

Trent University
COIS3380H
Winter 2021
Lab 3
Due: March 2nd, 2023

Lab #3 – Directories, Files and Timestamps

For this lab, you are required to create a C program which works with command line arguments. The arguments themselves **may or may not** be present on the command line. Your code will have to adapt itself to accommodate for this.

The aim of this lab is to familiarize yourself with reading and processing directories as well as extracting file attributes using the *stat()* system call. You are essentially writing your own version of the long format of the *ls* command. You will need to customize your output to match the following specifications:

You program must accept the following parameters (if present):

- o:** specifies the minimum age of the files (modification timestamp) to be listed from the target directory. The -o argument will be followed by an integer (as a separate parameter to make things easier if you wish). This integer will represent the minimum number of **days** old the files can be in order for them to be included in your listing. As an example "-o 3" passed as arguments would mean: list all files that have been modified more than 3 days ago (from the current system time).
- y:** specifies the age of the newest files (modification timestamp) to be listed from the target directory. The -y argument will be followed by an integer (as a separate parameter to make things easier if you wish). This integer will represent the maximum number of **days** old the files need to be in order for them to show up in your listing. You can think of the -y to represent YOUNGER THAN. As an example "-y 7" passed as arguments should represent list all files whose modification timestamp is less than 7 days older than the current system time.
- l** (lower case L): This specifies a minimum file size for the files to be listed. In essence, list all files that are LARGER than the value given.
- s:** List all files which are smaller than the value given. So this is the maximum size a file can be to show up in the listing.

You should use the *time()* functions to find the current epoch time. You can then add/subtract the appropriate number of second (ignoring leap years) to get a valid timestamp to compare to the *stat()* values.

directory_path: the **last** argument on the command line should be a directory specification. Use this parameter to point your code to a specific directory whose content you want to list. If this parameter is NOT there, the current working directory should be assumed (i.e. ./). You will be required to run your program against the **/home/COIS/3380/lab3** directory on the loki.trentu.ca server. Your code however should work with any directory path. You can assume that any path over 4096 characters can be rejected by your code as too long. You should select a number of different values for the parameters. Larger than X but small than Y. Smaller than Z but created in the last 10 days. Things like that.

It is important to use modular programming techniques (i.e. functions) as the code from this lab may be used in upcoming labs. It is strongly recommended that you work on a function to generate the appropriate formatting of the information returned from the *stat()* function for a single file before implementing it for the whole directory.

If you are **not** using the *getopt()* function, you need not implement logic to ensure that the -o/-y options are followed by integers (when present). Your code can "assume" the argv[] elements directly following the -o, y, l and -s are integers, just to make things simpler. When you run your code, just make sure to put the proper values on the command line. The target directory for your code must be the last parameter passed on the command line (if present. If not your code should default back to the current directory).

You are required to hand in to the Lab3 dropbox on BlackBoard, a well document and modular program **plus sample output** showing the functionality of your program. Remember to use your script from lab1 to zip up your work for submission. Your code can be used for any directory. The output your code creates for the /home/COIS/3380/lab3 directory should contain the same information as and look **similar** to, the examples below. Your log for the lab submission should include running your code on some additional directories as well.

NOTE: These listings are from a previous incarnation of the lab3 directory. Some files may be missing/new.

For the UID and GID fields, feel free to print out the numeric values. If you like a challenge, use the appropriate system calls to convert the numbers into actual user/group names.

HINT: Each of the flags (o,y,l,s) carry with them a value. If argc has an even value, then you know that the user put a directory on the command line. If the command line only has the verb, then argc=1. If it is the verb and any combination of flags, since they each represent two parameters, then the value of argc will be odd. Only when you add the directory at the end of the line will argc be even.

