IdentityFile	Filename	Identification	Name of identification file for Publickey authentication
KeepAlive	Y/N	Y	Send keepalives
LdapServers	ServerURL	None	Specified as <code>ldap://server.domainname:389</code> , CRLs are automatically retrieved from the CRL distribution point defined in the certificate to be checked if the point exists. Otherwise, the comma-separated server list given by option <i>LdapServers</i> is used. If intermediate CA certificates are needed in certificate validity checking, this option must be used or retrieving the certificates will fail.
LocalForward	Port, Socket		Local port forwarding

Keyword	Value	Default	Description
Macs	Algorithm	None	Select MAC (Message Authentication Code) algorithm
NoDelay	Y/N	N	Disable Nagle (TCP_NODELAY)
NumberOfPasswordPrompts	Number	3	Number of times the user is prompted for a password before the connection is dropped
PasswordPrompt	String	“%U’s password:”	Password prompt. The following substitutions may be made within the prompt string: %U = insert users’s username %H = insert user’s system name
Port	Port	22	Server port number
QuietMode	Y/N	Y	Quiet mode - only fatal errors are displayed
RandomSeedFile	Filename	Random_seed	Random seed file
RekeyIntervalSeconds	Seconds	3600	Number of seconds between doing key exchanges during a session. 0 = disable
RemoteForward	Port, Socket		Remote port forwarding
SendNOOPackets	Y/N		Send NOOP packets through the connection. Used typically to prevent a firewall from closing an interactive session
StrictHostKeyChecking	Y/N/Ask	Y	Behavior on hostkey mismatch
TryEmptyPassword	Y/N	N	Attempt an empty password first when doing password authentication. Doing so may result in an extra intrusion being logged.
User	Username		Remote username
VerboseMode	Y/N	N	Verbose mode
VerifyHostKeyDNS	Y/N/ASK	N	Determines if the hostkey fingerprint must be matched in DNS.

The user may specify default configuration options, called stanzas, for different destination systems. The format of this within the configuration file is:

```
hostname:
    keyword      value
    keyword      value
hostname2:
    keyword      value
    keyword      value
```

For example:

```
petunia:
    port         17300
    user         dilbert
    host         petunia.flowers.com
rose:
```

```

port          16003
user          dogbert
host          rose.flowers.com
allowedauthentications password
*.beans.com:
user          limabean
keepalive     no
ciphers       3des,twofish

```

In the preceding example:

- When a user types `$ SSH PETUNIA`, the client will connect to port 17300 on `petunia.flowers.com`, and will use the default username of `dilbert`.
- When a user types `$ SSH ROSE`, the client will connect to port 16003 on host `rose.flowers.com`, and will use the default username of `dogbert`, and only allow password authentication.
- When a user types `$ SSH <anything>.BEANS.COM`, the client will use the default username of `LIMABEAN`, will not send keepalives, and will only allow 3DES or TWOFISH encryption.

The user may override defaults specified in configurations. Options that are specified on the command line override any like options in the configuration file. For example, if the user wants to use a username of `catbert` when connecting to host `ROSE` instead of the default username of `dogbert`, this would be specified as:

```
$ SSH /USER=catbert ROSE
```

4.12.1. Authorization File Options

The authorization file has the same general syntax as the configuration files. The following keywords may be used.

Table 4.3.

Keyword	Description
Key	This is followed by the filename of a publickey in the <code>[.SSH2]</code> directory file that is used for identification when contacting the host. If there is more than one key, they are all acceptable for login.
Option	<p>This keyword, if used, must follow the Key keyword above. The following options are specified as a comma-separated list.</p> <ul style="list-style-type: none"> • allow-from and deny-from Specifies that in addition to Publickey authentication, the canonical name of the remote host must match the pattern(s). These parameters follow the logic of <code>{Allow,Deny}</code> Hosts described in detail in <code>sshd2_config</code>. Specify one pattern per keyword, and multiple keywords can be used. • command="command"

Keyword	Description
	<p>This is used to specify a “forced command” that will be executed on the server side instead of anything else when the user is authenticated. This option might be useful for restricting certain publickeys to perform just a specific operation. An example might be a key that permits remote backups but nothing else. Notice that the client may specify TCP/IP and/or X11 forwarding, unless they are explicitly prohibited.</p> <ul style="list-style-type: none"> <li>• idle-timeout=time <p>Sets idle timeout limit to time in seconds (s or nothing after number), in minutes (m), in hours (h), in days (d), or in weeks (w). If the connections have been idle (all channels) for that long a period of time, the connection is closed down.</p> <ul style="list-style-type: none"> <li>• no-port-forwarding <p>Forbids TCP/IP forwarding when this key is used for authentication. Any port forward requests by the client will return an error. This might be used, for example, in connection with the command option.</p> <ul style="list-style-type: none"> <li>• no-x11-forwarding <p>Forbids X11 forwarding when this key is used for authentication. An X11 forward request by the client will return an error.</p>
Command	This keyword is deprecated (though it still works). Use Option instead.

4.13. SSH Client/Server Authentication Configuration Examples

4.13.1. Hostbased Authentication Example

The following is an example of how to set up the SSH client and SSH2 server for Hostbased authentication:

```
$!
$! First, generate the hostkey - ONLY if it doesn't exist!
$!
$ ip sshkeygen /ssh2 /host
Generating 1024-bit dsa key pair
4 oOo.oOo.oOo
```

```
Key generated.
1024-bit dsa, myname@myclient.foo.com, Thu MAR 04 2017 13:43:54
Private key saved to ip_ssh2_hostkey_dir:hostkey.
Publickey saved to ip_ssh2_hostkey_dir:hostkey.pub

$ directory ip_ssh2_hostkey_dir:hostkey.*

Directory IP$SPECIFIC_ROOT:[IP.PSCSSH.SSH2.HOSTKEYS]

HOSTKEY.;1          HOSTKEY.PUB;1

Total of 2 files
$!
$! Copy the client system publickey to the user directory on the
$! server
$!
$! DECnet must be running before you execute the following
$! commands:
$!
$ copy ip_ssh2_hostkey_dir:hostkey.pub -
$ myserv"myname myuser"::[.ssh2.knownhosts]myclient_foo_com_ssh-dss.pub
$!
$! Finally, log into the server system and ensure the
$! SSH_DIR:HOSTS.EQUIV file is correct
$!
$ SET HOST MYSERV

        Welcome to VSI OpenVMS (TM) Operating System, V8.4-2L1
Username: myname
Password:
        Welcome to VSI OpenVMS V8.4-2L1

        Last interactive login on Monday, 1-MAR-2017 17:07
        Last non-interactive login on Monday, 1-MAR-2017 08:30

MYSERV_$ type ip:hosts.equiv
#
# HOSTS.EQUIV - names of hosts to have default "r" utility access
# to the local # system.
#
# This file should list the full domain-style names.
#
# This list augments the users' SYS$LOGIN:.RHOSTS file for
# authentication.
# Both the .RHOSTS and the HOSTS.EQUIV files are cached by
# VSI TCP/IP for OpenVMS - see the section entitled "RLOGIN and
# RSHELL Authentication Cache" in the _Administrator's Guide_ for
# more information on controlling the cache.
#
# This file is ignored for the users SYSTEM and ROOT. SYSTEM and
# ROOT must have a SYS$LOGIN:.RHOSTS file if you want to use
# RSHELL or RLOGIN with them.
#
localhost
myclient.foo.com          myname
MYSERV_$
MYSERV_$ logout
```

```

MYNAME          logged out at  1-MAR-2017 13:46:58.91
%REM-S-END, control returned to node MYCLIENT::

```

4.13.2. Publickey Authentication Example

The following is an example of how to set up the SSH client and SSH2 server for Publickey authentication:

```

$!
$! First, generate a key tuple
$!
$ ip sshkeygen /ssh2
Generating 1024-bit dsa key pair
  1 oOo.oOo.oOo.

Key generated.
1024-bit dsa, myname@myclient.foo.com, Thu Mar 04 2017 14:06:10
Passphrase :
Again      :
Private key saved to DISK$USERDISK:[MYNAME.SSH2]id_dsa_1024_a.
publickey saved to DISK$USERDISK:[MYNAME.SSH2]id_dsa_1024_a.pub
$ directory [.ssh2]id*.* /since = TODAY

Directory DKA0:[MYNAME.SSH2]

ID_DSA_1024_A.;1    ID_DSA_1024_A.PUB;1

Total of 2 files.
$!
$! Now create the IDENTIFICATION. file. This contains the name of
$! all the keys you wish to use for publickey authentication.
$!
$ set default [.ssh2]
$ copy tt: identification.
  idkey id_dsa_1024_a
  ^Z
$!
$! Copy the key to the user's [.ssh2] directory on the server
$! system
$!
$ copy id_dsa_1024_a.pub myserv"myname mypass"::[.ssh2]
$!
$! Now log into the server system and create the AUTHORIZATION
$! file
$!
$ set host myserv

Welcome to VSI OpenVMS (TM) Operating System, V8.4-2L1
Username: myname
Password:
Welcome to VSI OpenVMS V8.4-2L1

Last interactive login on Tuesday,  2-MAR-2017 13:46
Last non-interactive login on Tuesday,  2-MAR-2017 13:47

$ set default [.ssh2]
$ directory [.ssh2]id*.*

```

```
Directory DKA0:[MYNAME.SSH2]

ID_DSA_1024_A.PUB;1

Total of 1 file.
$ copy tt: authorization.
  key id_dsa_1024_a.pub
  ^Z
$ logout
  MYNAME      logged out at 2-MAR-2017 14:10:26.16
%REM-S-END, control returned to node MYCLIENT::
```

Note

The publickey assistant and subsystem can also be used to transfer publickeys and maintain the authorization file to implementations that support the publickey subsystem.

4.13.2.1. SSH1 Example

```
$ ! An example of the procedure of setting up SSH to enable
$ ! RSA-based authentication.
$ ! Using SSH client node to connect to an SSH server node.
$ !
$ ! On the client node
$ !
$ IP SSHKEYGEN /SSH1
Initializing random number generator...
Generating p: .....++ (distance 662)
Generating q: .....++ (distance 370)
Computing the keys...
Testing the keys...
Key generation complete.
Enter file in which to save the key
(DISK$SYS_LOGIN:[MYNAME.ssh]identity.):
Enter passphrase:
Enter the same passphrase again:
Your identification has been saved in
DISK$SYS_LOGIN:[MYNAME.ssh]identity..
Your publickey is:
1024 33 13428.....29361 MYNAME@long.hair.com
Your publickey has been saved in DISK$SYS_LOGIN:[MYNAME.ssh]identity.pub
$ !
$ ! A TCP/IP stack must be loaded on the remote system.
$ !
$  FTP DAISY /USER=MYNAME/PASSWORD=DEMONSOFSTUPIDITY -
_ $ PUT DISK$SYS_LOGIN:[MYNAME.ssh]identity.PUB -
_ $ DISK$SYS_LOGIN:[MYNAME.ssh]identity.PUB
long.hair.com VSI TCP/IP for OpenVMS FTP user process V4.4(119)
Connection opened (Assuming 8-bit connections)
<daisy.hair.com VSI TCP/IP for OpenVMS FTP Server Process V4.4(16) at Thu
 4-Mar-2017 3:20PM-EDT
[Attempting to log in as myname]
<User MYNAME logged into DISK$SYS_LOGIN:[MYNAME] at Thu 4-MAR-2017 3:21PM-
EDT, job 20e00297.
<VMS Store of DISK$SYS_LOGIN:[MYNAME.SSH]IDENTITY.PUB; started.
<Transfer completed. 395 (8) bytes transferred.
<QUIT command received. Goodbye.
```

```

$
$ TELNET DAISY
Trying... Connected to DAISY.HAIR.COM.

Authorized Users Only (TM) VSI OpenVMS V8.4-2L1

Username: MYNAME
Password:
    Welcome to VSI OpenVMS (TM) Operating System, V8.4-2L1 on node DAISY
    Last interactive login on Thursday,  4-MAR-2017 08:07
    Last non-interactive login on Thursday,  6-MAR-2017 15:21
    Logged into DAISY at  4-MAR-2017 15:22:43.68

$ !
$ ! For the first entry into the AUTHORIZED_KEYS file copy
$ ! (or rename) the file [.SSH]IDENTITY.PUB to
$ ! [.SSH]AUTHORIZED_KEYS.
$ !
$ !
$ COPY [.SSH]IDENTITY.PUB [.SSH]AUTHORIZED_KEYS.
$
$ ! FOR SUBSEQUENT ENTRIES use the APPEND command
$ !
$ APPEND [.SSH]IDENTITY.PUB [.SSH]AUTHORIZED_KEYS.
$
$ ! A sanity check of the file protections shows
$ !
$ DIRECTORY/PROTECTION [.SSH]*.*

Directory DISK$SYS_LOGIN:[MYNAME.SSH]

AUTHORIZED_KEYS.;1      (RWE,RWED,RE,E)
IDENTITY.;1             (RWD,RWD,,)
IDENTITY.PUB;1         (RWE,RWED,RE,E)
KNOWN_HOSTS.;1        (RWD,RWD,,)
RANDOM_SEED.;1         (RWD,RWD,,)

Total of 5 files.
$ !
$ DIRECTORY/PROTECTION SSH.DIR

Directory DISK$SYS_LOGIN:[MYNAME]

SSH.DIR;1              (RWD,RWD,,)

Total of 1 file.

```

4.13.2.2. SSH2 User Authentication Using Certificates

Client setup:

1. Copy the private key and certificate (.crt) into the user's [.SSH2] directory, and edit the [.SSH2] identification file, adding entry "certkey private key name".

```

certkey mycert1
$
$ dir [.ssh2]
Directory DKA0:[dilbert.SSH2]
AUTHORIZATION.;13 IDENTIFICATION.;1 MYCERT.;1 MYCERT1.CRT.;2

```

```
Total of 4 files.  
$ type [.ssh2]identification.
```

Server setup:

1. Copy the CA certificate into your `SSH2_DIR`: directory.
2. Add the following entries in `SSH2_DIR:SSHD2_CONFIG`:

```
Pki SSH2_DIR:<CAcertname>  
Mapfile SSH2_DIR:<CAcertname>.map
```

The **Pki** keyword begins an authority block for a given CA certificate. There might be more than one CA certificate along with its own mapping file.

The **Mapfile** keyword specifies the location of the certificate to username mapping file.

In addition, for testing, you might use `PkiDisableCRLs yes` to disable CRL checking for the given authorization block.

3. Create the mapping file `SSH2_DIR:<CAcertname>.map`

The mapping file consists of rows of the following format: `userid, mappingrule, mapdata`.

- *userid* is the user identification that is allowed to login for the given certificate. There might be multiple user identifications for a given certificate.
- *Mapping rule* is one of *subject*, *email*, *serialandissuer* and *emailregex*.
 - *Subject* means that the following mapdata is matched against the subject of the certificate:
 - *Email* is the e-mail alternative subject extension (with *emailregex* can be used regular expressions - e.g., `%subst% emailregex ([a-z] | +)@foo\.com` would be any trusted certificate having e-mail alternative name of `<username>@foo.com` to login with `userid <username>`)
 - *SerialAndIssuer* is the serial number and DN of the issuer separated by whitespace.
 - DNs are used in reverse LDAP order (e.g., `c=US, o=Fooobar, cn=dilbert dogbert`).

4.13.2.3. SSH2 Hostkey Authentication Using Certificates

Server setup:

1. Create a certificate for the server. Host certificate must contain FQDN as DNS alternative name.
2. Copy the private key and certificate into `IP_SSH2_HOSTKEY_DIR` directory.
3. Add the following entries into `ssh2_dir:sshd2_config` file

```
HostKeyFile ip_ssh_hostkey_dir:<hostcert>  
HostCertificateFile ip_ssh_hostkey_dir:<hostcert>.crt
```

Note

For testing purposes, you can use `HostCANoCRLs` instead of `HostCA` to disable CRL checking.

4.14. Hostkey Verification Using DNS

VSI TCP/IP SSH can be configured to calculate the fingerprint of the hostkey it receives, then perform a lookup in DNS for that fingerprint. This can help prevent man-in-the-middle attacks. See RFC 4255 for more details. Refer to the *VSI TCP/IP for OpenVMS Administrator's Guide Volume II* for information on configuring DNSSEC on VSI TCP/IP systems.

In order to do this, the following conditions must be met:

- DNSSEC must be enabled and configured for the DNS used by the client.
- A hostkey SSHFP record must be generated, signed by the zone key, and added to the DNSSEC configuration as a type SSHFP record for the server system. The VSI TCP/IP SSH-KEYGEN2 utility can be used to display the hostkey SSHFP type record for DNS.
- The client configuration keyword `VerifyHostKeyDNS` must be set to **Y** or **ASK**.
- The client configuration keyword `StrictHostKeyChecking` must be set to **Y** or **ASK**.

When the hostkey is received from the server, and after the client goes through its normal hostkey checking (e.g., does the client already know about this hostkey), it checks the status of the `VerifyHostKeyDNS` keyword. If not set to **N**, the client calculates the fingerprint of the hostkey, then performs a DNS lookup of the key,

If no records are found, the user may be given the option of proceeding (if `VerifyHostKeyDNS` is set to **ASK**). If the user responds **N**, then the session is terminated. Otherwise, the hostkey is accepted and the session continues.

If one or more records are found, the fingerprint and type of the hostkey received are compared against those found in DNS. If no matches are made, the user may be given the opportunity to ignore this state (see above).

If a match was made, the `RRSET_VALIDATED` flag returned by DNSSEC is examined to see if the signing of the records can be fully trusted. If this is true, the hostkey processing is complete. If this flag is false, the user may be given the opportunity to ignore this state (see above).

4.15. Port Forwarding

Port forwarding is a mechanism whereby programs that use known TCP/IP ports can have encrypted data forwarded over unsecure connections. This is also known as "tunneling".

If the user is using an authentication agent, the connection to the agent is forwarded automatically to the remote side unless disabled on the command line or in a configuration file. Forwarding of arbitrary TCP/IP connections over the secure channel can be specified either on the command line or in a configuration file.

Note

Forwarded ports (tunnels) exist only as long as the SSH session that established them exists; if the SSH session goes away, so do the forwardings.

```
/LOCAL_FORWARD=(localport:remotehost:remoteport)
```

This causes `localport` on the system the client is running on to be forwarded to `remotehost:remoteport`. The system to which SSH2 connects acts as the intermediary between the two endpoint systems.

For example: Use port forwarding to allow a system (`midsys`) to encrypt and forward TELNET sessions between itself (`mysys`) that is outside a corporate firewall to a system (`remotesys`) that is inside a corporate firewall. Note that the use of port 2300 in the examples is arbitrary.

From the DCL prompt on `mysys`:

```
$ SSH midsys /local_forward=(2300:remotesys:23)
```

With the SSH session to `midsys` now active, type in another window on `mysys`:

```
$ telnet localhost /port=2300
```

Note

The SSH session must remain active for port forwarding activity.

This causes a connection to `mysys:2300`. The SSH2 client has bound to this port, and will see the connection request. SSH sends an "open channel" request to `midsys`, telling it there's a connect request for port 23 on `remotesys`. `Midsys` will connect to `remotesys:23`, and send back the port information to `mysys`. `Mysys` completes the connection request, and the TELNET session between `mysys` and `remotesys` is now in place, using the tunnel just created through the firewall between `mysys` and `midsys`.

All traffic between `mysys` and `midsys` (through the firewall) is encrypted/decrypted by SSH on `mysys` and SSHD on `midsys`, and hence, is safe. TELNET does not know this, of course, and does not care.

Note that ports can also be forwarded from a `localhost` to the `remotehost` that's running SSHD, as illustrated in this figure.

In this example, port 2300 on `mysys` is being forwarded to `remotesys:23`. To do this, use SSH on `mysys`:

```
$ SSH remotesys /local_forward=(2300:remotesys:23)
```

Then, also on `mysys`, type:

```
$ telnet localhost /port=2300
```

When SSH and SSHD start their dialog, SSHD on `remotesys` connects back to itself, port 23, and the TELNET session is established.

```
/REMOTE_FORWARD=(remoteport1:remotehost:remoteport2)
```

This causes `remoteport1` on the system to which SSH connects to be forwarded to `remotehost:remoteport2`. In this case, the system on which the client is running becomes the intermediary between the other two systems.

For example, a user wants to use `mysys` to create a tunnel between `sys1:4000` and `sys2:23`, so that TELNET sessions that originate on `sys1:4000` get tunneled to `sys2` through the firewall. On `mysys`:

```
$ SSH sys1 /remote_forward=(4000:sys2:23)
```

Now, on `sys1`, a user could establish a TELNET session to `sys1` by doing:

```
$ telnet localhost /port=4000
```

The mechanism used for making the TELNET connection (setting up the tunnel) is essentially the same as described in the **/LOCAL_FORWARD** example above, except that the roles of SSH and SSHD in the dialog are reversed.

4.15.1. Other Files

The files in the Table 4.4 are used by SSH. Note that these files generally reside in the [.SSH2] subdirectory from the user's SYS\$LOGIN directory. The [.SSH2] subdirectory is created automatically on your local system the first time SSH is executed, and on a remote OpenVMS system the first time an SSH connection is made to that system. File protection for SYS\$LOGIN:SSH2.DIR should be (S:RWD, O:RWD, G:, W:).

Table 4.4. SSH2 Files

File Name	Resides On	Description
[.SSH2] SSH2_CONFIG.	Client System	This is the individual configuration file. This file is used by the SSH2 client. It does not contain sensitive information. The recommended file protection is (S:RWD,O:RWD,G:,W:).
[.SSH2] IDENTIFICATION	Client System	Contains the information about private keys that can be used for Publickey authentication, when logging in.
[.SSH2] ID_alg_bits_seq	Client System	Contains a private key for authentication. <ul style="list-style-type: none"> • <i>alg</i> is either RSA or DSA • <i>bits</i> is the length of the key • <i>seq</i> is an incrementing alphabetic value <p>Thus, a key named ID_DSA_1024_A. indicates this is a private DSA key 1024 bits long, and it is the first time the key was generated using SSHKEYGEN. A user may have multiple private key files in a directory.</p>
[.SSH2] ID_alg_bits_seq.PUB	Client System and Server System	Contains a publickey for authentication. <ul style="list-style-type: none"> • <i>alg</i> is either RSA or DSA • <i>bits</i> is the length of the key • <i>seq</i> is an incrementing alphabetic value <p>Thus, a key named ID_DSA_1024_B.PUB indicates this is a public DSA key 1024 bits long, and it is the second time the key was generated us-</p>

File Name	Resides On	Description
		ing SSHKEYGEN. A user may have multiple publickey files in a directory.
[.SSH2.HOSTKEYS]xxx.PUB	Client System	<p>Contains public hostkeys for all hosts the user has logged into. The files specifications have the format <code>KEY_port_hostname.PUB</code></p> <ul style="list-style-type: none"> <code>port</code> is the port over which the connection was made <code>hostname</code> is the hostname of the key's host. <p>For example, if <code>tulip.flowers.com</code> was accessed via port 22, the keyfile would be <code>KEY_22_TULIP_FLOWERS.COM.PUB</code>. If this file changes on the host (for example, the system manager regenerates the hostkey), SSH2 will note this and ask if you want the new key saved. This helps prevent man-in-the-middle attacks.</p>
[.SSH2]RANDOM_SEED.	Client System	<p>Seeds the random number generator. This file contains sensitive data and must have a protection of no more than (S:RWD,O:RWD,G:,W:), and it must be owned by the user. This file is created the first time the program is run and is updated automatically. The user should never need to read or modify this file. On OpenVMS systems, multiple versions of this file will be created; however, all older versions of the file may be safely purged.</p> <p>Use the DCL command: SET FILE / VERSION_LIMIT=n RANDOM_SEED to set a limit on the maximum number of versions of this file that may exist at any given time.</p>
IP\$: .RHOSTS	Server System	<p>Is used in Hostbased authentication to list the host/user pairs that are permitted to log in.</p> <p>Each line of the file contains a host name (in the fully-qualified form returned by name servers), and then a user name on that host, separated by a space. This file must be owned by the user, and must not have write permissions for anyone else. The recommended permission is read/write for the user, and not accessible by others.</p>

File Name	Resides On	Description
IP\$: .SHOSTS	Server System	Is used the same way as .RHOSTS.
IP\$: HOSTS .EQUIV	Server System	Is used during .RHOSTS authentication. It contains fully-qualified hosts names, one per line. If the client host is found in this file, login is permitted provided client and server user names are the same. Additionally, successful RSA host authentication is required. This file should only be writable by SYSTEM.
IP\$: SHOSTS .EQUIV	Server System	Is processed exactly as SSH_DIR : HOSTS .EQUIV. This file may be useful to permit logins using SSH but not using rshell/rlogin.
SSH2_DIR : SSH2_CONFIG	Client System	This is a system-wide client configuration file. This file provides defaults for those values that are not specified in a user's configuration file, and for users who do not have a configuration file. This file must be world-readable.
IP_SSH2_KNOWNHOSTS_DIR	Server System	<p>Contains public hostkeys for all hosts the system has logged into. The files specifications have the format <code>KEY_port_hostname .PUB</code></p> <ul style="list-style-type: none"> • <i>port</i> is the port over which the connection was made • <i>hostname</i> is the hostname of the key's host. <p>For example, if tulip.flowers.com was accessed via port 22, the keyfile would be <code>KEY_22_TULIP_FLOWERS_COM .PUB</code>. If this file changes on the host (for example, the system manager regenerates the hostkey), SSH will note this and ask if you want the new key saved. This helps prevent man-in-the-middle attacks.</p>

4.16. SSHKEYGEN

Generates authentication key pairs. The format of the keys is incompatible between SSH1 and SSH2. Therefore, the correct format keys must be generated for each version of the protocol to be supported.

