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## Dadfs Fixing Guide

### 0. Install independencies

- Check the kernel version of our own Ubuntu distribution.

```
uname -srf
```

The result we get is `Linux 4.15.0-45-generic i686`

```
sudo apt-get install git
```

### 1. Compile

```
make
```

We spot one main error is about `generic_write_checks` when calling `dadfs_write`, by looking up to bootlin, we find the usage of this function has changed in our kernel version <sup>1</sup>.

Next, we fix undeclared variable due to the different structure in function callings. For example, the following variable has to be re-linked:

- flip
- ppos
- len

Since we don't have `struct iov_iter`, we need to include `/linux/uio.h`

Next, we modify `retval` to let it formally use `generic_write_checks`.

Finally, we add version control for `.write` and the compile is success!

```
graves@ubuntu:~/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs$ make
make -C /lib/modules/4.15.0-45-generic/build M=/home/graves/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs modules
make[1]: Entering directory '/usr/src/linux-headers-4.15.0-45-generic'
CC [M] /home/graves/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs/base.o
LD [M] /home/graves/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs/dadfs.o
Building modules, stage 2.
MODPOST 1 modules
CC /home/graves/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs/dadfs.mod.o
LD [M] /home/graves/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs/dadfs.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.15.0-45-generic'
cc mkfs-dadfs.c -o mkfs-dadfs
```

### 2. create a small virtual disk (to be formatted in dadfs):

```
graves@ubuntu:~/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs$ dd bs=1M count=10 if=/dev/zero of=journal
10+0 records in
10+0 records out
10485760 bytes (10 MB, 10 MiB) copied, 0.0074131 s, 1.4 GB/s
```

### 3. create a small virtual disk (to be used as dadfs' journal):

```
graves@ubuntu:~/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs$ dd bs=1M count=10 if=/dev/zero of=journal
10+0 records in
10+0 records out
10485760 bytes (10 MB, 10 MiB) copied, 0.0074131 s, 1.4 GB/s
```

### 4. initialize the journal:

```
graves@ubuntu:~/Desktop/482dadfs/VE482-Intro-to-Operating-Systems/lab/l7/dadfs$ mke2fs -b 4096 -O journal_dev journal
mke2fs 1.42.13 (17-May-2015)
Discarding device blocks: done
Creating filesystem with 2560 4k blocks and 0 inodes
Filesystem UUID: 1d658e7d-12d8-4da7-b0f7-02dca813bca3
Superblock backups stored on blocks:
```

## 5. Format the disk

```
正在将日志设备清零: swayye@swayye-VirtualBox:~/dadfs$ ./mkfs-dadfs disk
Super block written successfully
root directory inode written successfully
journal inode written successfully
welcomefile inode written successfully
inode store padding bytes (after the three inodes) written successfully
Journal written successfully
root directory datablocks (name+inode_no pair for welcomefile) written successfully
padding after the rootdirectory children written successfully
block has been written successfully
```

## 6. load dadfs module

```
swayye@swayye-VirtualBox:~/dadfs$ sudo insmod dadfs.ko
[sudo] swayye 的密码:
swayye@swayye-VirtualBox:~/dadfs$
```

## 7. mount disk

```
swayye@swayye-VirtualBox:~/dadfs$ sudo losetup -f --show journal
/dev/loop0
swayye@swayye-VirtualBox:~/dadfs$ sudo mount -o loop,owner,group,users,journal_path=/dev/loop0 -t dadfs disk /tmp
swayye@swayye-VirtualBox:~/dadfs$
```