Here is what is currently in /home/COIS/3380/lab3 on loki.trentu.ca:

```
jacquesabeland@loki:~> ls -lt /home/COIS/3380/lab3
[jacques@loki lab3]$ ls -lt /home/COIS/3380/lab3
total 32644
drwxrwxrwx. 2 root COIS3380      4096 Jan 12 10:30 gnuplot
-rw-rw-rw-. 1 root COIS3380 16436089 Jul 30 2017 lab3_dir.tar.gz
-rw-rw-rw-. 1 root COIS3380      1921 Jul 30 2017 small_world.txt
-rw-rw-rw-. 1 root COIS3380       616 Jul 25 2017 lab2_textfile.txt
-rwxrwxrwx. 1 root COIS3380 9043232 Feb  4 2017 WinSCP-5.9.3-Setup.exe
-rw-rw-rw-. 1 root COIS3380      3093 Feb  1 2017 string_testing.c
-rw-rw-rw-. 1 root COIS3380 6477803 Jan 20 2017 cities_all.csv
-rw-rw-rw-. 1 root COIS3380       559 Jan 20 2017 cities_short.csv
-rwxrwxrwx. 1 root COIS3380 531368 Jan 17 2017 putty.exe
-rwxrwxrwx. 1 root COIS3380 213904 Dec  9 2016 visual_Studio_Community.exe
-rw-rw-rw-. 1 root COIS3380      6915 Jan 26 2016 3_range_random.c
-rw-rw-rw-. 1 root COIS3380      1832 Jan 26 2016 1_test_random.c
-rw-rw-rw-. 1 root COIS3380      2879 Jan 26 2016 2_seed_random.c
-rw-rw-rw-. 1 root COIS3380 22434 Jan 21 2016 Shell_file_processing.pdf
-rw-rw-rw-. 1 root COIS3380 46903 Jul  3 2005 jewel.jpg
-rw-rw-rw-. 1 root COIS3380 408606 Nov  1 2001 poke1.jpg
-rw-rw-rw-. 1 root COIS3380 20675 Feb 21 2000 arasaurolopus_baby.pdf
-rw-rw-rw-. 1 root COIS3380 87489 Feb 21 2000 diplodocus.pdf
-rw-rw-rw-. 1 root COIS3380 36019 Feb 21 2000 stegosau.pdf
-rw-rw-rw-. 1 root COIS3380 40102 Dec  6 1987 CALCOMP.ARC
-rw-rw-rw-. 1 root COIS3380      1179 Jan  1 1980 C128.XTK
```

```
jacques@loki lab3]$ ls -lt /home/COIS/3380/lab3/gnuplot/
total 3992
-rw-rw-rw-. 1 root COIS3380 2359473 Sep  2 2014 test_movie_1024x768.gif
-rw-rw-rw-. 1 root COIS3380 1591743 Aug 27 2014 video.gif
-rw-rw-rw-. 1 root COIS3380 117323 Aug 11 2014 sine.gif
-rw-rw-rw-. 1 root COIS3380      217 Aug 11 2014 sine.gp
-rw-rw-rw-. 1 root COIS3380      1107 Jun 28 2013 histo.gp
-rw-rw-rw-. 1 root COIS3380       62 Jun 28 2013 histo.dat
[jacques@loki lab3]$
```

lab3 sample output:

