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»**

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**Постановка задачи**

**Вариант 19.**

Родительский процесс создаёт два дочерних процесса. Первой строкой пользователь в консоль родительского процесса вводит имя файла, которое будет использовано для открытия File с таким именем на запись для child1. Аналогично для второй строки и процесса child2. Родительский и дочерний процесс должны быть представлены разными программами.

Родительский процесс принимает от пользователя строки произвольной длины и пересылает их в pipe1 или в pipe2 в зависимости от правила фильтрации. Процесс child1 и child2 производят работу над строками. Процессы пишут результаты своей работы в стандартный вывод.

Правило фильтрации: с вероятностью 80% строки отправляются в pipe1, иначе в pipe2. Дочерние процессы удаляют все гласные из строк.

**Общий метод и алгоритм решения**

Использованные системные вызовы:

* pid\_t fork(void); – создает дочерний процесс.
* int pipe(int \*fd); – создаёт канал (pipe) для межпроцессного взаимодействия.
* int dup2(int oldfd, int newfd); - дублирует файловый дескриптор oldfd и заменяет им дескриптор newfd.
* int execl(const char \*path, const char \*arg, ...); - загружает и исполняет новый образ программы.
* int waitpid(pid\_t pid, int \*status, int options); - ожидает завершения дочернего процесса с идентификатором pid и получает его статус завершения.
* close(int fd) - закрыть файл
* open(const char \*pathname, int flags, mode\_t mode) - открытие\создание файла
* exit(int status) - завершения выполнения процесса

**Алгоритм работы программы**

Описание алгоритма начнем с описание основной идеи программы. Будем действовать по описанию задачи. Для начала из родительского процесса считаем два имени(две строки) будущих файлов. Затем необходимо открыть два файла и создать два канала. Открываем файл через open, создаем каналы через вызов pipe.

Родительский процесс, как и в условии, запускает два дочерних процесса. После запуска перенаправляем стандартные потоки выхода и входа на файл и pipe исходя из схемы варианта. Далее необходимо закрыть неиспользуемые дескрипторы.

Основная идея работы программы это два бесконечных цикла. Один в родительском процессе: он принимает строки и с вероятностью перенаправляет её либо в pipe 1 либо в pipe 2. Цикл в дочернем процессе считывает строку из стандартного потока входа и выполняет действие со строкой.

Условием выхода из циклов будет строка “q”, обозначающая quit. После неё прерывается основной цикл программы, и в дочерние программы отправляется сигнал о завершении работы.

После завершения работы важно дождаться завершения работы детей и закрыть открытые дескрипторы.

После завершения работы результат программы будет записан в файлы, чьи имена были переданы в начале работы родительского процесса.

Вероятность для отправки строк в разные пайпы вычисляем с помощью функции rand().

**Код программы**

#include <iostream>

#include <string>

#include <unistd.h>

#include <sys/types.h>

#include <sys/wait.h>

#include <random>

#include <fcntl.h>

// return (rand() % 100 <= 80) ? 1 : 2;

// fd[0] - read, fd[1] - write

// Запись, создание, обрезание файла

// O\_WRONLY | O\_CREAT | O\_TRUNC

// Права доступа (чтение, запись, выполнение) для владельца, группы, всех

// S\_IRUSR | S\_IRGRP | S\_IROTH

int main()

{

    std::string f1, f2;

    std::cout << "Enter file name for child1: ";

    std::cin >> f1;

    std::cout << "Enter file name for child2: ";

    std::cin >> f2;

    int file1\_desc = open(f1.c\_str(), O\_RDWR | O\_CREAT | O\_TRUNC, 0666);

    int file2\_desc = open(f2.c\_str(), O\_RDWR | O\_CREAT | O\_TRUNC, 0666);

    // Создаём каналы

    int pipe1[2], pipe2[2];

    if (pipe(pipe1) == -1 || pipe(pipe2) == -1)

    {

        std::cout << "Ошибка при создании pipe";

        exit(1);

