

CSC 33200 (L) - Operating Systems – Fall 2022

Lab 4: Process Management System Calls

Date: 10/07/2022

This handout describes the **exec** family of functions, for executing a command. You can use these functions to make a child process execute a new program after it has been forked. The functions in this family differ in how you specify the arguments, but otherwise they all do the same thing. They are declared in the header file '**unistd.h**'.

execv (char *filename, char *const argv[])

The **execv** function executes the file named by **filename** as a new process image.

The **argv** argument is an array of null-terminated strings that is used to provide a value for the **argv** argument to the **main** function of the program to be executed. The last element of this array *must* be a null pointer.

execvp (char *filename, char *const argv[])

The **execvp** function is similar to **execv**, except that it searches the directories listed in the **PATH** environment variable to find the full file name of a file from **filename** if **filename** does not contain a slash.

This function is useful for executing system utility programs, because it looks for them in the places that the user has chosen. **Shells use execvp to run the commands** that users type.

execl (char *filename, const char *arg0, ...)

This is similar to **execv**, but the **argv** strings are specified individually instead of as an array. A null pointer must be passed as the last such argument.

execlp (char *filename, const char *arg0, ...)

This function is like **execl**, except that it performs the same file name searching as the **execvp** function.

Example 1: Using `execv(...)` command

Note: This version will not search the path, so the full name of the executable file must be given. Parameters to `main()` are passed in a single array of character pointers.

```
#include <unistd.h>
#include <stdio.h>

int main(int argc, char* argv[]){

    execv("/bin/echo", &argv[0]);
    printf("EXECV Failed\n");

    return 0;
}
```

`./example1.out "Hello World"`

Example 2: Using `execvp(...)` command

Note: This version searches the path, so the full name of the executable need not be given. Parameters to `main()` are passed in a single array of character pointers. *This is the form used inside a shell!*

```
#include <unistd.h>

#include <stdio.h>

int main(int argc, char* argv[]){

    execvp("echo", &argv[0]);
    printf("EXECVP Failed\n");

    return 0;
}
```

`./example2.out "Hello World"`

Lab 4. Marks: 30**Submission Deadline: 10/20/2022**

Part 1 Write a program where a child is created to execute command that tells you the date and time in Unix.

Use `execl(...)`.

Note, you need to specify the full path of the file name that gives you date and time information. Announce the successful forking of child process by displaying its PID.

Marks: 5

Part 2 Write a program where a child is created to execute a command that shows all files (including hid-den files) in a directory with information such as permissions, owner, size, and when last modified.

Use `execvp(...)`.

For the command to list directory contents with various options, refer the handout on Unix filesystem sent to you in the first class.

Announce the successful forking of child process by displaying its PID.

Marks: 5

Part 3

[Step 1] Prcs_P1.c: Create two files namely, destination1.txt and destination2.txt with read, write, and execute permissions.

[Step 2] Prcs_P2.c: Copy the contents of source.txt¹ into destination1.txt and destination2.txt as per the following procedure.

1. Read the next 100 characters from source.txt, and among characters read, replace each character '1' with character 'L' and all characters are then written in destination1.txt
2. Then the next 50 characters are read from source.txt, and among characters read, replace each character '3' with character 'E' and all characters are then written in destination2.txt.
3. The previous steps are repeated until the end of file source.txt. The last read may not have 100 or 50 characters.

Once you're done with successful creation of executables for the above two steps do the following.

Write a C program and call it Parent_Prcs.c. Execute the files as per the following procedure using `execv` system call. Use sleep system calls to introduce delays.

[Step 3] Using fork create a child process, say Child 1 that executes Prcs_P1. This will create two destination files according to Step 1.

[Step 4] After Child 1 finishes its execution, use fork to create another child process, say Child 2 and execute Prcs_P2 that accomplishes the procedure described in Step 2.

Marks: 20

Submission Instructions

- All the programs MUST be clearly indented and internally documented
- Make sure your programs compile and run without any errors
- Only include c files or txt files for submission. Do not include any executables.
- Save all your programs with meaningful names and zip into a single folder as:
Lab4_[your last name here].zip (e.g., Lab4_Xyz.zip)
- Email your code with the subject line, "**Lab4-CSC33200–Class#G-*lastname***"
- Email: sdebnath@ccny.cuny.edu