There is no way to recover a lost passphrase. If the passphrase is lost or forgotten, you need to generate a new key and copy the corresponding publickey to other systems.

Each key may be protected via a passphrase, or it may be left empty. Good passphrases are 10-30 characters long and are not simple sentences or otherwise easily guessable. Note that the passphrase

can be changed later, but a lost passphrase cannot be recovered, as a “one-way” encryption algorithm is used to encrypt the passphrase.

Note

The Hostkey has no password.

4.16.1. SSH1

```
$ IP SSHKEYGEN /SSH1 [/BITS=n] [/IDENTITY_FILE=file]
                        [/PASSPHRASE=passphrase] [/COMMENT=comment]
$ IP SSHKEYGEN /SSH1 /CHANGE_PASSPHRASE [/PASSPHRASE=old_passphrase]
                        [/NEW_PASSPHRASE=new_passphrase]
$ IP SSHKEYGEN /SSH1 /CHANGE_COMMENT [/PASSPHRASE=passphrase]
                        [/COMMENT=comment]
$ IP SSHKEYGEN /SSH1 /CHANGE_CIPHER [/IDENTITY_FILE=file]
                        [/PASSPHRASE=passphrase]
$ IP SSHKEYGEN /SSH1 /HOST [/BITS=n][/COMMENT=comment]
```

Table 4.5. SSH1 SSHKEYGEN Options

Option	Description
/BITS= <i>nnn</i>	Specify key strength in bits (default = 1024).
/CHANGE_PASSPHRASE	Change the passphrase of private key file.
/CHANGE_COMMENT	Change the comment for a key.
/CHANGE_CIPHER	Change the cipher to current default (3DES).
/COMMENT=" <i>comment</i> "	Provide the comment.
/HOST	Generate the hostkey.
/IDENTITY_FILE= <i>file</i>	Specify the name of the hostkey file.
/PASSPHRASE= <i>ppp</i>	Provide the current passphrase.
/NEW_PASSPHRASE= <i>ppp</i>	Provide new passphrase.
/VERSION	Print SSHKEYGEN version number.

4.16.2. SSH2

To authenticate key pairs with SSH2 use the following commands.

```
$ IP SSHKEYGEN /SSH2[/BITS=n][/COMMENT=comment][/KEYTYPE=type]
                        [/KEYS=(key1...keyn)]
                        [/PASSPHRASE=ppp|/NOPASSPHRASE][/STIR=file][/QUIET]
$ IP SSHKEYGEN /SSH2/HOST
                        [/BITS=n][/COMMENT=comment][/STIR=file][/QUIET]
$ IP SSHKEYGEN /SSH2/DERIVE_KEY=file
$ IP SSHKEYGEN /SSH2/EDIT=file
$ IP SSHKEYGEN /SSH2/FINGERPRINT=file
$ IP SSHKEYGEN /SSH2/INFO=file [/BASE=n]
$ IP SSHKEYGEN /SSH2/SSH1_CONVERT=file
$ IP SSHKEYGEN /SSH2/X509_CONVERT=file
$ IP SSHKEYGEN /SSH2/PKCS_CONVERT=file
```

```

$ IP SSHKEYGEN /SSH2/EXTRACT_CERTS=file
$ IP SSHKEYGEN /SSH2/HELP
$ IP SSHKEYGEN /SSH2/VERSION
$ IP SSHKEYGEN /SSH2/NOWARN
$ IP SSHKEYGEN /SSH2/DNS_DIGEST

```

Table 4.6. SSH2 SSHKEYGEN Options

Option	Description
/BASE= <i>nnn</i>	Number base for displaying key info
/BITS= <i>nnn</i>	Specify key strength in bits (default = 1024).
/COMMENTS=" <i>comment</i> "	Provide the comment.
/PKCS_CONVERT= <i>file</i>	Convert a PKCS 12 file to an SSH2 format certificate and private key.
/SSH1_CONVERT= <i>file</i>	Convert SSH1 identity to SSH2 format.
/X509_CONVERT= <i>file</i>	Convert private key from X.509 format to SSH2 format.
/DERIVE_KEY= <i>file</i>	Derive the private key given in 'file' to publickey.
/DNS_DIGEST	Calculate and display a DNSSEC SSHFP record of the local hostkey that can be added to a DNS configuration file.
/EDIT= <i>file</i>	Edit the comment/passphrase of the key.
/EXTRACT_CERTS= <i>file</i>	Extract certificates from a PKCS 7 file.
/FINGERPRINT= <i>file</i>	Dump the fingerprint of file.
/INFO= <i>file</i>	Load and display information for <i>file</i> .
/HELP	Print help text.
/HOST	Generate the hostkey.
/KEYS=(<i>key1</i> , . . . , <i>keyn</i>)	Generate the specified key file(s).
/KEYTYPE=(<i>dsa</i> <i>rsa</i>)	Choose the key type: <i>dsa</i> or <i>rsa</i> .
/OPENSSSH_CONVERT= <i>file</i>	Convert the specified OpenSSH key to SSH2 format
/OUTPUT_FILE= <i>file</i>	Write the key to the specified output file
/PASSPHRASE= <i>ppp</i>	Provide the current passphrase.
/NOPASSPHRASE	Assume an empty passphrase.
/QUIET	Suppress the progress indicator.
/STIR= <i>file</i>	Stir data from file to random pool.
/VERSION	Print SSHKEYGEN version number.
/[NO]WARN	Enable or disable warnings if the process of generating hostkeys using /HOST will cause existing hostkeys to be overwritten. If enabled, the user will be prompted to overwrite them. If disabled, no warnings or prompts are issued if the hostkeys exist. Default is /WARN.

There is also a comment field in the publickey file that is for the convenience to the user to help identify the key. The comment can tell what the key is for, or whatever is useful. The comment is initialized to `nnn-bit dsa,username@hostname,ddd mm-dd-yyyy hh:mm:ss` when the key is created unless the /COMMENT qualifier is used, and may be changed later using the /EDIT qualifier.

Note

When the `/HOST` qualifier is used, the `/KEYS=(key1,...keyn)` qualifier is ignored. The `publickey` file must be world-readable.

4.17. SSHAGENT (authentication agent)

SSHAGENT is a program that holds authentication private keys. Both SSH1 and SSH2 keys are supported by SSHAGENT. SSHAGENT may be started in the beginning of a login session by including the commands to start it in, for example, `LOGIN.COM`. It may also be started interactively at any time during a login session.

To start SSHAGENT, one of the three methods may be used:

1. Start it in a separate window:

```
$ IP SSHAGENT
```

2. Spawn it as a subprocess:

```
$ SPAWN/NOWAIT IP SSHAGENT
```

3. Run it in a detached process:

```
$ RUN/DETACHED/OUTPUT=AGENT.OUT/INPUT=NLA0:/PROCESS_NAME="SSH AGENT"
  SSH_EXE:SSH-AGENT2
```

The agent is used for Publickey authentication when logging to other systems using SSH. A connection to the agent is available to all programs run by all instances of the user on a specific system. The name of the mailbox used for communicating with the agent is stored in the `IP_SSH_AGENT-T_username` logical name. Note that while the agent mailbox is accessible only by the user that starts the agent, a user with sufficient OpenVMS privileges could access the agent mailbox and steal or modify keys currently loaded into the agent (although, the keys as stored on disk cannot be modified simply by accessing the agent).

The agent does not have any private keys initially. Keys are added using `SSHADD`. When executed without arguments, `SSHADD` adds the user's identity files. If the identity has a passphrase, `SSHADD` asks for the passphrase. It then sends the identity to the agent. Several identities can be stored in the agent; the agent can use any of these identities automatically.

`$ IP SSHADD /LIST` displays the identities currently held by the agent. The idea is that the agent is run on the user's workstation.

Files

[.SSH] IDENTITY in SYS\$LOGIN :	Contains the RSA authentication identity of the user. This file should not be readable by anyone but the user. It is possible to specify a passphrase when generating the key. That passphrase is used to encrypt the private part of this file. This file is not used by SSHAGENT, but is added to the agent using SSHADD at login.
-----------------------------------	--

4.18. SSHADD

Adds identities for the authentication agent.

```
IP SSHADD [OPTIONS] [FILE[,FILE,FILE]]
```

Description

SSHADD adds identities to SSHAGENT, the authentication agent. When run without arguments, SSHADD adds the file [`.SSH`] IDENTITY. Alternative file names can be given on the command line. If any file requires a passphrase, SSHADD asks for the passphrase from the user.

The authentication agent must be running and must have been executed by the user for SSHADD to work.

FILE is an identity or certificate file. If no file is specified, the files in the user's [`.SSH2`] directory are used.

Options

/HELP	Display help text.
/LIST	List all identities currently represented by the agent.
/LOCK	Lock the agent with a password.
/NOSSH1	Agent cannot use SSH1 keys.
/PURGE	Remove all identities from the agent.
/REMOVE	Remove the identity from the agent. In order to remove identities, you must either issue the command from the subdirectory that the identities are located in, or issue the command using the full path name of the identity (as is seen in an SSHADD /LIST command).
/TIMEOUT= <i>n</i>	Agent should delete this key after the timeout value (in minutes) expires.
/UNLOCK	Unlock the locked agent.
/URL	Give key to the agent as a URL.

Files

These files exist in SYS\$LOGIN:

[<code>.SSH</code>] IDENTITY	<p>Contains the RSA authentication identity of the user. This file should not be readable by anyone but the user. It is possible to specify a passphrase when generating the key. That passphrase is used to encrypt the private part of this file. This is the default file added by SSHADD when no other files have been specified.</p> <p>If SSHADD needs a passphrase, it reads the passphrase from the current terminal if it was run from a terminal. If SSHADD does not have a terminal associated with it but DECW\$DISPLAY is set, it opens an X11 window to read the passphrase.</p>
--------------------------------	--

[.SSH] IDENTITY . PUB	Contains the publickey for authentication. The contents of this file should be added to [.SSH] AUTHORIZED_KEYS on all systems where you want to log in using RSA authentication. There is no need to keep the contents of this file secret.
[.SSH] RANDOM_SEED	Seeds the random number generator. This file should not be readable by anyone but the user. This file is created the first time the program is run, and is updated every time SSHKEYGEN is run.

4.19. CERTTOOL

The CERTTOOL utility is used for different needs concerning X.509 certificates.

```
ip certtool [options] /pk10 /subject=<subject> /key_usage=<flags>
/extended_key_usage=<flags>
ip certview [options] /pk12 /input_files=<objects>
```

Valid Options

/BITS= <i>n</i>	Key strength in bits (default 2048)
/DEBUG= <i>n</i>	Set debug level to <i>n</i>
/EXTENDED_KEY_USAGE=(<i>flag1...flagn</i>)	(PKCS#10 only) Extended key usage flags, as a comma-separated list. Valid values are: <ul style="list-style-type: none">• anyExtendedKeyUsage• ServerAuth• clientAuth• codeSigning• emailprotection No extended flags are set by default.
/HELP[=(PK10,PK12)]	Display help. More detailed help on manipulating PKCS#10 and PKCS#12 certs is available by adding the PK10 and PK12 qualifier, respectively, to the HELP switch.
/INPUT_FILES=(<i>file1...filen</i>)	(PKCS#12 only) List of files to include in the PFX package.
/KEY_TYPE= <i>type</i>	Create a new key of type DSA or RSA.
/KEY_USAGE=(<i>flag1...flagn</i>)	(PKCS#10 only) Key usage flags, as a comma-separated list. Valid values are: <ul style="list-style-type: none">• digitalSignature

	<ul style="list-style-type: none"> • nonRepudiation • keyEncipherment • dataEncipherment • keyAgreement • keyCertSign • CRLSign • encipherOnly • decipherOnly <p>Default values are digitalSignature and keyEncipherment.</p>
/OPTION=(<i>x</i> , <i>y</i>)	<p>Set certificate option <i>x</i> to <i>y</i>. The options that can be set are dependent upon the type of certificate (PKCS#10 or PKCS#12) being affected.</p> <p>For PKCS#10:</p> <ul style="list-style-type: none"> • DNS - set certificate DNS names • Email - set certificate email addresses. <p>For PKCS#12:</p> <ul style="list-style-type: none"> • KeyPBE - set the PBE scheme for shrouding keys. “default” means pbeWithSHAAnd3-KeyTripleDES-CBC. • SafePBE - set the PBE scheme for protecting safes. “default” means pbeWithSHAAnd40BitRC2-CBC.
/OUTPUT_FILE= <i>prefix</i>	Use prefix as the prefix for all output filenames. Private key filenames will be prefix . SSH2 and PKCS#10 files will be prefix .PKCS10.
/PRIVATE_KEY= <i>keyname</i>	Use keyname as the private key.
/SUBJECT=" <i>subject</i> "	(PKCS#10 only) Use subject as the certificate subject.
/VERSION	Display the version of CERTTOOL .

Example

```
$ IP CERTTOOL /PK10 /SUBJECT="(cn=john doe,cn=lima,cn=beans)"-
$_ /PRIVATE_KEY=DKA0:[JOHENDOE.SSH2]ID_DSA_1024_A
PKCS#10 creation successful.
Wrote certificate request to output.pkcs10.
```

4.20. CERTVIEW

CERTVIEW can be used to view certificates and check their validity. This tool can also be used to output the data in format that is suitable for insertion in the `SSH2_DIR:SSHD2_CONFIG` configuration file.

```
$ ip certview [options] certificate [, certificate, ..., certificate]
```

Valid Options

/COMMENT	Prepend information lines with # (comment mark)
/DEBUG= <i>n</i>	Set debug level to <i>n</i>
/FORMAT_OUTPUT	Output data in a format suitable for insertion to <i>user-map</i>
/HELP	Display help
/QUIET	Don't display certificate information
/VALIDATE= <i>certificate</i>	Validate using the CA certificate <i>certificate</i>
/VERBOSE	Increase verbosity (display extensions).
/VERSION	Display version information

Example

```
$ IP CERTVIEW MYCERT_PKCS7.P7B-1_SSH2_CRT
Certificate MYCERT_PKCS7.P7B-1_SSH2_CRT
Certificate issuer ..... : MAILTO=foo@bar.com, C=US, ST=CO,
  L=Colorado Springs, CN=FOOCA
Certificate serial number .... : 20668029027158235697617769792662904421
Certificate subject ..... : MAILTO=foo@bar.com, C=US, ST=CO,
  L=Colorado Springs, CN=FOOCA
```

4.21. CMPCLIENT

```
ip cmpclient [options]/ca_access_url="<url>"/subject="<subject>"cert-file
[private-key]
```

Description

Allows users to enroll certificates. It will connect to a CA (certification authority) and use the CMPv2 protocol for enrolling a certificate. The user may supply an existing private key when creating the certification request or allow a new key to be generated.

Command Parameters

URL	Specifies the URL for the Certification Authority
Subject	Specifies the subject name for the certificate. For example, <code>c-ca, o=acme, ou=development, cn=Bob Jones</code>
Cert file	Specifies the file the certification is written to.

Private key	Specifies the private key to be written to.
-------------	---

Valid Options

/BASE=<name>	Specify base prefix for the generated files.
/BITS= <i>n</i>	Specify the key length in bits.
/CA_URL="<url>"	Specify the URL of the Certification Authority.
/DEBUG= <i>n</i>	Set debug to level <i>n</i> (0-60).
/ENROLLMENT_PROTOCOL= <i>prot</i>	Use specified enrollment protocol (SCEP or CMP).
/EXTENSIONS	Enable extensions in the subject name.
/GENERATE_KEY	Generate a new private key.
/HELP	Print this help text.
/PROXY_URL="<url>"	Specify the URL of the HTTP proxy server URL to be used when connecting to the certification authority.
/REFNUM= <i>refnum:key</i>	Specify the CMP enrollment reference number and key.
/SOCKS_SERVER="<url>"	Specify the URL of the SOCKS server URL to be used when connecting to the certification authority.
/SUBJECT="<subject>"	Specifies the subject name for the certificate.
/TYPE= <i>rsa/dsa</i>	Specify the key type to generate (default: RSA)
/USAGE_BITS= <i>n</i>	Specify the key usage bits.
/VERSION	Print the version information for this program.

Examples

1. Enroll a certificate and generate a DSA private key:

```
$ ip cmpclient/type=dsa/generate_key/base=mykey/refnum=1234:abc -
_$ /ca_access_url="http://www.ca-auth.domain:8080/pkix/" -
_$ /subject="c=us,o=foobar,cn=dilbert dogbert" ca-certification.crt
```

This will generate a private key called `mykey.prv` and a certificate called `mykey-0.crt`.

2. Enroll a certificate using a supplied private key and provide an e-mail extension:

```
$ ip cmpclient/base=mykey/refnum=12345:abcd -
_$ /ca_access_url="http://www.ca-auth.domain:8080/pkix/" -
_$ /subject="c=us,o=foobar,cn=Dilbert -
_$ Dogbert:email=foo@bar.com" -
_$ ca-certification.crt my_private_key.prv
```

This will generate and enroll a certificate called `mykey-0.crt`.

Note

SSH stores and uses software certificates in DER encoded binary format. You can use `SSHKEYGEN` to import and convert PKCS#12 packages (`/pkcs_convert=file`) into private key/certificate pair, X.509 format private key into SSH private key (`/x509_convert=file`) or PKC#7 into certificate (`/extract_certs=file`).

4.22. Public-key Subsystem

The publickey subsystem and assistant that can be used to add, remove and list publickeys stored on a remote server. The publickey assistant and server are based upon a recent **IETF** draft, so other implementations of SSH may not yet offer this functionality.

The publickey assistant can be started with:

```
$ IP PUBLICKEY_ASSISTANT [qualifiers] [[user@]host[#port]]
```

4.23. Publickey Assistant Commands

- **ADD** *key file name* – Transfers the key file name to the remote system. The file name specified is expected to be in the SSH2_CONFIG directory from the user's login directory. e.g., ADD ID_DSA_1024_A.PUB will transfer the publickey in ID_DSA_1024_A.PUB to the remote system and updates the AUTHORIZATION.file on the remote system to include this key name.
- **CLOSE** - Closes the connection to the remote system.
- **DEBUG** {*no* / *debug_level*} - Sets debug level (like in SFTP2).
- **DELETE** *key fingerprint* - Deletes the key that matches the fingerprint specified. It is necessary to do a LIST command before this to get a list of the finger prints (and for the program to build its internal database mapping fingerprints to keys).
- **EXIT**- Exits the program.
- **HELP** - Displays a summary of the commands available.
- **LIST** - Displays the fingerprint and attributes of keys stored on the remote system. The attributes that are listed will vary with key.

Example 4.1. Example output

```
Fingerprint: xozil-bemup-favug-fimid-tohuk-kybic-huloz-fukuc-kuril-
gezah-loxex
key type: ssh-dss
Comment: 1024-bit dsa, user@simple.example.com, Wed Jun 05 2002 21:05:40
```

- **OPEN** [*user@*]*host*[*#port*] - Opens a connection to a remote publickey subsystem.
- **QUIT** - Quits the program.
- **UPLOAD** *key file name* - Transfers the key file name to the remote system. The file name specified is expected to be in the SSH2_CONFIG directory from the user's login directory. For example, ADD ID_DSA_1024_A.PUB will transfer the publickey in ID_DSA_1024_A.PUB to the remote system and updates the AUTHORIZATION.file on the remote system to include this key name.
- **VERSION** [*protocol version*] - Displays or sets the protocol version to use. The protocol version can only be set before the OPEN command is used. The default version is 1.

4.23.1. Publickey Assistant Qualifiers

- **/BATCHFILE** - Provides file with publickey assistant commands to be executed. Starts SSH2 in batch mode. Authentication must not require user interaction.

- `/CIPHER` - Selects encryption algorithm(s).
- `/COMPRESS` - Enables SSH data compression.
- `/DEBUG` - Sets debug level (0-99).
- `/HELP` - Displays a summary of the qualifiers available.
- `/MAC` - Selects MAC algorithm(s). `/MAC=(mac-1, . . . , mac-n)`
- `/PORT` - Tells SFTP2 which port SSHD2 listens to on the remote machine.
- `/VERBOSE` - Enables verbose mode debugging messages.

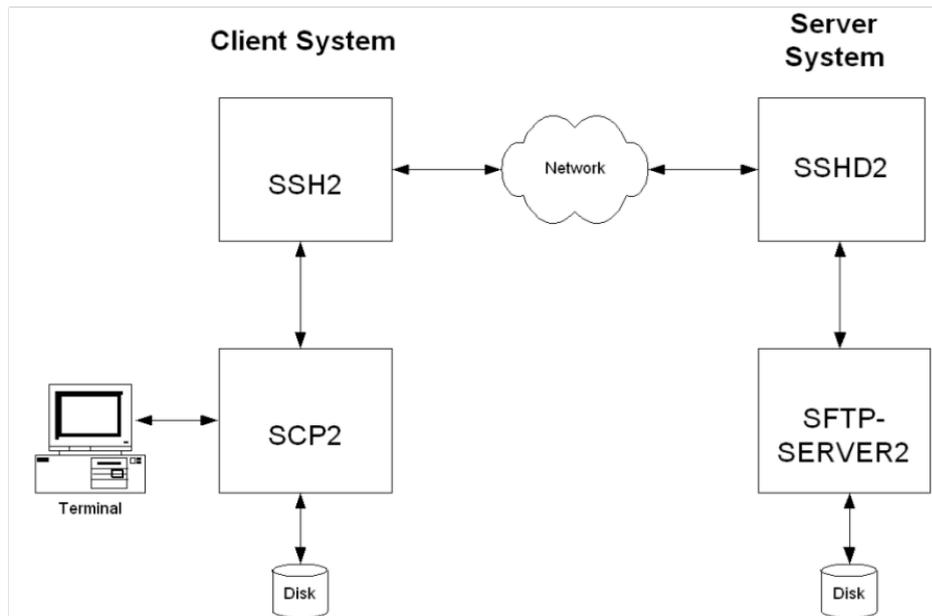
Equal to `/DEBUG=2`. You can disable verbose mode by using “debug disable.”

- `/VERSION` - Displays version number only.

Chapter 5. Secure File Transfer

There are three methods to do secure file transfer: SCP2, SFTP2, and FTP over SSH2. SCP2 and SFTP2 communicate with SSH2 for authentication and data transport (which includes encryption) to remote systems and to activate the SFTP-SERVER2 image. An SCP1 server is provided for compatibility with OpenSSH SCP.

The following diagram illustrates the relationship among the client and server portions of an SCP2 or SFTP2 file transfer:



SCP file transfers are different from FTP file transfers. With FTP a file can be transferred as ASCII, BINARY, RECORD, or in OpenVMS format (if VSI TCP/IP or TCPware is in use). In SCP the primary transfer format is BINARY. Also, the defined syntax for a file specification is UNIX syntax. Due to these restrictions, files that are transferred from dissimilar systems may or may not be useful. ASCII transfers are done by searching the transferred data for the specified newline sequence and making the specified substitution. VSI has used methods available in the protocol to attempt to improve the chances that files will be useful upon transfer. The SSH File Transfer Protocol is an evolving specification, and some implementations may not support all options available in the protocol, or worse, not tolerate some optional parts of later versions of the protocol.

VSI has used the defined extensions in the protocol to transfer information about the OpenVMS file header characteristics such that when a file is transferred between two OpenVMS systems running VSI TCP/IP, TCPware v5.6, and/or SSH for OpenVMS, the file header information will also be transferred and the file will have the same format on the destination system as it had on the source system. Also, when a text file is transferred to a non-VMS system, a method has been provided to convert those files that can be translated into a format that will be usable on the remote system. Files that are converted from non-VMS systems are stored as stream files on the OpenVMS system, which provides compatibility for text files from those systems. Filenames are SRI-encoded when files are stored on ODS-2 disks.

5.1. SCP-SERVER1

The SCP-SERVER1 program is used when a system with OpenSSH initiates an SCP command. OpenSSH uses RCP over SSH2 instead of the SFTP protocol. SCP-SERVER1 will always convert

OpenVMS text files (if possible) when copying a file from OpenVMS. Converted OpenVMS text files may have some trailing nulls at the end of them, due to the RCP protocol not being able to tolerate a file that comes up short of the reported size. SCP-SERVER1 (and SFTP-SERVER2) use sophisticated methods to estimate the amount of user data in the file to minimize this. On ODS-5 disks the estimation routine uses the file size hint if it is valid. On ODS-2 disks (and ODS-5 without a valid size hint), the size of the file and file characteristics are used to estimate the amount of user data. The method provides as accurate an estimate as possible without actually reading the file and never underestimates the amount of data in the file. Underestimating would cause significant problems as the programs use the size of the file to determine how much data to expect.

5.2. SCP2

5.2.1. Usage

```
SCP2 [qualifiers] [[user@]host[#port]::]file [[user@]host[#port]::]file
```

Note

The source and destination file specification must be quoted if they contain a user specification or a non-VMS file specification.

