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## Problem Set 2: Recursive Filesystem Exploration with Hard Linked Directory Loop Detection

Program Name = walkfs: walk file system

Screenshot showing layout of current directory called root. It was from within root that the program walkfs was invoked for several tests demonstrating the functionality of the program.

```
Terminal
george@george-Vostro-1400 ~/Desktop/ECE460/PS2/root $ ls -iRh .
556000 A 556001 B 556002 C 556003 D
532517 al 556143 Al 532516 a2 556145 A2 532518 a3 542942 a4 symlink
/ A/A1:
543099 all 556151 All 543100 al2
./ A/A1/A11:
543153 all1 543175 all2 symlink
/ A/A2:
543084 a21
./ B:
532530 bl 556146 Bl 532533 b2 542938 b3 symlink
./ B/B1:
543089 bll 543105 bl2
534519 cl 534521 c2 532055 c4
/ D:
534528 dl 556147 Dl 556149 D2 543030 <mark>d2_symlink</mark> 556150 D3 543032 <mark>d3_symlink</mark>
/_D/D1:
543126 d11
./ D/D2:
543129 d21
/ D/D3:
543130 d31
george@george-Vostro-1400 ~/Desktop/ECE460/PS2/root $ 🗌
```

The following screenshot shows walkfs begin run with Valgrind's memory leak detection tool. The path was root. The layout of root was shown in the above screenshot. No options were used in this invocation of walkfs. All of the subdirectories are opened and their metadata are printed in the following order:

dev\_number/ino\_number file\_type\_perms num\_links user group size last\_mod\_time path
-->link\_content (if any)

