

NAME

tdiff – tree diff, list differences between various inode attributes (**stat(2)** structure) and contents for two directory trees

SYNOPSIS

tdiff [*OPTIONS*]... *DIRECTORY1* *DIRECTORY2*

DESCRIPTION

List differences between *DIRECTORY1* and *DIRECTORY2* file trees, comparing any of the inode attributes, also known as **stat(2)** structure members. Inode attributes are:

- file type (regular file, directory, FIFO, socket, etc.)
- file size
- file block count (physical storage size)
- owner uid and gid
- access, modification and inode change times
- extended attributes (if supported)
- ACLs (if supported)
- file system flags (BSD UFS, MacOSX)

By default, **tdiff** reports differences in any file contents or attributes except for the various file times. The set of attributes to be checked can be modified with the various options.

Beyond inode attribute checks, **tdiff** can check (and will check by default) regular files for contents difference. Optionally, **tdiff** can use an external program to determine if the files are considered to be different. See the **-x/--exec**, **-w/--exec-always**, and **-W/--exec-always-diff** options.

OPTIONS

Most single-letter options come in two versions, upper-case and lower-case. The lower-case option enables the attribute check, while the upper-case option disables it. Similarly, most long options have a **--no-** version to turn off the equivalent check.

-a, --all

Turn on all checks, except for file times.

This is equivalent to **-dtmogsbcnejkql** or **--dirs --type --mode --owner --group --size --blocks --contents --nlinks --major --minor --xattr --acl**.

Note that the file time options are not touched.

This is the default.

-A, --no-all

Turn off all checks, including file times.

This is equivalent to **-DTMOGZIRSBCNEJKQL** or **--no-dirs --no-type --no-mode --no-owner --no-group --no-ctime --no-mtime --no-atime --no-size --no-blocks --no-contents --no-nlinks --no-major --no-minor --no-xattr --no-acl**.

Unless an other option is used after **-A/--no-all**, **tdiff** will not report anything but will still traverse the file trees.

-b, --blocks

Report file **block** count differences for regular files, directories and symbolic links (*st_blocks* does not make sense on other types of inodes).

-B, --no-blocks

Do not report file **block** count differences.

-c, --contents

Report file **content** differences for regular files and symbolic links.

For regular files, their contents are compared and any discrepancies are reported as contents difference.

For symbolic links, a difference will be reported if their targets differ.
See the **CONTENTS COMPARISONS** section below for the exact semantics.

- C, --no-contents**
Do not report file **content** differences.
- d, --dirs**
Diff **directory** contents: report if any file is present in only one directory.
- D, --no-dirs**
Do not diff **directory** contents: files only present in a single directory are not reported.
- g, --group**
Report on any differences in file **group** ownership (owner group id).
- G, --no-group**
Do not report any differences in file **group** ownership (owner group id).
- h, --help**
Show a short **help** message and exit.
- i, --mtime**
Report on any differences in file modification **time** (*st_mtime*), up to nanosecond resolution if the underlying OS reports it.
- I, --no-mtime**
Do not report any differences in file modification **times** (*st_mtime*).
- j, --major**
For device files (either block or character), report any differences in **major** device numbers.
Note that major numbers will be compared across same or different (block or character) device file types.
- J, --no-major**
Do not report any differences in major device numbers on device files.
- k, --minor**
For device files (either block or character), report any differences in minor device numbers.
Note that minor numbers will be compared across same or different (block or character) device file types.
- K, --no-minor**
Do not report any differences in minor device numbers on device files.
- l, --acl**
Report on any differences in file ACLs as defined by **acl_set_file(3)**.
Any missing or different ACLs between the file pairs are reported. Access, default and mask ACL entries are supported.
- L, --no-acl**
Do not report any differences in file ACLs.
- m, --mode**
Report on any differences in file access **mode** (permission bits as set by **chmod(1)**). If set, **--mode-or** and **--mode-and** bitmasks are applied
- M, --no-mode**
Do not report any differences in file access **modes** (permission bits).
- n, --nlinks**
Report on any differences in file (hard) link counts (*st_nlinks*).
- N, --no-nlinks**
Do not report any differences in file (hard) link counts.