5.2.2. Qualifiers

Table 5.1. SCP Qualifiers

Qualifier	Description
<code>/ASCII [=newline convention]</code>	Newline convention is one of dos, mac, unix, vms, or sftp. The newline convention specified is the newline convention to use if a newline convention is not specified by the server. Allowed values: dos (<code>\r\n</code>), mac (<code>\r</code>), unix (<code>\n</code>), vms (<code>\n</code>), sftp (<code>\r\n</code>). Default is unix.
<code>/BATCH</code>	Starts SSH2 in batch mode. Authentication must be possible without user interaction.
<code>/BUFFER_SIZE =integer</code>	Number of bytes of data to transfer in a buffer. Default is 7500. Minimum value is 512.
<code>/CIPHER=(cipher-1,...,cipher-n)</code>	Selects an encryption algorithm(s).
<code>/COMPRESS</code>	Enables SSH data compression.
<code>/CONCURRENT_REQUEST =integer</code>	Number of concurrent read requests to post to the source file. Default is 4.
<code>/DEBUG =level</code>	Sets a debug level. (0-99)
<code>/DIRECTORY</code>	Forces the target to be a directory.
<code>/HELP</code>	Displays the help text.
<code>/IDENTITY_FILE =file</code>	Identifies the file for publickey authentication.
<code>/OVERWRITE</code>	Overwrite existing file instead of deleting first.
<code>/PORT =number</code>	Tells SCP2 which port SSHD2 listens to on the remote machine.

Qualifier	Description
/PRESERVE	Preserves file attributes and timestamps. This is important when connecting to an SCP on a Unix system because the "e" (execute) is stripped off due to the difference between OpenVMS and Unix systems.
/NOPROGRESS	Does not show progress indicator.
/QUIET	Does not display any warning messages.
/RECORD	Open the source file in OpenVMS Record mode if possible. This is equivalent to record mode transfer in SFTP2. The file is transferred as a stream of records with no carriage control added between them.
/RECURSIVE	Processes the entire directory tree.
/REMOVE	Removes the source files after copying.
/TRANSLATE_VMS = (ALL , NONE , VARIABLE , FIXED , VFC)	Selects the OpenVMS text files to be translated (default=ALL). Note that /ASCII performs a similar function and may be supported in other SCP products.
/VERBOSE	Displays verbose debugging messages. Equal to /DEBUG=2.
/VERSION	Displays the version number only.
/VMS	Negotiates the ability to transfer OpenVMS file information.

Note

/ASCII, /VMS and /TRANSLATE_VMS are mutually exclusive.

5.3. File Specifications

The source and destination strings are changed to lowercase unless they are enclosed in quotes, in which case they are left the same. File specification must be in UNIX format for remote systems, unless the remote system is running TCPware 5.6, VSI TCP/IP, or SSH for OpenVMS, and /VMS or /TRANSLATE_VMS (source files only) are used. UNIX format file specifications need to be enclosed in quotes (") if they contain the / character to prevent the DCL parsing routines from interpreting the string as a qualifier.

5.3.1. Qualifiers

- /ASCII [=newline convention]

Uses the newline convention specified if the server does not specify a newline convention. Available conventions are: dos (\r\n), mac (\r), unix (\n), vms (\n), sftp (\r\n). Default is unix.

- /BATCH

Starts SSH2 in BATCH mode. When SSH2 is running in BATCH mode it does not prompt for a password, so user authentication must be performed without user interaction.

- `/BUFFER_SIZE =integer`

Number of bytes of data to transfer in a buffer. Default is 7500.

- `/CIPHER =(cipher,...,cipher-n)`

Lets you select which SSH2 cipher to use.

- **`/COMPRESS`**

Enables SSH2 data compression. This can be beneficial for large file transfers over slow links. The compression level is set by the client configuration file for SSH2.

- `/CONCURRENT_REQUEST =integer`

Number of concurrent read requests to post to the source file. Default is 4.

- `/DEBUG`

Enables debugging messages for SCP2 and SSH2. Higher numbers get more messages. The legal values are between 0 (none) and 99. Debugging for SFTP-SERVER2 is enabled via the `IP $SSH_SFTP_SERVER_DEBUG` logical.

- `/DIRECTORY`

Informs SCP2 that the target specification should be a directory that the source file(s) will be put in. This qualifier is necessary when using wildcards in the source file specification, or `/RECURSIVE`.

- `/HELP`

Displays command qualifier list and parameter format.

- `/IDENTITY_FILE =file`

Specifies the identity file that SSH2 should use for Public-Key authentication.

- `/PORT =number`

Specifies the port that SSH2 uses on the remote system. Note that if both the source and destination files are remote, this value is applied to both. If SSH2 is available on different ports on the two systems, then the `#port` method must be used.

- `/PRESERVE`

Sets the Protection, Owner (UIC), and Modification dates on the target file to match that of the source file. The adjustment of timestamps for timezones is dependent upon the logical `SYS$LOCALTIME` being set correctly. This is defined automatically on OpenVMS V7 and can be defined similarly on earlier versions of OpenVMS. `/PRESERVE` is not very useful when the target machine is a OpenVMS system as OpenVMS does not provide runtime library calls for setting the file attributes (owner, protection) and timestamps. Note that the OpenVMS modification date (not the creation date) is propagated to the remote system. When files are copied between two OpenVMS systems and `/VMS` is used `/PRESERVE` is implied and the process of transferring OpenVMS attributes preserves the information about the protection, dates, and file characteristics.

- `/NOPROGRESS`

SCP2, by default, updates a progress line at regular intervals when it is run interactively to show how much of the file has been transferred. This qualifier disables the progress line.

- `/QUIET`

Disables warning messages. Note that it does not disable warning messages from SFTP-SERVER2, which return on the error channel.

- `/RECORD`

Open the source file in VMS record mode. This copies the source file to the destination as records converted to a stream of bytes without any carriage control between records. This is equivalent to RECORD mode transfer in SFTP.

- `/RECURSIVE`

Copies all of the files in the specified directory tree. Note that the top level directory on the local system is not created on the remote system. Only the most recent version is copied unless in VMS mode and the `IP$SFTP_VMS_ALL_VERSIONS` logical is defined to be TRUE.

- `/REMOVE`

Deletes the source files after they have been copied to the remote system.

- `/TRANSLATE_VMS`

Translates OpenVMS text files in the copying process to byte streams separated by linefeeds because the defined data transfer format for SCP2 is a binary stream of bytes.

`/TRANSLATE_VMS` is only applicable to the source specification. If a remote source file is specified, then that system must be running VSI TCP/IP, TCPware 5.6, or SSH for OpenVMS. If `/TRANSLATE_VMS` is specified with no value, then `VARIABLE`, `FIXED`, and `VFC` (`V`ariable, `F`ixed `C`ontrol) files are translated to stream linefeed files. If the value is `NONE`, no files are translated. `VARIABLE`, `FIXED`, and `VFC` can be combined in any manner. The SFTP-SERVER2 process uses the value of the logical `IP$SFTP_TRANSLATE_VMS_FILE_TYPES` to determine which files should be translated automatically. This is a bit mask with bit 0 (1) = `FIXED`, bit 1 (2) = `VARIABLE`, and bit 2 (4) = `VFC`. These values can be combined into a number between 0 and 7 to control which files are translated.

Note

Due to the structure of the programs, the SCP2 program uses this logical if the `/TRANSLATE_VMS` qualifier has not been specified.

- `/VERBOSE`

Displays debugging messages that allow the user to see what command was used to start up SSH and other basic debugging information. Note that debugging information can interfere with the normal display of the progress line. Equivalent to `/DEBUG=2`.

- `/VERSION`

Displays the version of the base SCP2 code.

- /VMS

Transfers OpenVMS file information similar to that transferred in OVMS mode in FTP such that OpenVMS file structure can be preserved. All of the information transferred in FTP OVMS mode is transferred along with the file creation date and protection. Timestamps are not adjusted for timezone differences in OpenVMS transfers. If the file is a contiguous file, and it is not possible to create the file contiguously, and the logical `IP$SFTP_FALLBACK_TO_CBT` has the value of `TRUE`, `YES`, or `1`, SFTP-SERVER2 attempts to create the file Contiguous, Best Try. VMS mode is only available with SCP2 provided in VSI TCP/IP, TCPware 5.6, and SSH for OpenVMS.

The logical name `IP$SCP2_VMS_MODE_BY_DEFAULT` can be defined to `TRUE`, `YES`, or `1` to specify that /VMS should be the default unless /NOVMS or /TRANSLATE_VMS are specified. /VMS and /TRANSLATE_VMS can not be used on the same command line. If /VMS is not specified, but the logical is set to enable it by default, a /TRANSLATE_VMS on the command line will take precedence.

Note that even though SCP2 and SFTP-SERVER2 pass the request for OpenVMS file transfers or to translate a OpenVMS file in a manner that is consistent with the protocol specification, other implementations may not handle this information well. Since there is no error response present at that point in the protocol, the program hangs. To prevent it from hanging forever, the logical `IP$SCP2_CONNECT_TIMEOUT` is checked to see how long SCP2 should wait for a response when establishing the connection. The format for this logical is a OpenVMS delta time. The default value is 2 minutes. If SCP2 times out before a connection is established with SFTP-SERVER2 and /VMS or /TRANSLATE_VMS were specified, a warning message is displayed and the initialization is tried again without the request for OpenVMS information (or /TRANSLATE_VMS). This retry is also subject to the timeout, and if the timeout happens again, then SCP2 exits. This helps for implementations that ignore the initialization message when information they do not recognize is present; implementations that abort will cause SCP2 to exit immediately.

5.4. Logicals

For the following logicals, all that start `IP$SFTP` apply to the SCP2 client, SFTP2 client and SFTP2 server.

- `IP$SFTP_FALLBACK_TO_CBT`

When defined to `TRUE`, `YES`, or `1` (the number 1) and a OpenVMS file transfer is being performed, this logical creates a Contiguous file if that file has Contiguous characteristics. The file will be created as Contiguous Best Try if there is insufficient space to create it as Contiguous.

- `IP$SFTP_TRANSLATE_VMS_FILE_TYPES`

This is a bit mask that determines which OpenVMS file types should be translated when not operating in OpenVMS mode.

- Bit 0 (1) = `FIXED`
- Bit 1 (2) = `VARIABLE`
- Bit 2 (4) = `VFC`

The values are:

- 0 (zero) = `NONE`

- 7 = ALL

Note that this logical affects SCP2 as well as the server, as SCP2 has the server built into it for handling local file access. If this logical is not defined, the value 7 will be used.

- IP\$SCP2_CONNECT_TIMEOUT

This logical defines a number specifying how long SCP2 should wait for a response to the INITIALIZE command from the server program. This is a OpenVMS delta time number. The default is 2 minutes.

- IP\$SCP2_VMS_MODE_BY_DEFAULT

When defined to TRUE, YES, or 1, this logical chooses the /VMS qualifier if /TRANSLATE_VMS or /NOVMS has not been specified.

- IP\$SFTP_RETURN_ALQ

When defined to TRUE, YES, or 1 (the number one) and files are being transferred in OpenVMS mode, this logical includes the Allocation Quantity for the file in the file header information. This is disabled by default because copying a small file from a disk with a large cluster size to a disk with a small cluster size causes the file to be allocated with more space than necessary. You have the option of retaining the allocated size of a file if it was allocated the space for a reason. Some combinations of file characteristics require that the Allocation Quantity be included in the file attributes; this is handled by SCP2/SFTP-SERVER2.

- IP\$SSH_SCP_SERVER_DEBUG

Enables debugging messages for the SCP-SERVER1 image that provides service to SCP commands that use the RCP over SSH2 protocol (OpenSSH). When this is defined, the file

SCP-SERVER.LOG is created in the user's login directory. These files are not purged. Larger values yield more debugging information.

- IP\$SSH_SFTP_SERVER_DEBUG

Enables debugging messages for the SFTP-SERVER2 image that provides service to SCP2 commands that use the SFTP protocol. When this is defined, the file SFTP-SERVER.LOG is created in the user's login directory. These files are not purged. Larger values yield more debugging information

- IP\$SFTP_MAXIMUM_PROTOCOL_VERSION

This logical can be used to limit the version of the SSH File Transfer Protocol that the SFTP client and Server use. This can sometimes provide a work-around for problems encountered with different implementations of the protocol. The default value is 4. Protocol versions 2 and 3 are also used by popular implementations.

- IP\$SFTP_VMS_ALL_VERSIONS

This logical controls whether or not all versions of a file are returned. The values TRUE, YES or 1 (the number one) will cause all versions to be returned, any other value is to only return the name of the file without a version. The default is to return only one filename without the version number.

- `IP$SFTP_NEWLINE_STYLE`

This logical controls the newline style that SFTP uses. Which can be helpful in transferring text files. The values are: UNIX `<lf>`, VMS `<lf>`, MAC `<cr>`. If the logical is not defined, or defined to any other value, then `<cr><lf>` will be used for the text line separator as documented in the SSH File Transfer specification.

- `IP$SFTP_CASE_INSENSITIVE`

This logical causes SFTP to treat filenames in a case insensitive manner when it is defined to TRUE, YES, or 1 (the number one).

- `IP$SFTP_ODS2_SRI_ENCODING`

This logical controls whether or not SRI encoding is used for filenames on OpenVMS ODS-2 disks. If the logical is not defined, or is defined to TRUE, YES, or 1 (the number one) then SRI encoding is used on ODS-2 disks for filenames that contain uppercase letters and special characters.

- `IP$SFTP_FILE_ESTIMATE_THRESHOLD`

This logical controls the minimum number of blocks that a text file must be for an estimated transfer size to be returned instead of an exact size. The default is to estimate the transfer size for all text files.

- `IP$SFTP_DEFAULT_FILE_TYPE_REGULAR`

If this logical is defined to TRUE, YES or 1 (the number one), then the SFTP server will use a default file type of REGULAR instead of UNKNOWN for OPEN operations. This can correct problems with filenames without a . (dot) in them getting `.dir` added to them. The filename will appear with a . at the end of the name in directory listings.

- `IP$SFTP_<username>_CONTROL`

The logical `IP$SFTP_<username>_CONTROL` can be defined /SYSTEM to any combination of NOLIST, NOREAD, NOWRITE, NODELETE, NORENAME, NOMKDIR, NORMDIR, to restrict operations for the username in the logical. NOWRITE will disable PUT, DELETE, RENAME, MKDIR, RMDIR; NOREAD will disable GET and LIST.

- `IP$SFTP_<username>_ROOT`

The logical `IP$SFTP_<username>_ROOT` can be defined /SYSTEM to restrict the user to the directory path specified. Subdirectories below the specified directory are allowed.

- `SSH_SFTP_LOG_SEVERITY`

The logical `SSH_SFTP_LOG_SEVERITY` can be defined /SYSTEM to 20000 to log file transfers or 30000 to log all SFTP operations.

- `SSH2_SFTP_LOG_FACILITY`

The logical `SSH2_SFTP_LOG_FACILITY` must also be defined /SYSTEM to specify the logging class that is used with OPCOM.

Values below 5 will use the network class; 5 will use OPER1, 6 will use OPER2, etc. The maximum value that can be specified is 12, which will use OPER8.

- `IP$SFTP_SEND_VENDOR_ID`

If this logical is defined to No, False or 0 (zero), then the SFTP2 client will not send the extended command containing the vendor-id upon completion of version negotiation with the server.

5.5. SFTP2

5.5.1. File Specifications

File specification must be in UNIX format for remote systems, unless /VMS transfers are being used.

5.5.2. SFTP2 Command Syntax and Qualifiers

5.5.2.1. Usage

```
SFTP2 [qualifiers] [[user@]host[#port]]
```

If the `username@` is included in the remote system specification, the specification must be enclosed in quotes.

5.5.2.2. Qualifiers

Table 5.2. SFTP2 Qualifiers

Qualifier	Description
<code>/BATCHFILE=<file specification></code>	Provides file with SFTP commands to be executed. Starts SSH2 in batch mode. Authentication must not require user interaction.
<code>/BUFFER_SIZE=<i>integer</i></code>	Number of bytes of data to transfer in a buffer. Default is 7500.
<code>/CIPHER=(<i>cipher-1</i>, ..., <i>cipher-n</i>)</code>	Selects encryption algorithm(s).
<code>/COMPRESS</code>	Enables SSH data compression.
<code>/CONCURRENT_REQUEST=<i>integer</i></code>	Number of concurrent read requests to post to the source file. Default is 4.
<code>/DEBUG=<i>level</i></code>	Sets debug level (0-99).
<code>/HELP</code>	Displays help.
<code>/MAC=(<i>mac-1</i>, ..., <i>mac-n</i>)</code>	Select MAC algorithm(s).
<code>/NOPROGRESS</code>	Do not show progress indicator.
<code>/PORT</code>	Tells SFTP2 which port the SSHD2 server is listening on.
<code>/VERBOSE</code>	Enables verbose mode debugging messages. Equal to <code>/DEBUG=2</code> . You can disable verbose mode by using <code>debug disable</code> .
<code>/VERSION</code>	Displays version number only.
<code>/[NO]VMS</code>	Negotiates ability to transfer OpenVMS file information. OpenVMS transfer mode will be automatically negotiated if

Qualifier	Description
	SFTP2 detects that the server is capable of doing OpenVMS transfers unless /NOVMS is specified.

Table 5.3. SFTP2 Commands

SFTP2 Command	Description
ASCII [<i>-s</i> <i><remote></i> [<i><local></i>]]	<p>With “-s” option, shows current newline convention. <i><remote nl conv></i> sets remote newline convention. <i><local nl conv></i> operates on local side, but is not as useful (the correct local newline convention is usually compiled in, so this is mainly for testing). You can set either of these to “ask”, which will cause sftp to prompt you for the newline convention when needed. With the exception of “-s” option, this command sets transfer mode to ascii. Available conventions are dos, unix, sftp, vms, or mac, using \r\n, \n, \r\n, \n and \r as newlines, respectively.</p> <p>Note that some implementations of SFTP may check to see if a file can be transferred in ASCII mode before doing so, and return errors for files that cannot be transferred. SSH for OpenVMS, VSI TCP/IP, and TCPware make this check.</p>
AUTO	Sets the transfer mode (ASCII or BINARY) to depend upon the extension of the file specification.
BINARY	Sets the transfer mode to be binary. (This is the default.)
BUFFERSIZE [<i>number</i>]	Sets the size of the buffer used for file transfer. A larger buffer size helps speed large transfers. Displays the current buffer size when no parameter is specified.
CD <i><directory specification></i>	Changes current directory on remote system. OpenVMS file specifications may be used when operating in OpenVMS mode. A logical name must include the trailing colon so that it can be recognized as such. SFTP from other vendors cannot use OpenVMS specifications due to the way that SFTP works.
CHMOD [<i>-R</i>] <i><mode></i> file [<i>file...</i>]	Change the protection on a file or directory to the specified octal mode. (Unix values). -R recurses over directories.
CLOSE	Closes connection to the remote server.
DEBUG { <i>disable</i> <i>no</i> <i><debug level></i> }	Sets the debug level for SFTP2. It does not change the current debug level for SSH2 for an existing connection, but will be used with SSH2 for a new connection. With <i>disable</i> or <i>no</i> , this disables all debugging current sessions for SFTP2.

SFTP2 Command	Description
DELETE <file specification>	Removes the specified file from the remote system.
DIRECTORY [<file directory specification>]	Displays the contents of the current directory or specified directory in OpenVMS format when the transfer mode is VMS. File names are displayed as they would be with a DIRECTORY command from DCL.
EXIT	Exits SFTP client.
GET [--preserve-attributes -p] <file1> [<file2>...]	Retrieves the specified file(s) from the remote system and stores it in the current working directory on the local system. File names are case sensitive and in UNIX format. When operating in VMS mode, either UNIX or OpenVMS-style file specifications can be used. Directories are recursively copied with their contents. Multiple files may be specified by separating the names with spaces. If --preserve-attributes or -p is specified, then SFTP attempts to preserve timestamps and access permissions. Note that a target filename cannot be provided.
GETTEXT	Displays the list of file extensions to use ASCII transfers when in AUTO mode. The initial value is txt, htm*, pl, php*
HELP	Displays help on commands.
LCD <directory specification>	Changes the current directory on the local system. OpenVMS file specifications may be used when in VMS mode.
LCHMOD [-R] <mode> file [file...]	Change the protection on a file or directory on the local connection to the specified octal mode. (Unix values). -R recurses over directories.
LCLOSE	Close the local connection.
LDELETE <file>	Removes the specified file from the local system. OpenVMS file specifications may be used when in VMS mode.
LDIRECTORY [<file directory specification>]	Displays the contents of the current directory for the local system in OpenVMS format when the transfer mode is VMS. File names are displayed as they would be with a DIRECTORY command from DCL.
LLS [<file directory specification>]	Displays the contents of the current directory or specified directory in UNIX format. Lists the names of files on the local server. For directories, contents are listed. See LS for options and more details.
LLSROOTS	Like LSROOTS, but for the “local” side.

SFTP2 Command	Description
LMKDIR <i><directory specification></i>	Creates the specified directory on the local system.
LOCALOPEN {[<i>user@host[#port]</i>] -l }	<p>Tries to connect the local side to the host <i><host-name></i>. If successful, <i>lls</i> and <i>friends</i> will show the contents of the filesystem on that host. With the <i>-l</i> option, connects to the local filesystem (which doesn't require a server). There is an implied LOCALOPEN <i>-l</i> when SFTP2 starts up.</p> <p>Note that an implicit LOCALOPEN is done when SFTP2 starts, so the only time that a user needs to do a LOCALOPEN is when neither directory tree is immediately accessible. OPEN is the command that is generally used to establish the connection with the remote system.</p> <p>LOPEN is a synonym for LOCALOPEN.</p>
LPWD	Displays the current working directory on the local system.
LREADLINK <i><path></i>	Provided that <i><path></i> is a symbolic link, shows where the link is pointing to. This command is not supported for OpenVMS.
LRENAME <i><oldfile></i> <i><newfile></i>	Renames a file on the local system.
LRM <i><file specification></i>	Removes the specified file from the local system. OpenVMS file specifications may be used when in VMS mode.
LRMDIR <i><directory specification></i>	Deletes a directory on the local system.
LS [-R] [-l] [-S] [-r] [<i><file></i> ...]	<p>Displays the contents of the current directory or specified directory in UNIX format. Lists the names of files on the remote server. For directories, contents are listed. When the <i>-R</i> is given, directory trees are listed recursively. (By default, subdirectories of the arguments are not visited.)</p> <p>When the <i>-l</i> option is given, permissions, owners, sizes, and modification times are also shown.</p> <p>When the <i>-S</i> options is specified sorting is based upon file size instead of alphabetically. The <i>-r</i> option reverses the sort order. When no arguments are given, it assumes that the contents of <i>.</i> (current working directory) are being listed. Currently, the options <i>-R</i> and <i>-l</i> are mutually incompatible. <i>LS</i> will fill a screen with output, then wait for the user to decide if they want more or have seen enough.</p>
LSROOTS	Displays the virtual roots of the server. (This VanDyke Software's V Shell extension. Without this you can't know the filesystem structure of a V Shell server). This is also a OpenVMS extension

SFTP2 Command	Description
	to display the roots (devices) on the OpenVMS system. Though the commands are the same, the information provided is not compatible with what is displayed by VanDyke Software's Secure FX.
LSYMLINK <targetpath> <linkpath>	Like SYMLINK, but for the "local" side.
MGET [--preserve-attributes -p] <file1> [<file2>...]	Retrieves multiple files from the remote system and stores them in the current working directory on the local system. If --preserve-attributes or -p is specified, then SFTP attempts to preserve timestamps and access permissions.
MKDIR <directory specification>	Creates the specified directory on the remote system.
MPUT [--preserve-attributes -p] <file1> [<file2>...]	Stores multiple files in the current working directory on the remote system. File names are case-sensitive and in UNIX format. When operating in VMS mode, either UNIX or OpenVMS-style file specifications can be used. Directories are recursively copied with their contents. Multiple files may be specified by separating the names with spaces. If --preserve-attributes or -p is specified, then SFTP attempts to preserve timestamps and access permissions.
OPEN { -l [user@host#port]}	Tries to connect to the host <hostname>. Or with the -l option, connects the remote side to the local filesystem (which doesn't require a server).
PUT [--preserve-attributes -p] <file1> [<file2>...]	Stores the specified file in the current working directory on the remote system. File names are case-sensitive and in UNIX format. When operating in VMS mode, either UNIX or OpenVMS-style file specifications can be used. Directories are recursively copied with their contents. Multiple files may be specified by separating the names with spaces. If --preserve-attributes or -p is specified, then SFTP attempts to preserve timestamps and access permissions. Note that a target filename cannot be provided.
PWD	Displays the current working directory on the remote system. Displayed in OpenVMS format when in VMS mode; otherwise displayed in UNIX format.
QUIT	Exits SFTP client.