We can then use `mount -l` to check whether our dadfs has been correctly mounted.

```
swayye@swayye-VirtualBox:~/dadfs$ cd /tmp
swayye@swayye-VirtualBox:/tmp$ mount -l
sysfs on /sys type sysfs (rw,nosuid,nodev,noexec,relatime)
proc on /proc type proc (rw,nosuid,nodev,noexec,relatime)
udev on /dev type devtmpfs (rw,nosuid,relatime,size=473896k,nr_inodes=118474,mode=755)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,noexec,relatime,size=100884k,mode=755)
/dev/sda1 on / type ext4 (rw,relatime,errors=remount-ro,data=ordered)
securityfs on /sys/kernel/security type securityfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev)
tmpfs on /run/lock type tmpfs (rw,nosuid,nodev,noexec,relatime,size=5120k)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,noexec,mode=755)
cgroup on /sys/fs/cgroup/systemd type cgroup (rw,nosuid,nodev,noexec,relatime,xattr,release_agent=/lib/systemd/systemd-cgroups-agent,name=systemd)
pstore on /sys/fs/pstore type pstore (rw,nosuid,nodev,noexec,relatime)
cgroup on /sys/fs/cgroup/devices type cgroup (rw,nosuid,nodev,noexec,relatime,devices)
cgroup on /sys/fs/cgroup/rdma type cgroup (rw,nosuid,nodev,noexec,relatime,rdma)
cgroup on /sys/fs/cgroup/perf_event type cgroup (rw,nosuid,nodev,noexec,relatime,perf_event)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup (rw,nosuid,nodev,noexec,relatime,cpu,cpuacct)
cgroup on /sys/fs/cgroup/hugetlb type cgroup (rw,nosuid,nodev,noexec,relatime,hugetlb)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset)
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,noexec,relatime,freezer)
cgroup on /sys/fs/cgroup/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio)
cgroup on /sys/fs/cgroup/net_cls,net_prio type cgroup (rw,nosuid,nodev,noexec,relatime,net_cls,net_prio)
cgroup on /sys/fs/cgroup/pids type cgroup (rw,nosuid,nodev,noexec,relatime,pids)
cgroup on /sys/fs/cgroup/memory type cgroup (rw,nosuid,nodev,noexec,relatime,memory)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs (rw,relatime,fd=28,pgrp=1,timeout=0,minproto=5,maxproto=5,direct,pipe_ino=12580)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime,pagesize=2M)
mqueue on /dev/mqueue type mqueue (rw,relatime)
debugfs on /sys/kernel/debug type debugfs (rw,relatime)
fusectl on /sys/fs/fuse/connections type fusectl (rw,relatime)
configfs on /sys/kernel/config type configfs (rw,relatime)
tmpfs on /run/user/1000 type tmpfs (rw,nosuid,nodev,relatime,size=100884k,mode=700,uid=1000,gid=1000)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=1000,group_id=1000)
/home/swayye/dadfs/disk on /tmp type dadfs (rw,nosuid,nodev,noexec,relatime)
```

Note that the last line denotes that we have dadfs in `/tmp`

## 8. play with dad filesystem

After a very casual testing for dadfs, we have the following initial findings:

- mv, cp doesn't work properly
- Tab key is not handled well -> it will cause the terminal freeze
- mkdir, cat, rm, ls, cd, touch seems fine.

```
swayye@swayye-VirtualBox:/tmp$ ls
awordfromdad  fileutl.message.8IJ3tz  newdirawordfromdad  sh-thd-876224088
fileuqUQtX    newdir                  sh-thd-876223171    tmpf0h6TQ0
swayye@swayye-VirtualBox:/tmp$ cd newdir
swayye@swayye-VirtualBox:/tmp/newdir$ ls
aword
swayye@swayye-VirtualBox:/tmp/newdir$ mv aword ababa
mv: 无法将'aword' 移动至'ababa': 不允许的操作
swayye@swayye-VirtualBox:/tmp/newdir$ cd ..
swayye@swayye-VirtualBox:/tmp$ ls
awordfromdad  fileutl.message.8IJ3tz  newdirawordfromdad  sh-thd-876224088
fileuqUQtX    newdir                  sh-thd-876223171    tmpf0h6TQ0
swayye@swayye-VirtualBox:/tmp$ cp awordfromdad ./newdir
cp: 无法打开'awordfromdad' 读取数据: 权限不够
swayye@swayye-VirtualBox:/tmp$
```

- We've also found a word from dad...

```
swayye@swayye-VirtualBox:/tmp$ sudo cat awordfromdad
[sudo] swayye 的密码:
Congratulations, I'm proud of you. Dad
```

#### 9. check the logs

```
swayye@swayye-VirtualBox:/tmp$ cd /var/log
swayye@swayye-VirtualBox:/var/log$ ls
alternatives.log  dpkg.log          lastlog           vboxadd-setup.log.1
apt               faillog           lightdm           vboxadd-setup.log.2
auth.log          fontconfig.log    speech-dispatcher wtmp
bootstrap.log     fsck              syslog            Xorg.0.log
btmptmp           gpu-manager.log   unattended-upgrades Xorg.0.log.old
cups              hp                upstart
dist-upgrade      installer         vboxadd-install.log
dmesg             kern.log          vboxadd-setup.log
swayye@swayye-VirtualBox:/var/log$ cat dmesg
(Nothing has been logged yet.)
```

#### 10. umount disk

```
swayye@swayye-VirtualBox:~$ sudo umount -l /tmp
swayye@swayye-VirtualBox:~$ cd /tmp
swayye@swayye-VirtualBox:/tmp$ ls
config-err-hF7hGF
fcitx-qimpanel:0.pid
fcitx-socket-:0
systemd-private-03edb4f521be4bab952c4cc0fb6aad7a-color.service-KXhemR
systemd-private-03edb4f521be4bab952c4cc0fb6aad7a-fwupd.service-xN6Nq9
systemd-private-03edb4f521be4bab952c4cc0fb6aad7a-rtkit-daemon.service-HKax0L
unity_support_test.1
VirtualBox Dropped Files
```

#### 11. unload module

```
sudo rmmod dadfs.ko
```