Valgrind reports that in this execution, no memory was leaked

```
Terminal
 4074== Memcheck, a memory error detector
4074== Copyright (C) 2002-2013, and GNU GPL'd, by Julian Seward et al.
 4074== Using Valgrind-3.10.0.SVN and LibVEX; rerun with -h for copyright info
 4074== Command:
                  ./walkfs root/
4074==
4006/556003
                                                                        Wed Sep 23 16:10:00 2015
                drwxr-xr-x
                                                            4096
                                      george
                                                    george
                                                                                                     root// D
4006/534528
                                                                        Mon Sep 21 18:09:26 2015
                                                                                                            D/d1
                                      george
                                                    george
                                                                                                     root//
4006/556150
                                                                        Wed Sep 23 16:10:42
                                                                                                     root// D/D3
                drwxr-xr-x
                                                    george
                                      george
4006/543130
                                                                                 23 16:10:42
                                      george
                                                    george
                                                                        Wed Sep
                                                                                                     root//
                                                                                                             D/D3/d31
4006/543032
                lrwxrwxrwx
                                                    george
                                                                        Wed Sep 23 15:54:50 2015
                                                                                                             D/d3 symlink --> root/ A/al
                                      george
4006/556147
                                                            4096
                                                                                 23 16:10:22 2015
                                                                                                             D/D1
                                      george
                                                    george
4006/543126
                                                                                                             D/D1/d11
                                      george
                                                    george
                                                                        Wed Sep 23 16:10:22 2015
                                                                                                     root//
4006/556149
                                                                        Wed Sep 23 16:10:35 2015
                                                            4096
                drwxr-xr-x
                                      george
                                                    george
                                                                                                     root//
                                                                                                             D/D2
                                                                        Wed Sep 23 16:10:35 2015
4006/543129
                                                                                                             D/D2/d21
                                      george
                                                                                                     root//
                                                    george
4006/543030
                                                                        Wed Sep 23 15:54:16 2015
                                                                                                             D/d2 symlink --> root/ B/b2
                                                                                                     root//
                                      george
                                                    george
4006/556001
                                                                                 23 16:09:14 2015
                drwxr-xr-x
                                                    george
                                                                        Wed Sep
                                      george
4006/542938
                                                                        Wed Sep 23 15:57:29 2015
                                                                                                             B/b3 symlink --> root/ A/al
                lrwxrwxrwx
                                                    george
4006/556146
                drwxr-xr-x
                                                            4096
                                                                        Wed Sep 23 16:09:38 2015
                                                                                                             B/B1
                                      george
                                                    george
                                                                                                             B/B1/b12
4006/543105
                                                                        Wed Sep 23 16:09:38 2015
                -rw-r--r--
                                      george
                                                    george
                                                                                                     root//
4006/543089
                                                                        Wed Sep 23 16:09:38 2015
                                                                                                             B/B1/b11
                                      george
                                                    george
                                                                                                     root//
4006/532530
                                                                        Mon Sep 21 18:42:11 2015
                                                                                                             B/b1
                                                                                                     root//
                                      george
                                                    george
                                                                        Mon Sep 21 18:09:26 2015
                                                                                                             B/b2
                                                                                                     root//
                                      george
                                                    george
4006/556002
                drwxr-xr-x
                                      george
                                                    george
                                                                         Tue Sep 22
                                                                                    19:41:02
4006/532055
                                                                        Tue Sep 22 19:40:08 2015
                                                    george
4006/534519
                                                    george
                                                                        Mon Sep 21 18:09:26 2015
                                                                                                             C/cl
                                      george
4006/534521
                                                                        Mon Sep 21 18:09:26 2015
                                      george
                                                    george
                                                                                                     root//
                                                                                                             C/c2
4006/556000
                                                                        Wed Sep 23 16:06:58 2015
                                                            4096
                drwxr-xr-x
                                                                                                     root//
                                      george
                                                    george
                                                                                 23 15:58:31 2015
4006/542942
                                                                        Wed Sep
                                                                                                             A/a4 symlink --> root/ C/c2
                lrwxrwxrwx
                                      george
                                                    george
                                                                                                     root//
4006/556143
                                                                        Wed Sep 23 16:15:20 2015
                drwxr-xr-x
                                                                                                     root//_A/Al
                                      george
                                                    george
                                                                        Wed Sep 23 16:07:25 2015
Wed Sep 23 16:25:01 2015
4006/543100
                                                                                                             A/A1/a12
                                      george
                                                    george
4006/556151
                drwxr-xr-x
                                                    george
                                                            4096
                                                                                                             A/A1/A11
                                      george
4006/543153
                                      george
                                                                        Wed Sep 23 16:15:51 2015
                                                                                                     root//_A/Al/All/alll
                -rw-r--r--
                                                    george
4006/543175
                                                                        Wed Sep 23 16:25:01 2015
Wed Sep 23 16:07:25 2015
                                                                                                     root//_A/A1/A11/a112_symlink --> C/c4
                lrwxrwxrwx
                                      george
                                                    george
4006/543099
                                                                                                     root// A/A1/a11
                                      george
                                                    george
4006/532516
                                                                        Mon Sep 21 18:09:26
                                                                                                     root//_A/a2
                                      root
                                                    george
4006/532517
                                                                        Mon Sep 21 18:13:48 2015
                                      root
                                                    george
                                                                                                     root//_A/al
4006/556145
                drwxr-xr-x
                                                            4096
                                                                        Wed Sep 23 16:08:40 2015
                                                                                                     root//_A/A2
                                      george
                                                    george
4006/543084
                                      george
                                                    george
                                                                        Wed Sep 23 16:08:40 2015
                                                                                                     root//_A/A2/a21
4006/532518
                                      george
                                                    george
                                                                        Mon Sep 21 18:09:26 2015
                                                                                                     root// A/a3
4074==
 4074== HEAP SUMMARY:
            in use at exit: 0 bytes in 0 blocks
 4074==
          total heap usage: 458 allocs, 458 frees, 451,863 bytes allocated
4074== All heap blocks were freed -- no leaks are possible
 4074==
 4074== For counts of detected and suppressed errors, rerun with: -v
4074== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```

The following screenshot shows walkfs with the -u option. Only those nodes owned by root were printed. The first time, -u was given with the username. The second time, -u was given with the uid.

