DFU V2.7-A

DFU Disk / File Utilities for OpenVMS VAX and Alpha

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1 Introduction

The Disk / File utilities is a tool developed to help finding and solving disk , directory and file problems. The usage of low-level VMS-I/O features have resulted in a powerfull and high-performance utility. Also, DFU provides many features which are not available with normal DCL commands.

DFU supports all types of disk sets which comply to the VMS ODS-2 standard such as volume sets, stripe sets, shadow sets and RAID sets, and combinations of these. Spiralog disks are NOT supported

DFU also supports the new Extended File Specifications (also known as ODS-5) which is introduced in VMS 7.3 (Alpha-only).

DFU is fully Year-2000 compliant.

1.1 Support on DFU

Although there is no official support on DFU you may mail questions/remarks/bug reports to the author via internet at:

ton.dorland@compaq.com.

1.2 General description

DFU provides the following functions (in alphabetical order) :

- DEFRAG : This function allows simple defragmentation of a file or files.
- DELETE : This function allows either a delete by file-id, or a fast delete of a complete directory or directory tree with all its subdirectories.
- DIRECTORY : This function has 8 options :
  1. COMPRESS a directory
  2. DUMP a directory block by block
  3. CREATE a directory with a preallocated size
  4. REBUILD_MFD rebuilds the MFD (000000.dir) directory
  5. RECOVER a corrupted directory
  6. Search all directories on the disk for files which have multiple versions
  7. Search all directories on the disk for alias file entries
  8. Search all directories on the disk for empty directories

- REPORT : Generates a file and free space report for a disk. Also a disk space usage report, based on UIC/Identifier, can be generated, even on a disk which has disk quota disabled.
- SEARCH : Look up files on a disk by specific file attributes (eg. files sizes, dates, ownership, and so on)
- SET : This functions allows setting of vitually all possible file attributes.
- UNDELETE : A safe file recovery function.
- VERIFY : This function performs a fast disk structure verification and can optionally repair certain disk structure errors (comparable with ANALYZE/DISK/REPAIR).

Each function is described in detail in the corresponding chapter.

DFU is supported on OpenVMS V6.2 through V7.3 (VAX and Alpha).

1.3 New features and bugfixes of V2.7-A

This version of DFU offers some improved and new features, as well as a couple of bugfixes. If you are using DFU on VMS 7.2/7.3 it is strongly recommended to install this version.

The table below lists all new features :

- The performance on DELETE/DIR/TREE has been improved by some 30%.
- DIR : Added DIR/REBUILD_MFD qualifier to fix a broken MFD (000000.DIR) directory.
- New SEARCH qualifiers :
  1. /ORGANIZATION=(INDEXED | SEQUENTIAL | RELATIVE | DIRECT) : List all files with RMS Organization Indexed, Sequential, Relative or Direct.
  2. /NAME_TYPE=(ODS2 | ISL1 | UCS2): search for files with ODS2 , Iso-Latin-1 or Unicode name type.
- SET : /(NO)BCK to set file(s) to (NO)BACKUP.

The following bugs and problems are fixed :

- Several ACCVIO's bugs have been fixed:
  1. A rare situation where we had an empty file name string
  2. Very large disks with low cluster sizes on VMS 7.2; this results in larger BITMAP.SYS files which could crash DFU
  3. With very long device names (eg through a logical name) VERIFY could crash
- Under rare circumstances a directory could become corrupt during a compress operation.

- DELETE/DIRECTORY did not handle files correctly when the extension was '.DIRxxx'. DFU erroneously handled such files as directories.
- DELETE/DIRECTORY did not handle files correctly when the filename contained a space (ODS5 only). The result was a 'File not found' error when trying to delete such files.
- Indirect input files were were not always read in correctly. This resulted in 'File not found' errors.

1.4 Restrictions and Parameters

The DFU program has a few restrictions :

- DFU can not handle volume sets with more than 32 members.

The following minimum process quotas are recommended for DFU usage:

- WSQUOTA : 1500
- WSEXTENT : 3000
- DIOLM : 40
- ASTLM : 40
- FILLM : 40
- BYTLM : 30000
- PGFLQUOTA : 30000

If you use DFU on volume sets with a large number of members you may need to increase the SYSGEN parameter CHANNELCNT.

If you use the directory command on very large directory files (> 1000 blocks) and run into errors you may need to increase the following parameters:

- WSQUOTA at least 1000 + size-of-largest directory file
- WSEXTENT : WSQUOTA + at least 1000
- CTLPAGES (SYSGEN parameter) : at least 100
- WSMAX (SYSGEN parameter) : at least WSEXTENT

Do not change parameters unless you run into errors such as EXCEEDED QUOTA or INSUFFICIENT WORKING SET LIMITS.

1.5 Restrictions on FAST-IO features

VMS 7.1 introduced a way to improve I/O performance, called FAST-IO. This feature does only work on Alpha. DFU will try to perform directory processing using FAST-IO. If this fails DFU will switch back to 'normal' I/O. To enable FAST-IO the following conditions must be met:

- The user must have the identifier VMS$BUFFER_OBJECT_USER granted.
- There must be sufficient free Buffer object space. This is governed by the SYSGEN parameter MAXBOBMEM. DFU may require up to 1000 MAXBOBMEM pages.

If DFU can use FAST-IO then commands such as DIR/ALIAS, DIR/VERSION and VERIFY/DIR will gain a 10-15% performance improvement.

2 Using DFU

This chapter describes the installation procedure and other actions which must be taken to run DFU.

2.1 Installation procedure

DFU must be installed with the PRODUCT INSTALL utility. During the installation PRODUCT INSTALL does the following:

- Moves the documentation to SYS$HELP (Optional)
- Relinks DFU
- Creates the DFU_ALLPRIV identifier needed to perform the special privileged functions. (See chapter 2.2)

The DFU utility in fact contains just 2 files :

1 SYS$SYSTEM:DFU.EXE : the DFU program

2 SYS$HELP:DFUHLP.HLB : the on-line help file

The installation no longer offers an opportunity for private installation. If you don't want DFU to be available systemwide you must manually move DFU.EXE and the help file to your private directory.

To install DFU log in into a privileged account. Next, copy the .PCSI installation kit to disk:[directory] (may be anywhere on your system). Note that there are two different kits, one for the VAX and one for the Alpha architecture, named DEC-VAXVMS-DFU-V0207-A-1.PCSI and DEC-AXPVMS-DFU-V0207-A-1.PCSI. Next enter the following command:

```
$ Product Install DFU/SOURCE=disk:[directory]

The following product has been selected:
DEC VAXVMS DFU V2.7-A

Do you want to continue? [YES]
```

If you enter YES the installation will proceed :

```
*** DEC VAXVMS DFU V2.7-A: Disk and File Utilities for OpenVMS

    Do you want all the default values for this product? [YES]
```

If you enter YES DFU will be installed with all manuals. If you enter NO you will be prompted for the manuals you want to install. Finally, Product Install will continue with the installation :

```
%PCSIUI-I-DONEASK, execution phase starting
The following product will be installed:
DEC VAXVMS DFU V2.7-A

%PCSI-I-VOLINFO, estimated space information for volume DISK$OPENVMSVAX
-PCSI-I-VOLSPC, 93 required; 373793 available; 373700 net

Portion Done: 0%...10%...20%...30%...70%...80%...100%

The following product has been installed:
DEC VAXVMS DFU V2.7-A
```

If you installed DFU system wide you may manually execute SYS$STARTUP:DFU$STARTUP.COM on any node in the cluster. Executing DFU$STARTUP.COM adds DFU.EXE to the installed file list and thus improves performance. if you want DFU Installed each time the system boots you must add the command @SYS$STARTUP:DFU$STARTUP to the file SYS$STARTUP:SYSTARTUP_VMS.COM.

Next you must grant any DFU user including yourself the DFU_ALLPRIV identifiers if they must be able to use all DFU functions. See chapter 2.2 for the meaning of this identifier.

2.2 Security and access

DFU has some functions which must not be made available for general usage. Therefore DFU has a certain group of commands which require the user to be granted the DFU_ALLPRIV qualifier. The DFU_ALLPRIV identifier is created during the installation procedure. To enable a user to perform these special functions the system manager must grant this identifier as follows :

```
$ mc authorize
UAF> grant/id DFU_ALLPRIV username
```

If the DFU_ALLPRIV identifier is not granted then the functions listed below cannot be performed :

1 DEFRAG

2 DELETE/FILE

3 SPAWN

4 UNDELETE

5 VERIFY/FIX and VERIFY/REBUILD

Note that this behaviour is different from previous versions of DFU. Some commands which required the DFU_ALLPRIV identifier on previous DFU versions have been removed from the list above. It is highly recommended that the DFU_ALLPRIV identifier is only granted to a limited number of users.

All DFU functions need SYSPRV or BYPASS privilege.

IMPORTANT *** IMPORTANT *** IMPORTANT

Please note that the DFU$STARTUP.COM procedure installs DFU.EXE with BYPASS privilege. Because of the new SPAWN command you must not grant non-privileged users the DFU_ALLPRIV identifier. Otherwise they can get the BYPASS privilege simply by using the SPAWN command. As a workaround you can change the DFU$STARTUP.COM procedure to remove the /BYPASS privilege from the INSTALL command.

2.3 Running DFU

To run DFU you can enter :

```
$ RUN disk:[mydir]DFU
```

or (if DFU is installed systemwide):

```
$ MC DFU
```

You can also define and use a symbol for DFU as follows:

```
$ DFU == "$disk:[dir]DFU"
$ DFU
```

DFU now prompts with :

```
    Disk and File Utilities for OpenVMS DFU V2.7-A
    Freeware version
    Copyright (C) 2000 COMPAQ COMPUTER Corporation

DFU>
```

You can now enter DFU commands. HELP gives you online help. After each command DFU returns to the DFU> prompt. You can recall and edit commands, just as with DCL (20 commands will be stored in the recall buffer). Use EXIT or CTRL/Z to leave DFU. If you use a symbol for DFU, you also process a single command and return to DCL immediately:

```
$DFU SEARCH disk/qualifiers
```

During a DFU run, you can interrupt DFU with CTRL/C or CTRL/Y. These interrupts are caught by DFU to allow a correct rundown of the current command. It may therefore take some time before DFU responds to a CTRL/C or Y interrupt.

