Московский Авиационный Институт

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Институт №8 “Компьютерные науки и прикладная математика”

Кафедра №806 “Вычислительная математика и программирование”

**Лабораторная работа №1 по курсу**

**«Операционные системы»**

Группа: М80-206Б-22

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**Постановка задачи**

**Группа вариантов 2.**

Родительский процесс создает дочерний процесс. Первой строчкой пользователь в консоль родительского процесса вводит имя файла, которое будет использовано для открытия файла с таким именем на чтение. Стандартный поток ввода дочернего процесса переопределяется открытым файлом. Дочерний процесс читает команды из стандартного потока ввода. Стандартный поток вывода дочернего процесса перенаправляется в pipe1. Родительский процесс читает из pipe1 и прочитанное выводит в свой стандартный поток вывода. Родительский и дочерний процесс должны быть представлены разными программами.

**Вариант 8.**

В файле записаны команды вида:«число число число<endline>». Дочерний процесс производит деление первого числа команда, на последующие числа в команде, а результат выводит в стандартный поток вывода. Если происходит деление на 0, то тогда дочерний и родительский процесс завершают свою работу. Проверка деления на 0 должна осуществляться на стороне дочернего процесса. Числа имеют тип int. Количество чисел может быть произвольным.

**Общий метод и алгоритм решения**

Использованные системные вызовы:

* pid\_t fork(void); – создает дочерний процесс.
* int pipe(int \*fd); – создает неименованный канал, у которого первое поле отвечает за чтение, а второе - за запись.
* int execv(const char \*\_\_path, char \*const \*\_\_argv); - предоставляет новой программе список аргументов в виде массива указателей на строки, заканчивающиеся (char \*)0.
* int dup2(int, int); - создает копию файлового дескриптора oldfd *(1 поле)*, используя для нового дескриптора newfd *(2 поле)* файловый дескриптор (они становятся взаимозаменяемыми).
* \_exit(int status); – выходит из процесса с заданным статусом.
* pid\_t wait(int \*status); – приостаналивает выполнение текущего процесса до тех пор, пока дочерний процесс не завершится.
* int read(int fd, void \*buffer, int nbyte); – читает nbyte байтов из файлового дескриптора fd в буффер buffer.

Программа parent.c принимает аргументом название файла, который нужно будет прочитать. Далее происходит проверка поданного файла на чтение, и если прочитался успешно, создаётся pipe и дочерний процесс (с дальнейшими проверками их создания, конечно же). Потом происходит перераспределение файловых дескрипторов стандартного ввода (на файл) и вывода (на pipe) в дочернем процессе. Следующим шагом дочерний процесс запускает программу child.c и обрабатывает свой стандартный ввод. В то же время, родительский процесс читает pipe и выводит полученные результаты в стандартный поток вывода, а если встречает -1 (что значит завершение программы дочернего процесса неудачей), то выводит сообщение об ошибке (“Division by zero”) и завершает работу.

**Код программы**

**parent.c**

#include <stdio.h>

#include <unistd.h>

#include <stdlib.h>

#include <sys/types.h>

#include <sys/wait.h>

#include <fcntl.h>

#include <string.h>

#include <stdbool.h>

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

if (argc != 2) {

perror("\nError: no filename\n");

exit(EXIT\_FAILURE);

}

int fd = open(argv[1], O\_RDONLY);

if(fd == -1){

perror("\nCan't open file\n");

\_exit(EXIT\_FAILURE);

}

int pipe\_fd[2];

if (pipe(pipe\_fd) == -1){

perror("\npipe: Here is a problem\n");

\_exit(EXIT\_FAILURE);

}

pid\_t pid = fork();

if (pid == -1) {

perror("\nfork: Here is a problem\n");

\_exit(EXIT\_FAILURE);

}

else if(pid == 0){ //child

close(pipe\_fd[0]);

dup2(fd, STDIN\_FILENO);

dup2(pipe\_fd[1], STDOUT\_FILENO);

char\* args[] = {"./child", NULL};

if (execv(args[0], args) == -1){

fprintf(stderr, "Unable to exec\n");

\_exit(EXIT\_FAILURE);

