Ch.40 Simulation hw
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1.

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -s 17
ARG seed 17
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse False
ARG printFinal False

Initial state

inode bitmap  10000000
inodes        [d a:0 r:2] [] [] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11000000
inodes        [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (u,1)] [(.,1) (..,0)] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (u,1) (a,2)] [(.,1) (..,0)] [] [] [] [] [] []

Which operation took place?

inode bitmap  11000000
inodes        [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (u,1)] [(.,1) (..,0)] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:4] [d a:1 r:2] [d a:2 r:2] [] [] [] [] []
data bitmap   11100000
data          [(.,0) (..,0) (u,1) (z,2)] [(.,1) (..,0)] [(.,2) (..,0)] [] [] [] [] []

tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ []
```

For random seed 17 you can see that it first adds a directory "u" as can be seen by the addition of "(u,1)" and the "d" symbolizing directory in the inode section. Then it adds a file "a" as can be seen by the addition of "(a,2)" and the "f" in the inode section

symbolizing a file. After that it removes "a". Then it adds a directory "z" as can be seen by the addition of "(z,2)".

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -s 18
ARG seed 18
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse False
ARG printFinal False

Initial state

inode bitmap  10000000
inodes        [d a:0 r:2] [] [] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11000000
inodes        [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (f,1)] [(.,1) (..,0)] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (f,1) (s,2)] [(.,1) (..,0)] [] [] [] [] [] []

Which operation took place?

inode bitmap  11110000
inodes        [d a:0 r:4] [d a:1 r:2] [f a:-1 r:1] [d a:2 r:2] [] [] [] []
data bitmap   11100000
data          [(.,0) (..,0) (f,1) (s,2) (h,3)] [(.,1) (..,0)] [(.,3) (..,0)] [] [] [] [] []

Which operation took place?

inode bitmap  11110000
inodes        [d a:0 r:4] [d a:1 r:2] [f a:3 r:1] [d a:2 r:2] [] [] [] []
data bitmap   11110000
data          [(.,0) (..,0) (f,1) (s,2) (h,3)] [(.,1) (..,0)] [(.,3) (..,0)] [f] [] [] [] []

tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ 
```

For random seed 18 you can see that at first directory "f" is added. Then file "s" is added, then directory "h" is added. After that you can see that the letter "f" was written to file "s" because the reference count for s increased.

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -s 19
ARG seed 19
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse False
ARG printFinal False

Initial state

inode bitmap  10000000
inodes        [d a:0 r:2] [] [] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11000000
inodes        [d a:0 r:2] [f a:-1 r:1] [] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0) (k,1)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:2] [f a:-1 r:1] [f a:-1 r:1] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0) (k,1) (g,2)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:2] [f a:1 r:1] [f a:-1 r:1] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (k,1) (g,2)] [g] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:2] [f a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (k,1) (g,2) (b,1)] [g] [] [] [] [] [] []

tholmquist@tholmquist:~/Downloads/OS_ch40_hw$
```

With the random seed 19 you can see that the first file "k" was added. Then file "g" was added. Then the letter "g" was written to file k. Finally "b" was added and linked to "k" as can be seen by the fact that they both have 1 as their second parameter in the parenthesis and the reference count for k went from 1 to 2.

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -s 20
ARG seed 20
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse False
ARG printFinal False

Initial state

inode bitmap  10000000
inodes        [d a:0 r:2] [] [] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11000000
inodes        [d a:0 r:2] [f a:-1 r:1] [] [] [] [] [] []
data bitmap   10000000
data          [(.,0) (..,0) (x,1)] [] [] [] [] [] [] []

Which operation took place?

inode bitmap  11000000
inodes        [d a:0 r:2] [f a:1 r:1] [] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (x,1)] [x] [] [] [] [] [] []

Which operation took place?

inode bitmap  11100000
inodes        [d a:0 r:2] [f a:1 r:1] [f a:-1 r:1] [] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (x,1) (k,2)] [x] [] [] [] [] [] []

Which operation took place?

inode bitmap  11110000
inodes        [d a:0 r:2] [f a:1 r:1] [f a:-1 r:1] [f a:-1 r:1] [] [] [] []
data bitmap   11000000
data          [(.,0) (..,0) (x,1) (k,2) (y,3)] [x] [] [] [] [] [] []

tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ █
```

For random seed 20 we first add a file "x". Then write the letter "x" to that file x. Then
add a file named "k". And finally add a file named "y".

2.

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -c -s 21 -r
ARG seed 21
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse True
ARG printFinal False

Initial state

inode bitmap   10000000
inodes         [d a:0 r:2] [] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0)] [] [] [] [] [] [] []

mkdir("/o");

inode bitmap   11000000
inodes         [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (o,1)] [(.,1) (..,0)] [] [] [] [] [] []

creat("/b");

inode bitmap   11100000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (o,1) (b,2)] [(.,1) (..,0)] [] [] [] [] [] []

creat("/o/q");

inode bitmap   11110000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [f a:-1 r:1] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (o,1) (b,2)] [(.,1) (..,0) (q,3)] [] [] [] [] [] []

fd=open("/b", O_WRONLY|O_APPEND); write(fd, buf, BLOCKSIZE); close(fd);