2.4 Using an indirect file list

There are 3 commands, DIRECTORY, DEFRAG and SET which accept an indirect file as input parameter. This is achieved by using the @ sign. An indirect file is a file containing a list of valid filenames (each line in such a file must contain exactly one filename). Such indirect files can be the output file of the DFU Search command eg.:

```
$ DFU
DFU> SEARCH mydisk/CHAR=DIRECTORY/OUTPUT=x.x
DFU> DIRECTORY/COMPRESS @x.x
```

3 The SMG output interface

DFU uses SMG (Screen management routines) to perform output for an interactive DFU session. This chapter describes the layout of the DFU screen, the special commands used only in the SMG interface and other items with respect to the SMG interface.

3.1 Enabling/Disabling SMG

DFU automatically selects SMG output if you run an interactive DFU session on a terminal or workstation which supports SMG. In a batch job or a non-DEC terminal DFU will use normal line oriented output. You can explicitly disable SMG by defining the logical DFU$NOSMG to any value.

3.2 Automatic switching between SMG and Line mode

You may prefer to perform interactive DFU sessions in SMG mode, and single DFU commands in normal line mode. This can be done by using the command procedure listed below:

```
$! Procedure to switch beteen SMG and line mode
$ DFU = "$DFU"
$ if p1 .eqs. ""
$ then
$!Interactive session
$ define/user sys$input sys$command
$ dfu
$ else
$!Single command so disable SMG
$ define/user dfu$nosmg x
$ dfu 'p1' 'p2' 'p3' 'p4' 'p5' 'p6' 'p7' 'p8'
$ endif
$ exit
```

3.3 Layout of the SMG screen

After starting DFU the screen looks as follows :

The SMG output interface

```
+-----------------------< DFU V2.7-A (Freeware) >---------------------------+
|                                                                            |
|     Disk and File Utilities for OpenVMS DFU V2.7-A                         |
|     Freeware version                                                       |
|     Copyright © 2000 COMPAQ COMPUTER Corporation                           |
|                                                                            |
|     DFU functions are :                                                    |
|                                                                            |
|     DEFRAGMENT : Defragment files                                          |
|     DELETE     : Delete files by File-ID; delete directory (trees)         |
|     DIRECTORY  : Manipulate directories                                    |
|     REPORT     : Generate a complete disk report                           |
|     SEARCH     : Fast file search                                          |
|     SET        : Modify file attributes                                    |
|     UNDELETE   : Recover deleted files                                     |
|     VERIFY     : Check and repair disk structure                           |
|                                                                            |
|                                                                            |
+---------------------------------Statistics---------------------------------+
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+
 DFU>
```

This screen is divided into 3 sections:

- Main Screen : the top part of the screen is used for the output from DFU commands. Also broadcast messages are send to this window.
- Statistics : the lower part contains statistics from the current command. During most of the commands this screen will contain a progress indicator and a status for the current command.
- DFU prompt : the bottom line is used as the input command line.

3.4 Special Screen commands

In SMG mode the following keys perform special functions :

- DO : invokes a subprocess (same as the SPAWN command)
- HELP or PF2 : invokes a special SMG window for the help command.
- CTRL/W : redraws the screen
- PF4 : creates a screen dump into the file DFU_SCREEN.TXT
- PREV SCREEN : Scrolls back the output screen.
- NEXT SCREEN : Scrolls forward the output screen
- INSERT HERE : Scrolls back one line
- REMOVE : Scrolls forward one line
- SELECT : Toggles between 80 and 132 columns.

Although only some 20 lines are visible in the output (main) screen DFU in fact remembers 500 output lines. You can scroll back and forward through one screen with the NEXT and PREV SCREEN keys, and one line with the REMOVE and INSERT HERE keys. At the beginning of each new DFU command these lines are cleared.

If you execute a command which produces a lot of output, you can paginate the output by using the /PAGE qualifier.

On a workstation with DECwindows/Motif you can change the DECterm size to be more than the standard 24 lines. DFU's SMG screen will automatically adjust to the screen size of such a DecTerm.

3.5 Side effects

There are a few side effects when using SMG mode. CTRL/C and CTRL/Y are catched but not echoed. Also all broadcast messages are trapped and will be displayed in the main screen at the end of the current DFU command. Sometimes this may slightly disrupt the main screen, which can be repaired with the CTRL/W key.

Further, during the execution of a DFU command the cursor will disappear. After the command finishes the cursor will reappear at the DFU> prompt.

4 DFU basics

Note : this chapter is meant for first time users of DFU. If you already used DFU before you may probably skip this chapter.

This chapter gives a brief overview of the commands which can be used with DFU, and how they can provide the system manager with the necessary information.

One of most common actions by a system manager is trying to locate specific files eg. files with a certain file size. Although a lot can be done with the VMS DIRECTORY command this can be a time consuming process, especially if the complete disk must be scanned. The SEARCH command of DFU is exactly meant for this situation. It gives a very quick list of specific files, with their size, and if needed the number of file fragments. Some useful SEARCH commands are :

```
DFU> SEARCH disk/SIZE=MINIMUM=1000 (files > 1000 blocks)
DFU> SEARCH disk/IDENT=SYSTEM (files owned by SYSTEM)
DFU> SEARCH disk/FRAGMENT=MINIMUM=10 (files with at least 10 fragments)
DFU> SEARCH disk/CHAR=MARKED (all files marked for delete)
DFU> SEARCH disk/CREATED=SINCE=YESTERDAY (all files created since YESTERDAY)
```

Of course these qualifiers can be combined to narrow the search. As the SEARCH command scans INDEXF.SYS, not directories, the output generated by SEARCH may look a bit random (but it is just the order in which the file headers are in the INDEXF.SYS file). To smooth the output use the /SORT qualifier.

Another important action for a system manager is to gather some overall disk information, such as number of files, free space statistics and fragmentation information. The REPORT command will generate such a disk report. To get individual disk space usage information the /USAGE qualifier can be used. This will work even if there is no disk quota enabled on the disk.

At regular intervals a system manager may need to check a disk with ANALYZE/DISK. The DFU VERIFY command provides more or less the same functionality but many times faster. The /FIX qualifier provides some REPAIR options which (unlike ANALYZE/DISK/REPAIR) do NOT lock the disk, and thus do not interfere with other disk operations. However, the disk can be rebuilt completely by using the /REBUILD qualifier.

Occasionaly a user will delete the wrong file, leaving the system manager or operator with the tedious task of restoring the file from a backup set. The UNDELETE command may be able to recover the file if it has not yet been overwritten with a new one. Much care has been taken to make this command as safe as possible; therefore no disk corruptions will be the result of an UNDELETE. If DFU encounters a problem with a deleted file it will refuse to UNDELETE it.

Another type of typical system manager problems deals with directories. The DFU command DIRECTORY can handle such problems. DIRECTORY can generate reports about empty directories (/EMPTY qualifier) or directories which contain files with a certain number of versions (/VERSION=n qualifier). Also, directories may become internally fragmented. This can be quickly solved with the /COMPRESS qualifier.

A second problem with directories is in deleting a directory with many files. This may take several hours using a DCL DELETE *.* command. This problem is solved by using DFU's DELETE/DIRECTORY command which can delete large directories some 10 times faster than the normal DELETE command does. Also, using DELETE/DIR/TREE will delete a complete directory tree with just one command.

The last 2 commands deal with individual files. SET allows settings of some special file attributes. Since VMS V6.0 this functionality is also provided by the DCL SET FILE/ATTRIBUTE command, but DFU's SET offers some more options. The DEFRAG command is an interface to the MOVEFILE function offered by VMS 5.5 and higher. This allows a simple defragmentation of individual files.

The next chapters gives a detailed description of each individual DFU command.

5 ODS-5 features

VMS 7.2 introduces an extension on the current ODS2 file system, called the Extended File Specifications, or ODS-5. This feature is available only on Alpha systems. Also, VMS 7.2 adds support for 255 levels of subdirectories. This is often called deep-directory support. Both features are now fully supported by DFU V2.7-A. There is no need to perform any special action to execute DFU commands on ODS-5 disks. Nevertheless the following points are worth to be considered before using DFU on VMS 7.2 and ODS-5 disks:

1 It is highly recommended to add the following command to LOGIN.COM :

```
$ SET PROCESS/PARSE=EXTENDED
```

This allows easy usage of the new file naming scheme (such as lower-case character, multiple dots in a file name).

2 File names can become large, either trough the file name, or because we can have 255 levels of subdirectories. A filename longer than 255 characters will be abbreviated into a so-called DID-ed name.

A DID-ed name looks like 'device:[x,y,z]file.ext'. As can be seen the directory string has been replaced by the file id (x,y,z) of the parent directory.

6 DEFRAG

This chapter describes the DEFRAG command with the related parameters and qualifiers.

6.1 Description

The DEFRAG command can be used to defragment a single file or a group of files. You can also enter an indirect command file containing a list of files. This feature allows you to create an output file with SEARCH and use that as an input to DEFRAG.

DEFRAG makes use of the file-primitive MOVEFILE function. Therefore files which are open, or which are marked NOMOVE will not be DEFRAGmented.

6.2 Error messages

The most common errors returned by DEFRAG are :

- ACCONFLICT: File is open by another user
- DEVICEFULL: Device has not enough contiguous free space to move the entire file
- FILNOTACC: File has been set to NOMOVE.
- FILENUMCHK: You tried to move a reserved file (eg INDEXF.SYS).
- RMS Errors: Almost always caused by an invalid or wrong file specifcation.

DEFRAG

Defragment a file or a list of files on the disk.

FORMAT **DEFRAG** *file1,file2,@file...*

PARAMETERS ***file1,file2,@file...***

The file(s) to be defragmented. You can also use an indirect command file (@file) which contains a list of files to be defragmented. This may be an output file generated with the SEARCH/OUTPUT command.

QUALIFIERS

/BESTTRY

Normally DEFRAG tries to create a contiguous file. If there is not enough contiguous free space the operation will fail. With the /BESTTRY qualifier DEFRAG tries to move the file with the contiguous-best-try method. This means a maximum of 3 fragments. You should only use this qualifier when a normal DEFRAG fails. If a DEFRAG/BESTTRY also fails this is an indication that the disk's free space is too fragmented. Run a REPORT to see what the largest contiguous free space is, and check the free space fragmentation index.

