

A promotional photo of the cast of the TV show 'Full House'. The group consists of nine people: three men in the back row (from left to right) wearing plaid shirts, a woman in a grey sweater vest in the middle row, and six children (three boys and three girls) in the front row. They are all smiling and looking towards the camera.

System Administration

Week 02, Warmup Exercise
Full House: No space left on device

**Department of Computer Science
Stevens Institute of Technology**

Jan Schaumann

jschauma@stevens.edu

<https://stevens.netmeister.org/615/>



```
shell$ dd if=/dev/zero of=/tmp/big bs=1G
dd: error writing '/tmp/big': No space left on device
11+0 records in
10+0 records out
11030556672 bytes (11 GB, 10 GiB) copied, 30.976 s, 356 MB/s
shell$ du -h /tmp/big
11G    /tmp/big
shell$ df -h /tmp
Filesystem           Size   Used  Avail Use% Mounted on
/dev/mapper/nemo--vg-root  18G   17G    0 100% /
shell$ ls -l /dev/std*
lrwxrwxrwx 1 root root 15 Oct  6 19:17 /dev/stderr -> /proc/self/fd/2
lrwxrwxrwx 1 root root 15 Oct  6 19:17 /dev/stdin -> /proc/self/fd/0
lrwxrwxrwx 1 root root 15 Oct  6 19:17 /dev/stdout -> /proc/self/fd/1
shell$ ps x
  PID TTY      STAT   TIME COMMAND
20104 ?        Ss      0:00 /lib/systemd/systemd --user
20109 ?        S      0:00 (sd-pam)
20114 ?        R      0:00 sshd: jschauma@pts/0
20115 pts/0    Ss      0:00 -ksh
20156 ?        S      0:00 sshd: jschauma@pts/36
20157 pts/36   Ss+     0:00 -ksh
20175 pts/0    R+     0:00 ps x
shell$
```

```
Access: (0600/-rw-----) Uid: (10235/jschauma)  Gid: (10000/professor)
Access: 2021-01-25 16:19:10.835400210 -0500
Modify: 2021-01-25 16:19:10.835400210 -0500
Change: 2021-01-25 16:19:10.835400210 -0500
Birth: -
gits$ cp ${BIG} ${BIG}2
gits$ ls -ls ${BIG}*
0 -rw----- 1 jschauma professor 11055256000000 Jan 25 16:19 /tmp/jschauma/big
0 -rw----- 1 jschauma professor 11055256000000 Jan 25 16:19 /tmp/jschauma/big2
gits$ cat ${BIG} > ${BIG}2
cat: write error: No space left on device
gits$ ls -ls ${BIG}*
      0 -rw----- 1 jschauma professor 11055256000000 Jan 25 16:19 /tmp/jschau
ma/big
11055260 -rw----- 1 jschauma professor      11320561664 Jan 25 16:20 /tmp/jschau
ma/big2
gits$ df /tmp
Filesystem           1K-blocks      Used Available Use% Mounted on
/dev/mapper/nemo--vg-root 17951152 17016244          0 100% /
gits$ rm -fr /tmp/$USER
gits$ df /tmp
Filesystem           1K-blocks      Used Available Use% Mounted on
/dev/mapper/nemo--vg-root 17951152 5960984  11055256  36% /
gits$
```

```
1+0 records in
1+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 3.8616 s, 278 MB/s
avalon$ du /tmp/newfile
1048580 /tmp/newfile
avalon$ df /tmp
Filesystem           1K-blocks   Used Available Use% Mounted on
/dev/mapper/nemo--vg-root 17951152 7732864 9283376 46% /
avalon$ rm -fr /tmp/10235/
^Z[1] + Stopped          rm -fr /tmp/10235/
avalon$ df -i /tmp
Filesystem           Inodes IUsed IFree IUse% Mounted on
/dev/mapper/nemo--vg-root 1148304 960121 188183 84% /
avalon$ fg
rm -fr /tmp/10235/
^Z[1] + Stopped          rm -fr /tmp/10235/
avalon$ ls -ld /tmp/10235/
drwx----- 2 jschauma professor 20115456 Jan 25 16:58 /tmp/10235/
avalon$ fg
rm -fr /tmp/10235/
avalon$ df -i /tmp
Filesystem           Inodes IUsed IFree IUse% Mounted on
/dev/mapper/nemo--vg-root 1148304 225044 923260 20% /
avalon$
```

Takeaways

Running out of disk space can lead to odd side effects.

File sizes are not always what they seem to be.

Error messages aren't always what they seem to be!

All resources are finite.

Links

Benchmark: Deep directory structure vs. flat directory structure to store millions of files on ext4:

<https://is.gd/nXO7RR>

Sparse Files:

https://en.wikipedia.org/wiki/Sparse_file

Monitoring disk space and usage:

<https://developer.ibm.com/technologies/systems/articles/au-satdiskmon/>