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Лабораторная работа №2 по курсу «Операционные системы»

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Вариант: 1
Дата:
Оценка:
Подпись:

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Лабораторная работа №1

Вариант: Написать собственную программу, которая демонстрирует работу с различными системными вызовами (8-15) операционной системы. Произвести диагностику работы написанной программы с помощью утилит ОС, изучив основные принципы применения используемых утилит.

2 Исходный код

```
#include <sys/wait.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>
#include <fcntl.h> // options flags
#include <inttypes.h>
#include <errno.h>

#define BUFFER_SIZE 256

void rename_file(char * oldfilename, char* newfilename) {
	if (rename(oldfilename, newfilename) == -1) {
		perror("Error while 'rename' \n");
	}

}

int main(void) {
	char* str = "This string was created in this file by system call\n";
	char* oldfilename ="old";
	char buffer[BUFFER_SIZE];
	int fd, w;
	fd = creat(oldfilename, S_IREAD | S_IWRITE);
	if (fd == -1) {
		perror("Error while 'creat' ");
	} else {
		printf("File with filenasme 'old' was created \n");
	}

	if (w = write(fd, str, strlen(str)) == -1 ) {
		perror("Error while 'write' \n");
	}
	if (fsync(fd) == -1) {
		perror("Error while 'fsync' \n");
	}
	if (close(fd) == -1) {
		perror("Error while 'close'\n");
	}
```

```
        char newfilename[20];
        printf("Enter new filename to rename 'old' \n");
        scanf("%s", newfilename);
        rename_file(oldfilename, newfilename);
        fd = open(newfilename, O_RDWR);
        if (read(fd, buffer, strlen(str)) == strlen(str)) {
                fprintf(stdout, "%s",buffer);
        } else {
                perror("Error while 'read'\n");
        }
        if (close(fd) == -1) {
                perror("Error while 'close'\n");
        }


        char dirname[20];
        printf("Enter a dirname to create new folder \n");
        scanf("%s", dirname);


        if (mkdir(dirname, 0755) == -1) {
                perror("Error while 'mkdir' \n");
        }


        if (unlink(newfilename) == -1) {
                perror("Error while unlink\n");
        }

        pid_t pid = fork();
   if (pid == 0) {
      fprintf(stdout, "It's child process, pid = ");
      fprintf(stdout, "%ld\n", (intmax_t)getpid());
      fprintf(stdout, "Parent's pid = ");
      fprintf(stdout, "%ld\n", (intmax_t)getppid());
   } else if (pid > 0) {
      fprintf(stdout, "It's parent process, pid = ");
      fprintf(stdout, "%ld\n", (intmax_t)getpid());
      fprintf(stdout, "Parent's pid = ");
      fprintf(stdout, "%ld\n", (intmax_t)getppid());
      wait(NULL);
   } else if (pid == -1) {
      perror("Error fork");
        }
        return 0;


}
```

3 Консоль
Вызовы:

```
timxag@KEKNOTE:~/Документы$ ./o1
File with filenasme 'old' was created
Enter new filename to rename 'old'
old
This string was created in this file by system call
Enter a dirname to create new folder
testdi1
It's parent process, pid = 10919
Parent's pid = 8384
It's child process, pid = 10923
Parent's pid = 10919
timxag@KEKNOTE:~/Документы$ ls
1.c    4      lab1.c  lab2.o  lab6     o2    testdi1     Отчет2.pdf
1.cpp  a.out  lab1.o  lab3.c  labs old  o3    testdir     Отчет3.odt
1.o    kp     lab2    lab4    logpro   old  testdir1    Отчет3.pdf
2      lab1   lab2.c  lab5    o1       test  Отчет2.odt
timxag@KEKNOTE:~/Документы$
```

Диагностика:

```
timxag@KEKNOTE:~/Документы$ sudo strace ./o1
execve("./o1", ["./o1"], 0x7ffc43b0a760 /* 17 vars */) = 0
brk(NULL)                               = 0x55a32802f000
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory)
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=83290, ...}) = 0
mmap(NULL, 83290, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f2418ff2000
close(3)                                = 0
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0755, st_size=2030544, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7f2418ff0000
mmap(NULL, 4131552, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0)
= 0x7f24189ef000
mprotect(0x7f2418bd6000, 2097152, PROT_NONE) = 0
mmap(0x7f2418dd6000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x1e7000) = 0x7f2418dd6000
mmap(0x7f2418ddc000, 15072, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f2418ddc000
close(3)                                = 0
arch_prctl(ARCH_SET_FS, 0x7f2418ff1500) = 0
mprotect(0x7f2418dd6000, 16384, PROT_READ) = 0
mprotect(0x55a326437000, 4096, PROT_READ) = 0
mprotect(0x7f2419007000, 4096, PROT_READ) = 0
munmap(0x7f2418ff2000, 83290)           = 0
creat("old", 0600)                      = 3
```

```
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 1), ...}) = 0
brk(NULL)                               = 0x55a32802f000
brk(0x55a328050000)                     = 0x55a328050000
write(1, "File with filenasme 'old' was cr"..., 39File with filenasme 'old' was created
) = 39
write(3, "This string was created in this "..., 52) = 52
fsync(3)                                = 0
close(3)                                = 0
write(1, "Enter new filename to rename 'ol"..., 36Enter new filename to rename 'old'
) = 36
fstat(0, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 1), ...}) = 0
read(0, 3
"3\n", 1024)                    = 2
rename("old", "3")                      = 0
openat(AT_FDCWD, "3", O_RDWR)           = 3
read(3, "This string was created in this "..., 52) = 52
write(1, "This string was created in this "..., 52This string was created in this file by system call
) = 52
close(3)                                = 0
write(1, "Enter a dirname to create new fo"..., 38Enter a dirname to create new folder
) = 38
read(0, 4
"4\n", 1024)                    = 2
mkdir("4", 0755)                        = 0
unlink("3")                             = 0
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|
SIGCHLD, child_tidptr=0x7f2418ff17d0) = 10909
getpid()                                = 10906
It's child process, pid = 10909
Parent's pid = 10906
write(1, "It's parent process, pid = 10906"..., 33It's parent process, pid = 10906
) = 33
getppid()                               = 10904
write(1, "Parent's pid = 10904\n", 21Parent's pid = 10904
)  = 21
wait4(-1, NULL, 0, NULL)                = 10909
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=10909, si_uid=0, si_status=0,
si_utime=0, si_stime=0} ---
lseek(0, -1, SEEK_CUR)                  = -1 ESPIPE (Illegal seek)
exit_group(0)                           = ?
+++ exited with 0 +++
```

4 Вывод

Изучение системных вызовов позволило по-настоящему понять, что делает операционная система в момент их исполнения. Важно правильно обрабатывать системные вызовы, это поможет избежать ошибок при некорректном исполнении программы и поможет в ее отладке.