/DEVICE

The device on which the files reside. The device name is added to the file name. If you generate a file list with the DFU SEARCH command you don't need this qualifier anymore. However you may have a list of files produced from another source and thus need to append a device name to it. Example:

```
DFU> SEARCH mydisk/...../frag=min=50/output=x.x
DFU> DEFRAG @x.x
```

/LBN=logical-block-number

Forces a single file to be moved to the specified logical block number. Do not use this qualifier when processing a list of files.

/STATISTICS

This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.

/WRITECHECK

Perform a writecheck on the resultant file. The default is /NOWRITECHECK. Note that a writecheck doubles the number of involved disk I/O's.

7 DELETE

This chapter describes the DELETE command with the related parameters and qualifiers.

7.1 Introduction

The DELETE command is designed for 2 purposes:

1 Delete a file by file id (with the /FILE qualifier). This functionality is needed to be able to delete files which no longer have a parent directory. This way 'lost' files and (sometimes) files marked for delete can be removed from a disk.

2 A fast method to delete a complete directory or even a directory tree (with the /DIRECTORY and /TREE qualifier). First all entries of a directory are deleted without removing the directory entry ; this saves a lot of unnecessary directory updates. Finally the directory file itself is deleted, unless the /KEEP qualifier is used. This way a directory is cleaned up many times faster than with the DCL DELETE *.* command. On large directories DFU may be even 10 or more times faster than DCL. To delete a complete directory tree use the /TREE qualifier. The DCL command DELETE [.SUBDIR...]*.*;* will almost always fail to delete the intermediate subdirectory files forcing you to issue this command several times. The DFU DELETE command is smart enough to delete the files and the subdirectory files in the proper order; therefore only one command is sufficient to delete a complete directory tree.

   The /KEEP qualifier allows you to preserve the directory tree. The contents are deleted but the directory file(s) remains intact.

   If a file cannot be deleted for some reason (such as a file access conflict) the file will stay at its place together with the parent directory.

DELETE

Deletes files or directories.

FORMAT **DELETE** *device[:] or directory-file(s)*

DELETE command
DELETE

PARAMETERS

device
The device on which to perform the DELETE/FILE=file-id command.

directory-file(s)
The filespecification of the directory on which to perform the DELETE/DIRECTORY command. Wildcard file specifications may be used. DFU will automatically add .DIR to the filespecification if a filetype is not provided.

QUALIFIERS

/DIRECTORY
Specify the directory file which must be deleted. Wildcards may be used but must be used very carefully. Make sure that the directory does not contain non-empty subdirectories. Note that the directory file itself will also be deleted, unless the /KEEP qualifier is used.

Example:

```
$ DIR EXAMPLE

Directory MYDISK:[RUBBISH]

EXAMPLE.DIR;1

$ DFU
DFU> DELETE/DIRECTORY EXAMPLE.DIR

%DFU-I-CLEANUP, Deleting MYDISK:[RUBBISH]EXAMPLE.DIR;1...
%DFU-S-DELETED, File DBGINI.COM;3 deleted
%DFU-S-DELETED, File ICON.COM;1 deleted
%DFU-S-DELETED, File I_FOOL.COM;1 deleted
%DFU-S-DELETED, File LOGICALS.COM;51 deleted
%DFU-S-DELETED, File LOGIN.COM;79 deleted
%DFU-S-DELETED, File LOGOUT.COM;4 deleted
%DFU-S-DELETED, File NOTE_COMPRESS.COM;3 deleted
%DFU-S-DELETED, File SHOWCL.COM;3 deleted
%DFU-S-DELETED, File SYMBOLS.COM;89 deleted
%DFU-S-DELETED, File TPUBUILD.COM;5 deleted
%DFU-S-TOTAL, 11 file(s) deleted
%DFU-S-DELETED, File EXAMPLE.DIR;1 deleted
```

/FILE=file-id
Specify a complete file-id (num,seq,rvn) of the file which must be deleted. This qualifier allows the deletion of lost files or files marked for delete. Example :

```
$ DFU
DFU> VERIFY MYDISK:

%DFU-S-CHKHOME, Home block info verified OK
%DFU-I-IFSCAN, Scanning INDEXF.SYS...
%DFU-E-INVBAKFID, file (86,17915,1) 0004CF04$BFS.;1 has invalid backlink
%DFU-W-DELETED, file (537,2878,1) APPL_UTRYIT_BOOK.TMP;1 marked for delete
 .
 .
 .

DFU> DELETE MYDISK/FILE=(86,17915,1)
%DFU-S-DELETED, File 0004CF04$BFS.;1 deleted

DFU> DELETE MYDISK/FILE=(537,2878,1)
%DFU-S-DELETED, File APPL_UTRYIT_BOOK.TMP;1 deleted
```

/KEEP
Preserve the directory tree; only delete the contents. /KEEP is only valid with the /DIRECTORY qualifier. /KEEP works for DELETE/DIR and DELETE/DIR/TREE.

/NOLOG
Do not log succesfull deletes to SYS$OUTPUT. /LOG is the default.

/NOREMOVE
Can only be used with /FILE. Default DELETE/FILE will try to remove the file from the parent directory. If the file's backlink no longer points to a valid directory this will generate an error. The /NOREMOVE qualifier overrules this behaviour allowing such files to be deleted.

/STATISTICS
This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.

/TREE
Can only be used with /DIRECTORY. The delete command will delete all subdirectories within the directory file specified. DFU will first sort out the subdirectory tree and than delete the files in the proper order. Thus a complete directory tree is deleted with one command.

DELETE

8 DIRECTORY

This chapter describes the DIRECTORY command with the related parameters and qualifiers.

8.1 Introduction

The DIRECTORY command offers 8 major functions. 3 functions deal with all directories on a disk, the other 5 functions are used for manipulating individual directories. These functions are activated by special qualifiers:

- Individual directory functions :

  1 /COMPRESS : Rebuild one or more directory files. Directories are alphabetically sorted lists of filenames and file id's. Because file names are randomly inserted and deleted, holes will occur in directory files. Such holes will only be reused if a file can be alphabetically fitted into it. As a result directory files will grow. Especially MAIL subdirectories suffer from this behaviour.

  To make matters worse directory files above 127 blocks will no longer be cached by the file system. This will degrade performance on such directories dramatically. The COMPRESS function will rebuild the complete directory file. The /TEST qualifier can be used to preview the results of a possible COMPRESS command.

  2 /CREATE/ALLOCATE=n : Create a directory with a preallocated size of 'n' blocks. Note that 'n' will be rounded up to a multiple of the disk's cluster size. (This feature is also available on VMS 7.1/2 with the DCL command CREATE/DIR/ALLOC=n).

  3 /DUMP : Make a dump of the directory blocks and formats the output. This option is useful for debugging directory files which are suspected or corrupted. This function is equivalent to the previously undocumented VMS command DUMP/DIRECTORY, although the layout of the output is different.

  4 /REBUILD_MFD : Rebuild a corrupted disk's master file directory ([000000]). This can also be used if the MFD is entered in another directory in stead of 000000.DIR.

  5 /RECOVER : Completely rebuild a directory. This option should only be used to recover corrupted directories. During the recovery procedure the directory will be inaccesible for some time. Therefore this command should NEVER be used on critical system directories. (DFU refuses this command on directory names containing the string 'SYS' to avoid accidental usage).

- Disk-wide directory functions :

  1 /ALIAS : Scan all directories on the disk for alias file entries.

2 /EMPTY : Scan the disk for empty directories

3 /VERSION=n : Scan all directories on the disk for files which have at least 'n' versions.

The diskwide function qualifiers can be used in one command; other combinations of qualifiers are not possible. Note that the diskwide directory functions can take several minutes to complete because a complete directory scan uses a lot of disk I/O (approximately 2 I/O's per directory).

An indirect command file containing a list of files can be used as a parameter to /COMPRESS or /DUMP. Such a list can be generated with the SEARCH command. Example:

```
DFU> SEARCH disk/FILE=*.DIR/SIZE=MIN=50/OUT=x.x
DFU> DIRECTORY/COMPRESS @x.x
```

Caution: Care should be taken when compressing critical system directories. To be safe you should first use the /TEST qualifier before compressing the directory. Another problem may be caused by a systemcrash just when DFU is rewriting the new compressed directory (although the chance that this happens is very small). When this happens you can recover the files by executing the following procedure:

1 Do a $SET FILE/NODIR of the corrupted directory

2 Delete the directory and create a new one

3 Do a $ANALYZE/DISK/REPAIR ; this will move all the lost files to [SYSLOST].

4 Move the files from [SYSLOST] to the newly created directory.

8.2 Discussion of directory compression

The DIRECTORY/COMPRESS function will improve performance on large directories. There are some options which can further enhance performance :

- /TRUNCATE: When a directory is compressed , the free space will be at the end of the directory. Therefore , if new files are added VMS is capable of using this space, and avoid a directory entension. The /TRUNCATE qualifier overrules this behaviour by immediately truncating the free space back to the disk.
- /FILL_FACTOR: Normally DFU tries to compress as much as possible. However, it may be better to deliberately create extra free space into each directory block. This can be done using the /FILL_FACTOR=n qualifier. Eg: a fill factor of 50% will result in approximately half of each block being free. Note that a fill_factor lower tha 100% may result in an error DFU-E_EXTERR; in that case a higher factor must be choosen.

So, what strategy should be used when compressing directories?

1 Inactive directories : use DIR/COMPRESS/TRUNCATE.

2 Not very active directories : use DIR/COMPRESS (/TRUNCATE=n).

3 Active directories, files added at the end (such as MAIL directories) : use DIR/COMPRESS without /TRUNCATE

4 Active directories, files added in random alphabetical order : use DIR/COMPRESS/FILL_FACTOR=n, n between 50 and 75.

8.3 Output formatting

The qualifier /FORMAT can be used with DIRECTORY/VERSION. This allows the build up of a command procedure directly from the output generated by the DIR/VERSION command. /FORMAT has the following restrictions :

1 /FORMAT is only valid with the /VERSION and the /OUTPUT qualifier.