```
Terminal
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ sudo chown root root/
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ sudo chown root root/_D/D1/d11
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u 0 root
 4006/543126
                 -rw-r--r--
                                                                           Wed Sep 23 16:10:22 2015
                                                                                                        root/ D/D1/d11
                                        root
                                                     george
 4006/543153
                  -rw-r--r--
                                                     george
                                                                           Wed Sep 23 16:15:51 2015
                                                                                                        root/ A/A1/A11/a111
                                        root
 4006/532516
                                                     george
                                                                           Mon Sep 21 18:09:26 2015
                                                                                                        root/ A/a2
                                        root
 4006/532517
                 -rw-r--r--
                                                                           Mon Sep 21 18:13:48 2015
                                        root
                                                      george
                                                                                                        root/ A/al
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u root root
 4006/543126
                                                                           Wed Sep 23 16:10:22 2015
                                                                                                        root/ D/D1/d11
                                        root
                                                     george
 4006/543153
                                                      george
                                                              0
                                                                           Wed Sep 23 16:15:51 2015
                                                                                                        root/_A/A1/A11/a111
                                                                           Mon Sep 21 18:09:26 2015
 4006/532516
                  -rw-r--r--
                                        root
                                                     george
                                                                                                        root/ A/a2
                                                                                       18:13:48 2015
```

Show me all files owned by user with uid 1000 (george)

```
Terminal
eorge@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u 1000
4006/556003 drwxr-xr-x 5 george george 4006
                                         george
                                                       george
                                                                             Wed Sep 23 16:10:00 2015
                                                                                                            root/ D
4006/534528
                                                                             Mon Sep 21 18:09:26 2015
Wed Sep 23 16:10:42 2015
                                                                                                           root/ D/d1
                  -rw-r--r-
                                         george
                                                       george
                                                                                                           root/ D/D3
4006/556150
                 drwxr-xr-x
                                         george
                                                       george
                                                                4096
4006/543130
                                                                             Wed Sep 23 16:10:42 2015
                                                                                                           root/ D/D3/d31
                  -rw-r--r--
                                         george
                                                       george
4006/543032
                                                                             Wed Sep 23 15:54:50 2015
                                                                                                           root/ D/d3 symlink --> root/ A/al
                  lrwxrwxrwx
                                                       george
                                         george
4006/556147
                                                                             Wed Sep 23 16:10:22 2015
                                                                                                            root/ D/D1
                                                                4096
                 drwxr-xr-x
                                         george
                                                       george
4006/556149
                                                                             Wed Sep 23 16:10:35 2015
                 drwxr-xr-x
                                                                4096
                                                                                                            root/ D/D2
                                         george
                                                       george
                                                                             Wed Sep 23 16:10:35 2015
4006/543129
                                                                                                            root/ D/D2/d21
                                         george
                                                       george
                                                                             Wed Sep 23 15:54:16 2015
Wed Sep 23 16:09:14 2015
                                                                                                            root/ D/d2 symlink --> root/ B/b2
4006/543030
                                         george
                                                       george
4006/556001
                                                                4096
                 drwxr-xr-x
                                                                                                            root/ B
                                         george
                                                       george
4006/542938
                                                                             Wed Sep 23 15:57:29 2015
                                                                                                            root/B/b3 symlink --> root/ A/al
                  lrwxrwxrwx
                                         george
                                                       george
4006/556146
                                                                4096
                                                                             Wed Sep 23 16:09:38 2015
                                                                                                            root/ B/B1
                 drwxr-xr-x
                                         george
                                                       george
)4006/543105
)4006/543089
                                                                             Wed Sep 23 16:09:38 2015
Wed Sep 23 16:09:38 2015
                                                                                                            root/B/B1/b12
                  -rw-r--r--
                                         george
                                                       george
                                         george
                                                       george
                                                                                                            root/ B/B1/b11
04006/532530
04006/532533
04006/556002
04006/532055
04006/534519
                                         george
                                                       george
                                                                             Mon Sep 21 18:42:11 2015
                                                                                                            root/ B/b1
                                         george
                                                       george
                                                                             Mon Sep 21 18:09:26 2015
                                                                                                            root/ B/b2
                                                                             Tue Sep 22 19:41:02 2015
                 drwxr-xr-x
                                         george
                                                       george
                                                                4096
                                                                             Tue Sep 22 19:40:08 2015
                                                                                                           root/_C/c4
                                         george
                                                       george
                                                                             Mon Sep 21 18:09:26 2015
                                         george
                                                       george
                                                                                                            root/ C/cl
4006/534521
4006/556000
                                                                             Mon Sep 21 18:09:26 2015
                  -rw-r--r--
                                         george
                                                       george
                                                                                                            root/ C/c2
                                                                             Wed Sep 23 16:06:58 2015
                                                                                                            root/ A
                                                                4096
                 drwxr-xr-x
                                         george
                                                       george
4006/542942
                                                                             Wed Sep 23 15:58:31 2015
                                                                                                            root/ A/a4 symlink --> root/ C/c2
                  lrwxrwxrwx
                                                                10
                                         george
                                                       george
4006/556143
                                                                4096
                                                                             Wed Sep 23 16:15:20 2015
                                                                                                            root/ A/A1
                 drwxr-xr-x
                                         george
                                                       george
                                                                             Wed Sep 23 16:07:25 2015
Wed Sep 23 16:25:01 2015
4006/543100
                                                                                                            root/ A/A1/a12
                  -rw-r--r--
                                         george
                                                       george
                                                                0
4006/556151
                 drwxr-xr-x
                                                                4096
                                                                                                            root/ A/A1/A11
                                         george
                                                       george
                                                                             Wed Sep 23 16:25:01 2015
Wed Sep 23 16:07:25 2015
                                                                                                            root/ A/A1/A11/a112 symlink --> C/c4
4006/543175
                                         george
                                                       george
4006/543099
                                         george
                                                       george
                                                                                                            root/ A/A1/a11
4006/556145
                                                                             Wed Sep 23 16:08:40 2015
                                                                                                           root/ A/A2
                 drwxr-xr-x
                                         george
                                                       george
                                                                4096
4006/543084
                                         george
                                                       george
                                                                             Wed Sep 23 16:08:40 2015
                                                                                                           root/ A/A2/a21
4006/532518
                                                        george
                                                                             Mon Sep 21 18:09:26 2015
eorge@george-Vostro-1400 ~/Desktop/ECE460/PS2 $
```

Show me all files that are less than a day old