SFTP2 Command	Description
READLINK <targetpath> <linkpath>	Provided that <path> is a symbolic link, shows where the link is pointing to. Not valid for OpenVMS systems as OpenVMS does not have symbolic links.
RECORD	Enters record transfer mode if the server supports VSI's record open. The direction in which record transfer mode is possible will be displayed in response to this command. In record transfer mode the source file is opened as binary records and the destination file is opened as binary. This produces the same effect as VSI TCP/IP FTP server BINARY transfer when a BLOCK_SIZE has not been specified, and can be used to transfer a file that contains OpenVMS records to a system that can only handle "flat" files.
RENAME <oldfile> <newfile>	Renames file on the remote system.
RM <file specification>	Removes the specified file from the remote system.
RMDIR <directory specification>	Deletes a directory on the remote system.
SETEXT <ext1> [<ext2>...]	Sets the list of file extensions to use ASCII transfers when in AUTO mode. Individual file extensions must be separated by spaces.
STATUS	Shows the transfer mode, remote server name, and remote server version. The current newline sequence is displayed if operating in ASCII or AUTO mode.
SYMLINK <targetpath> <linkpath>	Creates symbolic link <linkpath>, which will point to <targetpath>. Not valid for OpenVMS systems as OpenVMS does not have symbolic links.
VERBOSE	Enables verbose mode (identical to /DEBUG=2 command-line option). You may later disable verbose mode by debug disable .
VMS	Sets the transfer mode to include OpenVMS file information.

5.5.3. SFTP2 Commands

5.5.3.1. Logicals

IP\$SFTP_VMS_MODE_BY_DEFAULT logical is specific to SFTP2.

When defined to TRUE, YES, or 1, this logical chooses the /VMS qualifier if /NOVMS has not been specified.

5.6. Configuration File Parameters

The system wide configuration file (`SSH2_DIR:SSH2_CONFIG.`) or the user's configuration file (`SYS$LOGIN: [.SSH2]SSH2_CONFIG.`) can be used to specify the following parameters. The user's configuration file takes precedence over the system configuration file.

Table 5.4. SFTP/SCP2 user configuration parameters

FilecopyMaxBuffers	This is equivalent to the <code>/CONCURRENT_REQUEST</code> qualifier on the SFTP2 or SCP2 command line. The command line qualifier will supercede any value in the configuration file.
FilecopyMaxBuffersize	This is equivalent to the SFTP2 <code>BUFFERSIZE</code> command or the SCP2 <code>/BUFFER_SIZE</code> qualifier. The command or qualifier takes precedence.

The system server configuration file (`SSH2_DIR:SSHD2_CONFIG.`) can include parameters to control which users can perform remove SSH commands (including SSH terminal sessions) as well as SFTP2 access.

Table 5.5. Table 5-5 SSH2 terminal restriction parameters

Terminal.AllowUsers	Allow users in the specified list to create SSH2 terminals and do interactive commands
Terminal.DenyUsers	Prevent users in the specified list from creating SSH2 terminals and performing interactive commands. The users can still use the SFTP2, SCP1 and publickey servers.
Terminal.AllowGroups	Allow groups in the specified list to create SSH2 terminals and do interactive commands
Terminal.DenyGroups	Prevent groups in the specified list from creating SSH2 terminals and performing interactive commands. The groups can still use the SFTP2, SCP1 and publickey servers.

5.7. FTP over SSH

SSH2 can be used to set up port forwarding that can be used for FTP. This allows users to use the richness of the FTP command set to access files on a remote system and have their control and data information encrypted. The command format to set up the SSH port forwarding is:

```
$ SSH <remote_host_name>/local_forward=
(" " "ftp/<forwarded_port_number>:localhost:21" " ")
```

The usual SSH authentication mechanisms come into play, so there may be a request for a password and a terminal session is established to the remote host. As long as this terminal session is alive, other users on the local system can use FTP to access the remote system over an encrypted channel. The location of the quotes is important, as it is necessary to prevent DCL from interpreting the `/` in the local forwarding information as the start of a new qualifier, and SSH2 does not know or expect to find the `()` around the forwarding information. Note that the `localhost` inside of the forwarding string is important, as it will make the connection to FTP on the remote system come from `localhost`, which will then allow FTP to open the data port.

When a user desires to use an encrypted FTP connection, the following sequence of commands would be issued:

```
PORT <forward_port_number>  
OPEN LOCALHOST
```

Normal FTP authentication takes place and multiple FTP sessions may use a single forwarded port. The FTP protocol filter in SSH2 scans the FTP command stream for the FTP PORT and PASV commands and their replies, and makes substitutions in these commands and replies to use a secure data stream through the SSH2 session that has been set up. This command will establish an encrypted FTP session with the remote host that the SSH connection is sent to.

To allow a single system to act as a gateway between two networks, add /ALLOW_REMOTE_CONNECT to the SSH command that initiates the connection.

Appendix A. DCL User Commands

This appendix lists the commands you can invoke from the DCL command line.

Command Summary

Table A-1 lists the VSI TCP/IP user DCL commands:

Table A.1. DCL Command Summary

Utility	Description
IP DECODE	Decodes a file encoded by the VSI TCP/IP SMTP mail handler.
IP FINGER	Displays information about users currently logged into local or remote systems.
IP FTP	Uses the standard Internet FTP protocol to transfer files between TCP/IP hosts, and allows you to manipulate them.
IP RCP	Transfers file between TCP/IP hosts.
IP REMIND	Creates reminders to be sent at specified intervals by either mail or broadcast to the recipient's terminal.
IP RLOGIN	Connects your terminal to another system on the network.
IP RSHELL	Runs commands on a remote system and displays the command output on your terminal.
IP RUSERS	Displays information about users logged into local or remote systems.
IP SEND	Sends a brief message to another user's terminal.
IP TELNET	Logs into a remote host from the local host.
IP TFTP	Transfers files between TCP/IP hosts.
IP TALK	Initiates an interactive conversation with another user on the local host or on any remote host that supports the TALK protocol.
IP WHOIS	Displays information about users registered with the Internet Network Information Center (InterNIC).

IP DECODE

IP DECODE — Decodes a file encoded by the VSI TCP/IP SMTP mail handler.

Format

```
IP DECODE input_file output_file
```

Parameters

input_file

Specifies the name of a file containing the encoded file, including the RFC822 headers at the top of the message. The message must include MIME-Version, Content-Type, and Content-Transfer-En-

coding headers in order to be decoded. Only the APPLICATION/RMS content-type and base64 content-transfer-encoding are supported.

output_file

The name for the resulting decoded file.

Example

Binary files can be sent via SMTP using the undocumented /FOREIGN qualifier of the OpenVMS Mail SEND command. The following example shows how to send such a file and use DECODE to translate the corresponding mail message:

1. First, send an executable file using OpenVMS Mail:

```
$ MAIL
MAIL>SEND /FOREIGN /NOEDIT BINARY.EXE
TO: SMTP%"TREEFROG@ABC.COM"
Subj: BINARY.EXE
```

2. When the file arrives, store the ASCII-encoded mail as a text file:

```
$ MAIL
MAIL>EXTRACT/NOHEADER BINARY.TXT
```

3. Finally, decode the BINARY.TXT file into an executable file:

```
$ IP DECODE BINARY.TXT BINARY.EXE
```

IP FINGER

IP FINGER — Displays information about users currently logged into local or remote systems.

Format

```
IP FINGER [user_name] [@host_name]
```

Parameters

[*user_name*]

Specifies the user name about which to obtain detailed information. If not specified, brief information is displayed about users currently logged in.

[*@host_name*]

The name (or network address) of the host to which a connection should be made. If you do not specify a host name, information about the local host is displayed. The host name can be specified as an IP address; for example:

```
$ IP FINGER @127.0.0.1
```

Qualifiers

/NOCLUSTER

Restricts output to that of a single system instead of its OpenVMScluster.

/CLUSTER

Displays all cluster users.

Restrictions

To display information about users logged into a remote system, that system must have a FINGER server enabled.

Example

```
$ IP FINGER
Friday, May 5, 2017 12:39 AM-PDT Up 0 02:10:27 4+0 Load ave 0.24 0.25 0.19
User      Personal Name      Job  Subsys      TTY      Console Location
SYSTEM    System Manager       37   *DCL*       TTA3     Macintosh SE
SMITH L.  Stuart Smith        32   FINGER      FTA1     Console
                            33   *DCL*       FTA2     Console
                            35   *DCL*       FTA3     Console
```

IP FTP

IP FTP — Uses the standard Internet FTP protocol to transfer files between TCP/IP hosts, and allows you to manipulate them.

Format

```
IP FTP [host] [command]
```

Parameters

[*host*]

Specifies the name of a remote host to which you want to connect. You can also specify the host name as an IP address. If you enter the name of a remote host on the DCL command line, FTP immediately attempts to connect to the FTP server on that host. If you do not specify a remote host, FTP enters its TOPS-20 style command interpreter and prompts for FTP commands.

[*command*]

Specifies an FTP command to execute. If you do not specify a command, FTP starts interactive mode and prompts for commands.

Note

You must specify all FTP DCL qualifiers on the command line before any *command*.

If *command* causes an FTP error to occur, the error condition is reported back to DCL in the \$STATUS symbol. To determine if an FTP error occurred, examine the hexadecimal value of \$STATUS. If the lower byte is the value %X2C, the FTP error code can be determined by dropping the high order four bits of the 32-bit condition code and examining the next twelve. For example, if you specify the incorrect remote password, the FTP error status code returned by the server will be the

decimal value 530. As the FTP image exits, the error status (and hence the \$STATUS symbol) is set to the value %X1212002C (decimal 530 is the same as hexadecimal %X212).

Qualifiers

/ACCOUNT=account_name

Specifies your account name. In addition to a user name and password for validation, some systems require an account string. VSI TCP/IP preserves the case of characters placed within quotation marks. Characters not placed within quotation marks are converted to lowercase. Be aware that some systems might not recognize these lowercase characters and deny access.

/BINARY

Equivalent to /TYPE=IMAGE, this qualifier allows you to transfer binary files. You can override the /BINARY qualifier with the TYPE command in interactive mode.

/IMAGE

Equivalent to /TYPE=IMAGE, this qualifier allows you to transfer binary files. You can override the /IMAGE qualifier with the TYPE command in interactive mode.

/INITIALIZATION (default)

/NOINITIALIZATION

Tells FTP to read commands from your SYS\$LOGIN:FTP . INIT file when invoked. Use the /NOINITIALIZATION qualifier to disable this behavior.

{ STREAM (default) }

/MODE= { COMPRESS }

{ user-defined-mode }

Specifies the file transfer mode. You can change the MODE by using the MODE command in interactive mode, and default to STREAM. A user-defined mode can be created as an executable file.

/PASSWORD=password

Specifies the password to use on the remote host, which must be specified in conjunction with the /USERNAME qualifier. If not specified, FTP prompts for the password. VSI TCP/IP preserves the case of characters placed within quotation marks. Characters not placed within quotation marks are converted to lowercase. Be aware that some systems might not recognize these lowercase characters and deny access.

/PORT=port

Specifies an alternate TCP port number to use when connecting to the FTP control port on the remote host. You should only use this qualifier when communicating with an FTP server that uses a non-standard control port number.

{ CONNECT, }

/PROMPT[=({ NOMISSING_ARGUMENTS })]

Modifies the operation of FTP. If `/PROMPT=CONNECT` is used following a successful connection FTP prompts for a user name and password to send to the remote system. The same result can be achieved by adding the line `PROMPT-ON-CONNECT ON` to your `SYS$LOGIN:FTP . INIT` file.

If you use `/PROMPT=NOMISSING_ARGUMENTS`, FTP does not prompt you for missing command line arguments. The same behavior can be accomplished by adding the line `PROMPT-FOR-MISSING-ARGUMENTS OFF` to your `SYS$LOGIN:FTP . INIT` file.

The use of the `/PROMPT` qualifier alone implies `/PROMPT=CONNECT`.

`/STATISTICS /NOSTATISTICS (default)`

Sets the FTP `STATISTICS` flag so FTP displays transfer timing statistics upon completion of file transfers.

`{ FILE }`

`/STRUCTURE={ RECORD }`

`{ VMS }`

Specifies the `STRUCTURE` of the file transfers. You can change the `STRUCTURE` by using the `STRUCTURE` command in interactive mode. The default is `FILE`, or `OpenVMS` when communicating between systems running VSI TCP/IP. The `/STRUCTURE` qualifier disables automatic negotiation of `OpenVMS` structure.

`/TAKE_FILE=file`

Causes FTP to execute commands from the specified file before entering command mode. This qualifier is functionally equivalent to re-directing `SYS$INPUT :`.

`{ ASCII }`

`{ IMAGE }`

`/TYPE={ BACKUP }`

`{ LOGICAL_BYTE }`

Specifies the file transfer `TYPE`. You can change the `TYPE` by using the `TYPE` command (which defaults to `ASCII`) in interactive mode.

`/USERNAME=username`

Specifies the user name to use on the remote host. VSI TCP/IP preserves the case of characters placed within quotation marks. Characters not placed within quotation marks are converted to lowercase. Be aware the some systems might not recognize these lowercase characters and deny access.

`/VERBOSE`

`/NOVERBOSE (default)`

Sets the FTP `VERBOSE` flag. Causes FTP to display all responses from the remote FTP server as they are received.

`/VMS_STRUCTURE_NEGOTIATION (default)`

/NOVMS_STRUCTURE_NEGOTIATION

Causes the FTP client to send a STRU O OpenVMS FTP command to the server FTP to negotiate transparent transfer of files with arbitrary RMS attributes. If the server responds with an error, the default transfer structure of FILE is assumed. The negotiation takes place after a connection has been successfully opened.

You can use the /NOVMS_STRUCTURE_NEGOTIATION qualifier to disable this feature if automatic negotiation causes unforeseen problems with another vendor's server.

Examples

This example shows how to establish a connection to the host FLOWERS.COM with prompting for a remote user name and password, and printing statistics for the duration of the session (or until the user turns it off).

```
$ IP FTP FLOWERS.COM /PROMPT=CONNECT /STATISTICS
```

This example shows how to establish a connection to the host DS.INTERNIC.NET, log in with the user name ANONYMOUS and password GUEST, and fetch the file RFC:RFC959.TXT (the FTP Request for Comments), placing it in the file RFC959.TXT in your default directory.

```
$ IP FTP /USER=ANONYMOUS /PASSWORD=GUEST DS.INTERNIC.NET -  
_ $ GET RFC:RFC959.TXT RFC959.TXT
```

IP RCP

IP RCP — Transfers file between TCP/IP hosts. Uses the 4.3BSD UNIX "rcp" (remote copy) to copy files between TCP/IP hosts. If the remote host you specify in the input or output file specification is an OpenVMS system running VSI TCP/IP, the VSI TCP/IP RCP utility automatically negotiates transparent transfer of any OpenVMS file, retaining all RMS attributes.

Format

```
IP RCP input_file_spec output_file_spec
```

Parameters

input_file_spec

Specifies the name of one or more files to be copied. This parameter may be either a local OpenVMS file specification or a remote file specification of the form:

```
hostname::input_file_spec
```

If *input_file_spec* is not a full directory and file specification, it is interpreted relative to your login directory on *hostname*. If the directory/file specification on the remote host contains special characters (including mixed-case directory and file names), you should enclose it within double quotation marks.

input_file_spec can be a directory specification if used with the /RECURSIVE qualifier. See the /RECURSIVE qualifier for more details.

You may use wildcards in either the local or remote file specification. For remote file specifications, however, you must use the wildcard characters normally used on the remote system.

output_file_spec

Specifies the name(s) of the output file(s) into which the input file(s) are to be copied. This parameter may be either a local OpenVMS file specification or a remote file specification of the form:

hostname::output_file_spec

If *output_file_spec* is not a full directory and file specification, it is interpreted relative to your login directory on *hostname*. If the directory and file specification on the remote host contains special characters (including mixed-case directory and file names), you should enclose it within double quotation marks.

You may use wildcards in either the local or remote file specification. For remote file specifications, however, you must use the wildcard characters normally used on the remote system.

Qualifiers

/AUTHENTICATION=KERBEROS

If you specify **/AUTHENTICATION=KERBEROS**, command authentication is performed using Kerberos; you will not be prompted for authentication information. (KERBEROS is currently the only value supported by this qualifier.)

/EXACT

/NOEXACT (default)

Disables the automatic conversion of file names to lowercase. When DCL passes command line parameters and qualifiers to RCP, it converts them to uppercase unless you explicitly enclose them within double quotation marks. Because lowercase file names are preferred by UNIX, and since OpenVMS file names are case-insensitive, RCP converts file names to lowercase. You can use mixed case file names if you enclose them in double quotation marks, and specify them with the **/EXACT** qualifier.

/LOG=log_spec

/NOLOG (default)

Specifies whether RCP should display the file specifications and transfer information of each file copied. *log_spec* can take the values **SIZE** or **TIME** (or both if enclosed in parentheses and separated by commas). If you specify only **/LOG**, **/LOG=SIZE** is assumed.

When you use the **/LOG** qualifier, RCP displays the following information for each file copied:

- The names of the input and output files
- The number of blocks copied if you specify **/LOG=SIZE**
- The data transfer rate (in bytes or kilobytes per second) if you specified **/LOG=TIME**
- Both the number or blocks and the data transfer rate if you specified **/LOG=(SIZE,TIME)**

/PASSWORD=password

Specifies the password to use on the remote host which you must specify with the **/USERNAME** qualifier. If you specify **/PASSWORD** without a value, RCP prompts for the password (terminal echoing is disabled).

/RECURSIVE**/NORECURSIVE (default)**

Specifies that the directory subtree rooted at the directory named by *input_file_spec* should be copied recursively, that is, the directory and all files and directories below it. If you specify the local file specification with an ellipsis ([...]), the /RECURSIVE qualifier is assumed.

/TRUNCATE_USERNAME**/NOTRUNCATE_USERNAME (default)**

Causes RCP to truncate your OpenVMS user name to be no longer than eight characters. Some RSHHELL server implementations, notably UNIX, assume that the remote user name is not longer than eight characters and dies with the error "remuser too long" if it is longer. You can use this qualifier to communicate with those systems.

/USERNAME=username

Specifies the user name to use on the remote host.

/VMS[={TCPWARE | IP}] (default) /NOVMS

If /VMS is omitted, RCP by default attempts a VSI TCP/IP style OpenVMS mode transfer. This retains OpenVMS file attributes across copies. Use /VMS=TCPWARE to do a transfer involving a TCPware machine. /NOVMS disables maintaining OpenVMS file attributes during a third-party copy.

Restrictions

The VSI TCP/IP RCP utility does not support third-party copies, so either the input or output file specification may contain remote host information, but not both.

You may use wildcards in either the local or remote file specification. For remote file specifications, however, you must use the wildcard characters normally used on the remote system.

You must specify at least one field in the local file specification. If you do not specify the device or directory, your current default device and directory are used. For a local output specification, RCP fills in any other missing fields (file name, file type, version) with the corresponding field of the input file specification.

RCP fails if a login command procedure displays information. Ensure your OpenVMS login command procedure contains the following lines at the start of the file:

```
$ VERIFY := 'F$VERIFY(0)'  
$ IF F$MODE() .EQS. "OTHER" THEN EXIT
```

You should also add this line to the end of your login command procedure:

```
$ IF VERIFY THEN SET VERIFY
```

For UNIX login scripts (such as .profile), ensure the file does not display any information.

Examples

This command copies the file JETSON.LOG from your login directory on the host SPROCKETS.COM to your default directory (USERS: [SPACELY]) on the local host.

```
$ RCP SPROCKETS1COM::JETSON.LOG [ ] /LOG
%RCP-I-COPIED, SPROCKETS.COM::JETSON.LOG;8
  copied to USERS:[SPACELY]JETSON.LOG;1 (1 block)
```

This command copies the file LOGIN.COM in your default directory on the local system to the login directory of the user GIGI on the host BIGBOOTE.FLOWERS.COM.

```
$ RCP /USER=GIG2 /PASS=RABBIT LOGIN.COM BIGBOOTE.FLOWERS.COM::
```

In this example, you copy all files in the "tmp" subdirectory of your login directory on the host UNIX.SPROCKETS.COM into your default directory on the local system.

Note

The double quotation marks enclosing "tmp/*" are required to prevent DCL from interpreting the slashes.

```
$ RCP /LOG U3IX.SPROCKETS.COM::"tmp/*" [ ]
%RCP-I-COPIED UNIX.SPROCKETS.COM::tmp/work.order
  copied to USERS:[SPROCKETS]WORK.ORDER;1 (9 blocks)
%RCP-I-COPIED UNIX.SPROCKETS.COM::tmp/judy.note
  copied to USERS:[SPROCKETS]JUDY.NOTE;1 (4 blocks)
%RCP-I-NEWFILES, 2 files created
```

This command copies all directories and files under the "/src" directory tree on UNIX.SPROCKETS.COM. The command creates a comparable directory structure on the local host starting at the current default directory (USERS:[JETSON]), and places the files into this tree. As in the previous example, the double quotation marks enclosing "tmp/*" are required to prevent DCL from interpreting the slashes.

```
$ RCP /RECURSIVE /LOG UNIX.SPROCKETS.COM::"/src" [...]
%RCP-I-CREATED, created directory USERS:[JETSON.SRC]
%RCP-I-COPIED, UNIX.SPROCKETS.COM::/src/hack.c
  copied to USERS:[JETSON.SRC]HACK.C;1 (20 blocks)
%RCP-I-COPIED UNIX.SPROCKETS.COM::/src/hack.h
  copied to USERS:[JETSON.SRC]HACK.H;1 (2 blocks)
%RCP-I-COPIED created directory USERS:[JETSON.SRC.DATA]
%RCP-I-COPIED, UNIX.SPROCKETS.COM::/src/data/tes
  copied to USERS:[JETSON.SRC.DATA]TEST.;1 (100 blocks)
%RCP-I-NEWFILES, 3 files created
```

IP REMIND

IP REMIND — Creates reminders to be sent at specified intervals by either mail or broadcast to the recipient's terminal.

Format

IP REMIND

Parameters

After invoking the utility, you are prompted to enter a command. Enter HELP to list information about the utility, or enter one of these commands:

Command	Use to...
CREATE	Create new reminders
DELETE <i>nn</i>	Delete a reminder
EXIT	Exit REMIND
LIST	List reminder headers
MODIFY <i>nn</i>	Change an existing reminder
TYPE <i>nn</i>	Display an existing reminder

nn is the reminder number you must supply.

Example

In the following example, a question mark is first entered to list possible commands. At each step, a question mark is entered to investigate the possibilities. A reminder is then created and sent.

```

$ REMIND
REMIND>?
CREATE      DELETE      EXIT      HELP      LIST      MODIFY      TYPE
REMIND>CREATE
Time of first reminder? ?
date and time
or one of the following:
FRIDAY      MONDAY      SATURDAY      SUNDAY      THURSDAY
TODAY      TOMORROW      TUESDAY      WEDNESDAY
or one of the following:
APRIL-FOOLS      BASTILLE-DAY      BEETHOVENS-BIRTHDAY
BILBOS-BIRTHDAY      CHRISTMAS      COLUMBUS-DAY
FLAG-DAY      FRODOS-BIRTHDAY      GONDORIAN-NEW-YEAR
GROUND-HOG-DAY      GUY-FAWKES-DAY      HALLOWEEN
INDEPENDENCE-DAY      LEAP-DAY      LINCOLNS-BIRTHDAY
MAY-DAY      MEMORIAL-DAY      NEW-YEARS
SAINT-PATRICKS-DAY      SHERLOCK-RV-BIRTHDAY      VALENTINES-DAY
Time of first reminder? GROUND-HOG-DAY
Expiration count? ? Number of times to repeat message
decimal number
Expiration count? 1
How should I send it? ? one of the following:
BOTH      MAIL      SEND
How should I send it? MAIL
Addresses? HOLMES@FLOWERS.COM
Subject? Happy Ground Hog Day!!!
Text (end with ^Z)
If you see your shadow, consider moving to Santa Cruz.
-Watson
^Z
REMIND> EXIT
$

```

IP RLOGIN

IP RLOGIN — Connects your terminal to another system on the network. RLOGIN is similar to TELNET, except support for the protocol is not as wide-spread and the protocol automatically authenticates the user instead of requesting a user name and password. Local flow control (instead of remote)

is also negotiated dynamically. RLOGIN permits the use of X applications without issuing a SET DISPLAY command.

Format

```
IP RLOGIN host_name
```

Parameters

host_name

Specifies the remote host to which to connect.

Qualifiers

/AUTHENTICATION=KERBEROS

If you specify /AUTHENTICATION=KERBEROS, command authentication is performed using Kerberos; you will not be prompted for authentication information. (KERBEROS is currently the only value supported by this qualifier.)

/BUFFER_SIZE=number

Changes the maximum size of write operations to the terminal. A large write size is more efficient, but a smaller size makes RLOGIN more responsive to output flushing (**Ctrl/O**). The default buffer size is 1024 bytes; the value for number can range from 20 bytes to 1024 bytes. Number is reset to 20 bytes if you specify a value below 20; a value for number above 1024 bytes is reset to 1024.

/DEBUG

Displays any out-of-band control information that arrives during the session.

/EIGHT_BIT

Forces RLOGIN to set the OpenVMS terminal to 8-bit mode for the duration of the session. The default behavior is to use the current setting of the OpenVMS terminal parameter /EIGHT_BIT.

/PORT=number

Specifies a non-standard TCP port number to which to connect (the default port is 513).

/TRUNCATE_USERNAME

/NOTRUNCATE_USERNAME (default)

Truncates your OpenVMS user name to a maximum of eight characters. Some RLOGIN server implementations, notably UNIX, assume the remote user name is not longer than eight characters and fail with the error "remuser too long" if it is longer. You can use this qualifier when communicating with such hosts.