}

}else{ //parent

close(pipe\_fd[1]);

wait(0);

int result = 0;

while(read(pipe\_fd[0], &result, sizeof(int))){

if(result == -1){

printf("Division by zero\n");

\_exit(EXIT\_FAILURE);

}

else printf("%d\n", result);

}

}

return 0;

}

**child.c**

#include "stdio.h"

#include "stdlib.h"

#include "unistd.h"

int main(){

int c = '\0';

int tmp = 0, res = 0;

int end\_of\_str = 0;

do{

if(!end\_of\_str){

if(c>='0' && c<='9'){

tmp = tmp\*10 + c - '0';

}

if(c == ' ' || c == '\n' || c == EOF){

if(res == 0 && tmp != 0){

res = tmp;

}

else if(res != 0 && tmp != 0){

res /= tmp;

}

else if(res == 0 && tmp == 0){

end\_of\_str = 1;

}

else if(res != 0 && tmp == 0){

res = -1;

write(STDOUT\_FILENO, &res, sizeof(int));

\_exit(EXIT\_FAILURE);

}

tmp = 0;

}

}

if(c == '\n' || c == EOF){

write(STDOUT\_FILENO, &res, sizeof(int));

end\_of\_str = 0;

res = 0;

}

}while(read(STDIN\_FILENO, &c, sizeof(char)) > 0);

return 0;

}

**Протокол работы программы**

**Тестирование:**

mishazhadnov@McB-airmi scr % ./parent test.txt

1

3

0

Division by zero

**Dtrace (аналог strace):**

mishazhadnov@McB-airmi scr % sudo dtruss -f ./parent test.txt

dtrace: system integrity protection is on, some features will not be available

PID/THRD SYSCALL(args) = return

**51526/0x4e6cb5:** fork() = 0 0

51526/0x4e6cb5: munmap(0x113F14000, 0x9C000) = 0 0

51526/0x4e6cb5: munmap(0x113FB0000, 0x8000) = 0 0

51526/0x4e6cb5: munmap(0x113FB8000, 0x4000) = 0 0

51526/0x4e6cb5: munmap(0x113FBC000, 0x4000) = 0 0

51526/0x4e6cb5: munmap(0x113FC0000, 0x54000) = 0 0

51526/0x4e6cb5: open(".\0", 0x100000, 0x0) = 3 0

51526/0x4e6cb5: fcntl(0x3, 0x32, 0x7FF7B8F17230) = 0 0

51526/0x4e6cb5: close(0x3) = 0 0

51526/0x4e6cb5: fsgetpath(0x7FF7B8F17240, 0x400, 0x7FF7B8F17228) = 58 0

51526/0x4e6cb5: fsgetpath(0x7FF7B8F17240, 0x400, 0x7FF7B8F17228) = 14 0

51526/0x4e6cb5: csrctl(0x0, 0x7FF7B8F1764C, 0x4) = -1 1

51526/0x4e6cb5: \_\_mac\_syscall(0x7FF810C2E11B, 0x2, 0x7FF7B8F174C0) = 0 0

51526/0x4e6cb5: csrctl(0x0, 0x7FF7B8F1765C, 0x4) = -1 1

51526/0x4e6cb5: \_\_mac\_syscall(0x7FF810C2B0A8, 0x5A, 0x7FF7B8F175F0) = 0 0

dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

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dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