```
Terminal
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $
 4006/556003
                  drwxr-xr-x
                                                                    4096
                                                                                 Wed Sep 23 16:10:00 2015
                                                                                                                 root/ D
                                           george
                                                          george
4006/556150
                                                                                 Wed Sep 23 16:10:42 2015
Wed Sep 23 16:10:42 2015
                  drwxr-xr-x
                                           george
                                                                    4096
                                                                                                                 root/ D/D3
                                                          george
4006/543130
                                                                                                                 root/ D/D3/d31
                   -rw-r--r--
                                           george
                                                          george
                                                                                 Wed Sep 23
                                                                                              15:54:50 2015
                                                                                                                        D/d3 symlink --> root/ A/al
4006/543032
                   lrwxrwxrwx
                                           george
                                                                                                                 root/
                                                          george
                                                                   4096
4006/556147
                                                                                 Wed Sep 23 16:10:22 2015
                  drwxr-xr-x
                                                                                                                 root/ D/D1
                                           george
                                                          george
                                                                                 Wed Sep 23 16:10:22 2015
Wed Sep 23 16:10:35 2015
4006/543126
                                                                                                                        D/D1/d11
                                                          george
                                                                                                                 root/ D/D2
4006/556149
                                                                    4096
                   drwxr-xr-x
                                           george
                                                          george
4006/543129
                                                                                 Wed Sep 23
                                                                                              16:10:35 2015
                                                                                                                 root/_D/D2/d21
                                           george
                                                          george
4006/543030
                                           george
                                                          george
                                                                                 Wed Sep 23 15:54:16 2015
                                                                                                                 root/_D/d2_symlink --> root/_B/b2
                                                                                 Wed Sep 23 16:09:14 2015
Wed Sep 23 15:57:29 2015
4006/556001
                   drwxr-xr-x
                                           george
                                                          george
4006/542938
                                                                                                                 root/_B/b3_symlink --> root/_A/a1
                   lrwxrwxrwx
                                           george
                                                          george
                                                                                 Wed Sep 23 16:09:38 2015
Wed Sep 23 16:09:38 2015
4006/556146
                                                                    4096
                   drwxr-xr-x
                                           george
                                                          george
                                                                                                                 root/ B/B1
                                                                                                                 root/ B/B1/b12
4006/543105
                   -rw-r--r--
                                           george
                                                          george
4006/543089
4006/556002
                                                                                 Wed Sep 23 16:09:38 2015
Tue Sep 22 19:41:02 2015
                   -rw-r--r--
                                                                                                                        B/B1/b11
                                           george
                                                          george
                   drwxr-xr-x
                                                          george
                                                                    4096
                                           george
04006/532055
04006/556000
04006/542942
04006/556143
                                                                                 Tue Sep 22 19:40:08 2015
                                           george
                                                          george
                   drwxr-xr-x
                                           george
                                                                    4096
                                                                                 Wed Sep 23 16:06:58 2015
                                                          george
                                                                                 Wed Sep 23 15:58:31 2015
Wed Sep 23 16:15:20 2015
                   lrwxrwxrwx
                                           george
                                                          george
                                                                                                                 root/
                                                                                                                        A/a4_symlink --> root/_C/c2
                   drwxr-xr-x
                                           george
                                                          george
                                                                    4096
                                                                                                                 root/ A/A1
4006/543100
                                                                                 Wed Sep 23 16:07:25 2015
Wed Sep 23 16:25:01 2015
                                                                                                                 root/_A/A1/a12
                                           george
                                                          george
                                                                                                                 root/ A/A1/A11
                                                                    4096
                   drwxr-xr-x
                                           george
                                                          george
4006/543153
4006/543175
                                                                                 Wed Sep 23 16:15:51 2015
Wed Sep 23 16:25:01 2015
                                                                                                                 root/ A/A1/A11/a111
                                                          george
                   lrwxrwxrwx
                                           george
                                                          george
                                                                                                                 root/A/A1/A11/a112 symlink --> C/c4
                   -rw-r--r-
                                                                                 Wed Sep 23 16:07:25 2015
Wed Sep 23 16:08:40 2015
4006/543099
                                                                                                                 root/_A/A1/a11
                                           george
                                                          george
                                                                    0
4006/556145
                                                                   4096
                   drwxr-xr-x
                                           george
                                                          george
                                                                                                                 root/_A/A2
                                                                                                                 root/_A/A2/a21
4006/543084
                                                                                 Wed Sep 23 16:08:40 2015
                                                            eorge
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ [
```

Show me all files less than a day old owned by root