    }

    pid\_t ch1 = fork();

    switch (ch1)

    {

    case -1:

        std::cout << "Ошибка при выполнении fork 1";

        exit(1);

        break;

    case 0:

        // Закрываем ненужные дескрипторы

        close(pipe1[1]);

        close(pipe2[0]);

        close(pipe2[1]);

        close(file2\_desc);

        // Перенаправление stdin на pipe и stdout на file1 для child 1

        if (dup2(pipe1[0], STDIN\_FILENO) == -1) {

            std::cout << "Ошибка при перенаправлении stdin 1";

            return 1;

        }

        if (dup2(file1\_desc, STDOUT\_FILENO) == -1) {

            std::cout << "Ошибка при перенаправлении stdout 1";

            return 1;

        }

        close(pipe1[0]);

        close(file1\_desc);

        // Запуск дочернего процесса

        execl("./child", "child1", NULL);

        std::cout << "Ошибка при вызове execl 1";

        return 1;

        break;

    default:

        pid\_t ch2 = fork();

        switch (ch2)

        {

        case -1:

            std::cout << "Ошибка при выполнении fork 2";

            exit(1);

            break;

        case 0:

            close(pipe2[1]);

            close(pipe1[0]);

            close(pipe1[1]);

            close(file1\_desc);

            // Перенаправление stdin на pipe и stdout на file2 для child 2

            if (dup2(pipe2[0], STDIN\_FILENO) == -1) {

                std::cout << "Ошибка при перенаправлении stdin 2";

                return 1;

            }

            if (dup2(file2\_desc, STDOUT\_FILENO) == -1) {

                std::cout << "Ошибка при перенаправлении stdout 2";

                return 1;

            }

            close(pipe2[0]);

            close(file2\_desc);

            // Запуск дочернего процесса

            execl("./child", "child2", NULL);

            std::cout << "Ошибка при вызове execl 2";

            return 1;

        default: // Код родительского процесса

            // Закрываем дескрипторы для записи в пайпы

            close(pipe1[0]);

            close(pipe2[0]);

            close(file1\_desc);

            close(file2\_desc);

            std::string st = "";

            std::cout << "Enter linens. To finish entering lines, enter 'q'.\n";

            std::cin >> st;

            while (st != "q")

            {

                int len = st.size() + 1;

                st += '\n';

                if (rand() % 100 <= 80)

                {

                    std::cout<<"pip1\n";

                    if (write(pipe1[1], st.c\_str(), len \* sizeof(char)) == -1) // отправляем строку

                    {

                        std::cout << "Ошибка при записи чисел";

                        return 1;

                    }

                }

                else

                {

                    std::cout<<"pip2\n";

                    if (write(pipe2[1], st.c\_str(), len \* sizeof(char)) == -1)

                    {

                        std::cout << "Ошибка при записи чисел";

                        return 1;

                    }

                    if (write(pipe2[1], "\n", 1 \* sizeof(char)) == -1)

                    {

                        std::cout << "Ошибка при записи чисел";

                        return 1;

                    }

                }

                std::cin >> st;

            }

            // Отправляем сигнал завершения

            st = "q\n";

            int status;

            write(pipe1[1], st.c\_str(), 2);

            write(pipe2[1], st.c\_str(), 2);

            // Закрываем ненужные дескрипторы

            close(pipe1[1]);

            close(pipe2[1]);

            // Ждем завершения дочерних процессов

            waitpid(ch1, &status, 0);

            waitpid(ch2, &status, 0);

            break;

        }

        break;

    }

    return 0;

