Computer Architecture and Technology Area (ARCOS)

Universidad Carlos III de Madrid

OPERATING SYSTEMS
Lab 1. System Calls

Bachelor's Degree in Computer Science & Engineering
Bachelor's Degree in Applied Mathematics & Computing
Dual Bachelor in Computer Science & Engineering & Business Administration

Year 2022-2023

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Lab Statement

- Implementation of three programs in C that are capable of manipulating files and directories.

- Each program will be implemented in just one file
  - **mywc.c** → Counts the number of lines, words and bytes of a file
  - **myenv.c** → Searches a specific environment variable
  - **myls.c** → It shows on the screen the entries of a directory

mywc

- `./mywc <path_to_input_file>`
- Result:
  - The program must show the **number of lines, words, and bytes on the console, followed by the name of the read file**
  - The program returns -1 in case of error
  - The program must return 0 if everything worked correctly
- Example:

```
          $ ./mywc p1_tests/f1.txt
           2 15 85 p1_tests/f1.txt
```

myenv

- `./myenv <env> <out_file>`
- Result:
  - The program must write **all the entries** with the variable in the order in which they are in the input file (`env.txt`) **located in the same directory as `myenv`**
  - The program must separate each entry by **a new line**
  - The program must create the out_file file empty if it does not find any line with the variable
  - The program returns -1 in case of error
  - The program must return 0 if everything worked correctly
- Example:

```
$ ./myenv PATH ./getenv.out
  PATH=/usr/local/bin:/usr/bin:/bin:/usr/local/games
```

myls

- `./myls <dir> //List dir`
- `./myls //List current dir`
- Result:
  - List of directory entries. **One entry per line**
  - The program must return -1 if there was an error while opening the file (e.g. the file does not exist)
- Example:

```
$ ./myls p1_tests/
dirC
f1.txt
dirA
f2.txt
.
..
```

Initial Code

- A compressed folder including the files of the programs to be developed (*mywc.c*, *myenv.c* and *myls.c*) and a file to compile them (*Makefile*) is provided as the starting code.
- To compile: go to the folder and use the command `make`.

Tester

- Students are provided with the script in **python (Version 3) checker_os_p1.py**
- The tester must be executed in the Linux computers of the Virtual Aulas of the university.
- The command to execute the tester is the following:

```
python3 checker_os_p1.py <submitted_file.zip>
```

- Example:

```
$ python3 checker_os_p1.py
os_p1_100254896_100047014.zip
```

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Assignment Submission & Rules

- Groups: 3 students maximum
- Delivery:
  - Source code in a compressed file
  - Lab report in PDF through TURNITIN
  - Only one member of the group may deliver
- Delivery date:

March 12*th* 2023 (until 23:55h)

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System Calls

- For **mywc** you must use the calls related to file manipulation (open, read, write, and close).
- For **myenv** you must use the calls related to file manipulation (open, read, write, and close).
- For **myls** you must use calls related to directory manipulation (getcwd, opendir, readdir and closedir).
- The documentation of those calls can be found in the manuals (see appendix).

Management of input arguments

- Extract the path of the files and directories that are passed as arguments to the program.

- **Implement error handling routines.**

- Example:

```
int main (int argc, char *argv[]){
    int returnValue = 0;
    if (argc >= 3){
        printf(argv[0]);
        printf(argv[1]);
        printf(argv[2]);
    }else{
        printf("Not enough arguments\n");
        returnValue = -1;
    }
    return returnValue;
}
```

Printing on the screen

- **mywc**
  - Print with printf call the number of lines, words, bytes and the file name.

```
printf("%d %d %d %s\n", lines, words, bytes, file);
```

- **myenv**
  - Print with printf call each matching entry

```
printf("%s\n", entry);
```

- **myls**
  - Print with the call printf the field *d_name* of the structure *dirent*.

```
printf("%s\n", input->d_name);
```

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