```
        Terminal

        george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u 0 -m -86400 root

        04006/543126 -rw-r--r-- 1 root george 0 Wed Sep 23 16:10:22 2015 root/_D/D1/d11

        04006/543153 -rw-r--r-- 1 root george 0 Wed Sep 23 16:15:51 2015 root/_A/A1/A11/a111

        george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $
```

Now make a new directory in root called mnt and mount evilfs.img on it. Then show me all files owned by george older than a day and stay within the initial volume. Next, show me all files owned by root older than a day and stay within the initial volume

```
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ mkdir root/mnt
leorge@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ sudo mount -oloop ~/Desktop/evilfs.img root/mnt
sudo] password for george:
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u george -m 86400 -x root
4006/534528
                - rw- r-- r--
                                                  george 11
                                                                      Mon Sep 21 18:09:26 2015
                                                                                                 root/ D/d1
                                     george
4006/532530
                                                                      Mon Sep 21 18:42:11 2015
                                                  george 42
                                                                                                 root/ B/b1
                                     george
4006/532533
                -rw-r--r--
                                                  george
                                                                      Mon Sep 21 18:09:26 2015
                                                                                                 root/ B/b2
                                     george
4006/534519
                -rw-r--r--
                                                  george
                                                                      Mon Sep 21
                                                                                 18:09:26 2015
                                                                                                  root/ C/cl
                                     george
                                                                      Mon Sep 21 18:09:26 2015
4006/534521
                -rw-r--r--
                                                  george
                                                                                                  root/ C/c2
                                     george
94006/532518
                -rw-r--r--
                                                                      Mon Sep 21 18:09:26 2015
                                                                                                  root/ A/a3
                                                  george 11
                                     aeorae
note: not crossing mount point at root/mnt
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u root -m 86400 -x root
                                                  george 11
george 51
                                                                      Mon Sep 21 18:09:26 2015
4006/532516
                -rw-r--r--
                                     root
                                                                                                 root/ A/a2
4006/532517
                                                                      Mon Sep 21 18:13:48 2015
                                                                                                 root/ A/al
ote: not crossing mount point at root/mnt
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $
```

Show me all files owned by george modified within half a day whose links successfully resolve to root/\_A/a1. Make sure to stay within the starting volume

```
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u george -m -43200 -x -l root/_A/a1 root
04006/543032 lrwxrwxrwx 1 george george 10 Wed Sep 23 15:54:50 2015 root/_D/d3_symlink --> root/_A/a1
04006/542938 lrwxrwxrwx 1 george george 10 Wed Sep 23 15:57:29 2015 root/_B/b3_symlink --> root/_A/a1
note: not crossing mount point at root/mnt
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ [
```

Show me all files owned by george modified within half a day whose links successfully resolve to root/\_A/a2. Make sure to stay within the starting volume.