2 The format string used must contain the !AS directive (in uppercase). The file found will be substituted at the !AS location

Example:

```
DFU> DIR/VERSION=4/OUTPUT=PURGE.COM/FORMAT="$PURGE/KEEP=3 !AS" mydisk
```

DIRECTORY

Performs directory functions.

FORMAT DIRECTORY *device[:] or directory-file(s)*

PARAMETERS

device

The device on which to perform one of the diskwide directory functions.

directory-files(s)

The file specification of the directory on which to perform the /CREATE, /COMPRESS, /DUMP or /RECOVER function. /REBUILD_MFD requires a device name only (assumes 000000.DIR implicitly). Wildcard file specifications may be used. DFU will automatically add .DIR to the filespecification if a filetype is not provided.

QUALIFIERS

/ALIAS

The /ALIAS qualifier directs DFU to scan all directories for alias file entries on a disk. Normally only the system disk should contain alias files. This qualifier can be combined with /VERSION=n and /EMPTY.

/ALLOCATE=n

Used in combination with /CREATE. Creates the new directory with an allocated size of 'n' blocks.

/COMPRESS

Performs the directory compression unless /TEST is also specified. The output will show the results in terms of file sizes. Example:

```
DFU> DIR/COMP OWN$:[000000]MAIL

%DFU-S-DONE, OWN$:[000000]MAIL.DIR;1: 31 files; was : 4/9, now : 3/3 blocks

DFU>
```

/CREATE

Create a new, empty directory. The allocated size will be 1 cluster unless /ALLOCATE is specified.

/DEVICE

The device on which the files reside. The device name is added to the file name. If you generate a file list with the DFU SEARCH command you don't need this qualifier. However you may have a list of files produced from another source and thus need to append a device name to it. This qualifier can only be used in combination with /COMPRESS or /DUMP.

/DUMP

Produce a block level dump of a directory. /DUMP will interpret the directory entries found in each block. A directory entry contains a size, version-limit, type and name field. Next the directory entry contains a list of versions and file ID's for this entry. /DUMP will produce a rather low level output of this information. Example :

```
DFU> DIR/DUMP C.DIR
```

```
DUMP of directory block 1
Size: 22, Version limit: 3, Type: 0, Name(10): CHKDSK.EXE
   Version: 3, FID : (1027,1456,0)
Size: 26, Version limit: 3, Type: 0, Name(13): CHKDSK.README
   Version: 2, FID : (33892,1171,0)
   Version: 3, FID : (1256,11234,0)
Size: 22, Version limit: 3, Type: 0, Name(10): CHKDSK.SAV
   Version: 2, FID : (13947,100,0)
Size: 24, Version limit: 3, Type: 0, Name(11): CHKDSK.SAVE
   Version: 1, FID : (12531,2114,0)
Size: 26, Version limit: 3, Type: 0, Name(14): CHKDSK_LNK.COM
   Version: 2, FID : (12314,72,0)
Size: 18, Version limit: 3, Type: 0, Name(5): C_D.C
   Version: 3, FID : (32650,32,0)
Size: 20, Version limit: 3, Type: 0, Name(7): C_D.EXE
   Version: 9, FID : (2675,64,0)
Size: 20, Version limit: 3, Type: 0, Name(7): C_D.OBJ
   Version: 4, FID : (9835,117,0)
Size: 20, Version limit: 3, Type: 0, Name(7): C_D_2.C
   Version: 15, FID : (12428,84,0)
Size: 22, Version limit: 3, Type: 0, Name(9): C_D_2.OBJ
   Version: 9, FID : (8439,119,0)
Size: 22, Version limit: 3, Type: 0, Name(9): C_D_3.CLD
   Version: 3, FID : (9777,178,0)
Size: 22, Version limit: 3, Type: 0, Name(9): C_D_3.OBJ
   Version: 2, FID : (9737,161,0)
Size: 20, Version limit: 3, Type: 0, Name(7): C_D_4.C
   Version: 3, FID : (10594,1580,0)
Size: 22, Version limit: 3, Type: 0, Name(9): C_D_4.OBJ
   Version: 2, FID : (10177,109,0)

DUMP of directory block 2
Size: 18, Version limit: 3, Type: 0, Name(5): DFU.C
   Version: 169, FID : (31123,52,0)

 .
 .
 .
%DFU-I-TOTAL, OWN$:[SOURCES.FORTRAN.DFUSRC]C.DIR;1: 42 files
```

/EMPTY

The /EMPTY qualifier will produce a list of empty directories. This qualifier can be combined with /ALIAS and /VERSION=n.

/FILL_FACTOR=n

Specifies ,in percentage, the filling of directory blocks during a /COMPRESS operation. Fill factor may be between 50 and 100. Omitting this qualifier is the same as /FILL_FACTOR=100 (maximum compression). If the directory has not enough allocated space a low fill factor may result in failure of the Compress operation. DFU will issue a DFU-E-EXTERR error, and the directory file will not be modified.

/FORMAT=format-string

Create an output file in a format described by the format string. The string must contain the !AS directive (this must be uppercase). At the !AS location the resultant filename will be filled in. The /OUTPUT qualifier is required.

/OUTPUT=filename

This qualifier redirects the output to a file. The output will also go to SYS$OUTPUT.

/REBUILD_MFD

Syntax : DIRECTORY/REBUILD_MFD <device> This qualifier causes the master file directory (000000.DIR) of the device to be rebuild and entered in itself.

/RECOVER

This qualifier rebuilds a corrupted directory. Do not use this command on critical or active directories.

/STATISTICS

This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.

/TEST

The /TEST can only be used in conjunction with /COMPRESS. The qualifier will show the results of the /COMPRESS but will not compress the directory file.

/TRUNCATE=blocksize

During a compress operation truncate the directory back to the blocksize specified. If blocksize is not specified, the file will be truncated back to the end-of-file block number. Truncation will always be rounded up to the next highest multiple of the disk's cluster size.

/VERSION=n

The /VERSION qualifier directs DFU to scan all directories on the device to produce a list of files which have at least 'n' versions. This qualifier can be combined with /ALIAS and /EMPTY.

9 REPORT

This chapter describes the REPORT command with the related parameters and qualifiers.

9.1 Description

The REPORT command function generates a report of the file and free space fragmentation of the disk. Also a graph may be generated by the /GRAPH qualifier; this visualises the free space distribution on your disk. The /USAGE qualifier will generate a diskspace usage report. This is especially useful if DISKQUOTA is not enabled on the disk.

The default report contains information of the Volume, files and the bitmap. This output can be suppressed by the /NOVOLUME, NOFILE and NOBITMAP qualifiers. Also the /USAGE qualifier can be used by displaying information of a specific UIC or Identifier simply by specifying /USAGE=<uic> or /USAGE=<identifier>.

9.2 Syntax and Output

The syntax of the report command is:

```
DFU> REPORT device/QUALIFIERS
```

Below follows an example and output of the report command:

```
DFU> REPORT USER3:/GRAPH/USAGE

%DFU-I-REPORT, Reporting on USER3: ($1$DUA102:)

  ***** Volume info for USER3: (from HOME block) *****
 Volume name                      :  USER3
 Volume owner                     :  SYSTEM
 Volume set name                  :
 Highwater mark. / Erase on del.  :  No / No
 Structure name                   :
 Clustersize                      :  3
 Maximum # files                  :  367618
 First header VBN                 :  103
 Header count                     :  51547 (1)
 Free headers                     :  10951 (2)
```

```
 ***** File statistics (from INDEXF.SYS) *****
INDEXF.SYS fragments /map_in_use :  21 / 61 (39% used)   (3)
Total files (ODS2 / ODS5)        :  40595 / 0
Files with extension headers     :  0
Files marked for delete          :  19 , size : 25/63 blocks
Directory files                  :  1957
Empty files                      :  177
Files with allocation            :  40418
Contiguous files                 :  40326 (4)
Total size used /allocated       :  2492431 /2533209
Total fragments                  :  40770
Average fragments per file       :  1.009  (5)
File fragmentation index         :  0.692 (excellent) (6)
Average size per fragment        :  62
Most fragmented file             :
   $1$DUA102:[LARGEUSER]A.DAT;1 ( 180/630 blocks; 30  fragments)

 ***** Free space statistics (from BITMAP.SYS) *****
Total blocks on disk             :  2940951
Total free blocks                :  407742
Percentage free (rounded)        :  13
Total free extents               :  260
Largest free extent              :  42912 blocks at LBN: 2463597 (7)
Average extent size (rounded)    :  1568
Free space fragmentation index   :  0.191 (excellent) (6)

    LBN   +-----------------------------------------------------------+   %
       0->|***....***********.************.******...*********..********|  6%
  208360->|************************************************************| 13%
  416721->|************************************************************| 20%
  625081->|*****************************************************.*****| 26%
  833442->|*******..*********************************..****************| 33%
 1041802->|******.**.*********...********.*****.*******...*.**..*.***..| 40%
 1250163->|.*..*****************....*.....**.*. ..*****.***..****.  ..*| 46%
 1458523->|**********. .*******************************************.**.| 53%
 1666884->|.**...  ....... .*******...**********.*..***********..******| 60%
 1875244->|***..  ....*...**********.   ..*********.    .**************| 66%
 2083605->|*********************************.*****..   .****... . ....  | 73%
 2291965->| ..*******....  ......*************************************| 80%
 2500326->|****..*****.*****.**.      .********...*.*****..*******.*..*| 86%
 2708686->|.*******..*******.***..*.****************.*. .*...**********| 93%
 2917047->|..**.    .********************.******..  .*******.         |100%
          +-----------------------------------------------------------+
* : Fully allocated, . : Partial allocated, <space> : Free, 3472 blocks each

Free space distribution, each * =  2100  free blocks

 ***** Disk Usage Table (from INDEXF.SYS and QUOTA.SYS) *****
Identifier/UIC                 Used/Allocated   Headers   Quota Used/Perm
-----------------------------------------------------------------------
[SSG,MRX]                       42079/46356      2259      48615/60000
[SSG,TESTJE]                   189306/254742     4935     259677/300000
[SSG,LARGEUSER]                 47961/50238      1648      51886/65000
[SYSTEM]                       499554/505626     4954     510580/2000000
.
.
.
```

The various items have the following meaning :

1 The header count is calculated based on the size of INDEXF.SYS. If more headers are needed INDEXF.SYS has to be extended.

