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Lab 12 CIS 452 02

1. **Perform the following operations and answer the associated questions (7 points):**
   a. **Access the man pages, what is the difference between stat(1) and stat(2)?**
   stat(1) is a command-line utility that is used to display file or file system status
   stat(2) is a system call that is used by C programs to retrieve file or file system information
   b. **Compile and test sampleProgramOne. Run it twice: use the sampleProgramOne source code and its executable files as test inputs. What exactly does sampleProgramOne do?**

```
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramOne sampleProgramOne.c
value is: 33188
inode value is: 80501843339250166
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramOne sampleProgramOne
value is: 33261
inode value is: 39969446693227298
```

   It prints value, which represents the file type code and its access permissions. It also prints the inode value of the file.
   c. **Modify sampleProgramOne so that it reports whether a file is a directory. Verify that your program works (as shown below). Include a screenshot of the execution. Also, include your source code as an attachment when uploading to Blackboard.**
      - **Use sampleProgramOne and your current directory as your test inputs. Verify and demonstrate the correctness of your program by testing its output against the output of the stat(1) utility. For example:**
        - **stat sampleProgramOne.c**
        - **./sampleProgramOne sampleProgramOne.c**

```
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramOne sampleProgramOne.c
value is: 33188
inode value is: 80501843339250166
sampleProgramOne.c is not a directory
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramOne sampleProgramOne
value is: 33261
inode value is: 40250921669937954
sampleProgramOne is not a directory
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramOne ../lab12
value is: 16877
inode value is: 51228445761491063
../lab12 is a directory
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ stat sampleProgramOne.c
  File: sampleProgramOne.c
  Size: 656             Blocks: 8          IO Block: 512    regular file
Device: 2h/2d   Inode: 80501843339250166  Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/kirbergf)   Gid: ( 1000/kirbergf)
Access: 2023-11-30 07:11:03.323251900 -0500
Modify: 2023-11-30 07:11:01.268592000 -0500
Change: 2023-11-30 07:11:01.268592000 -0500
 Birth: -
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ stat ../lab12
  File: ../lab12
  Size: 512             Blocks: 0          IO Block: 512    directory
Device: 2h/2d   Inode: 51228445761491063  Links: 1
Access: (0755/drwxr-xr-x)  Uid: ( 1000/kirbergf)   Gid: ( 1000/kirbergf)
Access: 2023-11-30 07:12:46.601957300 -0500
Modify: 2023-11-30 07:11:03.699975700 -0500
Change: 2023-11-30 07:11:03.699975700 -0500
 Birth: -
```

2. **Perform the following operations and answer the associated questions (9 points):**
   a. **Compile and test sampleProgramTwo, what exactly does sampleProgramTwo do?**

```
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramTwo
.
..
.vscode
sampleProgramOne
sampleProgramOne.c
sampleProgramTwo
sampleProgramTwo.c
```

   The program uses opendir, readdir, and closeddir to open the current directory, read and print all the files and directories within it, and then closes the directory.

   b. **Modify sampleProgramTwo so that it also reports the size of each file (in bytes). Ensure your output is human-friendly (i.e., readable)**

```
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramTwo
.                    - Size: 512 bytes
..                   - Size: 512 bytes
.vscode              - Size: 512 bytes
sampleProgramOne     - Size: 16992 bytes
sampleProgramOne.c   - Size: 656 bytes
sampleProgramTwo     - Size: 17080 bytes
sampleProgramTwo.c   - Size: 568 bytes
```

   c. **Verify and demonstrate the correctness of your program by testing it against the ls program using your current directory. For example 'ls -l' should return the same value as './sampleProgamTwo'. Submit your modified program and include a screenshot of the execution.**

```
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./sampleProgramTwo
.                    - Size: 512 bytes
..                   - Size: 512 bytes
.vscode              - Size: 512 bytes
sampleProgramOne     - Size: 16992 bytes
sampleProgramOne.c   - Size: 656 bytes
sampleProgramTwo     - Size: 17080 bytes
sampleProgramTwo.c   - Size: 568 bytes
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ls -l
total 104
-rwxr-xr-x 1 kirbergf kirbergf 16992 Nov 30 07:11 sampleProgramOne
-rw-r--r-- 1 kirbergf kirbergf   656 Nov 30 07:11 sampleProgramOne.c
-rwxr-xr-x 1 kirbergf kirbergf 17080 Nov 30 07:33 sampleProgramTwo
-rw-r--r-- 1 kirbergf kirbergf   568 Nov 30 07:33 sampleProgramTwo.c
```

3. **Answer the following questions (9 points):**
    a. **Use du to report the usage of all the files in some of your directories (be sure to choose some with subdirectories), based on the order of information provided, which of the two tree traversal algorithms does du use?**
    Based on the order of the information output using du, it uses depth-first-search tree traversal algorithm. This is because the output shows descends into each subdirectory of a directory as far as possible before moving on to the next directory.
    b. **What is the default block size used by du?**
    1024 bytes
    c. **Speculate: given the intended purpose of du, why is the usage reported in blocks, instead of bytes?**
    du uses blocks instead of bytes because it is used to report a summary of disk usage. Representing this using blocks allows for increased efficiency, consistency, and a more readable overview of disk storage.

Programming Assignment (ls - Directory Listing)

```
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ./programmingAssignmentLab12 .
File: .                     UID: 1000 GID: 1000 Inode: 51228445761491063
File: ..                    UID: 1000 GID: 1000 Inode: 14918173766384976
File: .vscode               UID: 1000 GID: 1000 Inode: 7036874418053234
File: programmingAssignmentLab12 UID: 1000 GID: 1000 Inode: 14355223812313036
File: programmingAssignmentLab12.c UID: 1000 GID: 1000 Inode: 37999121855985314
File: sampleProgramOne      UID: 1000 GID: 1000 Inode: 40250921669937954
File: sampleProgramOne.c    UID: 1000 GID: 1000 Inode: 80501843339250166
File: sampleProgramTwo      UID: 1000 GID: 1000 Inode: 8162774324920742
File: sampleProgramTwo.c    UID: 1000 GID: 1000 Inode: 13229323905720224
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ls -n
total 172
-rwxr-xr-x 1 1000 1000 17160 Nov 30 08:05 programmingAssignmentLab12
-rw-r--r-- 1 1000 1000  1077 Nov 30 08:04 programmingAssignmentLab12.c
-rwxrwxrwx 1 1000 1000 16992 Nov 30 07:11 sampleProgramOne
-rwxrwxrwx 1 1000 1000   656 Nov 30 07:11 sampleProgramOne.c
-rwxrwxrwx 1 1000 1000 17080 Nov 30 07:33 sampleProgramTwo
-rwxrwxrwx 1 1000 1000   568 Nov 30 07:33 sampleProgramTwo.c
kirbergf@DESKTOP-2B8TP1M:~/cis452/lab12$ ls -i
14355223812313036 programmingAssignmentLab12    80501843339250166 sampleProgramOne.c
37999121855985314 programmingAssignmentLab12.c   8162774324920742 sampleProgramTwo
40250921669937954 sampleProgramOne              13229323905720224 sampleProgramTwo.c
```