```
Terminal

george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $ ./walkfs -u george -m -43200 -x -l root/_A/a2 root
note: not crossing mount point at root/mnt
george@george-Vostro-1400 ~/Desktop/ECE460/PS2 $
```

The loop detection feature was implemented and matched the output given in the course website (with 2 exceptions)

- 1. My output is not sorted
- 2. I was not able to successfully obtain the inode information for the "weird file" located at the relative path: /root/mnt/D/type\_13

The output below was copied and pasted from Terminal since a screen shot would not capture its entirety:

```
./walkfs root/mnt
==5353== Memcheck, a memory error detector
==5353== Copyright (C) 2002-2013, and GNU GPL'd, by Julian Seward et al.
==5353== Using Valgrind-3.10.0.SVN and LibVEX; rerun with -h for copyright info
==5353== Command: ./walkfs root/mnt
==5353==
03400/4097 drwxr-xr-x
                       4
                               root.
                                         root.
                                                  1024
                                                             Mon Jan 30 18:25:20 2012 root/mnt/C
03400/4100
                                                  10
                                                             Mon Jan 30 18:25:21 2012
                                                                                      root/mnt/C/3
           -rw-r--r--
                        1
                               root
                                         root
03400/4098 drwxr-xr-x
                                                  1024
                                                             Mon Jan 30 18:45:34 2012
                                                                                      root/mnt/C/1
                        4
                               root
                                         root
03400/4103 drwxr-xr-x
                                                  1024
                                                             Mon Jan 30 18:45:34 2012
                        2
                                                                                      root/mnt/C/1/z
                               root
                                         root
03400/8195 drwxr-xr-x
                               root
                                         root
                                                  1024
                                                             Mon Jan 30 18:45:05 2012
                                                                                      root/mnt/C/1/z/3001
03400/8196 drwxr-xr-x 3
                               root
                                         root
                                                  1024
                                                             Mon Jan 30 18:45:16 2012
                                                                                      root/mnt/C/1/z/3001/c
03400/8193 drwxr-xr-x 4
                                                             Mon Jan 30 18:44:59 2012
                                                  1024
                               root
                                         root
root/mnt/C/1/z/3001/c/1002
03400/8194 -rw-r--r- 1
                               root
                                         root
                                                  12
                                                             Mon Jan 30 18:25:50 2012
root/mnt/C/1/z/3001/c/1002/101
03400/8195 drwxr-xr-x
                      5
                                                  1024
                                                             Mon Jan 30 18:45:05 2012
root/mnt/C/1/z/3001/c/1002/102
Not traversing root/mnt/C/1/z/3001/c/1002/102 w. dev=03400 ino=8195 : previously seen as root/mnt/C/1/z/3001
03400/8198 drwxr-xr-x
                                         root
                                                  1024
                                                             Mon Jan 30 18:45:16 2012
                               root
root/mnt/C/1/z/3001/c/1001
```