2 The free headers gives the number of free entries in INDEXF.SYS before it has to extend.

3 The INDEXF.SYS number of fragments and mapwords in use are very important figures to determine if the INDEXF.SYS file can be extended. The theoretical maximum number of mapwords is 155. This value may be less if there are ACL's on INDEXF.SYS. Each fragment, and therefore each retrieval pointer must be in the mapword area. As the size of a retrieval pointer depends on the physical size of a disk, it is not easy to say how many fragments INDEXF.SYS can store in the mapwords area. If the mapword area is full the INDEXF file can no longer extend, and creating new files may result in a SYSTEM-W-HEADERFULL error.

4 Files which have exactly 1 retrieval pointer are considered to be contiguous. This doesn't mean that the CONTIGUOUS bit is set in the file header.

5 The average fragments per file give some indication about the total file fragmentation.

6 The file and free space fragmentation index classifies your disk as follows :

- 0-1 : Excellent
- 1-2 : Good
- 2-3 : Fair
- 3-4 : Poor
- >4 : Bad

If your index is greater than 3 you should consider defragmenting the disk using COMPAQ's DFO software, by performing an Image BACKUP / Restore, or of course by using DFU's DEFRAG/DISK command.

7 The largest free extent is a useful figure for defragmentation purposes. You cannot defragment a file when its size is greater than this value.

When using /GRAPH the disk's free space distribution is shown as a bitmap image. Each position in the graph represents a certain number of blocks (in the example above 3472 blocks). This bitmap image gives a quick impression about the free space distribution on the disk.

If you use the /USAGE qualifier a sorted usage table will be added. Per Identifier / UIC the blocks used/allocated, and the number of file headers are shown. If Diskquota is enabled a third column will be included which shows the blocks used/permitted allowing to QUOTA.SYS. Normally quota should satisfy the following rule :

```
Quota used = blocks allocated + # of file headers
```

REPORT

Create a file and free space report of a disk device.

FORMAT

REPORT *device[:]*

PARAMETERS

device[:]

Device to be reported. You may also specify a logical devicename.

QUALIFIERS

/APPEND=filename

This qualifier redirects the output to be appended to an already existing file. If the output file does not exists it will be created. You can use /APPEND or /OUTPUT but not both.

/GRAPH

This qualifier generates a graph table which visualizes the free space distribution on the disk. /NOGRAPH is the default.

/NOBITMAP

The /NOBITMAP qualifier suppresses the "Free space statistics" output.

/NOFILE

The /NOFILE qualifier suppressed the "File Statistics" output.

/NOVOLUME

The /NOVOLUME qualifier suppresses the "Volume info" output.

/OUTPUT=filename

This qualifier redirects the output to a file. The output will also go to SYS$OUTPUT.

/STATISTICS

This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.

/USAGE(=uic or identifier)

The /USAGE qualifier will generate a diskspace usage report based on Identifiers/UIC. If diskquota is enabled on the disk the blocks used/permitted allowing to QUOTA.SYS will also be shown. /USAGE is very useful when diskquota is not enabled on the disk. When a UIC or identifier is specified only the information for this UIC or identifier will be displayed.

10 SEARCH

This chapter describes the SEARCH command with the related parameters and qualifiers.

10.1 Introduction

The search function allows very quick disk-wide searches for specific files. You can use almost any possible file attribute as a search qualifier.

10.2 Syntax and Output

The command syntax for SEARCH is:

```
DFU> SEARCH device/qualifiers
```

The output is displayed on your terminal. You can also sort the output with the /SORT qualifier. The output is shown in 2 or 3 columns eg:

```
DFU> SEARCH MYDISK/FILE=X.X/FRAGMENT
 .
 .
$1$DUA102:[USER.COMMAND]X.X;1             1/3               1/1
 .
 .
```

The first column shows the full file name . The device name is included in the file name. The second columns shows the file size as actual/allocated size. The 3rd column is optional and will only be shown when the /FRAGMENT qualifier is used. It shows the number of fileheaders / number of file fragments.

10.3 Volume Set processing

SEARCH checks if the device to-be-searched is member of a volume set. If so, the complete volume set will be processed, starting with Relative Volume Number 1 up to the last member in set. You can override this behaviour with the /NOVOLSET qualifier.

10.4 Output formatting

The qualifier /FORMAT can be used with SEARCH. This allows the build up of a command procedure directly from the output generated by the SEARCH command. /FORMAT has the following restrictions :

1 /FORMAT is only valid with the /OUTPUT qualifier, and can not be used together with the /FULL or the /SORT qualifiers.

2 The format string used must contain the !AS directive (in uppercase). The file found will be substituted at the !AS location

Example:

```
DFU> SEARCH/OUTP=DEL.COM/FORMAT="$DELETE/CONF !AS"/FILE=*.LOG mydisk
```

10.5 UIC and identifier processing

Version V2.4 introduced an improved handling of UIC's. Previous versions of DFU only accepted a numeric UIC in the /OWNER qaulifier or an identifier in the /IDENT qualifier. V2.4 and later now accepts all valid UIC and identifier formats (numeric and alphanumeric) in the /OWNER and /IDENT qualifiers. Technically there is no longer any difference between these two qualifiers, but they will be left in for compatibility reasons.

SEARCH

Fast file search through INDEXF.SYS.

FORMAT SEARCH *device[:]*

PARAMETERS *device[:]*

Device to be searched. You may also specify a logical devicename.

DESCRIPTION

The SEARCH command is used for quick disk-wide searches for specific files. The qualifiers describe the file attributes used as the search criteria. You can combine almost all of the possible qualifiers, unless otherwise specified. Eg.:

```
DFU> SEARCH DISK1/SIZE=MIN=10/OWN=[1,4]/CREATED=SINCE=YESTERDAY
```

is a valid command. Note that qualifiers will be used in a logical AND manner, that is, SEARCH will only display files which match all qualifiers and options specified.

QUALIFIERS */ACCESS=option(,option)*

The /ACCESS qualifier is used to search files depending on their last ACCESS date (VMS 7.2 only). The possible options are :

- /ACCESS=BEFORE=date
- /ACCESS=SINCE=date
- /ACCESS=NONE

/ACE=identifier

Search for files which have an ACE containing the specific identifier. Only ACE's of the format "IDENTIFIER=<identifier>,..." will be searched.

/ALLOCATED

Default, SEARCH will use the actual file size. The /ALLOCATED qualifier forces SEARCH to use the allocated filesize. This qualifier is only meaningfull if you combine it with /SIZE.

/APPEND=filename

This qualifier redirects the output to be appended to an already existing file. If the output file does not exists it will be created. You can use /APPEND or /OUTPUT but not both.

/ATTRIBUTE=option(,option)

The /ATTRIBUTE qualifier is used to search files depending on their last attribute change date (VMS 7.2 only). The possible options are :

- /ATTRIBUTE=BEFORE=date
- /ATTRIBUTE=SINCE=date
- /ATTRIBUTE=NONE

/BACKUP=option(,option)

The /BACKUP qualifier is used to search files depending on their backup date. The possible options are :

- /BACKUP=BEFORE=date
- /BACKUP=SINCE=date
- /BACKUP=NONE

The NONE option gives files which don't have a backup date recorded.The other 2 options can be used to get files which have a backup date before or after a specific date. The BEFORE and SINCE option can be combined in one command.

/BAKFID=backlink-file-id

You can use this qualifier to look for a file with a specific backlink. Only the first part of the file id must be specified, that is, if the file id is (x,y,z) you must specify 'x' as the file id. You can use this qualifier to get files from a specific directory. If you use /BAKFID=0 you will get files not belonging to a directory (often temporary files).

/CHARACTERISTIC=(char1,char2...)

This qualifier is used to get files with specific file characteristics.The characteristics can have the following values:

- Directory : directory files
- Nobackup : files marked nobackup
- Contiguous : files marked as contiguous
- Erase : erase file before deletion

- Spool : spool files
- Badblock : files which contain suspected bad block(s)
- Badacl : files with a corrupted ACL
- Besttry : files marked contiguous-best-try
- Scratch : files marked as scratch files
- Nocharge : files not charged against quota
- Nomove : files marked NoMove
- Locked : files with the deaccess lock bit set
- Marked : files marked for deletion
- Noshelvable : files which can not be shelved
- Isshelved : files which are shelved

The several characteristics can be combined in one command.If you want a logical OR behaviour in stead of the default AND behaviour, you can use the special option MATCH=OR eg:

```
SEARCH disk/CHAR=(NOMOVE,DIR,MATCH=OR)
```

/CREATED=option(,option)

The /CREATED qualifier is used to search files depending on their creation date. The options are :

- /CREATED=BEFORE=date
- /CREATED=SINCE=date

These 2 options can be used to get files which have a creation date before or after a specific date. The BEFORE and SINCE option can be combined in one command.

/EXCLUDE=(file1,file2...)

This qualifier is used to exclude files from the search. You can use wildcard filenames ; you can also specifiy a list of files.

/EXPIRED=option(,option)

The /EXPIRED qualifier is used to search files depending on their expiration date. The options are :

- /EXPIRED=BEFORE=date
- /EXPIRED=SINCE=date
- /EXPIRED=NONE

The NONE option gives files which don't have a expiration date recorded.The other 2 options can be used to get files which have a expiration date before or after a specific date. The BEFORE and SINCE option can be combined in one command.

/FID=file-id

The /FID qualifier is a special function of SEARCH. It directs SEARCH to go directly to the specified file without processing the rest of the Index file. Therefore, you cannot combine this qualifierwith other search qualifiers such as /FILE. Normally a file-id consists is in the form (x,y,z) where x is the number of the file header within INDEXF.SYS y is the sequence number, and z is the Relative Volume Number. You only need to specifiy the x value in the /FID qualifier.

/FILE=(file1,file2...)

This qualifier is used to search for files with a specific file name.You can use wildcard file names; also you can specify a list of files.

/FORMAT=format-string

Create an output file in a format described by the format string. The string must contain the !AS directive (this must be uppercase). At the !AS location the resultant filename will be filled in. The /OUTPUT qualifier is required.