List all of the files in /home/COIS/3380

```
jacques@loki lab3]$ ./my_lab3 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838607 REG rw-rw-rw- root COIS3380 2000-02-21 18:27:00 20675 arasaurolopus_baby.pdf
1838625 REG rw-rw-rw- root COIS3380 2017-02-01 07:07:25 3093 string_testing.c
1838619 REG rw-rw-rw- root COIS3380 2017-07-30 11:44:47 16436089 lab3_dir.tar.gz
1838315 REG rw-rw-rw- root COIS3380 2016-01-26 10:53:18 6915 3_range_random.c
1838313 REG rw-rw-rw- root COIS3380 2016-01-26 09:58:24 1832 1_test_random.c
1838616 DIR rwxrwxrwx root COIS3380 2021-01-12 10:30:49 4096 gnuplot
1838314 REG rw-rw-rw- root COIS3380 2016-01-26 09:58:24 2879 2_seed_random.c
1838620 REG rw-rw-rw- root COIS3380 2001-11-01 17:03:34 408606 poke1.jpg
1838622 REG rw-rw-rw- root COIS3380 2016-01-21 10:43:52 22434 Shell_file_processing.pdf
1838618 REG rw-rw-rw- root COIS3380 2017-07-25 11:23:57 616 lab2_textfile.txt
1838626 REG rwxrwxrwx root COIS3380 2016-12-09 10:17:00 213904 visual_Studio_Community.exe
1838614 REG rw-rw-rw- root COIS3380 2017-01-20 12:38:49 559 cities_short.csv
1838613 REG rw-rw-rw- root COIS3380 2017-01-20 12:38:49 6477803 cities_all.csv
1838624 REG rw-rw-rw- root COIS3380 2000-02-21 18:21:40 36019 stegosau.pdf
1838612 REG rw-rw-rw- root COIS3380 1987-12-06 16:21:52 40102 CALCOMP.ARC
1838621 REG rwxrwxrwx root COIS3380 2017-01-17 17:45:15 531368 putty.exe
1838627 REG rwxrwxrwx root COIS3380 2017-02-04 15:12:29 9043232 WinSCP-5.9.3-Setup.exe
1838615 REG rw-rw-rw- root COIS3380 2000-02-21 18:24:00 87489 diplodocus.pdf
1838623 REG rw-rw-rw- root COIS3380 2017-07-30 11:17:17 1921 small_world.txt
1838617 REG rw-rw-rw- root COIS3380 2005-07-03 13:09:58 46903 jewel.jpg
1838611 REG rw-rw-rw- root COIS3380 1980-01-01 00:01:28 1179 C128.XTK
[jacques@loki lab3]$
```

List all of the files smaller than 5000 bytes

```
[jacques@loki lab3]$ ./my_lab3 -s 5000 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838625 REG rw-rw-rw- root COIS3380 2017-02-01 07:07:25 3093 string_testing.c
1838313 REG rw-rw-rw- root COIS3380 2016-01-26 09:58:24 1832 1_test_random.c
1838616 DIR rwxrwxrwx root COIS3380 2021-01-12 10:30:49 4096 gnuplot
1838314 REG rw-rw-rw- root COIS3380 2016-01-26 09:58:24 2879 2_seed_random.c
1838618 REG rw-rw-rw- root COIS3380 2017-07-25 11:23:57 616 lab2_textfile.txt
1838614 REG rw-rw-rw- root COIS3380 2017-01-20 12:38:49 559 cities_short.csv
1838623 REG rw-rw-rw- root COIS3380 2017-07-30 11:17:17 1921 small_world.txt
1838611 REG rw-rw-rw- root COIS3380 1980-01-01 00:01:28 1179 C128.XTK
[jacques@loki lab3]$
```

List all of the files larger than 50,000 bytes

```
[jacques@loki lab3]$ ./my_lab3 -l 50000 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838619 REG rw-rw-rw- root COIS3380 2017-07-30 11:44:47 16436089 lab3_dir.tar.gz
1838620 REG rw-rw-rw- root COIS3380 2001-11-01 17:03:34 408606 pokel.jpg
1838626 REG rwxrwxrwx root COIS3380 2016-12-09 10:17:00 213904 visual_Studio_Community.exe
1838613 REG rw-rw-rw- root COIS3380 2017-01-20 12:38:49 6477803 cities_all.csv
1838621 REG rwxrwxrwx root COIS3380 2017-01-17 17:45:15 531368 putty.exe
1838627 REG rwxrwxrwx root COIS3380 2017-02-04 15:12:29 9043232 WinSCP-5.9.3-Setup.exe
1838615 REG rw-rw-rw- root COIS3380 2000-02-21 18:24:00 87489 diplodocus.pdf
[jacques@loki lab3]$
```