51526/0x4e6cb5: open("/\0", 0x20100000, 0x0) = 3 0

51526/0x4e6cb5: openat(0x3, "System/Cryptexes/OS\0", 0x100000, 0x0) = 4 0

1

3

0

Devision by zero

51526/0x4e6cb5: dup(0x4, 0x0, 0x0) = 5 0

51526/0x4e6cb5: fstatat64(0x4, 0x7FF7B8F16391, 0x7FF7B8F16790) = 0 0

51526/0x4e6cb5: openat(0x4, "System/Library/dyld/\0", 0x100000, 0x0) = 6 0

51526/0x4e6cb5: fcntl(0x6, 0x32, 0x7FF7B8F16420) = 0 0

51526/0x4e6cb5: dup(0x6, 0x0, 0x0) = 7 0

51526/0x4e6cb5: dup(0x5, 0x0, 0x0) = 8 0

51526/0x4e6cb5: close(0x3) = 0 0

51526/0x4e6cb5: close(0x5) = 0 0

51526/0x4e6cb5: close(0x4) = 0 0

51526/0x4e6cb5: close(0x6) = 0 0

51526/0x4e6cb5: shared\_region\_check\_np(0x7FF7B8F16D18, 0x0, 0x0) = 0 0

51526/0x4e6cb5: fsgetpath(0x7FF7B8F17270, 0x400, 0x7FF7B8F171A8) = 83 0

51526/0x4e6cb5: fcntl(0x8, 0x32, 0x7FF7B8F17270) = 0 0

51526/0x4e6cb5: close(0x8) = 0 0

51526/0x4e6cb5: close(0x7) = 0 0

51526/0x4e6cb5: getfsstat64(0x0, 0x0, 0x2) = 8 0

51526/0x4e6cb5: getfsstat64(0x106FEEA10, 0x43C0, 0x2) = 8 0

51526/0x4e6cb5: getattrlist("/\0", 0x7FF7B8F17100, 0x7FF7B8F17070) = 0 0

51526/0x4e6cb5: fsgetpath(0x7FF7B8F16EF0, 0x400, 0x7FF7B8F16ED8) = 83 0

51526/0x4e6cb5: stat64("/System/Volumes/Preboot/Cryptexes/OS/System/Library/dyld/dyld\_shared\_cache\_x86\_64h\0", 0x7FF7B8F17358, 0x0) = 0 0

51526/0x4e6cb5: stat64("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/parent\0", 0x7FF7B8F16980, 0x0) = 0 0

51526/0x4e6cb5: open("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/parent\0", 0x0, 0x0) = 3 0

51526/0x4e6cb5: mmap(0x0, 0x361C, 0x1, 0x40002, 0x3, 0x0) = 0x10702D000 0

51526/0x4e6cb5: fcntl(0x3, 0x32, 0x7FF7B8F16A90) = 0 0

51526/0x4e6cb5: close(0x3) = 0 0

51526/0x4e6cb5: munmap(0x10702D000, 0x361C) = 0 0

51526/0x4e6cb5: stat64("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/parent\0", 0x7FF7B8F16EE0, 0x0) = 0 0

51526/0x4e6cb5: stat64("/usr/lib/libSystem.B.dylib\0", 0x7FF7B8F15F30, 0x0) = -1 2

51526/0x4e6cb5: stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/libSystem.B.dylib\0", 0x7FF7B8F15EE0, 0x0) = -1 2

51526/0x4e6cb5: stat64("/usr/lib/system/libdispatch.dylib\0", 0x7FF7B8F13B30, 0x0) = -1 2

51526/0x4e6cb5: stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/system/libdispatch.dylib\0", 0x7FF7B8F13AE0, 0x0) = -1 2

51526/0x4e6cb5: stat64("/usr/lib/system/libdispatch.dylib\0", 0x7FF7B8F13B30, 0x0) = -1 2

51526/0x4e6cb5: open("/dev/dtracehelper\0", 0x2, 0x0) = 3 0

51526/0x4e6cb5: ioctl(0x3, 0x80086804, 0x7FF7B8F15B38) = 0 0

51526/0x4e6cb5: close(0x3) = 0 0

51526/0x4e6cb5: mprotect(0x106FE9000, 0x1000, 0x1) = 0 0

51526/0x4e6cb5: shared\_region\_check\_np(0xFFFFFFFFFFFFFFFF, 0x0, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x1) = 0 0

51526/0x4e6cb5: access("/AppleInternal/XBS/.isChrooted\0", 0x0, 0x0) = -1 2

51526/0x4e6cb5: bsdthread\_register(0x7FF810EF5BC4, 0x7FF810EF5BB0, 0x2000) = 1073742303 0

