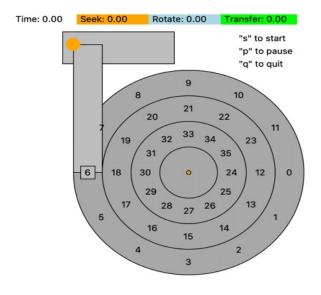
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## Quiz 3

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Your-	Name:			

For all the file system traces: we assume inode 0 is the root inode, and the root directory is represented as "/".

1. disk. As shown this figure - generated by the simulator disk.py, the disk head's initial position is at sector 6. Compute the seek, rotation, and transfer times for the following request: sector 33. Assumptions: the disk platter rotates 1 degree per time unit, seeking from one track to the right next track takes 50 time units, transfering (i.e., reading from or writing to) a sector takes 30 time units. Transferring starts when the disk head is 15 degrees ahead of the target sector, ends when the disk head is 15 degrees after the target sector. Note that this disk spins clockwise. (15 points)



Answer: seek: 100; rotation: 155; transfer: 30

2. **direct pointer and indirect pointer**. In the ext2 file system, each inode includes 12 direct pointers and 1 single indirect pointer, each direct pointer points to one data block; each single indirect pointer points to one block that contains pointers, and each of these pointers points to one data block. (The inode in an ext2 file system also contains 1 double indirect pointer and 1 triple indirect pointer, but let's ignore them for now).

Assume a block size of **2048 bytes** and the addresses (for pointers) are **32-bit**, answer the following questions for the ext2 file system. Please express your answers in appropriate units like KB, MB, GB, TB, PB etc.

What is the maximum size of a file using only the 12 direct pointers? (5 points)

Answer: 2048x12=24KB

What is the maximum size of a file using the 12 direct pointers and 1 single indirect pointer? (10 points)

Answer: 2048x12 + (2048/(32/8))x2048=24K+1M=24K+1024K=1048KB

3. Which operation has taken place in between states. A simulation trace is generated below using the tool vsfs.py.

```
(initial state) State 1:
inode bitmap
             11110000
inodes
              [d a:0 r:5] [d a:1 r:2] [f a:2 r:1] [d a:3 r:2]
              data bitmap
              11110000
dat.a
              [(.,0) (..,0) (f,1) (s,2) (h,3)] [(.,1) (..,0)] [f] [(.,3) (..,0)]
              [] [] [] []
State 2:
inode bitmap
              11111000
              [d a:0 r:5] [d a:1 r:3] [f a:2 r:1] [d a:3 r:2]
inodes
               [f a:-1 r:1] [] []
              11110000
data bitmap
              [(.,0) (..,0) (f,1) (s,2) (h,3)] [(.,1) (..,0) (o,4)] [f] [(.,3) (..,0)]
data
State 3:
inode bitmap
              11111100
inodes
              [d a:0 r:6] [d a:1 r:3] [f a:3 r:1] [d a:3 r:2]
              [f a:-1 r:1] [f a:-1 r:1] [] []
              11110000
data bitmap
data
              [(.,0) (..,0) (f,1) (s,2) (h,3) (c,5)] [(.,1) (..,0) (o,4)] [f] [(.,3) (..,0)]
              [] [] [] []
```

1. Please list all the directories/subdirectories/files at the initial state. (10 points)

For example:

Directories: '/', '/g', '/w' Files: '/t', '/m', '/w/p'

Answer:

directories: '/', 'f', '/h'

files: '/s'

Note: The character "f" in the inodes row has a different meaning than the "f" in the data row. The former represents a file, the latter means the file or the directory is named "f".

2. Based on this trace, which operation has taken place in between state 1 and state 2? Hints: It is either a create or a mkdir operation, and create() is used to create an empty file, while mkdir() is used to create a directory. Choose one from these two options, and make sure you specify the parameter: the full path of the file or directory created. For example, if you believe a directory /a/b/c is just created, then say mkdir("/a/b/c"); and if you believe a file is /d/e is created, then say create("/d/e"). (10 points)

Answer: create("/f/o")

3. Based on this trace, which operation has taken place in between state 2 and state 3? Hints: again, it is either a create or a mkdir operation. Please specify the full path. (10 points)

2 of 4 Random seed: 1234

Answer: create("/c");

## 4. Draw the file system state.

A simulation trace is generated below using the tool vsfs.py. Assumption: when a file or directory is created, if allocating an new inode is needed, the file system will always try to allocate first available inode; or if allocating a new data block is needed, the file system will always try to allocate the first available data block.

```
Initial state
inode bitmap 10000000
             [d a:0 r:2] [] [] [] [] [] []
inodes
             10000000
data bitmap
data
             [(.,0) (..,0)][][][][][][][]
mkdir("/x");
State 1:
inode bitmap
             11000000
inodes
             [d a:0 r:3] [d a:1 r:2] [] [] [] []
data bitmap
             11000000
             [(.,0) (..,0) (x,1)] [(.,1) (..,0)] [] [] [] []
data
create("/c");
State 2:
create("/x/y");
State 3:
```

1. Please draw the file system state at state 2. (10 points)

## 2. Please draw the file system state at state 3. (10 points)

Answer:

## 5. Analyzing the corruption states. (20 points)

Based on the following different corruption states, please detail what exact inconsistency do you see.

1.

Answer: INODE 0 should be type d, rather than f.

2.

Answer: INODE BITMAP corrupt bit 13: bitmap shows 0, but inodes say it is a file.