- o, --owner**
Report on any differences in file **ownership** (owner user id).
- O, --no-owner**
Do not report any differences in file **ownership** (owner user id).
- q, --xattr**
Report on any differences in file extended attributes as defined by **setxattr(2)**.
Any missing or different extended attributes between the file pairs are reported.
- Q, --no-xattr**
Do not report any differences in file extended attributes.
- r, --atime**
Report on any differences in file access time (*st_atime*), up to nanosecond resolution if the underlying OS reports it.
Since merely reading a file causes the access time to be updated, this option is likely to be of limited use. **tdiff** will not update the file access times when comparing files if compiled on an OS with **O_NOATIME** **open(2)** support. However commands specified with **-x/--exec**, **-w/--exec-always** or **-W/--exec-always-diff** may update the access times of the files they read.
- R, --no-atime**
Do not report any differences in file access times (*st_atime*).
- s, --size**
Report file size differences for regular files and symbolic links (*st_size* does not make sense on other types of inodes).
- S, --no-size**
Do not report file size differences.
- t, --type**
Report file **type** differences (files, directories, symbolic links, etc.)
- T, --no-type**
Do not report file **type** differences between the two compared directories.
- v, --verbose**
Increase **verbosity**, currently reports about the inode cache used to avoid comparing hard-linked files more than once. Four cumulative levels of logging verbosity are supported:
 - v** report overall statistics: total number of files scanned, compared, etc.
 - vv** report if any files are skipped, and for what reason (exclusion, already compared, etc.)
 - vvv** report internal data structure statistics.
 - vvvv** report memory statistics.
- V, --version**
Show the **tdiff** version information and compiled-in features then exit.
The compiled-in feature list shows which features **tdiff** has been compiled with: **O_NOATIME**, **flags**, **acl**, and **xattr** support, the list of supported file system flags, and the **readdir(2)** implementation used.
- w, --exec-always COMMAND... \;**
Always execute *COMMAND* for any pair of matching regular files found in the trees. *COMMAND* is defined as for the **-x/--exec** options.
If the option is specified more than once, the last command defined will be used.
- W, --exec-always-diff**
Always execute *diff -u* for any pair of matching regular files found in the trees. This is a shortcut for:
tdiff --exec-always diff -u %1 %2 ;

The option will supersede whichever command was specified in a **-w/--exec-always** option appearing earlier on the option list.

-x, --exec *COMMAND*... \;

Uses *COMMAND* when comparing files whose sizes are the same. *COMMAND* is a command line terminated by a semi-colon, which must be escaped to avoid processing by the shell.

In the arguments can appear the strings *%1* and *%2* which will be replaced by the paths to files in the first or second compared directories. *%1* and *%2* can only appear once on the command line, and must be full words: they cannot appear inside a larger shell word.

If the option is specified more than once, the last command defined will be used.

-X, --exclude *FILE*

Excludes *FILE* from processing: any discrepancies on a file or missing file named *FILE* will not be reported. Neither will external commands be ran on them. If *FILE* matches the name of a directory, it will not be descended into and any sub-directories or files it contains will be completely ignored.

This option may be specified more than once, all the files listed will be added to the exclusion list.

-z, --ctime

Report on any differences in file inode change time (*st_ctime*), up to nanosecond resolution if the underlying OS reports it.

Since inode change times are automatically set by Unix to the current time and cannot be changed afterwards, they will always be reported as different for any two file trees, except in rare cases (likely involving cloning raw file system images).

-Z, --no-ctime

Do not report any differences in file inode change times (*st_ctime*).

-|, --mode-or *MASK*

Note that the pipe character must be escaped to prevent it from being interpreted by the shell.

When comparing file permission bits, perform a binary or between the permission bits and *MASK* before comparing them.

MASK is specified in octal, like with **chmod(2)**, unless prefixed with *0x*, in which case it is parsed as hexadecimal.

-&, --mode-and *MASK*

Note that the ampersand character must be escaped to prevent it from being interpreted by the shell.

When comparing file permission bits, perform a binary and between the permission bits and *MASK* before comparing them.

MASK is specified in octal, like with **chmod(2)**, unless prefixed with *0x*, in which case it is parsed as hexadecimal.