/USERNAME=username

Specifies an alternative remote user name. By default, the requested remote user name is the same as your local user name.

Example

This example shows an OpenVMS user using RLOGIN to connect to a UNIX system.

```
$ RLOGIN UNIX.FLOWERS.COM
Last login: Mon May 15 22:43:48 from VMS.FLOWERS.COM
Sun UNIX 4.3 Release 3.5 (UNIX) #1: Fri Apr 9 17:07:00 PDT 2017
%
```

IP RSHELL

IP RSHELL — Runs commands on a remote system and displays the command output on your terminal.

Format

```
IP RSHELL host_name command_line
```

Parameters

host_name

Specifies the remote host on which to execute the command. You can also specify the host name as an IP address.

command_line

Specifies the command line to execute on the remote system. By default, the command line is converted to lowercase. If uppercase characters are required, specify them by enclosing the entire line in double quotations ("*command_line*").

You can specify multiple commands to the OpenVMS RSHELL server by separating them with a backslash-semicolon (\;). Ensure the multiple command string does not exceed the DCL limit of 256 bytes for reading command lines.

Qualifiers

/ERROR=filename

Specifies the error file name (by default, error output goes to SYS\$ERROR).

/INPUT=filename

Specifies the input file name (by default, SYS\$INPUT). To spawn an RSHELL that does not require input, specify /INPUT=NL: to prevent RSHELL from reading data from your terminal.

/OUTPUT=filename

Specifies the output file name (by default, SYS\$OUTPUT).

/PASSWORD[=password]

Indicates that the REXEC protocol should be used with the specified password instead of the RSHELL protocol. The two protocols are identical except REXEC requires a password, and RSHELL

validates on the basis of trusted user names and systems. If you specify `/PASSWORD` with no password, a password prompt appears with echoing disabled.

`/PORT=number`

Specifies a non-standard TCP port number to which to connect (by default, port 514 unless you specify `/PASSWORD`; in that case, port 512 is used).

`/TRUNCATE_USERNAME`

`/NOTRUNCATE_USERNAME (default)`

Truncates your OpenVMS user name to no longer than eight characters. Some RSHELL server implementations, notably UNIX, assume the remote user name is not longer than eight characters and exit with the error "remuser too long" if it is longer. You can use this qualifier to communicate with those systems.

`/USERNAME=username`

Specifies an alternative remote user name. By default, the remote user name is the same as your local user name.

Description

The VSI TCP/IP RSHELL utility uses the 4.3 BSD UNIX rsh (remote shell) protocol to log on, execute a command, and log out. Normally, it authenticates your use of the remote host with its database of trusted hosts and trusted users. However, if you use the `/PASSWORD` qualifier, the RSHELL utility uses the password you specify and the 4.3 BSD UNIX rexec (remote execution) protocol to authenticate your use of the remote host.

Restrictions

- RSHELL cannot be used to run interactive programs such as editors; use RLOGIN for these applications instead.
- RSHELL permits the use of X Windows applications without the need to issue a SET DISPLAY command.

Example

```
$ rshell unix ls -l
total 216 -rwxr-xr-x 1 smith 212992 Sep 25 07:37 foo
          -rw-r--r-1 smith 111 Nov 19 22:51 foo.c
$
```

IP RUSERS

IP RUSERS — Displays information about users logged into local or remote systems. RUSERS can display information about a particular system or, if supported by the network hardware, use broadcasts to display information about all remote systems on directly connected networks. RUSERS uses UDP/IP as its communication protocol.

Format

IP RUSERS [*host-name*]

Parameters

[host-name]

Specifies the name (or network address) of the host from which the remote user information is to be gathered. If you specify the host specified as an asterisk (*), a broadcast RPC gathers information from all directly-connected hosts. If you do not specify a host, a default of * is used.

Qualifiers

/ALL

Displays all remote hosts, even those on which there are no users logged in.

/NOALL

Displays only hosts on which there are users logged in (the default).

/FULL

Displays remote users in a longer format, including time of login, idle time, terminal line name, and remote host.

/NOFULL

Displays remote users as a summary line, showing only the system name and user names for that system (the default).

IP SEND

IP SEND — Sends a brief message to another user's terminal.

Format

IP SEND *address* [*message*]

Parameters

address

Specifies the user name or remote address in the form *user@hostname*.

Note

Many SMTP implementations do not support the SEND facility that this command uses to send messages.

[message]

Specifies optional text of the message. If omitted, you are prompted for the message text.

Qualifiers

/AND_MAIL

Specifies the message should be both mailed to the user and displayed on the user's terminal.

/OR_MAIL

Specifies the message should be mailed to the user if it cannot be displayed on the user's terminal.

IP TALK

IP TALK — Initiates an interactive conversation with another user on the local host or on any remote host that supports the TALK protocol. Start a conversation by specifying another user's name and host name, if necessary; for example, `BILL@FNORD.FOO.COM`. End TALKing by pressing **Ctrl/C**. TALK uses the OpenVMS Screen Management (SMG) runtime routines to create a multi-window display on your terminal through which the conversation takes place. TALK fails if you specify only the person's login name.

Format

```
IP TALK user_name [@host_name]
```

Parameters

user_name

Specifies the remote user name to talk with.

[*@host_name*]

Specifies the name (or network address) of the host to which a connection should be made. If you do not specify a host name, the local host name is used.

Qualifiers

/OLD

Uses the 4.4BSD-compatible TALK protocol. By default, the 4.4BSD-compatible TALK protocol is used. If you are not sure whether to use the new or old TALK, try each. Systems with different system byte-ordering schemes (such as Sun workstations) must use NTALK instead of TALK.

Restrictions

The restrictions for using TALK include:

You and the person with whom you want to talk need to be on systems with the same byte-ordering scheme (either "Big Endian" or "Little Endian"). While this is not easy to determine, the easiest rule is that if the other person is using a Sun workstation or a terminal connected to one, TALK does not work at their end. Sun users must use the NTALK command. NTALK is provided on the VSI TCP/IP software distribution CD-ROM in the [`CONTRIBUTED-SOFTWARE.APPLICATIONS.NTALK`] directory, and elsewhere as public domain software.

The [`CONTRIBUTED-SOFTWARE.APPLICATIONS.NTALK`] directory contains documentation describing how to access the file. NTALK is distributed as a UNIX tar file. Use these steps to make it available for use:

1. Copy the NTALK tar archive to a UNIX system.

2. Use tar to retrieve the archived files.
3. Use make to compile the files into binary source. (The make file assumes you have the UNIX cc compiler.)
 - Both of your terminals must accept broadcasts. Use these commands to enable broadcasts and to suppress mail broadcasts:


```
$ SET TERMINAL /BROADCAST
$ SET BROADCAST=NOMAIL
```
 - The terminal type must be listed in the OpenVMS TERMTABLE .TXT database. As shipped with OpenVMS, this database supports all Compaq Computer VT-series terminals. If you have a non-Compaq Computer terminal, check with your system manager.
 - The other person's system must be known to your system. TALK must be able to translate the remote system's IP address into its name. Therefore, your system must be using the Domain Name System (DNS), or have the remote system listed in its host tables.

Usage notes

Use the following keystrokes during a TALK session:

Press...	To...	Press...	To...
Ctrl/W	Delete the last word typed (left of the cursor)	Ctrl/L	Redraw the screen
DELETE	Delete the last character typed	Ctrl/C	Exit to DCL

When someone calls you using TALK, a message similar to the following appears on your terminal:

```
Message from TALK-DAEMON@FLOWERS.COM at 1:53PM-PDT
Connection request by username
[Respond with: TALK username@host]
```

Use this TALK command to answer the remote user's TALK request:

```
$ TALK username@host
```

Once communication is established, you and the other user can type simultaneously, and your output appears in separate windows.

If the user being called has disabled reception of broadcast messages, this message appears:

```
[Your party is refusing messages]
```

Example

```
$ TALK HOLMES@FLOWERS.COM
```

IP TELNET

IP TELNET — Logs into a remote host from the local host. TELNET uses the standard Internet TELNET protocol to establish a virtual terminal connection between a terminal connected to your OpenVMS system and a remote host.

Format

IP TELNET [*host*]

Parameters

[*host*]

Specifies the name or numeric network address of the remote host to which you wish to connect. If you don't specify a host name, TELNET enters a TOPS-20 style interactive mode. If you specify the name of a remote host on the DCL command line, TELNET immediately attempts to connect to the remote host. If you don't specify a remote host, TELNET enters its TOPS-20 style command interpreter and prompts you for TELNET commands.

Qualifiers

/ABORT_OUTPUT_CHARACTER=character

Sets the TELNET ABORT-OUTPUT character which, when typed during a TELNET session, sends a TELNET ABORT OUTPUT sequence to the remote host. Specify control characters with a caret (^) followed by a letter. By default, there is no ABORT OUTPUT character; specifying this qualifier without a value sets the character to **^/O** (a caret followed by uppercase **O**, to represent **Ctrl/O**).

/ARE_YOU_THERE_CHARACTER=character

Sets the TELNET ARE-YOU-THERE character which, when typed during a TELNET session, sends a TELNET ARE YOU THERE sequence to the remote host. By default, there is no ARE-YOU-THERE character; specifying that qualifier without a value sets the character to **^/T** (a caret followed by uppercase **T**, to represent **Ctrl/T**).

/AUTHENTICATION=KERBEROS

Uses the Kerberos authentication system.

/AUTOFLUSH

Activates the AUTOFLUSH feature. When used with the **/ABORT_OUTPUT_CHARACTER**, **/BREAK_CHARACTER**, and **/INTERRUPT_PROCESS_CHARACTER** qualifiers, the **/AUTOFLUSH** qualifier causes TELNET to flush any data which may be in the network buffers when the **ABORT-OUTPUT**, **INTERRUPT_PROCESS**, or **BREAK** character is used. Data is flushed by sending a TIMING-MARK command to the TELNET server and discarding all data until one is received in response.

/BREAK_CHARACTER=character

Sets the TELNET BREAK character which, when typed during a TELNET session, sends a TELNET BREAK sequence to the remote host. By default, there is no BREAK character; specifying this qualifier without a value sets the character to **^/C** (a caret followed by uppercase **C**, to represent **Ctrl/C**).

/BUFFER_SIZE=number

Changes the maximum size of terminal write operations to the specified *number* of bytes. A large write size is more efficient, but a smaller size makes TELNET more responsive.

The default buffer size is 512 bytes. The value for *number* can range from 20 to 1024 bytes. If you specify a value below 20, the buffer size is reset to 20. If you specify a value above 1024, it is reset to 1024.

/CREATE_NTY[=(options)]

Performs the same function as the CREATE-NTY command (available in command mode once a connection has been made). When specified without options, /CREATE_NTY causes TELNET to make a temporary connection to the specified host, attach this connection to an NTY device, and exit immediately. You can then run another application, such as KERMIT or SET HOST/DTE through this pseudo-terminal device. The TELNET_NTY logical name is defined to be the NTY device created. Use it as you would any other terminal device. When you are finished with the terminal, use the DEALLOCATE command to dismantle the connection and associated NTY device control blocks. Alternatively, the connection will be dismantled when you log out.

```
$ TELNET      /CREATE_NTY[=( [ PERMANENT ] -
    [ ,NAME=logical_name ] -
    [ ,TABLE=logical_name_table ] -
    [ ,MODE={EXECUTIVE | SUPERVISOR} ] -
    [ /PORT=target-TCP-port ] -
host
```

The *options* contain a comma-separated list beginning with:

PERMANENT	Specifies that the NTY device will persist after you close the TELNET connection. To delete the permanent NTY device, use the IP TELNET / DELETE_NTY= <i>logical_name</i> command.
and continuing with any of the following:	
NAME= <i>logical_name</i>	Specifies the NTY device's logical name. The default logical name is TELNET_NTY.
TABLE= <i>logical_name_table</i>	Specifies the logical name table to which the new NTY device name is added. The default logical name table is LNM\$PROCESS_PROCESS.
MODE= <i>access_mode</i>	Specifies the logical name's access mode. <i>access_mode</i> is either SUPERVISOR (the default) or EXECUTIVE.

Privileged users can use /CREATE_NTY options to establish permanent NTY devices. In this case, the NTY device is created but no connection is made to the specified host until the first I/O operation.

Use this qualifier only with permanent NTY devices.

/DELETE_NTY=*logical_name*

Deletes a permanent NTY device named by *logical_name*. Create permanent NTY devices with the IP TELNET /CREATE_NTY command.

/DEBUG

/NODEBUG (default)

Sets the TELNET debug flag. When you specify /DEBUG, TELNET prints all option negotiations made with the remote host.

/ERASE_CHARACTER_CHARACTER=character

Sets the TELNET ERASE-CHARACTER character which, when typed during a TELNET session, sends a TELNET ERASE CHARACTER sequence to the remote host. By default, there is no ERASE-CHARACTER character. Specifying this character without a value sets this character to ^/? (a caret followed by a question mark, to represent **DELETE**).

/ERASE_LINE_CHARACTER=character

Sets the TELNET ERASE-LINE character which, when typed during a TELNET session, sends a TELNET ERASE LINE sequence to the remote host. By default, there is no ERASE LINE character; specifying this qualifier without a value sets the character to ^/U (a caret followed by uppercase U, representing **Ctrl/U**).

/ESCAPE_CHARACTER=character

Sets the TELNET ESCAPE character. When you type the TELNET ESCAPE character during a TELNET session, communication with the remote host temporarily stops, and TELNET interprets the next character you type as a TELNET command. The **ESCAPE** character defaults to ^^ (two consecutive carets, representing **Ctrl/^**).

After you type the TELNET ESCAPE character, the next character you type is interpreted according to the following list:

Character	Action
?	Displays information about TELNET escape commands.
A	Sends an INTERRUPT PROCESS command to the remote host.
B	Sends a BREAK command to the remote host.
C	Closes the connection to the remote host.
O	Sends an ABORT OUTPUT command to the remote host.
P	Spawns a new DCL process (or attaches to a parent process).
S	Displays the status of the TELNET connection.
T	Sends an ARE YOU THERE (AYT) command. On a VSI TCP/IP server, this command is mapped to Ctrl/T .
Q	Quits TELNET.
X	Enters extended TELNET command mode.

Type the **ESCAPE** character twice to send it to the remote host.

/INTERRUPT_PROCESS_CHARACTER=character

Sets the TELNET INTERRUPT-PROCESS character which, when typed during a TELNET session, sends an INTERRUPT PROCESS sequence to the remote host. By default, there is no **INTERRUPT PROCESS** character; specifying this qualifier without a value sets the character to ^/C (a caret followed by uppercase C, representing **Ctrl/C**).

/LOCAL_FLOW_CONTROL**/NOLOCAL_FLOW_CONTROL**

Specifies that **Ctrl/Q** and **Ctrl/S** should be treated by the local terminal driver as XON and XOFF, instead of being passed down the network connection for processing by the remote terminal driver. Use of this qualifier makes XOFF more responsive, which helps prevent data loss; however, the remote system will never see any **Ctrl/S** character.

The default flow control setting depends on the setting of the OpenVMS terminal characteristic `TT $_TTSYNC` (set by the DCL command `SET TERMINAL /TTSYNC` or by many full-screen editors). Specify `/LOCAL_FLOW_CONTROL` to force TELNET into local flow control mode. Specify `/NOLOCAL_FLOW_CONTROL` to force TELNET into remote flow control mode.

/LOG_FILE=[file-spec]**/NOLOG_FILE (default)**

Specifies a file in which to log a transcript of the TELNET session. Everything received by the local system from the remote system is recorded in this file. If you specify the `/LOG_FILE` qualifier without a value, the default file specification `TELNET.LOG` is used. The log file is created in the directory from which TELNET is run. `/LOG_FILE` is not supported in 3270 or 5250 mode.

/PORT=port-spec

Specifies the port to which a connection is to be made. If you do not specify this qualifier, the standard TELNET port for the specified protocol is used. For the TCP/IP protocol, use a port number or a port defined in `IP$:HOSTS . service` file.

When connecting via TCP/IP to a port other than the default TELNET port (23), full VMS command line editing is available on command input.

/PRINT_ESCAPE_CHARACTER

Displays the **ESCAPE** character used to access TELNET command mode. If you use this qualifier, the escape character is displayed when a connection occurs:

Escape character is `^^`.

You can also use the logical name `IP$TELNET_PRINT_ESCAPE_CHARACTER` to set this feature. If this logical is defined, a message will be output.

/PROTOCOL=protocol-spec

Specifies the protocol to be used in making the connection to the remote system. The protocol specification can be either TCP or IP (TCP is the default).

/TCP

Used as an abbreviation for `/PROTOCOL=TCP`.

/TERMINAL_TYPE

Specifies the terminal type to be negotiated with the remote TELNET server. This qualifier has the same function as the `TERMINAL-TYPE` command.

/TN3270=AUTOMATIC (default)

FORCE**/NOTN3270**

Allows the negotiation of IBM 3270 terminal emulation mode. AUTOMATIC (the default) causes TELNET to automatically negotiate IBM 3270 emulation mode with the remote host. TELNET enters 3270 mode only if the remote host supports it.

Use FORCE to force TELNET into IBM 3270 emulation mode when communicating with a system that supports 3270 mode, but cannot negotiate it automatically. (IBM mainframes running ACCESS/MVS have this restriction.) Use /NOTN3270 to disable IBM 3270 emulation mode entirely.

/TN5250=AUTOMATIC (default)**FORCE****/NOTN5250**

Allows the negotiation of IBM 5250 terminal emulation mode. Use AUTOMATIC (the default) to cause TELNET to automatically negotiate IBM 5250 emulation mode with the remote host. TELNET enters 5250 mode only if the remote host supports it. FORCE is used to force TELNET into IBM 5250 emulation mode when communicating with a system that supports 5250 mode, but cannot negotiate it automatically. IBM MVS does not support 5250. Use /NOTN5250 to disable IBM 5250 emulation mode entirely.

/UNIX**/NOUNIX (default)**

Uses the 4.3BSD UNIX end-of-line specification, <CR><NL>, instead of the standard end-of-line specification, <CR><LF>. This qualifier is useful when using TELNET to connect to 4.3BSD UNIX systems.

/VERSION

Displays version information about the TELNET utility. If you use this qualifier, all other parameters and qualifiers are ignored and a TELNET session is not started.

Note

To specify a control character for the value of character in any of the preceding qualifiers, type it as a ^ (caret) followed by the appropriate character, all enclosed within double quotes.

Examples

This command creates a permanent NTY device pointing at port 9100 on WHORFIN.FLOWERS.COM, and creates the logical name WHORFINDEVICE (in the system logical name table in executive mode) that translates to the NTY device name.

1. \$ IP TELNET FLOWERS.COM
2. \$ IP TELNET SALES.FLOWERS.COM /LOG_FILE=SALES.LOG
3. \$ IP TELNET LOCALHOST /PORT=SMTP
4. \$ IP TELNET /ABORT_OUTPUT_CHARACTER="^A"

```
5. $ IP TELNET /PORT=9100 /CREATE_nty=PERMANENT, -
   _$ NAME=WHORFINDEVICE, TABLE=SYSTEM, MODE=EXECUTIVE -
   _$ WHORFIN.FLOWERS.COM
```

IP TFTP

IP TFTP — Transfers files between TCP/IP hosts. The TFTP utility uses the Internet standard Trivial File Transfer Protocol to transfer files between Internet hosts. TFTP uses the User Datagram Protocol (UDP), and performs no user authentication.

Format

```
TFTP [host [port]]
```

Parameters

[*host*]

Specifies the name or numeric address of the remote host to which you want to connect.

[*port*]

Specifies the UDP port number on the server to which you want to connect. If you do not specify the port number, the standard TFTP UDP server port number (69) is used.

Example

This example shows how to use TFTP to connect to the host FLOWERS.COM.

```
$ TFTP FLOWERS.COM
TFTP>
```

IP WHOIS

IP WHOIS — Displays information about users registered with the Internet Network Information Center (InterNIC). The default WHOIS server is RS.INTERNIC.NET.

Format

```
IP WHOIS name
```

Parameters

name

Specifies the name or *handle* of the registered user about whom you want to retrieve information.

For more information and help from the InterNic type **WHOIS HELP** from the DCL prompt.

Qualifiers

```
/HOST=hostname
```

Specifies the remote host to which to connect. The default is `RS . INTERNIC . NET`, but can be changed by a system manager. The connection is done to the `NICNAME` port.

/OUTPUT=filespec

Specifies an output file in which to store WHOIS output.

/PORT= port number

Specifies the number of a non-standard port.

Example

This example shows how to display information about the user "Smith" from the InterNIC database.

```
$ WHOIS SMITH
  SMITH, J.R. smith@abc.com
  ABC, Incorporated
  101 Elm Street
  Surf City, CA 95060
  (408) 555-1212
  Record last updated on 1-Jun-17.
```

The InterNIC Registration Services Host ONLY contains Internet Information Networks, ASN's, Domains, and POC's).

Appendix B. FTP Command Reference

The VSI TCP/IP FTP utility uses the Internet-standard FTP (File Transfer Protocol) to transfer files between the local host and a remote host. This appendix lists the commands you can use during an FTP session.

Command Summary

Table B-1 lists the VSI TCP/IP FTP commands:

Table B.1. FTP Command Summary

Command	Description
ACCOUNT	Sends an account name to the remote FTP server.
AGET	Appends a remote file to a file on the local host.
APPEND GET	Appends <code>remote_file</code> from the remote host to <code>local_file</code> on the local host.
APPEND PUT	Appends <code>local_file</code> on the local host to <code>remote_file</code> on the remote host.
APPEND RECEIVE	Appends <code>remote_file</code> from the remote host to <code>local_file</code> on the local host.
APPEND SEND	Appends <code>local_file</code> on the local host to <code>remote_file</code> on the remote host.
APUT	Appends <code>local_file</code> on the local host to <code>remote_file</code> on the remote host.
ASCII	Sets the transfer type to ASCII for transferring text files.
ATTACH	Detaches the terminal from the calling process and reattaches it to another process.
AUTHENTICATE	Requests the FTP server to enter into TLS authentication mode as defined in RFC 4217. This can be done after connecting to the remote server and before sending the USER command. For more information see Section 3.5.17.
BELL	Turns on, off, or toggles the sounding of a bell when a file transfer completes.
BINARY	Sets the transfer type for transferring binary files.
BLOCK	Reads files of TYPE I, STRUCTURE FILE using block I/O.
BYE	Closes the current FTP connection, but remains in the FTP command interpreter.
BYTE	Sets the transfer byte size to size.
CCC	Changes an encrypted command connection back to clear text. This command is provided so that an encrypted command connection can be put in clear text mode allowing firewalls and NAT devices to recognize and process PORT/PASV commands and their responses. The file transfer protection level should be established before setting the

	command channel to clear text mode. For more information see Section 3.5.17.
CD	Changes the current working directory on the remote host to <code>dir</code> .
CDUP	Changes the current working directory on the remote host by moving up one level in the directory system.
CLOSE	Closes the current FTP connection, but remains in the FTP command interpreter.
CONFIRM	Turns on, off, or toggles (the default) interactive confirmation of each command in a MULTIPLE command.
CONNECT	Establishes a connection to the FTP server on <code>host</code> .
CPATH	Changes the current working directory on the remote host to <code>dir</code> .
CREATE-DIRECTORY	Creates the directory <code>dir</code> on the remote host.
CWD	Changes the current working directory on the remote host to <code>dir</code> .
DELETE	Deletes a file on the remote host.
DIRECTORY	Obtains an annotated listing of the files on the remote host.
DISCONNECT	Closes the current FTP connection without waiting for a confirming response from the remote host, but remains in the FTP command interpreter.
EXIT	Closes the current FTP connection and exits FTP.
EXIT-ON-ERROR	Turns on, off, or toggles (the default) whether or not FTP automatically exits when an error occurs.
FACT	Sets or displays the file facts that will be set to match the facts of the source file after transfer. The facts currently supported are: MODIFICATION_TIME.
GET	Copies <code>remote_file</code> from the remote host to <code>local_file</code> on the local host.
HASH	Turns on, off, or toggles (the default) the display of hash marks (#) for each data buffer transferred.
HELP	Displays FTP help information.
LCD	Changes the current working directory on the local host to <code>dir</code> .
LDIR	Displays the contents of your local working directory. LDIR is the same as LOCAL-DIRECTORY.
LIST	Displays automatic login information for <code>host</code> .
LOCAL-CD	Changes the current working directory on the local host to <code>dir</code> .
LOCAL-DIRECTORY	Displays the contents of your local working directory.
LOCAL-PWD	Displays the current working directory on the local host.
LOGIN	Identifies you to a remote FTP server.
LPWD	Displays the current working directory on the local host.
LS	Displays a names-only listing of files on the remote host.
MDELETE	Deletes multiple files on the remote host.
MGET	Copies multiple files from the remote host to the local host.
MKDIR	Creates the directory <code>dir</code> on the remote host.