inode bitmap   11110000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:2 r:1] [f a:-1 r:1] [] [] [] []
data bitmap    11100000
data           [(.,0) (..,0) (o,1) (b,2)] [(.,1) (..,0) (q,3)] [m] [] [] [] [] []
```

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -c -s 22 -r
ARG seed 22
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse True
ARG printFinal False

Initial state

inode bitmap   10000000
inodes         [d a:0 r:2] [] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0)] [] [] [] [] [] [] []

creat("/z");

inode bitmap   11000000
inodes         [d a:0 r:2] [f a:-1 r:1] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0) (z,1)] [] [] [] [] [] [] []

fd=open("/z", O_WRONLY|O_APPEND); write(fd, buf, BLOCKSIZE); close(fd);

inode bitmap   11000000
inodes         [d a:0 r:2] [f a:1 r:1] [] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (z,1)] [q] [] [] [] [] [] []

unlink("/z");

inode bitmap   10000000
inodes         [d a:0 r:2] [] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0)] [] [] [] [] [] [] []

creat("/y");

inode bitmap   11000000
inodes         [d a:0 r:2] [f a:-1 r:1] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0) (y,1)] [] [] [] [] [] [] []
```

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -c -s 23 -r
ARG seed 23
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse True
ARG printFinal False

Initial state

inode bitmap   10000000
inodes         [d a:0 r:2] [] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0)] [] [] [] [] [] [] []

mkdir("/c");

inode bitmap   11000000
inodes         [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (c,1)] [(.,1) (..,0)] [] [] [] [] [] []

creat("/c/t");

inode bitmap   11100000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (c,1)] [(.,1) (..,0) (t,2)] [] [] [] [] [] []

unlink("/c/t");

inode bitmap   11000000
inodes         [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (c,1)] [(.,1) (..,0)] [] [] [] [] [] []

creat("/c/q");

inode bitmap   11100000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (c,1)] [(.,1) (..,0) (q,2)] [] [] [] [] [] []
```

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -n 4 -c -s 24 -r
ARG seed 24
ARG numInodes 8
ARG numData 8
ARG numRequests 4
ARG reverse True
ARG printFinal False

Initial state

inode bitmap   10000000
inodes         [d a:0 r:2] [] [] [] [] [] [] []
data bitmap    10000000
data           [(.,0) (..,0)] [] [] [] [] [] [] []

mkdir("/z");

inode bitmap   11000000
inodes         [d a:0 r:3] [d a:1 r:2] [] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (z,1)] [(.,1) (..,0)] [] [] [] [] [] []

creat("/z/t");

inode bitmap   11100000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (z,1)] [(.,1) (..,0) (t,2)] [] [] [] [] [] []

creat("/z/z");

inode bitmap   11110000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [f a:-1 r:1] [] [] [] []
data bitmap    11000000
data           [(.,0) (..,0) (z,1)] [(.,1) (..,0) (t,2) (z,3)] [] [] [] [] [] []

fd=open("/z/z", O_WRONLY|O_APPEND); write(fd, buf, BLOCKSIZE); close(fd);

inode bitmap   11110000
inodes         [d a:0 r:3] [d a:1 r:2] [f a:-1 r:1] [f a:2 r:1] [] [] [] []
data bitmap    11100000
data           [(.,0) (..,0) (z,1)] [(.,1) (..,0) (t,2) (z,3)] [y] [] [] [] [] []
```

Judging from these screenshots you can see that the first available block is what gets
allocated ,shown in each screenshot by the fact that the first block gets filled with the
data whenever there is a write to a file in order to ensure predictable allocation of data.

3.

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -d 2 -n 100 -p -c -s 17
ARG seed 17
ARG numInodes 8
ARG numData 2
ARG numRequests 100
ARG reverse False
ARG printFinal True

Initial state

inode bitmap  10000000
inodes        [d a:0 r:2] [] [] [] [] [] [] []
data bitmap   10
data          [(.,0) (..,0)] []

mkdir("/u");
File system out of data blocks; rerun with more via command-line flag?
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$
```

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -d 2 -n 100 -p -c -s 20
ARG seed 20
ARG numInodes 8
ARG numData 2
ARG numRequests 100
ARG reverse False
ARG printFinal True

Initial state

inode bitmap  10000000
inodes        [d a:0 r:2] [] [] [] [] [] [] []
data bitmap   10
data          [(.,0) (..,0)] []

creat("/x");

inode bitmap  11000000
inodes        [d a:0 r:2] [f a:-1 r:1] [] [] [] [] [] []
data bitmap   10
data          [(.,0) (..,0) (x,1)] []

fd=open("/x", O_WRONLY|O_APPEND); write(fd, buf, BLOCKSIZE); close(fd);
File system out of data blocks; rerun with more via command-line flag?
```

As can be seen from these screenshots writing to a file and mkdir() both fail under these
constraints but empty files are able to be made using creat().

4.

```
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -i 2 -n 100 -p -c -s 19
ARG seed 19
ARG numInodes 2
ARG numData 8
ARG numRequests 100
ARG reverse False
ARG printFinal True

Initial state

inode bitmap  10
inodes        [d a:0 r:2] []
data bitmap   10000000
data          [(.,0) (..,0)] [] [] [] [] [] [] []

creat("/k");
File system out of inodes; rerun with more via command-line flag?
tholmquist@tholmquist:~/Downloads/OS_ch40_hw$ ./vsfs.py -i 2 -n 100 -p -c -s 18
ARG seed 18
ARG numInodes 2
ARG numData 8
ARG numRequests 100
ARG reverse False
ARG printFinal True

Initial state

inode bitmap  10
inodes        [d a:0 r:2] []
data bitmap   10000000
data          [(.,0) (..,0)] [] [] [] [] [] [] []

mkdir("/f");
File system out of inodes; rerun with more via command-line flag?
```

Every action will fail besides unlink since the only available inode is the initial one.