```
03400/8197 drwxr-xr-x 2
                                                                                                                                       1024
                                                                                                                                                                   Mon Jan 30 18:45:05 2012 root/mnt/C/1/z/3001/d
                                                                                    root
                                                                                                               root
  03400/4098 drwxr-xr-x 4
                                                                                                                                     1024
                                                                                                                                                                   Mon Jan 30 18:45:34 2012
                                                                                     root
                                                                                                               root
  root/mnt/C/1/z/3001/d/2001
  Not traversing \operatorname{root/mnt/C/1/z/3001/d/2001} w. \operatorname{dev=03400} ino=4098 : \operatorname{previously} seen as \operatorname{root/mnt/C/1}
 03400/4102 -rw-r--r-- 1
03400/4101 -rw-r--r-- 1
                                                                           root
                                                                                                                                                                   Mon Jan 30 18:25:30 2012 root/mnt/C/1/b
                                                                                                               root
                                                                                                                               10
                                                                                                                                                                    Mon Jan 30 18:25:27 2012 root/mnt/C/1/a
                                                                                    root
                                                                                                                root
                                                                                                                                       10
  03400/4099 -rw-r--r- 1
                                                                                                                                                                 Mon Jan 30 18:25:18 2012 root/mnt/C/2
                                                                                  libuuid dialout 10
  03400/4097 drwxr-xr-x 4
                                                                                root
                                                                                                               root. 1024
                                                                                                                                                               Mon Jan 30 18:25:20 2012 root/mnt/A
                                                                                                                                    10
  03400/4100 -rw-r--r- 1
                                                                                                               root
                                                                                                                                                              Mon Jan 30 18:25:21 2012 root/mnt/A/3
                                                                               root
  03400/4098 drwxr-xr-x 4
                                                                                root
                                                                                                               root
                                                                                                                                      1024
                                                                                                                                                                   Mon Jan 30 18:45:34 2012 root/mnt/A/1
  03400/4103 drwxr-xr-x
                                                                 2
                                                                                                                                      1024
                                                                                                                                                                    Mon Jan 30 18:45:34 2012 root/mnt/A/1/z
                                                                                    root
                                                                                                               root
  03400/8195 drwxr-xr-x 5
                                                                                                               root
                                                                                                                                    1024
                                                                                                                                                                  Mon Jan 30 18:45:05 2012 root/mnt/A/1/z/3001
                                                                                    root
                                                                                                              root 1024
root 1024
  03400/8196 drwxr-xr-x 3
                                                                                    root
                                                                                                                                                                  Mon Jan 30 18:45:16 2012 root/mnt/A/1/z/3001/c
  03400/8193 drwxr-xr-x 4
                                                                                                           root
                                                                                                                                                                Mon Jan 30 18:44:59 2012
                                                                                    root
  root/mnt/A/1/z/3001/c/1002
  03400/8194 -rw-r--r- 1
                                                                                                                                                                   Mon Jan 30 18:25:50 2012
                                                                                    root
                                                                                                          root
                                                                                                                                   12
  root/mnt/A/1/z/3001/c/1002/101
  03400/8195 drwxr-xr-x 5
                                                                                                                                    1024
                                                                                                                                                                  Mon Jan 30 18:45:05 2012
                                                                                    root
                                                                                                          root
  root/mnt/A/1/z/3001/c/1002/102
 Not traversing \operatorname{root/mnt/A}/1/\operatorname{z}/3001/\operatorname{c}/1002/102 w. \operatorname{dev}=03400 ino=8195 : \operatorname{previously} seen as \operatorname{root/mnt/A}/1/\operatorname{z}/3001
  03400/8198 drwxr-xr-x 2
                                                                           root root 1024 Mon Jan 30 18:45:16 2012
  root/mnt/A/1/z/3001/c/1001
  03400/8197 drwxr-xr-x 2
                                                                                                                                       1024
                                                                                                                                                                Mon Jan 30 18:45:05 2012 root/mnt/A/1/z/3001/d
                                                                                     root
                                                                                                               root
  03400/4098 drwxr-xr-x 4
                                                                                     root
                                                                                                               root
                                                                                                                                    1024
                                                                                                                                                                  Mon Jan 30 18:45:34 2012
  root/mnt/A/1/z/3001/d/2001
 Not traversing root/mnt/A/1/z/3001/d/2001 w. dev=03400 ino=4098 : previously seen as root/mnt/A/1 \,
 03400/4102 -rw-r--r-- 1 root root 10 Mon Jan 30 18:25:30 2012 root/mnt/A/1/b 03400/4101 -rw-r--r-- 1 root root 10 Mon Jan 30 18:25:27 2012 root/mnt/A/1/a
 03400/4101 -rw-r--r-- 1 root root 10 ...
03400/4099 -rw-r--r-- 1 libuuid dialout 10 Mon Jan 30 18:25:18 2012 root/mnt/A/Z
03400/ 11 drwx----- 2 root root 12288 Mon Jan 30 18:24:56 2012 root/mnt/lost+found
03400/12289 drwxr-xr-x 2 root root 1024 Tue Sep 8 18:47:37 2015 root/mnt/D
Tue Sep 8 01:50:44 2015 root/mnt/D/symlink
  --> .././B/./101
  walkfs: Cannot lstat file root/mnt/D/type_13 w. ino=12293: Input/output error
  03400/12292 \ \text{prw-r--r--} \ 1 \qquad \text{root} \qquad \text{root} \qquad 0 \qquad \qquad \text{Tue Sep} \quad 8 \ 01:34:11 \ 2015 \ \ \text{root/mnt/D/npipe}
03400/12290 crw-r-r-- 1 1000