MODE	Sets the transfer mode to COMPRESSED or STREAM (the default).
MPUT	Copies multiple files from the local host to the remote host.
MULTIPLE DELETE	Deletes multiple files on the remote host.
MULTIPLE GET	Copies multiple files from the remote host to the local host.
MULTIPLE PUT	Copies multiple files from the local host to the remote host. MULTIPLE PUT is a synonym for MULTIPLE SEND. See MULTIPLE SEND for more information.
MULTIPLE RECEIVE	Copies multiple files from the remote host to the local host.
MULTIPLE SEND	Copies multiple files from the local host to the remote host.
OPEN	Establishes a connection to a host system.
PASSIVE	Enables or disables "passive" mode for file transfers with FTP servers on the opposite side of "firewall" gateways.
PASSWORD	Sends a password to the remote FTP server explicitly, which normally happens automatically during login.
PORT	Specifies a TCP port number to use for the FTP control connection.
PROMPT-FOR-MISSING-ARGUMENTS	Turns on, off, or toggles (the default) whether or not FTP prompts for missing command arguments automatically.
PROMPT-ON-CONNECT	Turns on, off, or toggles (the default) whether or not FTP prompts for a user name and password after making a connection automatically.
PROTECTION	Sets the protection level for data transfers as specified in RFC 4217. Use CLEAR to transfer files over a clear text connection. This is the default after specifying the username and password to an authenticated connection. Use PRIVATE to transfer files over an encrypted connection with data integrity checking. For more information see Section 3.5.17.
PUSH	Starts and attaches a DCL subprocess.
PUT	Copies <code>local_file</code> on the local host to <code>remote_file</code> on the remote host.
PWD	Displays the current working directory on the remote host.
QUIT	Closes the current FTP connection and exits FTP.
QUOTE	Sends a string to the FTP server verbatim.
RECEIVE	Copies remote-file from the remote host to local-file on the local host.
RECORD-SIZE	Sets or displays the record size for IMAGE mode transfers.
REMOTE-HELP	Displays information about commands available on the FTP server.
REMOVE-DIRECTORY	Deletes a directory on the remote host. REMOVE-DIRECTORY is the same as RMDIR.
RENAME	Renames files on the remote host.
RETAIN	Turns on, off, or toggles (the default) the retention of OpenVMS version numbers in file transfers.
RM	Deletes a file on the remote host.
RMDIR	Deletes a directory on the remote host.
SEND	Copies <code>local_file</code> on the local host to <code>remote_file</code> on the remote host.

SET	Sets automatic login information for host.
SHOW-DIRECTORY	Displays the current working directory on the remote host. SHOW DIRECTORY is the same as PWD.
SITE	Specifies commands that are interpreted by the VSI TCP/IP FTP server for use on the server host.
SPAWN	Executes a single DCL command, or if entered without options, starts a subprocess with the same effect as PUSH.
STATISTICS	Turns on, off, or toggles (the default) STATISTICS mode.
STATUS	Displays the status of the FTP server.
STREAM	Turns on, off, or toggles (the default) the creation of binary output files as Stream_LF files.
STRUCTURE	Sets the transfer structure to <i>structure</i> .
TAKE	Interprets FTP commands in a file.
TENEX	Changes the byte size for transferring binary files to or from a TOPS-20 system.
TYPE	Sets the transfer type to <i>type</i> .
USER	Identifies you to the remote FTP server.
VERBOSE	Turns on, off, or toggles (the default) VERBOSE mode.
VERSION	Prints information about the FTP program_version.
WINDOW-SIZE	Displays or sets the TCP window size to be used on data transfers.

ACCOUNT

ACCOUNT — Sends an account name to the remote FTP server. Use this command when connecting to hosts that require account specifications in addition to a user name.

Format

ACCOUNT *account*

Parameters

account

Specifies the name of the account to be sent to the remote FTP server.

Restrictions

Use this command only when connected to a remote host.

Example

```
FLOWERS.COM> account sales
<Account "sales" accepted
FLOWERS.COM>
```

AGET

AGET — Appends a remote file to a file on the local host. AGET is a synonym for APPEND GET.

Format

```
AGET remote_file [local_file]
```

APPEND GET

APPEND GET — Appends *remote_file* from the remote host to *local_file* on the local host. APPEND uses the current settings for type, mode, and structure during file transfers. APPEND GET is the same as AGET and APPEND RECEIVE.

Format

```
APPEND GET remote_file [local_file]
```

Parameters

remote_file

Specifies the name of the file on the remote host from which to copy.

[*local_file*]

Specifies the name of a file on the local host to which the file is to be appended.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the GET command.
- You cannot use the APPEND GET command in STRUCTURE VMS mode. If you try to do this, FTP toggles temporarily into STRUCTURE FILE mode for the transfer.

Example

This example shows how to append a remote file to a file on the local host.

```
FLOWERS.COM> append get login.com
To local file: RETURN
<ASCII retrieve of USERS:[HOLMES]LOGIN.COM;1 started.
<Transfer completed. 2498 (8) bytes transferred.
FLOWERS.COM>
```

APPEND PUT

APPEND PUT — Appends *local_file* on the local host to *remote_file* on the remote host. APPEND PUT is a synonym for APPEND RECEIVE.

Format

```
APPEND PUT local_file remote_file
```

APPEND RECEIVE

APPEND RECEIVE — Appends *remote_file* from the remote host to *local_file* on the local host. APPEND RECEIVE is a synonym for APPEND GET.

Format

```
APPEND RECEIVE remote_file [local_file]
```

APPEND SEND

APPEND SEND — Appends *local_file* on the local host to *remote_file* on the remote host. APPEND SEND uses the current settings for type, mode, and structure during file transfers. APPEND SEND is the same as APUT and APPEND PUT.

Format

```
APPEND SEND local_file remote_file
```

Parameters

local_file

Specifies the name of the file on the local host to be copied.

remote_file

Specifies the destination file name on the remote host.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the APPEND SEND command.
- The IP FTP Server cannot APPEND to a file in STRUCTURE VMS mode.

Example

This example shows how to append the LOGIN.COM file to the remote file FOO.COM.

```
FLOWERS.COM>append send login.com foo.com
<ASCII Store of ST_ROOT:[TMP]FOO.COM;12 started.
<Transfer completed. 2498 (8) bytes transferred.
FLOWERS.COM>
```

APUT

APUT — Appends `local_file` on the local host to `remote_file` on the remote host. APUT is a synonym for APPEND PUT and APPEND SEND.

Format

```
APUT local_file remote_file
```

ASCII

ASCII — Sets the transfer type to ASCII for transferring text files. ASCII is a synonym for TYPE.

Format

```
ASCII
```

ATTACH

ATTACH — Detaches the terminal from the calling process and reattaches it to another process. Use the SPAWN SHOW PROCESS /SUBPROCESSES command to list the names of subprocesses. Use the DCL LOGOUT command to return to the original process. If the IP\$DISABLE_SPAWN logical is enabled, ATTACH does not work.

Format

```
ATTACH process-name
```

Parameters

process-name

Specifies the name of a process to which you want your terminal attached. (Not all subprocesses can be attached; some testing may be required.)

BELL

BELL — Turns on, off, or toggles the sounding of a bell when a file transfer completes.

Format

```
BELL mode
```

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to toggle the bell feature.

```
FTP>bell  
[Bell will now ring when operations complete]  
FTP>
```

BINARY

BINARY — Sets the transfer type for transferring binary files. BINARY is a synonym for TYPE.

Format

BINARY

BLOCK

BLOCK — Reads files of TYPE I, STRUCTURE FILE using block I/O.

Format

BLOCK

Restrictions

Use this command only when connected to a remote host.

BYE

BYE — Closes the current FTP connection, but remains in the FTP command interpreter.

Format

BYE

Restrictions

Use this command only when connected to a remote host.

Example

This example shows how to disconnect an FTP connection.

```
FLOWERS.COM>bye  
<QUIT command received. Goodbye.  
FTP
```

BYTE

BYTE — Sets the transfer byte size to size.

Format

BYTE *size*

Parameters

size

Specifies the size to which to set the transfer byte size. The only permitted value is 8 bits.

Example

This example shows how to set the transfer byte size to 8 bits.

```
FLOWERS.COM>byte
Type: Logical-Byte (Byte Size 8), Structure: VMS, Mode: Stream
FLOWERS.COM>
```

CD

CD — Changes the current working directory on the remote host to *dir*. CD is the same as CPATH and CWD.

Format

CD *dir*

Parameters

dir

Specifies the name of the directory to use as the current working directory.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the CD command.

Example

This example shows how to change the default directory on the remote host to USERS : [ANONYMOUS].

```
FLOWERS.COM>cd [anonymous]
<Connected to USERS:[ANONYMOUS].
FLOWERS.COM>
```

CDUP

CDUP — Changes the current working directory on the remote host by moving up one level in the directory system.

Format

CDUP

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the CDUP command.

Example

This example shows how to move up one directory on the remote host.

```
FLOWERS.COM>cdup
<Connected to USERS:[000000].
FLOWERS.COM>
```

CLOSE

CLOSE — Closes the current FTP connection, but remains in the FTP command interpreter. CLOSE is a synonym for BYE.

Format

CLOSE

CONFIRM

CONFIRM — Turns on, off, or toggles (the default) interactive confirmation of each command in a MULTIPLE command.

Format

CONFIRM *mode*

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to enable CONFIRM mode and use it with MGET to prompt for each file name.

```
FLOWERS.COM>confirm
[You will be asked to confirm each transaction in a multiple transaction]
FLOWERS.COM>mget *.com
<List started.
<Transfer completed.
GET copy.com? [YES] n
```

```
GET login.com? [YES] y
<VMS retrieve of USERS:[HOLMES]LOGIN.COM;1 started.
<Transfer completed. 2498 (8) bytes transferred.
FLOWERS.COM>
```

CONNECT

CONNECT — Establishes a connection to the FTP server on *host*. CONNECT is the same as OPEN.

Format

```
CONNECT host
```

Parameters

host

Specifies the name of the host to which to establish a connection. *host* is specified as either a symbolic host name or as a dotted Internet address.

Restrictions

Do not use this command when connected to a remote host.

Example

This example shows how to connect to the FLOWERS.COM host.

```
FTP>connect flowers.com
Connection opened (Assuming 8-bit connections)
<FLOWERS.COM VSI TCP/IP for OpenVMS FTP Server Process
<10.5 (nnn) at Fri 9-Apr-2017 7:42am-PST
FLOWERS.COM>
```

CPATH

CPATH — Changes the current working directory on the remote host to *dir*. CPATH is a synonym for CD.

Format

```
CPATH dir
```

CREATE-DIRECTORY

CREATE-DIRECTORY — Creates the directory *dir* on the remote host. CREATE DIRECTORY is the same as MKDIR.

Format

```
CREATE-DIRECTORY dir
```

Parameters

dir

Specifies the name of the directory to create.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the CREATE-DIRECTORY command.

Example

This example shows how to create the subdirectory "test".

```
FLOWERS.COM>create-dir test
<"USERS:[HOLMES.TEST]" Directory created
FLOWERS.COM>
```

CWD

CWD — Changes the current working directory on the remote host to *dir*. CWD is a synonym for CD.

Format

CWD *dir*

DELETE

DELETE — Deletes a file on the remote host. DELETE is the same as RM.

Format

DELETE *file*

Parameters

file

Specifies the name of the file to delete.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the DELETE command.

Example

This example shows how to delete the file FOO.BAR from the remote host.

```
FLOWERS.COM>del foo.bar
<File deleted ok, file USERS:[HOLMES]FOO.BAR;1.
FLOWERS.COM>
```

DIRECTORY

DIRECTORY — Obtains an annotated listing of the files on the remote host.

Format

```
DIRECTORY [file_spec] [output_file]
```

Parameters

[*file_spec*]

Specifies the file specification to use in the directory lookup on the remote host. If you do not specify *file_spec*, the current working directory on the remote host is used. Any wildcards you specify are interpreted in the context of the remote host operating system.

[*output_file*]

Specifies the name of the file to which to write the directory listing. If you do not specify *output_file*, the list is directed to SYS\$OUTPUT:.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the **DIRECTORY** command.

Example

This example shows how to retrieve list of files that match the wildcard * .COM.

```
FLOWERS.COM>dir *.com
<List started.
USERS: [HOLMES]
COPY.COM;4      2      1-APR-2017 08:49 [HOLMES] (RWD,RWD,R,R)
LOGIN.COM;1     5      1-APR-2017 01:25 [HOLMES] (RWD,RWD,R,R)
Total of 7 blocks in 2 files.
<Transfer completed.
FLOWERS.COM>
```

DISCONNECT

DISCONNECT — Closes the current FTP connection without waiting for a confirming response from the remote host, but remains in the FTP command interpreter.

Format

```
DISCONNECT
```

Restrictions

Use this command only when connected to a remote host.

Example

```
FLOWERS.COM>disc
FTP>
```

EXIT

EXIT — Closes the current FTP connection and exits FTP. EXIT is the same as QUIT.

Format

```
EXIT
```

Example

```
FLOWERS.COM>exit
<QUIT command received. Goodbye.
$
```

EXIT-ON-ERROR

EXIT-ON-ERROR — Turns on, off, or toggles (the default) whether or not FTP exits automatically when an error occurs.

Format

If EXIT-ON-ERROR is enabled, FTP exits automatically if an error occurs. After exiting, the DCL symbol \$STATUS contains the status code of the last error to occur. If the last error was reported by the FTP server, it contains the value %X100002C + (%X10000 * *ftp_error_code*).

```
EXIT-ON-ERROR mode
```

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to use EXIT-ON-ERROR to exit automatically when an error occurs. Here the error was not an FTP error.

```
FTP>exit-on-error
[Will exit when an error occurs]
FTP>connect 1.2.3.4
1.2.3.4: %IP-F-ETIMEDOUT, Connection timed out
```

```
$ sho symbol $status $STATUS == "%X100081E4"
```

This example shows how EXIT-ON-ERROR exits when an error occurs automatically. Here the FTP Server responded as follows to the command

```
user unknown password
:

FTP>exit-on-error
[Will exit when an error occurs]
FTP>connect somehost
Connection opened (Assuming 8-bit connections)
<Somehost VSI TCP/IP for OpenVMS FTP Server Process V10.5(15) at Thu 4-
Mar-17 2:37PM-PDT
SOMEHOST>user unknownpassword
<%SYSTEM-F-INVLOGIN, login information invalid at remote node
$ show symbol $status
$STATUS == "%X1212002C"
$ write sys$output ($status-%X1000002C)/%X10000
530

530 %SYSTEM-F-INVLOGIN, login information invalid at remote node
```

FACT

FACT — Sets or displays the file facts that will be set to match the facts of the source file after transfer. The facts currently supported are: MODIFICATION_TIME.

Format

```
FACT [MFMT]
```

Parameters

```
[MFMT]
```

File modification time will be set after transferring files provided the FTP server supports the necessary commands.

Example

```
FTP>FACT MFMT
FTP>PUT FILE.EXE
```

GET

GET — Copies *remote_file* from the remote host to *local_file* on the local host. The current settings for type, mode, and structure are used during file transfers. GET is the same as RECEIVE.

Format

```
GET remote-file [local-file]
```

Parameters

remote-file

Specifies the name of the file on the remote host.

[*local-file*]

Specifies the name of the file on the local host.

Qualifiers

/FDL

Obtains a file previously saved with the PUT /FDL command. When you create a file with the PUT /FDL qualifier, a file description language (FDL) file is created at the same time as the original file. The output file is converted to raw block format. When you retrieve a file with GET /FDL, the original format is restored using the attributes stored in the FDL file. If you don't use the /FDL qualifier with the GET command, the new raw block format is retained. In any case, the FDL file is retained and must be deleted independently. The /FDL qualifier provides compatibility with HP TCP/IP Services for OpenVMS (formerly UCX). The FDL file has the same name except the string FDL is appended to the end.

/RESTART

For STREAM mode transfers restart the transfer where it was interrupted. The client verifies that the server supports the RFC 3659 SIZE and REST commands, and ignores the qualifier if it does not.

This does NOT work for VMS mode transfers (STRU VMS), and if the remote system is a OpenVMS system it is recommended that a STRU FILE be done before the transfer command and to include /NOVMS on the command line when starting FTP.

GET /RESTART is not supported in ASCII mode to systems that support VMS mode transfers due to problems with properly concatenating a possibly broken line of text. It is recommended that the file be ZIPped and then transfer the .ZIP file in binary mode.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the GET command.

Example

This example shows how to transfer a file to the local host.

```
FLOWERS.COM>get login.com
To local file: RETURN
<VMS retrieve of USERS:[HOLMES]LOGIN.COM;1 started.
<Transfer completed. 2498 (8) bytes transferred.
FLOWERS.COM>
```

HASH

HASH — Turns on, off, or toggles (the default) the display of hash marks (#) for each data buffer transferred.

Format

`HASH mode`

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to display hash marks during a GET file transfer.

```
FLOWERS.COM>hash
[Hash marks will be printed during transfers]
FLOWERS.COM>get login.com login.com
<VMS retrieve of USERS:[HOLMES]LOGIN.COM;1 started.
###
Transfer completed. 2498 (8) bytes transferred.
```

HELP

HELP — Displays FTP help information. Type HELP or ? to see a list of HELP topics. Type HELP without an argument to display general help information.

Format

`HELP [command]`

Parameters

[command]

Specifies the name of the command about which you want help.

Example

```
FTP>help
The HELP command prints on-line help for the FTP user program. The argument
to HELP selects the particular FTP command about which help is desired.
In addition to the FTP commands, several control characters can be typed
while file transfers are in progress:

Control-A shows the progress of a data transfer.
Control-G aborts the file transfer and returns to FTP command level.
Control-P spawns a new command interpreter.
FTP>
```

LCD

LCD — Changes the current working directory on the local host to dir. LCD is a synonym for LOCAL-CD.

Format

LCD *dir*

LDIR

LDIR — Displays the contents of your local working directory. LDIR is the same as LOCAL-DIRECTORY.

Format

LDIR

Example

```
FTP> ldir *.com
USERS:[FLOWERS.DOC.V32]
DOC.COM;2      1      1-APR-2017 01:36  FLOWERS_FILES (RWED,RWED,,)
LOGIN.COM;3    5      1-APR-2017 19:07  FLOWERS_FILES (RWED,RWED,,)
LOGIN.COM;2    5      1-APR-2017 19:04  FLOWERS_FILES (RWED,RWED,,)
LOGIN.COM;1    5      1-APR-2017 18:49  FLOWERS_FILES (RWED,RWED,,)
Total of 16 blocks in 4 files.
FTP>
```

LIST

LIST — Displays automatic login information for *host*. See the SET command for information about setting automatic login information for a host.

Format

LIST [*host*]

Parameters

[*host*]

Specifies the host whose automatic login information you are trying to display. If you do not specify host, LIST displays automatic login information for all hosts for which login information has been set.

Restrictions

Do not use this command when connected to a remote host.

Example

This example shows how to set and list information for the DS . INTERNIC . NET host.

```
FTP> set ds.internic.net /user=anonymous /pass=guest
FTP> list
DS.INTERNIC.NET
  User: anonymous
  Password: guest
FTP>
```

LOCAL-CD

LOCAL-CD — Changes the current working directory on the local host to *dir*. LOCAL-CD is the same as LCD.

Format

LOCAL-CD *dir*

Parameters

dir

Specifies the name of the directory to which to change the current working directory.

Example

```
FTP> lcd [-]
Connected to USERS:[FLOWERS.DOC].
FTP>
```

LOCAL-DIRECTORY

LOCAL-DIRECTORY — Displays the contents of your local working directory. LOCAL-DIRECTORY is a synonym for LDIR.

Format

LOCAL-DIRECTORY

LOCAL-PWD

LOCAL-PWD — Displays the current working directory on the local host. LOCAL-PWD is a synonym for LPWD.

Format

LOCAL-PWD

LOGIN

LOGIN — Identifies you to a remote FTP server. LOGIN is the same as USER.

Format

LOGIN *user* [*password*]

Parameters

user

Specifies your user name on the remote server.

[password]

Specifies your password on the remote server. If you do not specify password and the remote site requires one, you are prompted for it. In either case, the password is not echoed.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts do not allow you to use LOGIN once you have already logged in.

Example

This example shows how to connect to a remote host and log in.

```
$ ftp irisd.com
Connection opened (Assuming 8-bit connections)
<IRISD.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(nn) at Fri 9-
Apr-2017 7:42 am PST
IRISD.COM> login HOLMES password
<User HOLMES logged into U1:[HOLMES] at Fri 9-Apr-2017, 19:13, job
433.IRISD.COM>
```

LPWD

LPWD — Displays the current working directory on the local host. LPWD is the same as LOCAL-PWD.

Format

LPWD

Example

```
FTP> lpwd
Connected to USERS:[FLOWERS.DOC].
FTP>
```

LS

LS — Displays a names-only listing of files on the remote host. You can use wildcard specifications.

Format

LS *[file_spec]* *[output_file]*

Parameters

[file_spec]

Specifies the file specification to use in the directory lookup on the remote host. If you do not specify *file_spec*, the current working directory on the remote host is used. Any wildcards used are interpreted in the context of the remote host operating system.

[*output_file*]

Specifies the name of the file to which to write the directory listing. If *output_file* is not specified, the list is directed to SYS\$OUTPUT:.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the LS command.

Example

This example shows how to retrieve the directory listing of the files matching the wildcard character *.

```
FLOWERS.COM>ls *.
<List started.
$mailinterface.
mymail.
todo.
<Transfer completed.
FLOWERS.COM>
```

MDELETE

MDELETE — Deletes multiple files on the remote host. MDELETE is a synonym for MULTIPLE DELETE.

Format

MDELETE *files*

MGET

MGET — Copies multiple files from the remote host to the local host. MGET is a synonym for MULTIPLE GET.

Format

MGET *files*

MKDIR

MKDIR — Creates the directory *dir* on the remote host. MKDIR is a synonym for CREATE-DIRECTORY.

Format

MKDIR *dir*

MODE

MODE — Sets the transfer mode to COMPRESSED or STREAM (the default).

Format

MODE *mode*

Parameters

mode

Specifies one of two values: COMPRESSED or STREAM (the default).

Restrictions

- The MODE command can only be used when connected to a remote host.
- Not all modes are supported by all remote hosts.

Example

This example shows how to enable COMPRESSED mode.

```
FLOWERS.com>mode c
Type: Ascii (Non-Print), Structure: VMS, Mode: Compression
FLOWERS>COM>
```

MPUT

MPUT — Copies multiple files from the local host to the remote host. MPUT is a synonym for MULTIPLE SEND.

Format

MPUT *files*

MULTIPLE DELETE

MULTIPLE DELETE — Deletes multiple files on the remote host. If you have turned on CONFIRM, (to confirm multiple transactions interactively), you are asked to confirm the deletion of each file. MULTIPLE DELETE is the same as MDELETE.

Format

MULTIPLE DELETE *files*

Parameters

files

Specifies which files to delete. Wildcard characters in files are expanded on the remote host.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the MULTIPLE DELETE command.

Example

This example shows how to delete all files matching the remote wildcard * character.

```
FLOWERS.COM>multiple delete *.com;*
<List started
<Transfer completed.
<File deleted ok, file USERS:[FLOWERS.DOC.V32]LOGIN.COM;3.
<File deleted ok, file USERS:[FLOWERS.DOC.V32]LOGIN.COM;2.
<File deleted ok, file USERS:[FLOWERS.DOC.V32]LOGIN.COM;1.
```

MULTIPLE GET

MULTIPLE GET — Copies multiple files from the remote host to the local host. If you have turned on CONFIRM (to confirm multiple transactions interactively), you are asked to confirm the transfer of each file. MULTIPLE GET is the same as MGET and MULTIPLE RECEIVE.

Format

```
MULTIPLE GET files
```

Parameters

files

Specifies the names of the files to be copied. Wildcard characters are expanded on the remote host.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the MULTIPLE GET command.

Example

This example shows how to transfer all files matching the * wildcard character.

```
FLOWERS.COM>multiple get *.com
<List started
<Transfer completed.
<VMS retrieve of USERS:[HOLMES]COPY.COM;4 started.
<Transfer completed. 732 (8) bytes transferred.
<VMS retrieve of USERS:[HOLMES]LOGIN.COM;1 started.
```

<Transfer completed. 2498 (8) bytes transferred.

MULTIPLE PUT

MULTIPLE PUT — Copies multiple files from the local host to the remote host. MULTIPLE PUT is a synonym for MULTIPLE SEND.

Format

MULTIPLE PUT *files*

MULTIPLE RECEIVE

MULTIPLE RECEIVE — Copies multiple files from the remote host to the local host. MULTIPLE RECEIVE is a synonym for MULTIPLE GET.

Format

MULTIPLE RECEIVE *files*

MULTIPLE SEND

MULTIPLE SEND — Copies multiple files from the local host to the remote host. If you have turned on CONFIRM (to confirm multiple transactions interactively), you are asked to confirm the transfer of each file. MULTIPLE SEND is the same as MULTIPLE PUT and MPUT.

Format

MULTIPLE SEND *files*

Parameters

files

Specifies which files to copy. Wildcard characters in *files* are expanded on the local host.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the MULTIPLE SEND command.