51526/0x4e6cb5: shm\_open(0x7FF810DA0F5A, 0x0, 0x10D9F465) = 3 0

51526/0x4e6cb5: fstat64(0x3, 0x7FF7B8F15D80, 0x0) = 0 0

51526/0x4e6cb5: mmap(0x0, 0x3000, 0x1, 0x40001, 0x3, 0x0) = 0x10702F000 0

51526/0x4e6cb5: close(0x3) = 0 0

51526/0x4e6cb5: ioctl(0x2, 0x4004667A, 0x7FF7B8F15E34) = 0 0

51526/0x4e6cb5: mprotect(0x107037000, 0x1000, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x10703E000, 0x1000, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x10703F000, 0x1000, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x107046000, 0x1000, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x107032000, 0x98, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x107032000, 0x98, 0x3) = 0 0

51526/0x4e6cb5: mprotect(0x107032000, 0x98, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x107047000, 0x1000, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x107048000, 0x98, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x107048000, 0x98, 0x3) = 0 0

51526/0x4e6cb5: mprotect(0x107048000, 0x98, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x107032000, 0x98, 0x3) = 0 0

51526/0x4e6cb5: mprotect(0x107032000, 0x98, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x107047000, 0x1000, 0x3) = 0 0

51526/0x4e6cb5: mprotect(0x107047000, 0x1000, 0x1) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x3) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x1) = 0 0

51526/0x4e6cb5: issetugid(0x0, 0x0, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x3) = 0 0

51526/0x4e6cb5: getentropy(0x7FF7B8F158E0, 0x20, 0x0) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x1) = 0 0

51526/0x4e6cb5: getpid(0x0, 0x0, 0x0) = 51526 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x3) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x1) = 0 0

51526/0x4e6cb5: getattrlist("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/parent\0", 0x7FF7B8F15D60, 0x7FF7B8F15D78) = 0 0

51526/0x4e6cb5: access("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr\0", 0x4, 0x0) = 0 0

51526/0x4e6cb5: open("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr\0", 0x0, 0x0) = 3 0

51526/0x4e6cb5: fstat64(0x3, 0x7FA15AF04500, 0x0) = 0 0

51526/0x4e6cb5: csrctl(0x0, 0x7FF7B8F15FEC, 0x4) = -1 1

51526/0x4e6cb5: fgetattrlist(0x3, 0x7FF7B8F16000, 0x7FF7B8F16020) = 0 0

51526/0x4e6cb5: \_\_mac\_syscall(0x7FF81B4B2719, 0x2, 0x7FF7B8F16020) = 0 0

51526/0x4e6cb5: fcntl(0x3, 0x32, 0x7FF7B8F15C90) = 0 0

51526/0x4e6cb5: close(0x3) = 0 0

51526/0x4e6cb5: open("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/Info.plist\0", 0x0, 0x0) = -1 2

51526/0x4e6cb5: proc\_info(0x2, 0xC946, 0xD) = 64 0

51526/0x4e6cb5: csops\_audittoken(0xC946, 0x10, 0x7FF7B8F15F70) = -1 22

dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

51526/0x4e6cb5: csops(0xC946, 0x0, 0x7FF7B8F163D4) = 0 0

51526/0x4e6cb5: sysctlbyname(kern.system\_version\_compat, 0x1A, 0x0, 0x0, 0x7FF7B8F16404) = 0 0

51526/0x4e6cb5: mprotect(0x106FEC000, 0x40000, 0x3) = 0 0

51526/0x4e6cb5: open("test.txt\0", 0x0, 0x0) = 3 0

**51526/0x4e6cb5:** pipe(0x0, 0x0, 0x0) = 4 0

**51526/0x4e6cb5:** fork() = 51527 0

**51527/0x4e6cbd:** fork() = 0 0

51527/0x4e6cbd: thread\_selfid(0x0, 0x0, 0x0) = 5139645 0

51526/0x4e6cb5: close(0x5) = 0 0

51527/0x4e6cbd: bsdthread\_register(0x7FF810EF5BC4, 0x7FF810EF5BB0, 0x2000) = -1 22

51527/0x4e6cbd: mprotect(0x107048000, 0x98, 0x3) = 0 0

51527/0x4e6cbd: mprotect(0x107048000, 0x98, 0x1) = 0 0

51527/0x4e6cbd: close(0x4) = 0 0

51527/0x4e6cbd: dup2(0x3, 0x0, 0x0) = 0 0

51527/0x4e6cbd: dup2(0x5, 0x1, 0x0) = 1 0

dtrace: error on enabled probe ID 1688 (ID 285: syscall::execve:return): invalid address (0x106fe8f83) in action #12 at DIF offset 12