03400/12291 brw-r-r-- 1 root

03400/8193 drwxr-xr-x 4 root

03400/8194 -rw-r-r-- 1 root

03400/8195 drwxr-xr-x 5 root

03400/8196 drwxr-xr-x 3 root

03400/8193 drwxr-xr-x 4 root
                                                                                                                                                                    Tue Sep 8 01:33:41 2015 root/mnt/D/cdev
                                                                                                                                    0x01F20
                                                                                                               root
                                                                                                                                    0x0140A
                                                                                                           root
                                                                                                                                                                        Tue Sep 8 01:33:53 2015 root/mnt/D/bdev
                                                                                                          root
root
                                                                                                                                      1024 Mon Jan 30 18:44:59 2012 root/mnt/B
12 Mon Jan 30 18:25:50 2012 root/mnt/B/101
                                                                                                                                    12
                                                                                                                                    1024
                                                                                                                                                               Mon Jan 30 18:45:05 2012 root/mnt/B/102
                                                                                                           root
                                                                                                                                   1024 Mon Jan 30 18:45:16 2012 root/mnt/B/102/c
1024 Mon Jan 30 18:44:59 2012 root/mnt/B/102/c,
                                                                                                          root
                                                                                                                                                                Mon Jan 30 18:44:59 2012 root/mnt/B/102/c/1002
                                                                                                           root
  Not traversing \text{root/mnt/B}/102/\text{c}/1002 w. \text{dev=03400 ino=8193} : \text{previously seen as root/mnt/B}
 03400/8198 drwxr-xr-x 2 root root
03400/8197 drwxr-xr-x 2 root root
                                                                                                                                      1024 Mon Jan 30 18:45:16 2012 root/mnt/B/102/c/1001
1024 Mon Jan 30 18:45:05 2012 root/mnt/B/102/d
                                                                                                                                     1024
  03400/4098 drwxr-xr-x 4
                                                                                                                                   1024 Mon Jan 30 18:45:34 2012 root/mnt/B/102/d/2001
                                                                                root
                                                                                                               root
 03400/4103 drwxr-xr-x 2 root root 1024
03400/8195 drwxr-xr-x 5 root root 1024
                                                                                                                                                              Mon Jan 30 18:45:34 2012 root/mnt/B/102/d/2001/z
                                                                                                                                                               Mon Jan 30 18:45:05 2012
  root/mnt/B/102/d/2001/z/3001
 Not traversing root/mnt/B/102/d/2001/z/3001 w. dev=03400 ino=8195 : previously seen as root/mnt/B/102 and root/mnt/B/102 root
  03400/4102 \quad -\text{rw-r--r--} \quad 1 \qquad \quad \text{root} \qquad \quad 10 \qquad \quad \text{Mon Jan 30 } \\ 18:25:30 \quad 2012 \quad \text{root/mnt/B/102/d/2001/b} \\ 10 \quad \quad \text{root} \quad \quad 10 \quad \quad \text{Mon Jan 30 } \\ 10 \quad \quad \text{root} \quad \quad \text{root} \quad \quad \text{root} \quad \quad 10 \quad \quad \text{Mon Jan 30 } \\ 10 \quad \quad \text{root} \quad \quad \text{root} \quad \quad \text{root} \quad \quad 10 \quad \quad \text{root} \quad \quad \text{
  03400/4101 -rw-r--r-- 1
                                                                                                                                    10
                                                                                                                                                                Mon Jan 30 18:25:27 2012 root/mnt/B/102/d/2001/a
                                                                                 root
                                                                                                               root
  ==5353==
  ==5353== HEAP SUMMARY:
  ==5353==
                               in use at exit: 0 bytes in 0 blocks
  ==5353== total heap usage: 598 allocs, 598 frees, 931,285 bytes allocated
 ==5353==
  ==5353== All heap blocks were freed -- no leaks are possible
  ==5353==
  ==5353== For counts of detected and suppressed errors, rerun with: -v
  ==5353== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```