Example

This example shows how to transfer the files which match the *.COM wildcard.

```
YOYDYNE.COM>multiple send *.com
<VMS Store of ST_ROOT:[TMP]COPY.COM;4 started.
<Transfer completed. 732 (8) bytes transferred.
<VMS Store of ST_ROOT:[TMP]FIX.COM;3 started.
<Transfer completed. 496 (8) bytes transferred.
<VMS Store of ST_ROOT:[TMP]FOO.COM;11 started.
```

```
<Transfer completed. 436 (8) bytes transferred.  
<VMS Store of ST_ROOT:[TMP]LOGIN.COM;4 started.  
<Transfer completed. 2498 (8) bytes transferred.  
YOYDYNE.COM>
```

OPEN

OPEN — Establishes a connection to a host system. OPEN is a synonym for CONNECT.

Format

OPEN *host*

PASSIVE

PASSIVE — Enables or disables "passive" mode for file transfers with FTP servers on the opposite side of "firewall" gateways.

Format

PASSIVE [*state*] [*negotiate*]

Parameters

[*state*]

Specifies a value of ON, OFF, or TOGGLE.

Description

Typically, when an FTP client requests data from an FTP server, the server attempts to establish a connection with the client over which it transfers the data. If a "firewall" gateway separates the FTP client and server, the gateway may prohibit incoming connections. The solution is to enable "passive" mode transfers, in which the FTP server asks the FTP client to initiate the connection.

Note

Not all FTP servers support passive mode transfers.

The PASSIVE command lets you enable or disable passive mode explicitly. When you do not specify a state, the current state is toggled.

Example

This example uses PASSIVE to allow the server to transfer a directory listing across a connection established by the FTP client rather than the server.

```
FTP>connect ftp.abc.com  
Connection opened (Assuming 8-bit connections  
<HQ.ABC.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(14) at Wed 8-  
Mar-17 10:57 AM- PST  
HQ.ABC.COM>user anonymous
```

```

<anonymous user ok. Send real ident as password.
Password:*****
<Welcome to ABC's Anonymous FTP directory
<Guest User WHORFIN@FLOWERS.COM logged into USERS:[ANONYMOUS.ABC] at Wed 8-
Mar-17 11:15AM-PST, job 208040a2.
<Directory and access restrictions apply
HQ.ABC.COM>passive on
[Passive mode is ON for transfers]
HQ.ABC.COM>dir
<List started.
FTP_ANON:[000000]
.INDEX;32      3      6-APR-2017 00:00  [WEBMASTER] (R,RWED,RWED,R)
.WELCOME;4     2      16-MAR-2017 17:19  [WEBMASTER] (R,RWED,RWED,R)
ABOUT.TXT;8   5      27-MAR-2017 14:54  [WEBMASTER] (R,RWED,RWED,R)
COMPANY_INFORMATION.DIR;1|
                1      3-JAN-2017 13:54  [WEBMASTER] (R,RWED,RWED,R)
CUSTOMER_SUPPORT.DIR;1
                1      3-JAN-2017 13:55  [WEBMASTER] (R,RWED,RWED,R)
                544    27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
NFSACL.PS;1    72     27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
NFSACL.TXT;1  13     27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
PRODUCTS_AND_SERVICES.DIR;1
                1      3-JAN-2017 13:58  [WEBMASTER] (R,RWED,RWED,R)
SERVER_MAP.TXT;54 60    6-APR-2017 00:04  [WEBMASTER] (RWED,RWED,RWED,R)
SET2048.MAR;2  5      27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
THIRD_PARTY_TOOLS.DIR;1
                1      3-JAN-2017 13:58  [WEBMASTER] (R,RWED,RWED,R)
UNZIP.EXE;3    155    27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
UNZIP_ALPHA.EXE;1 163    27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
VMSIO.H;12     7      27-MAR-2017 10:29  [WEBMASTER] (R,RWED,RWED,R)
WHATS_NEW.TXT;1 1      5-MAR-2017 16:31  [WEBMASTER] (R,RWED,RWED,R)
Total of 1033 blocks in 15 files.
<Transfer completed.
HQ.ABC.COM>

```

PASSWORD

PASSWORD — Sends a password to the remote FTP server explicitly, which happens automatically during login.

Format

PASSWORD *password*

Parameters

password

Specifies the password to send to the remote server. The password is not echoed when typed.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that the password be sent as part of the login procedure only.

Example

This example shows how to send a password to the remote host.

```
FLOWERS.COM> pass airplane
<Password accepted, thank you.
FLOWERS.COM>
```

PORT

PORT — Specifies a TCP port number to use for the FTP control connection. Use this command only when connecting to an FTP server that provides a nonstandard FTP control connection port number.

Format

```
PORT port
```

Parameters

port

Specifies the port to use when establishing the FTP control connection with the remote server system.

Example

This example shows how to explicitly specify a port number for the FTP control connection with the remote host.

```
FLOWERS.COM>port 1099
FLOWERS.COM>
```

PROMPT-FOR-MISSING-ARGUMENTS

PROMPT-FOR-MISSING-ARGUMENTS — Turns on, off, or toggles (the default) whether or not FTP prompts for missing command arguments automatically.

Format

```
PROMPT-FOR-MISSING-ARGUMENTS mode
```

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to use the PROMPT-FOR-MISSING-ARGUMENTS command.

```
FTP>prompt-for-missing-arguments
{Will NOT prompt for missing arguments};
SALES.FLOWERS.COM>get
?Missing remote filename
```

SALES.FLOWERS.COM>

PROMPT-ON-CONNECT

PROMPT-ON-CONNECT — Turns on, off, or toggles (the default) whether or not FTP prompts for a user name and password automatically after making a connection.

Format

PROMPT-ON-CONNECT *mode*

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to use PROMPT-ON-CONNECT to automatically prompt for a user name and password when a connection is made.

```
FTP>prompt-on-connect
[Will automatically prompt for username and password]
FTP>connect ftp.yod.com
Connection opened (Assuming 8-bit connections)
<FTP.YOD.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(nn) at Sun 9-
Apr-2017 7:42am PST
Username: HOLMES
Password:
<User HOLMES logged into USERS:[HOLMES] at Sun 9-Apr-2017 14:42, job
 2060011f.
FTP.YOD.COM>
```

PUSH

PUSH — Starts and attaches a DCL subprocess. If a parent process exists, attach to it. To return from DCL, use the ATTACH or the LOGOUT command. To switch back from a DCL subprocess, use the ATTACH command. If the IP\$DISABLE_SPAWN logical is set, PUSH does not work.

Format

PUSH

PUT

PUT — Copies *local_file* on the local host to *remote_file* on the remote host. The current settings for type, mode, and structure are used during file transfers. PUT is the same as SEND.

Format

PUT *local_file remote_file*

Parameters

local_file

Specifies the name of the file on the local host.

remote_file

Specifies the name of the file on the remote host.

Qualifiers

/FDL

Puts a file in FDL format. When you create a file with the PUT /FDL qualifier, a file description language (FDL) file is created at the same time as the original file. The output file is converted to raw block format. When you retrieve a file with GET /FDL, the original format is restored using the attributes stored in the FDL file. If you do not use the /FDL qualifier with the GET command, the new raw block format is retained. In any case, the FDL file is retained and must be deleted independently. The /FDL qualifier provides compatibility with HP TCP/IP Services for OpenVMS (formerly UCX). The FDL file has the same name except the string FDL is appended to the end of the file name.

/RESTART

For STREAM mode transfers restart the transfer where it was interrupted. The client verifies that the server supports the RFC 3659 SIZE and REST commands, and ignores the qualifier if it does not.

This does NOT work for VMS mode transfers (STRU VMS), and if the remote system is a OpenVMS system it is recommended that a STRU FILE be done before the transfer command and to include /NOVMS on the command line when starting FTP.

GET/RESTART is not supported in ASCII mode to systems that support VMS mode transfers due to problems with properly concatenating a possibly broken line of text. It is recommended that the file be ZIPped and then transfer the .ZIP file in binary mode.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the PUT command.

Examples

This example copies the file LOGIN.COM to the remote file FOO.COM.

```
FLOWERS.COM>put login.com foo.com
<VMS Store of ST_ROOT:[TMP]FOO.COM;12 started.
<Transfer completed. 2498 (8) bytes transferred.
FLOWERS.COM>
```

This example copies AFILE.TXT to BFILE.TXT and creates the additional BFILE.TXTFDL file. The BFILE.TXTFDL file is in ASCII format and is an appropriate FDL description of AFILE.TXT.

```
FLOWERS.COM>PUT /FDL AFILE.TXT BFILE.TXT
<ASCII Store of USERS:[HOLMES]BFILE.TXTFDL;1 started.
<Transfer completed. 888 (8) bytes transferred.
<IMAGE Store of USERS:[HOLMES]BFILE.TXT;1 started.
```

```
<Transfer completed. 6 (8) bytes transferred.  
flowers.com
```

PWD

PWD — Displays the current working directory on the remote host. PWD is a synonym for SHOW-DIRECTORY.

Format

PWD

QUIT

QUIT — Closes the current FTP connection and exits FTP. QUIT is a synonym for EXIT.

Format

QUIT

QUOTE

QUOTE — Sends a string to the FTP server verbatim. You can use QUOTE to access non-standard commands on the FTP server.

Format

QUOTE *string*

Parameters

string

Specifies a string to send to the server.

Restrictions

Use this command only when connected to a remote host.

Example

This example shows how to send a NOOP command to the remote host.

```
FLOWERS.COM>quote noop  
<NOOP command successful.  
FLOWERS.COM>
```

RECEIVE

RECEIVE — Copies *remote-file* from the remote host to *local-file* on the local host. The current settings for type, mode, and structure are used during file transfers. RECEIVE is a synonym for GET.

Format

RECEIVE *remote-file* [*local-file*]

Parameters

remote-file

Specifies the name of the file on the remote host.

[*local-file*]

Specifies the name of the file on the local host.

Qualifiers

/FDL

Gets a file previously saved with the PUT /FDL command. When you create a file with the PUT /FDL qualifier, a file description language (FDL) file is created at the same time as the original file. The output file is converted to raw block format. When you retrieve a file with RECEIVE /FDL, the original format is restored using the attributes stored in the FDL file. If you do not use the /FDL qualifier with the RECEIVE command, the new raw block format is retained. In any case, the FDL file is retained and must be deleted independently. The /FDL qualifier provides compatibility with HP TCP/IP Services for OpenVMS (formerly UCX). The FDL file has the same name except the string FDL is appended to the end of the file name.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the GET command.

Example

This example shows how to transfer a file to the local host.

```
FLOWERS.COM>receive login.com
To local file: RETURN
<VMS retrieve of USERS:[HOLMES]LOGIN.COM;1 started.
<Transfer completed. 2498 (8) bytes transferred.
FLOWERS.COM>
```

RECORD-SIZE

RECORD-SIZE — Sets or displays the record size for IMAGE mode transfers.

Format

RECORD-SIZE [*size*]

Parameters

[*size*]

Specifies the record size for IMAGE mode transfers. Values range from 1 to 32767. When omitted, the current setting is displayed. The default record size is 512 bytes.

Example

```
$ ftp ftp.yod.com
FTP.YOD.COM VSI TCP/IP for OpenVMS FTP user process 10.5(nnn)
Connection opened (Assuming 8-bit connections)
<FTP.YOD.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(nnn) at Fri 9-
Apr-2017 7:42am-PST
FTP>record 1024
FTP>record
Record size for IMAGE files: 1024
FTP>
```

REMOTE-HELP

REMOTE-HELP — Displays information about commands available on the FTP server.

Format

REMOTE-HELP

Restrictions

Use this command only when connected to a remote host.

Example

This example shows how to retrieve help from a remote host.

```
UNIX.FLOWERS.COM>remote-help
<The following commands are recognized (* =>'s unimplemented).
<USER  PORT  STOR  MSAM*  RNT0  NLST  MKD  CDUP
<PASS  PASV  APPE  MRSQ*  ABOR  SITE  XMKD  XCUP
<ACCT*  TYPE  MLFL*  MRCP*  DELE  SYST  RMD  STOU
<SMNT*  STRU  MAIL*  ALLO  CWD  STAT  XRMD  SIZE
<REIN*  MODE  MSND*  REST  XCWD  HELP  PWD  MDTM
<QUIT  RETR  MSOM*  RNFR  LIST  NOOP  XPWD
<Direct comments to ftp-bugs@ucbarpa.Berkeley.EDU.
UNIX.FLOWERS.COM>
```

REMOVE-DIRECTORY

REMOVE-DIRECTORY — Deletes a directory on the remote host. REMOVE-DIRECTORY is the same as RMDIR.

Format

REMOVE-DIRECTORY *dir*

Parameters

dir

Specifies the name of the directory to be removed.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you be logged in before using the REMOVE-DIRECTORY command.

Example

This example shows how to delete the "test" subdirectory from the remote host.

```
FLOWERS.COM>remove-directory test
<"USERS:[HOLMES.TEST]" Directory deleted
FLOWERS.COM>
```

RENAME

RENAME — Renames files on the remote host.

Format

```
RENAME file1 file2
```

Parameters

file1

Specifies the name of the file to be renamed.

file2

Specifies the new name of *file1*.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the RENAME command.

Example

This example shows how to rename COPY.COM to NEWCOPY.COM on the remote host.

```
FLOWERS.COM>rename Copy.com newcopy.com
<Old FILE renamed to USERS:[HOLMES]NEWCOPY.COM;1.
FLOWERS.COM>
```

RETAIN

RETAIN — Turns on, off, or toggles (the default) the retention of OpenVMS version numbers in file transfers. By default, version numbers are stripped from OpenVMS file names before they are sent over the network.

Format

RETAIN mode

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to enable retention of OpenVMS version numbers.

```
FTP>retain
[Transferred files will retain their version numbers]
FTP>
```

RM

RM — Deletes a file on the remote host. RM is a synonym for DELETE.

Format

RM *file*

RMDIR

RMDIR — Deletes a directory on the remote host. RMDIR is a synonym for REMOVE-DIRECTORY.

Format

RMDIR *dir*

SEND

SEND — Copies *local_file* on the local host to *remote_file* on the remote host. The current settings for type, mode, and structure are used during file transfers. SEND is the same as PUT.

Format

SEND *local_file remote_file*

Parameters

local_file

Specifies the name of the file on the local host to be copied.

remote_file

Specifies the destination file name on the remote host.

Qualifiers

/FDL

Sends a file in FDL format. When you create a file with the SEND /FDL qualifier, a file description language (FDL) file is created at the same time as the original file. The output file is converted to raw block format. When you retrieve a file with GET /FDL, the original format is restored using the attributes stored in the FDL file. If you do not use the /FDL qualifier with the GET command, the new raw block format is retained. In any case, the FDL file is retained and must be deleted independently. The /FDL qualifier provides compatibility with HP TCP/IP Services for OpenVMS (formerly UCX). The FDL file has the same name except the string FDL is appended to the end of the file name.

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the SEND command.

Example

This example shows how to transfer the file LOGIN.COM to the remote file FOO.COM.

```
FLOWERS.COM>send login.com foo.com
<VMS Store of ST_ROOT:[TMP]FOO.COM;12 started.
<Transfer completed. 2498 (8) bytes transferred.
```

SET

SET — Sets automatic login information for host.

Format

SET *host*

Parameters

host

Specifies the host for which you want to set automatic login information.

Qualifiers

/USER:username

Specifies the user name sent when a connection is made to *host*.

/PASSWORD:password

Specifies the password sent when a connection is made to *host*.

/ACCOUNT:account

Specifies the account is sent when a connection is made to *host*.

Description

When a connection to *host* is made, FTP uses the information set to automatically log in. This command is usually used in the `FTP . INIT` file to specify a list of hosts and their login information. If `FTP . INIT` contains passwords in clear text, it is imperative that you protect the file from access by other users. If you specify `/USER` but not `/PASSWORD`, an automatic login is attempted and, if necessary, a password prompt displayed.

Restrictions

Do not use this command when connected to a remote host.

USAGE NOTE

If you do not specify any qualifiers, any automatic login information is cleared.

Example

This example sets the user name and password for the host `DS . INTERNIC . NET`.

```
FTP>ds.internic.net /user:anonymous /pass:guest
```

SHOW-DIRECTORY

SHOW-DIRECTORY — Displays the current working directory on the remote host. **SHOW DIRECTORY** is the same as `PWD`.

Format

```
SHOW-DIRECTORY
```

Restrictions

- Use this command only when connected to a remote host.
- Most remote hosts require that you log in before using the `SHOW-DIRECTORY` command.

Example

This example shows how to retrieve the remote default directory.

```
FLOWERS.COM>show  
<"ST_ROOT: [TMP]" is current directory.  
FLOWERS.COM>
```

SITE

SITE — Specifies commands that are interpreted by the VSI TCP/IP FTP server for use on the server host.

Format

SITE *command*

Parameters

command

Selects a command from the following:

RMS RECSIZE <i>n</i>	Indicates a non-default record size for files transferred in IMAGE mode to the FTP server. Record size values can range from 1 to 32767; the default is 512 bytes.
SPAWN	Allows users to execute commands on the server host. The command must not require a terminal device, and must exit on completion. You cannot use this command during an anonymous FTP session.

SPAWN

SPAWN — Executes a single DCL command, or if entered without options, starts a subprocess with the same effect as PUSH. To return from DCL, use the LOGOUT command. If the IP \$DISABLE_SPAWN logical is set, SPAWN does not work.

Format

SPAWN [*command*]

Parameters

[*command*]

Specifies a command to execute. If you omit *command*, a DCL command line subprocess is created.

Qualifiers

/INPUT=file-spec

Specifies an input file to the command you enter with SPAWN.

/LOGICAL_NAMES

/NOLOGICAL_NAMES

Specifies that logical names and logical name tables are not copied to the subprocess.

/SYMBOLS

/NOSYMBOLS

Specifies that global and local names are not passed to the subprocess.

/WAIT

/NOWAIT

Returns control without waiting for the command to complete. Do not use this qualifier with commands that have prompts or screen displays.

/OUTPUT=file-spec

Specifies a file that retains the output of the command invoked with SPAWN. This qualifier only works when a single command is entered without creating a DCL subprocess. In addition, this qualifier is positional; you must enter it immediately after SPAWN or other qualifiers.

STATISTICS

STATISTICS — Turns on, off, or toggles (the default) STATISTICS mode. In STATISTICS mode, FTP displays, upon completion of file transfers, timing statistics about the transfer.

Format

If the logical `IP$FTP_STATISTICS_IN_HHMMSS` is defined with either 1, T, or Y, then the elapsed time displays in HH:MM:SS format if statistics are requested using the STATISTICS mode.

STATISTICS *mode*

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to enable STATISTICS mode.

```
FTP>statistics
[Transfer statistics printing is ON]
FTP>
```

STATUS

STATUS — Displays the status of the FTP server.

Format

STATUS [*data*]

Parameters

[*data*]

Sends this command data to the FTP server; data depends on the implementation of the FTP server. This parameter is optional.

Restrictions

Use this command only when connected to a remote host.

Example

```
FLOWERS.COM>status
<FLOWERS.COM VSI TCP/IP for OpenVMS FTP Server Process 10.5(nnn)
<User HOLMES is logged into directory ST_ROOT:[TMP]
<The current transfer parameters are:
<   MODE S
<   Stru O VMS
<   TYPE A N
<A connection is open to host FLOWERS.COM
<The data connection is CLOSED.
FLOWERS.COM
```

STREAM

STREAM — Turns on, off, or toggles (the default) the creation of binary output files as Stream_LF files.

Format

STREAM *mode*

Parameters

mode

Specifies ON, OFF, or TOGGLE.

Example

```
FLOWERS.COM>stream
[IMAGE files will be written as Stream_LF format]
FLOWERS.COM>
```

STRUCTURE

STRUCTURE — Sets the transfer structure to *structure*.

Format

STRUCTURE *structure*

Parameters

structure

Specifies a value of FILE, RECORD, or VMS.

- Use FILE (the default) when connecting to systems that do not support OpenVMS structure negotiation.
- Use RECORD to transfer files when you want to preserve the record boundaries.

- Use VMS to transfer files with arbitrary RMS attributes transparently. Transparent transfer is negotiated automatically between systems that support it. RMS semantics are passed along with the data.

Restrictions

Use this command only when connected to a remote host.

Example

```
FLOWERS.COM>stru r
Type:Ascii (Non-Print), Structure: Record, Mode: Stream
FLOWERS.COM>
```

TAKE

TAKE — Interprets FTP commands in a file. When the end of the file is encountered, the FTP command interpreter returns to its previous input source. You can nest TAKE commands up to ten levels deep.

Format

TAKE *file*

Parameters

file

Specifies the name of the file that contains commands to be interpreted.

Example

This example shows how to take commands from the file FTP.COMMANDS.

```
FTP>take ftp.commands
```

TENEX

TENEX — Changes the byte size for transferring binary files to or from a TOPS-20 system.

Format

TENEX

Restrictions

Use this command only when connected to a remote host.

Example

This example shows how to set the transfer type to TENEX.

```
FLOWERS.COM>tenex
```

Type: Logical-Byte (Byte Size 8), Structure: File, Mode: Stream
FLOWERS.COM>

TYPE

TYPE — Sets the transfer type to *type*.

Format

TYPE *type*

Parameters

type

Specifies a value of ASCII, BACKUP, BINARY, IMAGE, or LOGICAL-BYTE.

- Use TYPE ASCII (the default) for transferring text files.
- Use TYPE BACKUP to set the transfer type to IMAGE and write the local file with 2048-byte fixed length records. Use this command to transfer OpenVMS BACKUP save sets.
- Use TYPE BINARY to transfer binary files (same as TYPE IMAGE).
- Use TYPE IMAGE to transfer binary files (for example, .EXE).
- Use TYPE LOGICAL-BYTE to transfer binary files to or from a TOPS-20 machine.

Restrictions

Use this command only when connected to a remote host.

Example

This example shows how to set the type to transfer an image file.

```
FLOWERS.COM>type i
Type: Image, Structure: File, Mode: Stream
FLOWERS.COM>
```

USER

USER — Identifies you to the remote FTP server. USER is a synonym for LOGIN.

Format

USER *user* [*password*]

VERBOSE

VERBOSE — Turns on, off, or toggles (the default) VERBOSE mode. VERBOSE mode causes FTP to display all responses from the remote FTP server as they are received.

Format

VERBOSE *mode*

Parameters

mode

Specifies a value of ON, OFF, or TOGGLE.

Example

This example shows how to enable VERBOSE mode.

```
FTP>verbose
[Verbose reply printing is ON]
FTP>
```

VERSION

VERSION — Prints information about the FTP program version.

Format

VERSION

Example

This example shows how to print the FTP program version number.

```
FLOWERS.COM>version
FLOWERS.COM VSI TCP/IP for OpenVMS FTP user process 10.5(nnn)
FLOWERS.COM>
```

WINDOW-SIZE

WINDOW-SIZE — Displays or sets the TCP window size to be used on data transfers

Format

WINDOW-SIZE [*size*]

PARAMETER

[*size*]

Integer value to use for TCP window size.

Example

This example shows how to display the current TCP window size.

```
EXAMPLE.COM>window-size  
TCP window size: 32768  
EXAMPLE.COM>
```


Appendix C. TELNET Command Reference

The VSI TCP/IP TELNET utility uses the Internet-standard TELNET protocol to establish a virtual terminal connection between your terminal and a remote host. This appendix lists the commands you can use during a TELNET session.

Command Summary

Table C-1 lists the TELNET commands:

Table C.1. TELNET Command Summary

Command:	Description:
ABORT	Sends an ABORT OUTPUT sequence to the remote host.
ATTACH	Detaches the terminal from the calling process and reattaches it to another process.
ATTN	Sends an INTERRUPT PROCESS sequence to the remote host.
AYT	Sends an ARE YOU THERE sequence to the remote host.
BINARY	Attempts to negotiate binary (8-bit) mode with the remote system.
BREAK	Sends a BREAK sequence to the remote host.
BYE	Closes any open TELNET connection and exits to DCL.
CLOSE	Closes the TELNET connection.
CONNECT	Establishes a TELNET connection to a host.
CREATE-NTY	Connects the local end of a TELNET connection to an NTY pseudo-terminal device.
DEBUG	Displays TELNET option negotiations.
ECHO	Turns on or off remote host character echoing.
EXIT	Closes any open TELNET connection and exits to DCL. EXIT is the same as BYE and QUIT.
HELP	Displays help information for the specified TELNET command.
LOG-FILE	Enables or disables logging of the TELNET session.
PUSH	Starts and attaches a DCL subprocess.
QUIT	Closes any open TELNET connection and exits to DCL. QUIT is the same as EXIT.
SET ABORT-OUTPUT-CHARACTER	Sets the character that TELNET maps to the ABORT OUTPUT sequence.
SET ARE-YOU-THERE-CHARACTER	Sets the character that TELNET maps to the ARE YOU THERE sequence.
SET AUTO-FLUSH	Turns auto-flushing on or off.
SET BREAK-CHARACTER	Sets the character that TELNET maps to the BREAK sequence.
SET DEBUG	Enables or disables the display of TELNET option negotiations.