}

**Протокол работы программы**

**Тестирование:**

**root@3d4dec048ee8:/workspaces/MAI\_OS\_Labs/lab1/src# ./main**

**Enter file name for child1: f\_1**

**Enter file name for child2: f\_2**

**Enter linens. To finish entering lines, enter 'q'.**

**door**

**apple**

**tomato**

**table**

**answer**

**elefant**

**poor**

**rich**

**omega**

**q**

**root@3d4dec048ee8:/workspaces/MAI\_OS\_Labs/lab1/src# cat f\_1**

**tmt**

**tbl**

**lfnt**

**mg**

**root@3d4dec048ee8:/workspaces/MAI\_OS\_Labs/lab1/src# cat f\_2**

**dr**

**ppl**

**nswr**

**pr**

**rch**

**Strace:**

**execve**("./main", ["./main"], 0x7fffb628aa98 /\* 30 vars \*/) = 0

brk(NULL) = 0x1269000

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7fbff9622000

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

newfstatat(3, "", {st\_mode=S\_IFREG|0644, st\_size=25258, ...}, AT\_EMPTY\_PATH) = 0

mmap(NULL, 25258, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7fbff961b000

**close(3)** = 0

openat(AT\_FDCWD, "/usr/local/lib64/libstdc++.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\0\0\0\0\0\0\0\0"..., 832) = 832

newfstatat(3, "", {st\_mode=S\_IFREG|0755, st\_size=2530008, ...}, AT\_EMPTY\_PATH) = 0

mmap(NULL, 2543808, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fbff93ad000

mmap(0x7fbff9452000, 1216512, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0xa5000) = 0x7fbff9452000

mmap(0x7fbff957b000, 581632, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1ce000) = 0x7fbff957b000

mmap(0x7fbff9609000, 57344, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x25c000) = 0x7fbff9609000

mmap(0x7fbff9617000, 12480, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7fbff9617000

**close(3)**  = 0

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libm.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\0\0\0\0\0\0\0\0"..., 832) = 832

newfstatat(3, "", {st\_mode=S\_IFREG|0644, st\_size=907784, ...}, AT\_EMPTY\_PATH) = 0

mmap(NULL, 909560, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fbff92ce000

mmap(0x7fbff92de000, 471040, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x10000) = 0x7fbff92de000

mmap(0x7fbff9351000, 368640, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x83000) = 0x7fbff9351000

mmap(0x7fbff93ab000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0xdc000) = 0x7fbff93ab000

**close(3)**  = 0

openat(AT\_FDCWD, "/usr/local/lib64/libgcc\_s.so.1", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

newfstatat(3, "", {st\_mode=S\_IFREG|0644, st\_size=906528, ...}, AT\_EMPTY\_PATH) = 0

mmap(NULL, 181160, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fbff92a1000

mmap(0x7fbff92a5000, 143360, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x4000) = 0x7fbff92a5000

mmap(0x7fbff92c8000, 16384, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x27000) = 0x7fbff92c8000

mmap(0x7fbff92cc000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x2b000) = 0x7fbff92cc000

**close(3)** = 0

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\20t\2\0\0\0\0\0"..., 832) = 832

pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

newfstatat(3, "", {st\_mode=S\_IFREG|0755, st\_size=1922136, ...}, AT\_EMPTY\_PATH) = 0

pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

mmap(NULL, 1970000, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fbff90c0000

mmap(0x7fbff90e6000, 1396736, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x26000) = 0x7fbff90e6000

mmap(0x7fbff923b000, 339968, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x17b000) = 0x7fbff923b000

mmap(0x7fbff928e000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1ce000) = 0x7fbff928e000

mmap(0x7fbff9294000, 53072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7fbff9294000

**close(3)**  = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7fbff90be000

arch\_prctl(ARCH\_SET\_FS, 0x7fbff90bf480) = 0

set\_tid\_address(0x7fbff90bf750) = 1651

set\_robust\_list(0x7fbff90bf760, 24) = 0

rseq(0x7fbff90bfda0, 0x20, 0, 0x53053053) = 0

mprotect(0x7fbff928e000, 16384, PROT\_READ) = 0

mprotect(0x7fbff92cc000, 4096, PROT\_READ) = 0

mprotect(0x7fbff93ab000, 4096, PROT\_READ) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7fbff90bc000