**51527/0x4e6cbe:** fork() = 0 0

51527/0x4e6cbe: mprotect(0x11171D000, 0x8000, 0x1) = 0 0

51527/0x4e6cbe: thread\_selfid(0x0, 0x0, 0x0) = 5139646 0

51527/0x4e6cbe: shared\_region\_check\_np(0x7FF7B21AB8D8, 0x0, 0x0) = 0 0

51527/0x4e6cbe: thread\_selfid(0x0, 0x0, 0x0) = 5139646 0

51527/0x4e6cbe: getpid(0x0, 0x0, 0x0) = 51527 0

51527/0x4e6cbe: proc\_info(0xF, 0xC947, 0x0) = 0 0

51527/0x4e6cbe: munmap(0x111681000, 0x9C000) = 0 0

51527/0x4e6cbe: munmap(0x11171D000, 0x8000) = 0 0

51527/0x4e6cbe: munmap(0x111725000, 0x4000) = 0 0

51527/0x4e6cbe: munmap(0x111729000, 0x4000) = 0 0

51527/0x4e6cbe: munmap(0x11172D000, 0x54000) = 0 0

51527/0x4e6cbe: open(".\0", 0x100000, 0x0) = 4 0

51527/0x4e6cbe: fcntl(0x4, 0x32, 0x7FF7B21AB250) = 0 0

51527/0x4e6cbe: close(0x4) = 0 0

51527/0x4e6cbe: fsgetpath(0x7FF7B21AB260, 0x400, 0x7FF7B21AB248) = 57 0

51527/0x4e6cbe: fsgetpath(0x7FF7B21AB260, 0x400, 0x7FF7B21AB248) = 14 0

51527/0x4e6cbe: csrctl(0x0, 0x7FF7B21AB66C, 0x4) = -1 1

51527/0x4e6cbe: \_\_mac\_syscall(0x7FF810C2E11B, 0x2, 0x7FF7B21AB4E0) = 0 0

51527/0x4e6cbe: csrctl(0x0, 0x7FF7B21AB67C, 0x4) = -1 1

51527/0x4e6cbe: \_\_mac\_syscall(0x7FF810C2B0A8, 0x5A, 0x7FF7B21AB610) = 0 0

dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

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51527/0x4e6cbe: open("/\0", 0x20100000, 0x0) = 4 0