SET ERASE-CHARACTER-CHARACTER	Sets the character that TELNET maps to the ERASE CHARACTER sequence.
SET ERASE-LINE-CHARACTER	Sets the character that TELNET maps to the ERASE LINE sequence.
SET ESCAPE-CHARACTER	Sets the character that switches TELNET to command mode.
SET EXTENDED	Causes TELNET to go into extended command mode automatically whenever you type the TELNET ESCAPE character, Ctrl/^ by default.
SET INTERRUPT-PROCESS-CHARACTER	Sets the character that TELNET maps to the INTERRUPT PROCESS sequence.
SET LOCAL-FLOW-CONTROL	Specifies whether or not Ctrl/S and Ctrl/Q should be treated by the local terminal driver as XON and XOFF.
SET LOG-FILE	Enables or disables logging of the TELNET session.
SET REMOTE-USERNAME	Specifies the user name to which you want to log in using Kerberos.
SET UNIX-LINE-TERMINATOR	Causes TELNET to use the 4.3BSD UNIX end-of-line specification, Ctrl/NULL .
SPAWN	Executes a single DCL command, or if entered without options, starts a subprocess with the same effect as PUSH.
STATUS	Displays the status of the current TELNET connection and parameters.
TERMINAL-TYPE	Specifies a terminal type for the TELNET session.
VERSION	Displays the TELNET version number.

ABORT

ABORT — Sends an ABORT OUTPUT sequence to the remote host. If the remote host is running VSI TCP/IP, the TELNET ABORT OUTPUT sequence is treated as a **Ctrl/O**.

Format

ABORT

Restrictions

Use this command only in extended mode.

Example

This example sends the ABORT OUTPUT sequence to the remote system.

```
TELNET>abort
```

ATTACH

ATTACH — Detaches the terminal from the calling process and reattaches it to another process. Use the SPAWN SHOW PROCESS /SUBPROCESSES command to list the names of subprocesses. Use

the DCL LOGOUT command to return to the original process. If the IP\$DISABLE_SPAWN logical is enabled, ATTACH does not work.

Format

ATTACH *process-name*

Parameters

process-name

Specifies the name of a process to which you want your terminal attached. (Not all subprocesses can be attached; some testing may be required.)

ATTN

ATTN — Sends an INTERRUPT PROCESS sequence to the remote host. If the remote host is also running VSI TCP/IP, the TELNET INTERRUPT PROCESS sequence is treated as a **Ctrl/C**.

Format

ATTN

Restrictions

Use this command only in extended mode.

Example

This example sends the INTERRUPT PROCESS sequence to the remote system.

```
TELNET>attn
```

AYT

AYT — Sends an ARE YOU THERE sequence to the remote host. If the remote host is also running VSI TCP/IP, the ARE YOU THERE sequence is treated as a **Ctrl/T**.

Format

Note

AYT does not work if the terminal is not enabled for broadcasts. Invoke the DCL command SET TERMINAL /BROADCAST before using AYT if broadcasts have been disabled.

AYT

Example

This example shows how to ensure the host is still active.

```
TELNET>ayt
```

```
FNORD::_VTA81: 01:37:57 (DCL) CPU=00:00:01.83 PF=2298 IO=530 MEM=345
```

BINARY

BINARY — Attempts to negotiate binary (8-bit) mode with the remote system.

Format

```
BINARY
```

Restrictions

Use this command only in extended mode.

Example

```
TELNET>binary
```

BREAK

BREAK — Sends a BREAK sequence to the remote host. If the remote host is running VSI TCP/IP, the BREAK sequence is treated as a **Ctrl/C**.

Format

```
BREAK
```

Restrictions

Use this command only in extended mode.

Example

```
TELNET>break
```

BYE

BYE — Closes any open TELNET connection and exits to DCL. BYE is the same as EXIT.

Format

```
BYE
```

Example

```
TELNET>bye  
$
```

CLOSE

CLOSE — Closes the TELNET connection.

Format

CLOSE

Usage notes

If you specified the remote host in the DCL TELNET command, exit to DCL. If you connected to the remote host in TELNET command mode, return to general command mode.

On most remote hosts, closing the connection is seen as a modem-style terminal hangup. If the remote host is also running VSI TCP/IP and OpenVMS virtual terminals are enabled, the remote login session becomes detached.

Restrictions

Use this command only in extended mode.

Example

```
TELNET>close
```

CONNECT

CONNECT — Establishes a TELNET connection to a host. TELNET connections may be established using INTERNET protocols; the default is INTERNET.

Format

```
CONNECT [protocol] host [port]
```

Parameters

[protocol]

Specifies the protocol to use to establish the connection. The protocol is INTERNET (the default).

host

Specifies the host to which to establish the connection. With the INTERNET protocol, the host can be a name or a numeric IP address.

[port]

Specifies the remote port number or name to use for the connection. With the INTERNET protocol, the default is the TELNET port.

Restrictions

Do not use this command in extended mode.

Example

This example shows how to connect to a remote system.

```
TELNET>connect internet unix
Trying... Connected to UNIX.FLOWERS.COM
UNIX (unix.FLOWERS.com)
login:
```

CREATE-NTY

CREATE-NTY — Connects the local end of a TELNET connection to an NTY pseudo-terminal device. This device can be used by other applications such as KERMIT. This command includes the remote host and port number in the SHOW TERMINAL “remote port information” field.

Format

```
CREATE-NTY
```

Example

```
TELNET>create-nty
TELNET session now connected to _NTY3:
%DCL-I-ALLOC, _NTY3: allocated
$
```

DEBUG

DEBUG — Displays TELNET option negotiations.

Format

```
DEBUG [mode]
```

Parameters

[*mode*]

Specifies whether debugging is enabled (default) or disabled (OFF). Debug mode causes TELNET to display option negotiations between the local host and the foreign host.

Example

This example shows how to enable DEBUG mode.

```
TELNET>debug on
```

ECHO

ECHO — Turns on or off remote host character echoing.

Format

```
ECHO mode
```

Parameters

mode

Specifies whether the server handles character echoing. If you specify OFF, TELNET performs local character echoing. If you specify ON, the remote system performs the echoing.

Restrictions

Use this command only in extended mode.

Example

```
TELNET>echo off
```

EXIT

EXIT — Closes any open TELNET connection and exits to DCL. EXIT is the same as BYE and QUIT.

Format

```
EXIT
```

Example

This example shows how to exit TELNET.

```
TELNET>exit  
$
```

HELP

HELP — Displays help information for the specified TELNET command. Type HELP ? to see a list of HELP topics, or type HELP with no argument to see general information regarding TELNET.

Format

```
HELP [command]
```

Parameters

[*command*]

Specifies information about this command.

Example

```
TELNET>help  
HELP  
Displays help information for the specified TELNET command.  
Type HELP ? to see a list of HELP topics, or type HELP with  
no argument to see general information regarding TELNET.  
Format
```

```
HELP [command]
Additional information available:
ATTACH  BYE   CONNECT  DEBUG  EXIT   HELP   LOG-FILE
PUSH   QUIT  SET      SPAWN  STATUS  TERMINAL-TYPE
VERSION
Topic?
```

LOG-FILE

LOG-FILE — Enables or disables logging of the TELNET session. If you specify `log_file`, everything received by the local system from the remote system is copied into this file.

Format

```
LOG-FILE log_file
```

Parameters

log_file

Specifies a file to which to write a log of the TELNET session. If you do not specify a file, logging is enabled to the file `TELNET.LOG`. If you specify the file name `NONE`, logging is disabled.

Restrictions

LOG-FILE is not supported in 3270 or 5250 modes.

Example

This example shows how to enable TELNET output to be logged to the file `ST_TMP:FNORD.LOG`.

```
TELNET>log-file st_tmp:fnord.log
[Log file open (ST_TMP:<TMP>FNORD.LOG.1)]
TELNET>
```

PUSH

PUSH — Starts and attaches a DCL subprocess. If a parent process exists, attach to it. To return from DCL, use the `ATTACH` or the `LOGOUT` command. To switch back from a DCL subprocess, use the `ATTACH` command. If the `IP$DISABLE_SPAWN` logical is set, `PUSH` does not work.

Format

```
PUSH
```

QUIT

QUIT — Closes any open TELNET connection and exits to DCL. `QUIT` is the same as `EXIT`.

Format

```
QUIT
```

Example

This example shows how to exit TELNET.

```
TELNET>quit
$
```

SET ABORT-OUTPUT-CHARACTER

SET ABORT-OUTPUT-CHARACTER — Sets the character that TELNET maps to the ABORT OUTPUT sequence. The value set by this command is not the character passed to the remote host. The remote host receives an ABORT OUTPUT sequence; SET ABORT-OUTPUT-CHARACTER defines the key you press to tell TELNET to send an ABORT OUTPUT sequence. This character can also be set by invoking TELNET with the /ABORT_OUTPUT_CHARACTER qualifier.

Format

```
SET ABORT-OUTPUT-CHARACTER character
```

Parameters

character

Specifies which character sends the ABORT OUTPUT sequence to the TELNET server.

If you type the command without specifying character, it defaults to **Ctrl/O**.

Example

This example sets the ABORT OUTPUT character to **Ctrl/A**.

```
TELNET>set abort "^A"
[Abort Output character set to ^A]
TELNET>
```

SET ARE-YOU-THERE-CHARACTER

SET ARE-YOU-THERE-CHARACTER — Sets the character that TELNET maps to the ARE YOU THERE sequence. The value set by this command is not the character passed to the remote host. The remote host receives an ARE YOU THERE sequence; SET ARE-YOU-THERE-CHARACTER defines the key you press to tell TELNET to send an ARE YOU THERE sequence. This character can also be set by invoking TELNET with the /ARE_YOU_THERE_CHARACTER qualifier. The **ARE YOU THERE** sequence can be sent by pressing the ARE YOU THERE character or by issuing the TELNET AYT command.

Format

Note

The ARE YOU THERE sequence only displays an information line from the host if broadcasts are enabled for the terminal.

```
SET ARE-YOU-THERE-CHARACTER character
```

Parameters

character

Specifies which character sends the ARE YOU THERE sequence to the TELNET server.

If you type the command without specifying character, it defaults to **Ctrl/T**.

Example

This example sets the ARE YOU THERE character to **Ctrl/T**.

```
TELNET>set are-you-there "^T"  
[Are-You-There character set to ^T]  
TELNET>
```

SET AUTO-FLUSH

SET AUTO-FLUSH — Turns auto-flushing on or off. You can also set this mode by invoking TELNET with the /AUTOFLUSH qualifier.

Format

When you define an ABORT-OUTPUT character, enabling AUTO-FLUSH (SET AUTO-FLUSH ON) causes TELNET to flush any data which may be in the network buffers when the ABORT-OUTPUT character is typed. The TELNET client does this by sending a TIMING-MARK command to the TELNET server and discarding all data until one is received in response.

```
SET AUTO-FLUSH mode
```

Parameters

mode

Turns auto-flush ON or OFF. If you do not specify *mode*, it defaults to ON.

Example

This example sets the AUTO FLUSH option on.

```
TELNET>set auto-flush on  
TELNET>
```

SET BREAK-CHARACTER

SET BREAK-CHARACTER — Sets the character that TELNET maps to the BREAK sequence. The value set by this command is not the character passed to the remote host. The remote host receives a BREAK sequence; SET BREAK-CHARACTER defines the key you press to tell TELNET to send a BREAK sequence. You can also set this character by invoking TELNET with the /BREAK_CHARACTER qualifier.

Format

```
SET BREAK-CHARACTER character
```

Parameters

character

Specifies which character sends the BREAK sequence to the TELNET server.

If you type the command without specifying *character*, it defaults to **Ctrl/A**.

Example

This example sets the BREAK character to **Ctrl/A**.

```
TELNET>set break "^A"  
[Break character set to ^A]  
TELNET>
```

SET DEBUG

SET DEBUG — Enables or disables the display of TELNET option negotiations. You can also set this mode by invoking TELNET with the /DEBUG qualifier.

Format

```
SET DEBUG [mode]
```

Parameters

[*mode*]

Turns debugging ON or OFF. If *mode* is not specified, the default is ON.

Example

This example enables DEBUG mode.

```
TELNET>set debug on
```

SET ERASE-CHARACTER-CHARACTER

SET ERASE-CHARACTER-CHARACTER — Sets the character that TELNET maps to the ERASE CHARACTER sequence. The value set by this command is not the character passed to the remote host. SET ERASE-CHARACTER-CHARACTER defines the key you press to tell TELNET to send an ERASE CHARACTER sequence. This character can also be set by invoking TELNET with the /ERASE_CHARACTER_CHARACTER qualifier.

Format

```
SET ERASE-CHARACTER-CHARACTER character
```

Parameters

character

Specifies which character sends the ERASE CHARACTER sequence to the TELNET server.

If you type this command without specifying character, it defaults to **DEL**.

Example

This example sets the ERASE CHARACTER to **Ctrl/A**.

```
TELNET>set erase "^A"  
[Erase character set to "^A"]  
TELNET>
```

SET ERASE-LINE-CHARACTER

SET ERASE-LINE-CHARACTER — Sets the character that TELNET maps to the ERASE LINE sequence. The value set by this command is not the character passed to the remote host; SET ERASE-LINE-CHARACTER defines the key you press to tell TELNET to send an ERASE LINE sequence. This character can also be set by invoking TELNET with the /ERASE_LINE_CHARACTER qualifier.

Format

```
SET ERASE-LINE-CHARACTER character
```

Parameters

character

Specifies which character sends the ERASE LINE sequence to the TELNET server.

If you type the command without specifying character, it defaults to **Ctrl/U**.

Example

This example sets the ERASE LINE character to **Ctrl/U**.

```
TELNET>set erase-line "^U"  
[Escape Line character set to ^U]  
TELNET>
```

SET ESCAPE-CHARACTER

SET ESCAPE-CHARACTER — Sets the character that switches TELNET to command mode. This character can also be set by invoking TELNET with the /ESCAPE_CHARACTER qualifier.

Format

```
SET ESCAPE-CHARACTER character
```

Parameters

character

Specifies which character is used as the TELNET ESCAPE character.

If you type the command without specifying character, it defaults to **Ctrl/**.

Example

This example sets the **ESCAPE** character to **Ctrl/**.

```
TELNET>set escape "^\  
[Escape character set to ^\  
TELNET>
```

SET EXTENDED

SET EXTENDED — Causes TELNET to go into extended command mode automatically whenever you type the TELNET ESCAPE character, **Ctrl/** by default.

Format

SET EXTENDED *mode*

Parameters

mode

Turns extended mode ON or OFF. If you do not specify *mode*, it defaults to ON.

Example

This example enables the extended option.

```
TELNET>set extended on  
TELNET>
```

SET INTERRUPT-PROCESS-CHARACTER

SET INTERRUPT-PROCESS-CHARACTER — Sets the character that TELNET maps to the INTERRUPT PROCESS sequence. The value set by this command is not the character passed to the remote host. The remote host receives an INTERRUPT PROCESS sequence; **SET INTERRUPT-PROCESS-CHARACTER** defines the key you press to tell TELNET to send an INTERRUPT PROCESS sequence. You can also set this character by invoking TELNET with the `/INTERRUPT_PROCESS_CHARACTER` qualifier.

Format

SET INTERRUPT-PROCESS-CHARACTER *character*

Parameters

character

Specifies which character sends the INTERRUPT PROCESS sequence to the TELNET server.

If you type the command without specifying character, it defaults to **Ctrl/C**.

Example

This example sets the INTERRUPT PROCESS character to **Ctrl/C**.

```
TELNET>set interrupt-process "^C"  
[Interrupt Process character set to ^C]  
TELNET>
```

SET LOCAL-FLOW-CONTROL

SET LOCAL-FLOW-CONTROL — Specifies whether or not **Ctrl/S** and **Ctrl/Q** should be treated by the local terminal driver as XON and XOFF. You can also set this mode by invoking TELNET with the /LOCAL_FLOW_CONTROL qualifier.

Format

Use of this qualifier causes a more responsive XOFF, which helps prevent data loss, but the remote system is unable to see any **Ctrl/S** characters.

The default under the VSI TCP/IP TELNET utility is to use the current setting of the OpenVMS terminal characteristic TT\$_TTSYNC (set by the DCL command SET TERMINAL/TTSYNC), unless the remote host supports the TOGGLE-FLOW-CONTROL TELNET option. In that case, the LOCAL-FLOW-CONTROL option is set automatically by the TELNET server.

```
SET LOCAL-FLOW-CONTROL mode
```

Parameters

mode

Turns local flow control ON or OFF. If *mode* is not specified, it defaults to ON.

Example

This example enables local processing of **Ctrl/S** and **Ctrl/Q**.

```
TELNET>set local-flow on  
TELNET>
```

SET LOG-FILE

SET LOG-FILE — Enables or disables logging of the TELNET session. You can also set a log file by invoking TELNET with the /LOG_FILE qualifier.

Format

```
SET LOG-FILE log_file
```

Parameters

log_file

Specifies a file to which to write the log of the TELNET session. If you specify *log_file*, everything received by the local system from the remote system is copied into this file. If you do not specify a file, logging is enabled to the file `TELNET.LOG`. If you specify the file name `NONE`, logging is disabled.

Restrictions

log_file is not supported in 3270 and 5250 modes.

SET REMOTE-USERNAME

`SET REMOTE-USERNAME` — Specifies the user name to which you want to log in using Kerberos. If you are not logging in with the `/AUTH` qualifier, TELNET prompts you to supply a user name.

Format

```
SET REMOTE-USERNAME username
```

Parameters

username

Specifies the user name to which you want to log in using Kerberos.

SET UNIX-LINE-TERMINATOR

`SET UNIX-LINE-TERMINATOR` — Causes TELNET to use the 4.3 BSD UNIX end-of-line specification, `Ctrl/NULL`. You can also set this mode by invoking TELNET with the `/UNIX` qualifier. This command is useful when using TELNET to connect to 4.3 BSD UNIX systems whose TELNET server does not conform to the TELNET specification.

Format

```
SET UNIX-LINE-TERMINATOR mode
```

Parameters

mode

If *mode* is `ON`, TELNET uses the 4.3BSD UNIX end-of-line specification, `Ctrl/NULL`.

If *mode* is `OFF` (the default), TELNET uses the standard end-of-line specification, `Ctrl/LF`.

Example

This example enables use of a 4.3BSD UNIX-style line terminator.

```
TELNET>set unix-line-terminator on
TELNET>
```

SPAWN

SPAWN — Executes a single DCL command, or if entered without options, starts a subprocess with the same effect as PUSH. To return from DCL, use the LOGOUT command. If the IP \$DISABLE_SPAWN logical is set, SPAWN does not work.

Format

SPAWN [*command*]

Parameters

[*command*]

Specifies a command to execute. If you omit command, a DCL command line subprocess is created.

Qualifiers

/INPUT=file-spec

Specifies an input file to the command you enter with SPAWN.

/LOGICAL_NAMES

/NOLOGICAL_NAMES

Specifies that logical names and logical name tables are not copied to the subprocess.

/SYMBOLS

/NOSYMBOLS

Specifies that global and local names are not passed to the subprocess.

/WAIT

/NOWAIT

Returns control without waiting for the command to complete. Do not use this qualifier with commands that have prompts or screen displays.

/OUTPUT=file-spec

Specifies a file that retains the output of the command invoked with SPAWN. This qualifier only works when a single command is entered without creating a DCL subprocess. In addition, this qualifier is positional; you must enter it immediately after SPAWN or other qualifiers.

STATUS

STATUS — Displays the status of the current TELNET connection and parameters.

Format

STATUS

Example

```
TELNET>status
This is FNORD.FOO.COM
Connected to host CONE.FOO.COM.
Remote host is echoing
Host is not sending binary
Client is not sending binary
NO Abort Output character
NO Interrupt Process character
NO Are-You-There character
NO Break Character character
NO Erase Character character
NO Erase Line character
Escape Character character is '^ ^'
Normal End Of Line mapping
Local Flow control
No log file
Terminal type is vt100
Remote host status reply:
FNORD::_VTA12: 16:40:02      (DCL) CPU=00:00:03.21 PF=686 IO=196 MEM=514
```

TERMINAL-TYPE

TERMINAL-TYPE — Specifies a terminal type for the TELNET session.

Format

```
TERMINAL-TYPE type
```

Parameters

type

Refer to RFC-1340 for a list of possible terminal types. RFCs are provided on the VSI TCP/IP CD-ROM. VSI TCP/IP TELNET permits you to specify any terminal type, even if the terminal type is not listed in the RFC. The TERMINAL-TYPE command has the same effect as invoking TELNET with the /TERMINAL_TYPE qualifier.

Example

```
TELNET>terminal-type dec-vt220
```

VERSION

VERSION — Displays the TELNET version number.

Format

```
VERSION
```

Example

```
TELNET>version
```

This is VSI TCP/IP for OpenVMS K5-TELNET V10.5(13)
TELNET>

Appendix D. TFTP Command Reference

The VSI TCP/IP TFTP utility uses the Internet-standard Trivial File Transfer Protocol (TFTP) to transfer files between the local host and a remote host. This appendix describes the commands you can use during a TFTP session.

Command Summary

Table D-1 lists the TFTP commands:

Table D.1. TFTP Command Summary

Command	Description
CONNECT	Specifies the name or address of the TFTP server.
GET	Transfers remote_file on the remote host to local_file on the local host.
PUT	Copies local_file on the local host to remote_file on the remote host.
QUIT	Terminates TFTP and returns to DCL.
REXMT	Specifies the amount of time TFTP waits for a response to arrive before retransmitting a request. The default value for the retransmission timer is five seconds.
STATUS	Displays the current TFTP status.
TIMEOUT	Sets the amount of time TFTP waits for a response from the server before aborting a transfer.
TRACE	Toggles TFTP packet tracing.

CONNECT

CONNECT — Specifies the name or address of the TFTP server. This value overrides the command line host specification. You may use either a symbolic host name or an Internet address.

Format

This command does not cause any network action, but sets the destination address for the TFTP UDP packets. If the host cannot be reached, an error is not displayed until a GET or PUT command is attempted.

```
CONNECT host
```

Parameters

host

Specifies a remote host.

Example

This example connects to the host FLOWERS.COM.

```
TFTP>CONNECT FLOWERS.COM
```

GET

GET — Transfers *remote_file* on the remote host to *local_file* on the local host.

Format

You must specify an absolute path name (device, directory, and file name) for *remote_file*, and typically the server requires the file to be world-readable. If you do not specify *local_file*, the default is the same name and directory as *remote_file*.

```
GET remote_file [local_file]
```

Parameters

remote_file

Specifies the name of the input file on the remote host.

[*local_file*]

Specifies the name of the output file on the local host.

Example

This example retrieves the file USERS:[SMITH]LOGIN.COM and stores it in the file LOGIN.COM.

```
TFTP>get users:[smith]login.com login.com
Received 2361 bytes in 1 seconds.
TFTP>
```

PUT

PUT — Copies *local_file* on the local host to *remote_file* on the remote host.

Format

You must use absolute pathnames on *remote_file*, and typically the server requires the file to already exist and be world-writable (W:W). If you do not specify *remote_file*, it defaults to the same name and directory as *local_file*.

```
PUT local_file [remote_file]
```

Parameters

local_file

Specifies the name of the input file on the local host.

[remote_file]

Specifies the name of the output file on the remote host.

Example

This example transfers SYS\$LOGIN:LOGIN.COM to the remote file specification "/tmp/foo".

```
TFTP>put sys$login:login.com /tmp/foo
Sent 2361 bytes in 1 second.
TFTP>
```

QUIT

QUIT — Terminates TFTP and returns to DCL.

Format

quit

Example

```
TFTP>quit
$
```

REXMT

REXMT — Specifies the amount of time TFTP waits for a response to arrive before retransmitting a request. The default value for the retransmission timer is five seconds.

Format

REXMT *seconds*

Parameters

seconds

Sets the TFTP retransmission timer to the specified number of seconds.

Example

This example sets the TFTP retransmission timer to 10 seconds.

```
TFTP>rexmt 10
```

STATUS

STATUS — Displays the current TFTP status.

Format

STATUS

Example

This example shows how to display TFTP status after a connection has been made to FLOWERS.COM. All values shown are the defaults.

```
TFTP>status
Connected to FLOWERS.COM.
Mode: octet Tracing: off
Rexmt-interval: 5 seconds, Max-timeout: 25 seconds
TFTP>
```

TIMEOUT

TIMEOUT — Sets the amount of time TFTP waits for a response from the server before aborting a transfer.

Format

The REXMT command controls how often the request is retransmitted. The default value for the maximum timeout is 25 seconds.

TIMEOUT *seconds*

Parameters

seconds

Specifies the number of seconds for the maximum timeout allowed per TFTP packet.

Example

This example shows how to set the maximum timeout to 50 seconds.

```
TFTP> timeout 50
TFTP>
```

TRACE

TRACE — Toggles TFTP packet tracing.

Format

trace

Example

This example shows how to enable TFTP packet tracing. Issue the command a second time to disable packet tracing.

```
TFTP>trace
Packet tracing on.
TFTP>
```

This example shows a transfer with packet tracing enabled.

```
get use2s:[smith]login.com .com

sent LOCALHOST.69      RRQ <file=users:[smith]login.com, mode=octet>
received LOCALHOST.69  DATA <block=1, 512 bytes>
sent LOCALHOST.69      ACK <block=1>
received LOCALHOST.69  DATA <block=2, 512 bytes>
sent LOCALHOST.69      ACK <block=2>
received LOCALHOST.69  DATA <block=3, 512 bytes>
sent LOCALHOST.69      ACK <block=3>
received LOCALHOST.69  DATA <block=4, 512 bytes>
sent LOCALHOST.69      ACK <block=4>
received LOCALHOST.69  DATA <block=5, 313 bytes>
Received 2361 bytes in 2 seconds.
TFTP>
```


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