List all of the files in /home/COIS/3380/lab3 created since 90 days ago:

```
[jacques@loki lab3]$ ./my_lab3 -y 190 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838623 REG rwxr-xr-x jacques cois3380 2022-09-26 11:47:21 1921 small_world.txt
```

List all of the files in /home/COIS/3380/lab3 created before 10 years ago (3650 days):

```
[jacques@loki lab3]$ ./my_lab3 -o 3650 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838624 REG rwxr-xr-x jacques cois3380 2000-02-21 18:21:40 36019 stegosau.pdf
1838612 REG rwxr-xr-x jacques cois3380 1987-12-06 16:21:52 40102 CALCOMP.ARC
1838615 REG rwxr-xr-x jacques cois3380 2000-02-21 18:24:00 87489 diplodocus.pdf
1838611 REG rwxr-xr-x jacques cois3380 1980-01-01 00:01:28 1179 C128.XTK
```

List all of the files in /home/COIS/3380/lab3 made more than 2500 days ago but since January of 1994:

```
[jacques@loki lab3]$ ./my_lab3 -o 2500 -y 9862 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838315 REG rwxr-xr-x jacques cois3380 2016-01-26 10:53:18 6915 3_range_random.c
1838313 REG rwxr-xr-x jacques cois3380 2016-01-26 09:58:24 1832 1_test_random.c
1838314 REG rwxr-xr-x jacques cois3380 2016-01-26 09:58:24 2879 2_seed_random.c
1838622 REG rwxr-xr-x jacques cois3380 2016-01-21 10:43:52 22434 Shell_file_processing.pdf
1838624 REG rwxr-xr-x jacques cois3380 2000-02-21 18:21:40 36019 stegosau.pdf
1838615 REG rwxr-xr-x jacques cois3380 2000-02-21 18:24:00 87489 diplodocus.pdf
```

List all of the files in /home/COIS/3380/lab3 made more than 10 years ago but since January of 1994, larger than 40,000 bytes but smaller than 100,000 bytes:

```
[jacques@loki lab3]$ ./my_lab3 -o 3650 -y 9862 -l 40000 -s 100000 /home/COIS/3380/lab3
inode Type Permission UID GID Modification date Size Filename
1838615 REG rw-rw-rw- root COIS3380 2000-02-21 18:24:00 87489 diplodocus.pdf
1838617 REG rw-rw-rw- root COIS3380 2005-07-03 13:09:58 46903 jewel.jpg
[jacques@loki lab3]$
```

no directory on command line:

```
[jacques@loki lab3]$ ./my_lab3
inode  Type  Permission UID      GID      Modification date      Size  Filename
663484  REG    rwxr-xr-x  root    root     2023-02-07 15:56:59    13464 my_lab3
661992  REG    rwxr-xr-x  root    root     2022-10-17 11:26:19    13464 lab3
660572  REG    rwxrwx---  jacques  jacques  2021-02-09 11:03:26    15245 lab3_w2021.c
660505  REG    rwxrwx---  jacques  jacques  2021-01-12 10:29:52    32193122 lab3.tar.gz
660571  REG    rwxrwx---  jacques  jacques  2021-02-09 09:01:16    11478 lab3.c
662839  REG    rw-r-----  root     root     2023-02-07 15:39:45    12538 find_slyo.c
660576  REG    rwxrwx---  jacques  jacques  2021-02-09 11:03:29    13464 my_ls
662840  REG    rwxr-x---  root     root     2023-02-07 15:56:48    15245 lab3_w2023.c
660618  REG    rwxr--r--  jacques  jacques  2021-03-06 10:33:42      696 test_solution.sh
```

my directory with parameters:

```
[jacques@loki lab3]$ ./my_lab3 -l 100000
inode  Type  Permission UID      GID      Modification date      Size  Filename
660505  REG    rwxrwx---  jacques  jacques  2021-01-12 10:29:52    32193122 lab3.tar.gz
```