/FRAGMENT=(MINIMUM=nr,MAXIMUM=nr)

This qualifier displays the number of fragments and file headers of each file found. You can further limit the files found by using the MINIMUM and MAXIMUM= options. For example:

```
DFU> disk/FRAG
DFU> disk/FRAG=min=10
DFU> disk/FRAG=(min=10,max=100)
```

/FULL

If you use this qualifier, SEARCH will give a full output for each file found. This output is a look-alike of the output from DIRECTORY/FULL. You cannot combine this qualifier with /SORT or /SUMMARY.

/HOME

This qualifier directs search to give output from the disk's home block. SEARCH uses the home block for calculating the free and used file headers within INDEXF.SYS.

/(NO)IDENT=identifier or uic

You can search for files owned by a specific identifier or UIC. Any valid UIC or identifier format may be used. Another way is the /OWNER_UIC qualifier; you cannot combine these 2 qualifiers in one SEARCH command. Issueing /NOIDENT directs DFU to search for files NOT owned by this IDENTIFIER, eg: DFU> SEARCH sys$sysdevice/NOIDENT=SYSTEM.

/LBN=logical-block-number

The /LBN qualifier is a special function of SEARCH. This allows you to find a file which contains a specific LBN. This may be useful if you have bad blocks logged in the error log. You cannot combine /LBN with search qualifiers such as /FILE.

/LIMIT=(MINIMUM=n,MAXAXIMUM=m)

Searches DIRECTORY files which have a default version limit between n and m (including n and m). Either MINIMUM or MAXIMUM is required.

/NAME_TYPE=ODS2 | ISL1 | UCS2

Search for files which have the specified name type attribute. ODS2 if for classic VMS file names, ISL1 is for Iso-Latin-1 names and UCS2 is for Unicode names. This qualifier is only meaningfull for ODS5 disks (requires VMS 7.2).

/(NO)OWNER_UIC=uic or identifier

This qualifier is used to get files owned by a specific UIC or identifier. Any valid UIC or identifier format may be used. You cannot combine this qualifier with /IDENT. Specifying /NOOWNER directs DFU to search for files NOT owned by this UIC or identifier.

/NOSEARCH

This qualifier can only be used in combination with /HOME. It is used to get the Homeblock info, without searching the entire disk.

/NOVOLSET

The default behaviour of SEARCH is to process an entire volume set. You can override this behaviour with /NOVOLSET. This may be useful when doing a /LBN search.

/MODIFIED=option(,option)

The /MODIFIED qualifier is used to search files depending on their modification date. The options are :

- /MODIFIED=BEFORE=date
- /MODIFIED=SINCE=date

These 2 options can be used to get files which have a modification date before or after a specific date. The BEFORE and SINCE option can be combined in one command.

/MULTIPLE

This qualifier searches for files which have more than 1 file header.

/ORGANIZATION=INDEXED | SEQUENTIAL | RELATIVE | DIRECT

Search for files with the specified RMS file organization.

/OUTPUT=file

This qualifier redirects the output from SEARCH to an output file.This file can later be used as input to the DEFRAG, DIRECTORY or SET command.

/OVER_ALLOCATED=n

Searches for files where the difference between the used and allocated size is at least 'n' blocks.

/PLACED

Checks for files which have a placement control retrieval pointer.This is sometimes set by non-DEC disk defragmentation programs.

/SIZE=(minimum=size1,maximum=size2)

The /SIZE qualifier is used to limit files found by their file size.You can either use minimum= or maximum= or use both options together. SEARCH will use the actual file size for selecting files, except when the /ALLOCATED qualifier is used.

/SORT

This qualifier will sort the files found before being output. You can combine this with the /OUTPUT qualifier (the default output is SYS$OUTPUT).

/STATISTICS

This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.

/SUMMARY

This qualifier will limit the output to the total number of files found, with their size (and optional the fragmentation when /FRAG is used). You cannot combine /SUMMARY with /FULL.

/TYPE=option

The /TYPE qualifier has 2 options : /TYPE=ODS2 or /TYPE=ODS5. This qualifier can be used to search for files with either a ODS2 or an ODS5 file header. This qualifier is only usefull on ODS5 disk (VMS V7.2).

/VERSION_NUMBER=(minimum=n,maximum=m)

The /VERSION_NUMBER qualifier is used search for files within a range (n thru m) of file version numbers. Logfiles which are produced with the same name may pose problems when they reach the maximum version number (32767). Using /VERSION=MIN=32000 is a quick way to find such files.

11 SET

This chapter describes the SET command with the related parameters and qualifiers.

11.1 Introduction

The SET command allows you to modify file attributes which can't be modified through DCL commands. Note that you should be careful about using this function; you may easily corrupt files. This much wanted functionality was introduced in VMS 6.0 with a new DCL command $SET FILE/ATTRIBUTES. Still DFU's SET has some options which are not in SET FILE/ATTRIBUTES (such as setting a BACKUP date).

The new qualifier, /IGNORE=INTERLOCK, allows setting file attributes even on open or locked files.

11.2 UIC and identifier processing

As of version V2.4 of DFU the /OWNER and /IDENT qualifier now accepts all valid UIC or identifier formats. See chapter 10.5 for details.

SET

Modify file attributes.

FORMAT

SET *file1,file2,...,@file*

PARAMETERS

file1,file2,...,@file

The files to be modified. The attributes to be modified are specified with qualifiers. Wildcards area allowed in the filename. An indirect file can be used by using the @ sign. This allows processing of a file list produced by a DFU SEARCH command.

QUALIFIERS

/ACCESS_DATE=date
/NOACCESS_DATE

Controls whether a new last-access date is assigned to the specified files. (V7.2 only) Specify the date according to the rules described in Chapter 1 of the VMS DCL Concepts Manual. Absolute date keywords are allowed. If you specify 0 as the date, today's date is used. If you specify /NOACCESS_DATE the last access date field will be cleared.

/ATTRIBUTE_DATE=date
/NOATTRIBUTE_DATE

Controls whether a new last attribute change date is assigned to the specified files (V7.2 only). Specify the date according to the rules described in Chapter 1 of the VMS DCL Concepts Manual. Absolute date keywords are allowed. If you specify 0 as the date, today's date is used. If you specify /NOATTRIBUTE_DATE the last attribute change date field will be cleared.

/BACKUP_DATE=date
/NOBACKUP_DATE

Controls whether a new backup date is assigned to the specified files. Specify the date according to the rules described in Chapter 1 of the VMS DCL Concepts Manual. Absolute date keywords are allowed. If you specify 0 as the date, today's date is used. If you specify /NOBACKUP_DATE the Backup date field will be cleared.

/BADACL
/NOBADACL

Sets or resets the 'BADACL' flag in the file header. This enables deletion of a file with a corrupted ACL.

/BCK
/NOBCK

Clears or sets the files NOBACKUP bit. Setting a file to NOBACKUP with /NOBCK causes it to be skipped by a BACKUP operation.

/BUCKETSIZE=size

Sets a new value for the bucket size in the file header.

/CONFIRM
/NOCONFIRM (default)

Controls whether a request is issued before each individual SET operation to confirm that the operation should be performed on that file. When the system issues the prompt, you can issue any of the following responses:

```
YES       NO      QUIT
TRUE      FALSE   CTRL/Z
1         0       ALL
          <RET>
```

You can use any combination of upper- and lowercase letters for word responses. Word responses can be abbreviated to one or more letters (for example, T, TR, or TRU for TRUE). Affirmative answers are YES, TRUE, and 1. Negative answers are NO, FALSE, 0, and <RET>. QUIT or CTRL/Z indicates that you want to stop processing the command at that point. When you respond with ALL, the command continues to process, but no further prompts are given. If you type a response other than one of those in the list, the prompt will be reissued.

/CONTIGUOUS_BEST_TRY
/NOCONTIGUOUS_BEST_TRY

Sets or resets the 'CONTIGUOUS_BEST_TRY' bit in the file header.

/CREATION_DATE=date
/NOCREATION_DATE

Controls whether a new creation date is assigned to the specified files. Specify the date according to the rules described in Chapter 1 of the VMS DCL Concepts Manual. Absolute date keywords are allowed. If you specify 0 as the date, today's date is used.

/DIRECTORY
/NODIRECTORY

Sets or resets the directory attribute of a file. This qualifier allows you to set the directory bit of a file which was mistakingly reset by the 'SET FILE/NODIRECTORY' command. If it is done on a non-directory file, then access to that directory will give a 'BADIRECTORY' error.

/EBLOCK[=block]

This qualifier will reset the end-of-file mark to the highest block allocated if no block has been specified. Otherwise the end-of-file mark will be set to the specified block.

/EBYTE[=byte]

This qualifier will set the end-of-file byte mark to the highest byte if it has not been specified. Otherwise the end-of-file byte mark will be set to the specified byte.

/EXPIRATION_DATE=date
/NOEXPIRATION_DATE

Controls whether an expiration date is assigned to the specified files. Specify the date according to the rules described in Chapter 1 of the VMS DCL Concepts Manual. Absolute date keywords are allowed. If you specify 0 as the date, today's date is used.

/IDENT=identifier or uic

Modify the file ownership. See also /OWNER_UIC. This allows modification of the file-ownership even if the file is open, eg. INDEXF.SYS. You cannot use both /IDENT and /OWNER_UIC.

/IGNORE=INTERLOCK

Perform the SET command on open or locked files. Default DFU will return a %SYSTEM-E-ACCONFLICT on open files. The /IGNORE=INTERLOCK option can overrule this behaviour.

/LOCKED
/NOLOCKED

This qualifier will lock a file for future use. Nothing else can then be done with the file, until it is unlocked (which can also be done with the VMS 'UNLOCK' command.

/LOG (default)
/NOLOG

Controls whether the SET command displays the file specification of each file after the modification is made.

/MAXREC=record

Sets a new value for the maximum record number in the file header.

/NOMOVE

This qualifier disables or enables (/NONOMOVE) the MoveFile attribute on files. It is the same as the DCL command SET FILE/NOMOVE, but in conjunction with /IGNORE=INTERLOCK DFU can change the setting on Open or Locked files.

/ORGANIZATION=keyword

The following keywords are used as parameters for the ORGANIZATION qualifier: DIRECT, INDEXED, RELATIVE and SEQUENTIAL. This will allow you to modify the file organization type in the file header. Of course this won't change the real organization of the file.