51527/0x4e6cbe: openat(0x4, "System/Cryptexes/OS\0", 0x100000, 0x0) = 6 0

51527/0x4e6cbe: dup(0x6, 0x0, 0x0) = 7 0

51527/0x4e6cbe: fstatat64(0x6, 0x7FF7B21AA3B1, 0x7FF7B21AA7B0) = 0 0

51527/0x4e6cbe: openat(0x6, "System/Library/dyld/\0", 0x100000, 0x0) = 8 0

51527/0x4e6cbe: fcntl(0x8, 0x32, 0x7FF7B21AA440) = 0 0

51527/0x4e6cbe: dup(0x8, 0x0, 0x0) = 9 0

51527/0x4e6cbe: dup(0x7, 0x0, 0x0) = 10 0

51527/0x4e6cbe: close(0x4) = 0 0

51527/0x4e6cbe: close(0x7) = 0 0

51527/0x4e6cbe: close(0x6) = 0 0

51527/0x4e6cbe: close(0x8) = 0 0

51527/0x4e6cbe: shared\_region\_check\_np(0x7FF7B21AAD38, 0x0, 0x0) = 0 0

51527/0x4e6cbe: fsgetpath(0x7FF7B21AB290, 0x400, 0x7FF7B21AB1C8) = 83 0

51527/0x4e6cbe: fcntl(0xA, 0x32, 0x7FF7B21AB290) = 0 0

51527/0x4e6cbe: close(0xA) = 0 0

51527/0x4e6cbe: close(0x9) = 0 0

51527/0x4e6cbe: getfsstat64(0x0, 0x0, 0x2) = 8 0

51527/0x4e6cbe: getfsstat64(0x10DD5AA10, 0x43C0, 0x2) = 8 0

51527/0x4e6cbe: getattrlist("/\0", 0x7FF7B21AB120, 0x7FF7B21AB090) = 0 0

51527/0x4e6cbe: fsgetpath(0x7FF7B21AAF10, 0x400, 0x7FF7B21AAEF8) = 83 0

51527/0x4e6cbe: stat64("/System/Volumes/Preboot/Cryptexes/OS/System/Library/dyld/dyld\_shared\_cache\_x86\_64h\0", 0x7FF7B21AB378, 0x0) = 0 0

51527/0x4e6cbe: stat64("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/child\0", 0x7FF7B21AA9A0, 0x0) = 0 0

51527/0x4e6cbe: open("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/child\0", 0x0, 0x0) = 4 0

51527/0x4e6cbe: mmap(0x0, 0x3264, 0x1, 0x40002, 0x4, 0x0) = 0x10DD99000 0

51527/0x4e6cbe: fcntl(0x4, 0x32, 0x7FF7B21AAAB0) = 0 0

51527/0x4e6cbe: close(0x4) = 0 0

51527/0x4e6cbe: munmap(0x10DD99000, 0x3264) = 0 0

51527/0x4e6cbe: stat64("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/child\0", 0x7FF7B21AAF00, 0x0) = 0 0

51527/0x4e6cbe: stat64("/usr/lib/libSystem.B.dylib\0", 0x7FF7B21A9F50, 0x0) = -1 2

51527/0x4e6cbe: stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/libSystem.B.dylib\0", 0x7FF7B21A9F00, 0x0) = -1 2

51527/0x4e6cbe: stat64("/usr/lib/system/libdispatch.dylib\0", 0x7FF7B21A7B50, 0x0) = -1 2

51527/0x4e6cbe: stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/system/libdispatch.dylib\0", 0x7FF7B21A7B00, 0x0) = -1 2

51527/0x4e6cbe: stat64("/usr/lib/system/libdispatch.dylib\0", 0x7FF7B21A7B50, 0x0) = -1 2

51527/0x4e6cbe: open("/dev/dtracehelper\0", 0x2, 0x0) = 4 0

51527/0x4e6cbe: ioctl(0x4, 0x80086804, 0x7FF7B21A9B58) = 0 0

51527/0x4e6cbe: close(0x4) = 0 0

51527/0x4e6cbe: mprotect(0x10DD55000, 0x1000, 0x1) = 0 0

51527/0x4e6cbe: shared\_region\_check\_np(0xFFFFFFFFFFFFFFFF, 0x0, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x1) = 0 0

51527/0x4e6cbe: access("/AppleInternal/XBS/.isChrooted\0", 0x0, 0x0) = -1 2

51527/0x4e6cbe: bsdthread\_register(0x7FF810EF5BC4, 0x7FF810EF5BB0, 0x2000) = 1073742303 0

51527/0x4e6cbe: shm\_open(0x7FF810DA0F5A, 0x0, 0x10D9F465) = 4 0

51527/0x4e6cbe: fstat64(0x4, 0x7FF7B21A9DA0, 0x0) = 0 0

51527/0x4e6cbe: mmap(0x0, 0x3000, 0x1, 0x40001, 0x4, 0x0) = 0x10DD9B000 0

51527/0x4e6cbe: close(0x4) = 0 0

51527/0x4e6cbe: ioctl(0x2, 0x4004667A, 0x7FF7B21A9E54) = 0 0

51527/0x4e6cbe: mprotect(0x10DDA3000, 0x1000, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DDAA000, 0x1000, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DDAB000, 0x1000, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB2000, 0x1000, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DD9E000, 0x98, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DD9E000, 0x98, 0x3) = 0 0

51527/0x4e6cbe: mprotect(0x10DD9E000, 0x98, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB3000, 0x1000, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB4000, 0x98, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB4000, 0x98, 0x3) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB4000, 0x98, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DD9E000, 0x98, 0x3) = 0 0

