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Department of Computer Science

COS 222 Operating Systems

Practical 3

Due date: 2016-09-27 07h30

September 15, 2016

PLAGIARISM POLICY

UNIVERSITY OF PRETORIA

The Department of Computer Science considers plagiarism as a serious offence. Disciplinary action will be taken against students who commit plagiarism. Plagiarism includes copying someone else's work without consent, copying a friend's work (even with consent) and copying material (such as text or program code) from the Internet. Copying will not be tolerated in this course. For a formal definition of plagiarism, the student is referred to `http://www.ais.up.ac.za/plagiarism/index.htm` (from the main page of the University of Pretoria site, follow the *Library* quick link, and then click the *Plagiarism* link). If you have any form of question regarding this, please ask one of the lecturers, to avoid any misunderstanding. Also note that the OOP principle of code re-use does not mean that you should copy and adapt code to suit your solution.

Instructions

In this practical you will answer some questions and edit source files in MINIX.

- Answer all the questions.
- Upload your work in a zip file before 07h30 of the 27th September 2016.
- Bring both your MINIX virtual machine and personal time-tracking sheet to your booked practical demonstration session starting on the 27th of September, so you may be marked.
- On non-demo days, there will still be teaching assistants available in the labs to help you.

Part 1 - Program Memory Allocation [5 Marks]

You can change the maximum amount of memory the operating system can allocate to a program with the following command:

- **chmem** [+] [−] [=] amount file

Find the location of the text editors **mined** and **vi** and answer the following questions:

1. Give the full directory path where **mined** and **vi** are located.[2]
2. How many bytes were allocated to **vi**? [0.5]
3. How many bytes were allocated to **mined**? [0.5]
4. Give the complete command that would change the amount of bytes allocated to **mined** to be the same as that of **vi**. [1]
5. **mined** cannot be used to open large files. If you try it would display an error: "File too big. Error code 12". A large file in MINIX is for example console.c, located at usr/src/drivers/tty/. Does this error still occur, after changing the max memory allocation for **mined**? [1]

Part 2 - Creating a New Command [10 Marks]

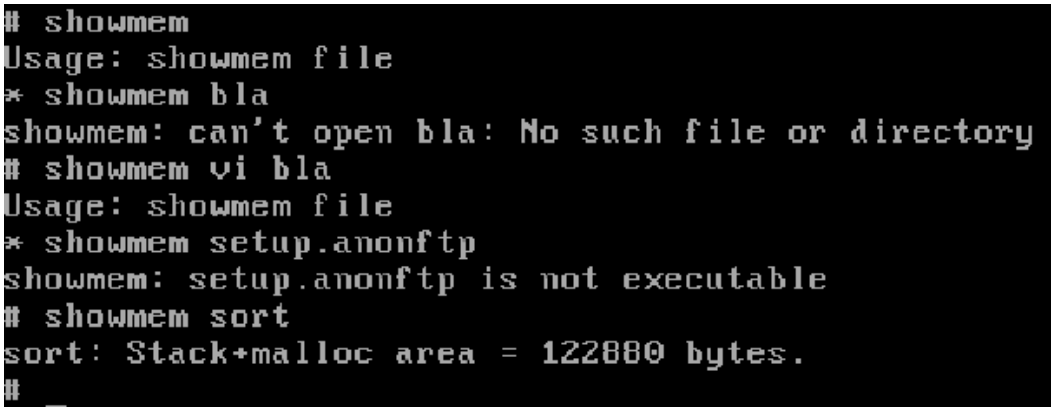
When you use the command **chmem**, it changes the maximum stack allocation number in the header of the executable file.

Create a new command called **showmem** which only prints out the max amount of stack space which will be allocated to the program when it runs.

Hints:

- You can make a copy of **chmem.c** (call it **showmem**) and edit that copy.
- You will need to edit a Makefile (same location as **chmem.c**) to include **showmem.c**.

Here are some examples of what should happen when you use your command:



IMPORTANT!

Make sure you upload screenshots showing where you edited the makefile(s).

Part 3 - Implement meminfo [5 Marks]

For this task, you will write your own shell command for MINIX. The command will display the memory allocation details of an executable file such as mined. You should call your command **meminfo**.

- You should be able to execute your command as follows: meminfo file
- Your command must check the arguments and produce usage information if valid arguments are supplied.

```
# meminfo
Usage: meminfo file
* meminfo nofile
meminfo: can't open nofile: No such file or directory
# meminfo Makefile
meminfo: Makefile is not executable
```

The output should include:

1. The **program name** that the information is being displayed for. (0.5)
2. The **text** segment size. (1)
3. The **data** segment size. (1)
4. The **BSS** segment size. (1)
5. The **stack** segment size.(1)
6. The **total** memory. (0.5)

- Your output should be similar to this.

```
# meminfo vi
----------------------------------
Memory information for vi
----------------------------------
Text segment: 307152 Bytes.
Data segment: 61016 Bytes.
BSS segment: 10828 Bytes.
Stack segment: 131072 Bytes.
----------------------------------
Total memory: 510068 Bytes.
# _
```

Part 4 - Upload Instructions

- Take screenshots of your completed practical. (Output and Source code changes)
- Every screenshot should contain your **name** and **student number.**
- Please make sure the screenshots are readable.
- For questions given like in Part 1, you are required to save your answers in a text/Word/PDF document. (Again include your **name** and **student number**)
- Put all these documents and images in a zip file, and upload only this zip file to the CS site before the deadline.
- You are required to demo your practical to a tutor or teaching assistant (in the practical slot for which you booked), starting on the 27th of September. Failure to do so will result in you getting 0 for the practical, even if you uploaded your work before the deadline.
- If a teaching assistant asks you a question about your work, you must be able to explain **what** you did, **how** you did it and **why** you did it. Failure to give proper explanation will lead to loss of marks.
- Do not commit plagiarism.
- At the demo, we will check your uploaded work, and you should be able to demo the practical in MINIX.
- If you don't upload your work before the deadline, you will receive 0.