/OWNER_UIC=uic or identifier

Modify the file ownership to an UIC or identifier. See also /IDENT. This allows modification of the file-ownership even if the file is open, eg. INDEXF.SYS. You cannot use both /IDENT and /OWNER_UIC.

/RECATTRIBUTES=keyword

The following keywords are used as parameters for the RECATTRIBUTES qualifier: NONE, FORTRAN, IMPLIED, PRINT and NOSPAN. This will allow you to modify the file's record attributes in the file header. NONE, FORTRAN, IMPLIED and PRINT are mutually exclusive, but can be used in combination with NOSPAN. When NOSPAN is omitted SPAN is assumed (the default is to allow records to cross block boundaries).

/RECSIZE=size

Sets a new value for the record size in the file header.

/RECTYPE=keyword

The following keywords are used as parameters for the RECTYPE qualifier: FIXED, STREAM, STREAMCR, STREAMLF, UNDEFINED, VARIABLE and VFC. This will allow you to modify the file's record type in the file header.

/REVISION_DATE=date
/NOREVISION_DATE

Controls whether a revision date is assigned to the specified files. Specify the date according to the rules described in Chapter 1 of the VMS DCL Concepts Manual. Absolute date keywords are allowed. If you specify 0 as the date, today's date is used.

/RVCOUNT=count

Sets a new value for the revision count in the file header.

/UPDATE
/NOUPDATE (default)

Normally the file's revision date will be updated after any modification to it. SET however disables this update (otherwise the REVISION date could not be set). Specify this qualifier if you want the revision date to be updated.

/VFCSIZE=size

Sets a new value for the VFC size in the file header. This value will only be used with the VFC record type.

12 UNDELETE

This chapter describes the UNDELETE command with the related parameters and qualifiers.

12.1 Introduction

The UNDELETE function is designed to recover deleted files, if possible. UNDELETE operates in a safe mode such that it first checks if the deleted file header and diskblocks are still available. Only in that case will the file be recovered. Otherwise UNDELETE will leave the disk unmodified. UNDELETE has some powerfull options:

- Generate a list of recoverable files with the /LIST qualifier. This qualifier will not undelete any file, and therefore it does not lock up the disk.
- Undelete multiple files in one pass.
- Make file selections based on the owner with the /OWNER or /IDENT qualifier.
- Undeleted files which cannot be entered back in their original directory will be moved to the [SYSLOST] directory. This saves an additional ANALYZE/DISK/REPAIR action.

12.2 File specification syntax

Because a deleted file no longer 'knows' its parent directory you must NOT enter a directory specification in the file name. Therefore , the syntax to undelete a specific file is :

```
DFU> UNDELETE <device:>/file=<filename.ext>
```

eg:

```
DFU> UNDELETE $1$DIA1:/file=FOO.BAR
```

DFU will try to re-enter the file in its original directory; it that fails the file will be entered in the [SYSLOST] directory.

12.3 How Undelete works

The UNDELETE command operates as follows :

1 Lock the volume. In the same manner as ANALYZE/DISK/REPAIR and SET VOLUME /REBUILD Undelete locks the disk for other writers such that no modifications to the INDEXF, BITMAP or QUOTA file can be made.

2 Search the INDEXF.SYS file if the requested file is still there. A check is made if it really is a valid deleted file header.

3 Checks if the deleted file header and all possible extension headers are still valid.

4 Checks if the blocks previously owned by this file are still free.

5 If all these conditions are met DFU will display the file and asks for a confirmation.

6 Rebuilds all of the deleted file headers and bitmaps in memory. If no errors are found all the file headers and bitmaps are written back to disk. The files original backlink is saved in a table in memory.

7 If appropiate the blocks and headers are charged against diskquota.

8 When all of INDEXF.SYS has been scanned the volume is unlocked.

9 The file(s) is (are) entered in the original directory if possible, using the table build up in memory. If the enter command fails (probably because the original directory is gone) the file will be entered in [SYSLOST]. DFU will create this directory if needed.

If the /LIST qualifier is used, DFU will just list the recoverable files without performing any action on the disk. The disk will not be locked.

It is important to note that during the bitmap and file header processing any error will immediately terminate the recovery process, and unlock the disk. Files which have been recovered up to that point will still be entered in the appropiate directory. As no wrong information has been written back to the disk this should leave the disk in a proper state.

NOTE: The blocks recovered will NOT be subtracted from the Volume's free block count. To get the actual freeblock count a SET VOLUME/REBUILD=FORCE is necessary. Also a complete reMOUNT will reset the freeblock count.

IMPORTANT: DFU takes care to recover only files whose original blocks are free. However these blocks may have been modified in the meantime by another file which also has been deleted. Therefore each recovered file must be checked manually to check its integrity.

Example of a Undelete session :

```
DFU> undel $1$dua102:/list

Recoverable file [TEST]CHANGE_UIC.FOR;2 found
Recoverable file [TEST]CHECK_ID.FOR;1 found
Recoverable file [TEST]CHKPRDIMG.FOR;1 found
Recoverable file [TEST]CHRLEN.FOR;1 found

DFU> undel/file=*.for $1$DUA102:

%DFU-I-READBMAP, Reading BITMAP.SYS...
%DFU-W-LOCKED, Volume now LOCKED for write
%DFU-I-UNDEL, Start search on $1$DUA102:
```

```
Recoverable file [TEST]CHANGE_UIC.FOR;2 found
Recover this file? (Y/N) [N] : n
Recoverable file [TEST]CHECK_ID.FOR;1 found
Recover this file? (Y/N) [N] : y
%DFU-S-RECOVER, File succesfully recovered
%DFU-I-ADDQUOTA, updating diskquota...

Recoverable file [TEST]CHKPRDIMG.FOR;1 found
Recover this file? (Y/N) [N] : n
Recoverable file [TEST]CHRLEN.FOR;1 found
Recover this file? (Y/N) [N] : y

%DFU-S-RECOVER, File succesfully recovered
%DFU-I-ADDQUOTA, updating diskquota...
%DFU-I-UNLOCK, Volume unlocked
%DFU-I-ENTER, Entering file(s) in directory...
%DFU-S-ENTERED, File CHECK_ID.FOR entered in original directory
%DFU-S-ENTERED, File CHRLEN.FOR entered in original directory

DFU> EXIT
```

12.4 Files marked for delete

Normally DFU does not undelete files marked for delete. To recover files marked for delete you must use the /MARKED qualifier. This will specifically undelete files marked for delete. This allows the recovery of files which are deleted but still open, such as INSTALLed files, or even recovery of the system dump file SYSDUMP.DMP whenever such a file is accidentially deleted.

UNDELETE

Recover one or more deleted files on a device.

FORMAT

UNDELETE *device[:]*

PARAMETERS

device

The device on which to undelete one or more files. The device will be write-locked during the undelete process.

QUALIFIERS

/FILE=filename

The file to be recovered. Wildcards may be used. If a matching file is found Undelete will ask a confirmation. If a certain file is confirmed, that file will be recovered if possible, and control will be returned to the DFU> prompt. If the /FILE qualifier is omitted DFU will assume *.*;* .

/IDENT=identifier or uic

You can search for files owned by a specific identifier or UIC. Another way is the /OWNER_UIC qualifier; you cannot combine these 2 qualifier in one UNDELETE command.

/LIST(=output-file-name)

Generate a list of recoverable files. No undelete will take place, and the disk will not be locked. The defaultoutput is SYS$OUTPUT.

/MARKED

Consider only files marked-for-delete. Such files are usuallly still open by some utility, such as INSTALLed files or the system dump file.

/OWNER_UIC=uic or identifier

This qualifier is used to select files by a UIC or identifier . You cannot combine this qualifier with /IDENT.

/STATISTICS

This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.

13 SPAWN

The new SPAWN command creates an interactive subprocess. This allows a quick escape to the DCL level from an interactive DFU session. The subprocess has a default prompt DFU_sub$. In SMG mode the <DO> key also performs a SPAWN command. You must logout explicitly to return to the DFU session.

14 VERIFY

This chapter describes the VERIFY command with the related parameters and qualifiers.

14.1 Introduction

The VERIFY command makes an analysis of the disk, scanning for file and disk structure errors. VERIFY performs almost all of the checks normally done by a ANALYZE/DISK command. But VERIFY is several times faster than ANALYZE/DISK, and uses less resources.

VERIFY checks and reports the following errors:

- Checks the logical information contained in the disk's HOME block
- Reports files marked for deletion
- Reports mismatches in the index file's bitmap
- Checks the VMS$COMMON.DIR backlink on system disks
- Checks all backlinks.
- Reports multiple allocated blocks
- Reports blocks incorrectly marked free and allocated
- Reports all lost files
- Checks for mismatches between blocks used and blocks charged in QUOTA.SYS. (Only done when diskquota is enabled)

14.2 Basic repair actions

The /FIX qualifier can be used to perform some basic repair actions. Unlike ANALYZE/DISK/REPAIR this does not lock the disk! /FIX repairs the following errors:

- Deletes file marked for delete (if possible).
- Recovers lost files and directories into [SYSLOST].
- Recovers a very rare problem which will get ANALYZE/DISK/REPAIR into a computable loop (This problem is fixed in VMS V6.2 or with the VERI02_061 patch kit).
- Recovers a corrupted backlink for the Master File Directory 000000.DIR.

- Recovers a wrong backlink for VMS$COMMON.DIR files on the system disk

14.3 Advanced repair actions

The /REBUILD qualifier can be used to perform some more repair actions. This will however lock the disk (like a DCL $SET VOLUME/REBUILD=FORCE command) for a short period of time (usually less than 30 seconds). /REBUILD repairs the following errors :

- Mismatches in the INDEXF.SYS bitmap (files reported with the NOBITSET and NOBITCLR errors)
- Blocks incorrectly marked allocated or free in the BITMAP.SYS.
- Mismatches in the diskquota file.

Note that /REBUILD does NOT change the disk's free block count.

14.4 Directory scanning

The /DIRECTORY_SCAN qualifier will force DFU to also verify and repair (when using /FIX) directory problems. This qualifier directs DFU to scan all directories on the disk. This has some advantages :

- Better detection of some cases of 'lost' files. Combined with the /FIX qualifier DFU may be able to recover such files into the correct directory instead of moving such files to [SYSLOST].
- Detects and fixes file-id mismatches between directories and the INDEXF.SYS file.
- Using the /DIRECTORY_SCAN qualifier makes DFU fully compatible with ANALYZE/DISK.