51527/0x4e6cbe: mprotect(0x10DD9E000, 0x98, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB3000, 0x1000, 0x3) = 0 0

51527/0x4e6cbe: mprotect(0x10DDB3000, 0x1000, 0x1) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x3) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x1) = 0 0

51527/0x4e6cbe: issetugid(0x0, 0x0, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x3) = 0 0

51527/0x4e6cbe: getentropy(0x7FF7B21A9900, 0x20, 0x0) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x1) = 0 0

51527/0x4e6cbe: getpid(0x0, 0x0, 0x0) = 51527 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x3) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x1) = 0 0

51527/0x4e6cbe: getattrlist("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/child\0", 0x7FF7B21A9D80, 0x7FF7B21A9D98) = 0 0

51527/0x4e6cbe: access("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr\0", 0x4, 0x0) = 0 0

51527/0x4e6cbe: open("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr\0", 0x0, 0x0) = 4 0

51527/0x4e6cbe: fstat64(0x4, 0x7FD45B704500, 0x0) = 0 0

51527/0x4e6cbe: csrctl(0x0, 0x7FF7B21AA00C, 0x4) = -1 1

51527/0x4e6cbe: fgetattrlist(0x4, 0x7FF7B21AA020, 0x7FF7B21AA040) = 0 0

51527/0x4e6cbe: \_\_mac\_syscall(0x7FF81B4B2719, 0x2, 0x7FF7B21AA040) = 0 0

51527/0x4e6cbe: fcntl(0x4, 0x32, 0x7FF7B21A9CB0) = 0 0

51527/0x4e6cbe: close(0x4) = 0 0

51527/0x4e6cbe: open("/Users/mishazhadnov/Desktop/wD/OS\_labs\_3t/lab1/scr/Info.plist\0", 0x0, 0x0) = -1 2

51527/0x4e6cbe: proc\_info(0x2, 0xC947, 0xD) = 64 0

51527/0x4e6cbe: csops\_audittoken(0xC947, 0x10, 0x7FF7B21A9F90) = -1 22

dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

dtrace: error on enabled probe ID 1741 (ID 571: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 28

51527/0x4e6cbe: csops(0xC947, 0x0, 0x7FF7B21AA3F4) = 0 0

51527/0x4e6cbe: sysctlbyname(kern.system\_version\_compat, 0x1A, 0x0, 0x0, 0x7FF7B21AA424) = 0 0

51527/0x4e6cbe: mprotect(0x10DD58000, 0x40000, 0x3) = 0 0

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1711 (ID 175: syscall::write:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1711 (ID 175: syscall::write:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1711 (ID 175: syscall::write:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1711 (ID 175: syscall::write:return): invalid kernel access in action #13 at DIF offset 68

51526/0x4e6cb5: wait4(0xFFFFFFFFFFFFFFFF, 0x0, 0x0) = 51527 0

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

51526/0x4e6cb5: getrlimit(0x1008, 0x7FF7B8F17380, 0x0) = 0 0

51526/0x4e6cb5: fstat64(0x1, 0x7FF7B8F17368, 0x0) = 0 0

51526/0x4e6cb5: ioctl(0x1, 0x4004667A, 0x7FF7B8F173B4) = 0 0

dtrace: error on enabled probe ID 1712 (ID 961: syscall::write\_nocancel:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1712 (ID 961: syscall::write\_nocancel:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1712 (ID 961: syscall::write\_nocancel:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1713 (ID 173: syscall::read:return): invalid kernel access in action #13 at DIF offset 68

dtrace: error on enabled probe ID 1712 (ID 961: syscall::write\_nocancel:return): invalid kernel access in action #13 at DIF offset 68

**Вывод**

Благодаря данной лабораторной работе я на практике изучил принципы работы с неименованными каналами для межпроцессного взаимодействия, разобрался, как перенаправлять потоки ввода/вывода, а также научился использовать системные вызовы и обращаться с файловыми дескрипторами (которые важно вовремя и уместно закрывать).

Очевидно, что в реальных, “рабочих” программах используется большее количество неименованных каналов и процессов. Эта лабораторная работа научила базовому обращению с ними.