HARD LINKS

tdiff optimizes for hard links in two ways:

- **tdiff** will skip examining a pair of files if it has already compared the pair's hard links copies.

For example, if you have *file1* hard linked to *file2* in both *DIRECTORY1* and *DIRECTORY2*, **tdiff** will only report any differences for *file1* and will skip *file2* entirely since it's linked to *file1* in both examined directories, and the list of differences would be the same as for the already reported *file1* case.

- **tdiff** will skip examining two hard-linked files.

For example, if *dir1/file* is hard linked to *dir2/file*, then **tdiff** will omit examining the file pair entirely since they really are the same object and would have no differences at all.

tdiff's hard link optimization depends on files' inode and device numbers to be stable, unique and consistent at least for the duration of the **tdiff** run. This is generally the case for traditional file systems.

tdiff can optionally show which hard linked files are skipped and for what reason when run at the verbosity

level 2 or above (**-vv** or **--verbose --verbose**).

CONTENTS COMPARISONS

tdiff uses built-in code for file contents comparisons. It avoid running an actual comparison if the file's sizes (*st_size*) are different: the files with different sizes will be reported as having different contents without even comparing them as the size difference is enough to ascertain that their contents differ.

If either the **-x** or **--exec** options are used, the command specified there will be ran instead of the built-in comparison and its exit status used to detect a difference (zero exit status meaning no difference, and non-zero meaning a difference). With either these options in effect, **tdiff** will not print any error message if the files are different, the command used for **-x/--exec** should take care of reporting the error. Note that the command *will not be ran if **tdiff** can find via the file size that the files differ by virtue of having different sizes.*

If either the **-w/--exec-always** or **-W/--exec-always-diff** options are used, the command specified with these options will always be ran for every pair of regular files having the same path in both directories, whether or not they have the same size. The internal comparison pass will run and will report if the files are different, then the **-w/--exec-always/-W/--exec-always-diff** command will run. **tdiff** will record a difference if the **-w/--exec-always/-W/--exec-always-diff** command returns with non-zero exit status, even if the internal comparison or the **-x/--exec** command are successful.

If both **-x/--exec** and **-w/--exec-always/-W/--exec-always-diff** options are used, then the command specified for **-x/--exec** will be ran if the file sizes of the compared files are the same, and the command specified by **-w/--exec-always/-W/--exec-always-diff** will always run.

This means that with options from both groups active, both the **-x/--exec** and **-w/--exec-always/-W/--exec-always-diff** commands will be ran for files with the same size.

EXIT STATUS

tdiff exits with status:

- 0 if no discrepancies nor errors were encountered.
- 1 if there were any problems with arguments or parsing the command line.
- 2 if there were any differences reported.
- 3 if there was any system error (a file couldn't be read for example).
- 4 if there was an internal error. This should not happen.

EXAMPLES

Only report if any files are present in only one directory:

```
tdiff --no-all --dirs directory1 directory2
```

Report only ownership differences, ignore any missing files:

```
tdiff --no-all --owner --group directory1 directory2
```

Report only group permission bits differences, ignore any missing files:

```
tdiff --no-all --mode --mode-and 70 directory1 directory2
```

or:

```
tdiff --no-all --mode --mode-or 7707 directory1 directory2
```

Report only sticky bits differences, ignore any missing files:

```
tdiff --no-all --mode --mode-and 1000 directory1 directory2
```

or:

```
tdiff --no-all --mode --mode-or 6777 directory1 directory2
```

Run **cmp -l** on every file of the same size in both trees:

```
tdiff --no-all --exec cmp -l %1 %2 \; directory1 directory2
```

Run super-diff: diff files with **diff -u** and reports any other kind of differences in inode contents except for times:

tdiff --exec--always--diff *directory1 directory2*

or more tersely:

tdiff -W *directory1 directory2*

REPORTING BUGS

Report bugs on the GitHub Issues page [⟨https://github.com/F-i-f/tdiff/issues⟩](https://github.com/F-i-f/tdiff/issues).

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SEE ALSO

acl_set_file(1), **chmod(1)**, **diff(1)**, **getfacl(1)**, **getfattr(1)**, **open(2)**, **setxattr(2)**, **stat(2)**.