Please note that a complete directory scan may take several minutes to complete.

14.5 Interpreting errors

On a system (cluster) wide mounted disk there will probably be concurrent disk activity during the VERIFY command. Therefore VERIFY may report some errors which are not really errors. Try running VERIFY 2 or 3 times to see if the errors are reported again. To get a really consistent report from VERIFY you can use the /LOCK qualifier. This will write-lock the disk during the VERIFY run, so don't use this qualifier too often. (The /REPAIR qualifier of ANALYZE/DISK also write-locks the disk). Even if DFU ends ungracefully the DFU exit handler will always UNLOCK the disk.

14.6 Error reporting

An example of a typical VERIFY run follows:

```
DFU> VERIFY mydisk
%DFU-I-VERIFY, Verifying MYDISK:
%DFU-S-CHKHOME, Home block info verified OK
%DFU-I-IFSCAN, Scanning INDEXF.SYS ...
%DFU-I-CHKBITMAP, Checking BITMAP.SYS...
%DFU-I-CHKLOST, Checking for lost files...
%DFU-I-CHKQUOTA, Checking QUOTA.SYS...

DFU> VERIFY/REBUILD sys$sysdevice
%DFU-W-LOCKED, Volume now write locked
%DFU=I-VERIFY, Verifying SYS$SYSDEVICE:
%DFU-S-CHKHOME, Home block info verified OK
%DFU-W-DELETED, file (620,351,1) RSF_DI_RSF_SERVER0.TMP;3 marked for delete
%DFU-W-DELETED, file (6349,173,1) DCLTABLES.EXE;937 marked for delete
%DFU-W-DELETED, file (19745,35,1) RSF_DI_RSF_SERVER0.TMP;3 marked for delete
%DFU-I-CHKBITMAP, Checking BITMAP.SYS...
%DFU-E-ALLOCCLR, blocks LBN 2667141 through 2667143 incorrectly marked allocated
%DFU-E-ALLOCCLR, blocks LBN 2667153 through 2667161 incorrectly marked allocated
  .
  .
%DFU-S-RBDBITMAP, BITMAP.SYS succesfully rebuild
%DFU-I-CHKLOST, Checking for lost files...
%DFU-I-UNLOCK, Volume unlocked

DFU>
```

VERIFY can report the following errors:

ALLOCCLR, blocks incorrectly marked allocated,

Severity: ERROR

Explanation: Blocks were found which are not allocated by a file but set in the BITMAP file. This error is often seen when VERIFY is run and there is concurrent file activity on the disk. Also, if after a system crash the disk is mounted with /NOREBUILD such blocks may exist. ReRun VERIFY with /LOCK to see if the error is still there.

User Action: Run VERIFY/REBUILD to rebuild the BITMAP file.

ALLOCSET, blocks incorrectly marked free,

Severity: ERROR

Explanation: Blocks were found which are allocated by a file but not set in the BITMAP file. This error is often seen when VERIFY is run and there is concurrent file activity on the disk. Also, if after a system crash the disk is mounted with /NOREBUILD such blocks may exist. ReRun VERIFY with /LOCK to see if the error is still there.

User Action: Run VERIFY/REBUILD to rebuild the BITMAP file.

BADBLOCK, file has suspected bad blocks,

Severity: ERROR

Explanation: A file has suspected bad blocks. This is likely to be caused by hardware errors on the disk.

User Action: Try to copy the file to another location. Also check the Error Log.

BADEXTLNK, link to extension header broken,

Severity: ERROR

Explanation: VERIFY tries to follow the extension link of the file and it failed, or the extension header is invalid.

User Action: Try ANALYZE/DISK/REPAIR. However, this may be an unrepairable error, in which case the file will be corrupted and unreliable.

BADMFDLNK, directory has backlink to 000000.DIR on RVN n,

Severity: ERROR

Explanation: A directory has a backlink to a Master file directory other than the one on RVN 1. This is incorrect, but the only way to recover is to reenter the directory manually into the 000000.DIR on RVN 1.

User Action: Do a SET FILE/ENTER into the 000000.DIR directory on RVN 1, then do a SET FILE/REMOVE from the wrong 000000.DIR.

DELETED, file marked for delete,

Severity: WARNING

Explanation: A file was found marked for deletion. Such files usually exists as a result of file being deleted while it was still INSTALLed, or as a result of a system crash. It is not considered as an error. You can try to delete such files by using VERIFY/FIX.

ERRHOME, Home block info not OK,

Severity: ERROR

Explanation: The Info contained in the Home Block was not consistent or corrupted.

User Action: Run ANALYZE/DISK/REPAIR to try to fix the error.

INVBAKFID, file has invalid backlink,

Severity: ERROR

Explanation: The files backlink file id is not filled in. This is likely to be a lost file. (Note that once VERIFY reports this error, it will not be reported again during the LOSTFILE check). But is also possible that the file is in a valid directory, but that the Backlink file id is not filled in.

User Action: Run ANALYZE/DISK/REPAIR. If the file is in a valid directory the backlink will be repaired. Otherwise the file will be moved to the [SYSLOST] directory. You can also use VERIFY/FIX but then the file will unconditionally be moved to [SYSLOST].

LOCKED, file is deaccess locked,

Severity: WARNING

Explanation: The file is deaccess locked. This may be a result of a system crash.

User Action: Try to unlock the file with the DFU SET command, or the DCL UNLOCK command.

LOSTHDR1, file found in nonexistent directory,

Severity: WARNING

Explanation: During the lost file check a file was discovered in a nonexistent directory. This error can be caused as follows : set a directory file to NODIRECTORY and delete it.

User Action: Run VERIFY/FIX to move the file to the [SYSLOST] directory.

LOSTHDR2, file found in directory with bad backlink,

Severity: WARNING

Explanation: During the lost file check a file was discovered in a valid directory. However, the directory has an invalid backlink. This error can be caused by doing a SET FILE/REMOVE of a directory file.

User Action: Run VERIFY/FIX to move the directory to the [SYSLOST] directory. Then move the directory back to the correct location. The files in the directory should be accesible again.

LOSTHDR3, file found in invalid directory,

Severity: WARNING

Explanation: During the lost file check a file was discovered in a directory which is not a valid directory. Either the file has a wrong backlink, or the directory file has the directory file attribute not set.

User Action: Look up the directory and use DFU SET to set the directory bit. If the directory file was OK then run VERIFY/FIX to recover the lost file.

LOSTHDR4, not found in a directory,

Severity: WARNING

Explanation: When the /DIRECTORY_SCAN qualifier is used, DFU detects files which have a valid backlink but which are not seen in the directory. This can be repaired with /FIX.

User Action: Using /FIX will enter these files in the correct directory.

MULTALLOC, blocks multiple allocated,

Severity: ERROR

Explanation: A file has blocks allocated which already belong to another file. Note that VERIFY will make a second pass through INDEXF.SYS to report all the files involved. This is a serious error, and may be a result of a disk being mounted on two seperated VAXClusters (or a partitioned VAXCluster).

User Action: Copy all the files found to another location. Next all the files must be deleted. Run VERIFY/REBUILD to repair the BITMAP. All the afflicted files must be manually inspected to see which files are valid and which are corrupted.

NOBITCLR, Deleted file header marked BUSY,

Severity: WARNING

Explanation: A file was deleted. The corresponding bit in the INDEXF bitmap should be cleared but is still set. This is not a serious error.

User Action: Run VERIFY/REBUILD to fix the error.

NOBITSET, index file bitmap bit not set,

Severity: WARNING

Explanation: A valid file was found, but the corresponding index file bitmap bit is clear. This is not a serious error.

User Action: Run VERIFY/REBUILD to fix the error.

NOOWNER, file has no owner,

Severity: WARNING

Explanation: A file was found with UIC [0,0] as the owner. This is not a normal situation.

User Action: Look up the file and modify the file owner.

QUOTAERR, UIC [x,y] has n blocks used, QUOTA indicates m blocks,

Severity: WARNING

Explanation: If a disk has diskquota enabled, VERIFY calculates the blocks used and compares them with the value in the QUOTA.SYS file. Any mismatch is reported. This error is often seen when VERIFY is run, and there is concurrent file activity on the disk. Also, if after a system crash the disk is mounted with /NOREBUILD such Quota mismatches may exist. ReRun VERIFY with /LOCK to see if the error is still there.

User Action: Run VERIFY/REBUILD to rebuild the QUOTA file. Or run a DISKQUOTA> REBUILD command.

SLFBAKFID, backlink points to itself,

Severity: WARNING

Explanation: This error indicates that DFU has found a directory with a backlink pointing to itself. This feature is only allowed for the MFD 000000.DIR. This error will result in ANALYZE/DISK going into a COMputable loop.

User Action: Run VERIFY/FIX to move the directory to the [SYSLOST] directory. Then remove the directory entry from itself with a SET FILE/REMOVE command. The files in the directory should be accesible again.

VERIFY

VERIFY a device for disk structure errors.

FORMAT

VERIFY *device[:]*

PARAMETERS

device

The device to be verified.

QUALIFIERS

/APPEND=filename

This qualifier redirects the output to be appended to an already existing file. If the output file does not exists it will be created. You can use /APPEND or /OUTPUT but not both.

/DIRECTORY_SCAN

Performs a full directory scan. This may take up some time, but it allows detection of mismatches between the directories and INDEXF.SYS.

/FIX
/NOFIX (default)

Repair errors on the disk. File marked for delete will be deleted and lost files and directories will be moved to [SYSLOST].

/LOCK
/NOLOCK (default)

Locks the disk for file allocation/deletion. This gives a consistent report for the disk, but other users may experience a delay when accessing the disk. The device will be unlocked a the end of the VERIFY command.

/OUTPUT=filename

This qualifier redirects the output to a file. The output will also go to SYS$OUTPUT. CAUTION: if you use /LOCK in combination with /OUTPUT be careful to specify an outputfile on ANOTHER disk, or DFU will finish with a severe error.

/REBUILD
/NOREBUILD (default)

Perform a volume rebuild. Using this qualifier will temporarily lock the disk for other users.

/STATISTICS

This qualifier displays the performance statistics: CPU time, Elapsed Time, I/O and PageFaults.