mprotect(0x7fbff9609000, 45056, PROT\_READ) = 0

mprotect(0x404000, 4096, PROT\_READ) = 0

mprotect(0x7fbff9654000, 8192, PROT\_READ) = 0

prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0

munmap(0x7fbff961b000, 25258) = 0

futex(0x7fbff961773c, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0

getrandom("\xc9\xbb\x38\x95\x2f\x76\xda\xc3", 8, GRND\_NONBLOCK) = 8

brk(NULL) = 0x1269000

brk(0x128a000) = 0x128a000

newfstatat(1, "", {st\_mode=S\_IFCHR|0620, st\_rdev=makedev(0x88, 0), ...}, AT\_EMPTY\_PATH) = 0

write(1, "Enter file name for child1: ", 28Enter file name for child1: ) = 28

newfstatat(0, "", {st\_mode=S\_IFCHR|0620, st\_rdev=makedev(0x88, 0), ...}, AT\_EMPTY\_PATH) = 0

read(0, file1

"file1\n", 1024) = 6

**write**(1, "Enter file name for child2: ", 28Enter file name for child2: ) = 28

read(0, file2

"file2\n", 1024) = 6

openat(AT\_FDCWD, "file1", O\_RDWR|O\_CREAT|O\_TRUNC, 0666) = 3

openat(AT\_FDCWD, "file2", O\_RDWR|O\_CREAT|O\_TRUNC, 0666) = 4

**pipe2**([5, 6], 0) = 0

**pipe2**([7, 8], 0) = 0

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLDstrace: Process 1693 attached

, child\_tidptr=0x7fbff90bf750) = 1693

[pid 1693] set\_robust\_list(0x7fbff90bf760, 24 <unfinished ...>

[pid 1651] clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD <unfinished ...>

[pid 1693] <... set\_robust\_list resumed>) = 0

strace: Process 1694 attached

[pid 1693] close(6 <unfinished ...>

[pid 1651] <... clone resumed>, child\_tidptr=0x7fbff90bf750) = 1694

[pid 1694] set\_robust\_list(0x7fbff90bf760, 24 <unfinished ...>

[pid 1651] close(5 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1651] <... close resumed>) = 0

[pid 1694] <... set\_robust\_list resumed>) = 0

[pid 1651] close(7 <unfinished ...>

[pid 1693] close(7 <unfinished ...>

[pid 1651] <... close resumed>) = 0

[pid 1694] close(8 <unfinished ...>

[pid 1651] close(3 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1651] <... close resumed>) = 0

[pid 1694] <... close resumed>) = 0

[pid 1651] close(4 <unfinished ...>

[pid 1693] close(8 <unfinished ...>

[pid 1651] <... close resumed>) = 0

[pid 1694] close(5 <unfinished ...>

[pid 1651] write(1, "Enter linens. To finish entering"..., 51 <unfinished ...>

Enter linens. To finish entering lines, enter 'q'.

[pid 1693] <... close resumed>) = 0

[pid 1651] <... write resumed>) = 51

[pid 1694] <... close resumed>) = 0

[pid 1651] read(0, <unfinished ...>

[pid 1693] **close**(4 <unfinished ...>

[pid 1694] **close**(6 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1694] <... close resumed>) = 0

[pid 1693] **dup2**(5, 0 <unfinished ...>

[pid 1694] **close**(3 <unfinished ...>

[pid 1693] <... dup2 resumed>) = 0

[pid 1694] <... close resumed>) = 0

[pid 1693] **dup2**(3, 1 <unfinished ...>

[pid 1694] **dup2**(7, 0 <unfinished ...>

[pid 1693] <... dup2 resumed>) = 1

[pid 1694] <... dup2 resumed>) = 0

[pid 1693] **close**(5 <unfinished ...>

[pid 1694] **dup2**(4, 1 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1694] <... dup2 resumed>) = 1

[pid 1693] **close**(3 <unfinished ...>

[pid 1694] **close**(7) = 0

[pid 1693] <... close resumed>) = 0

[pid 1694] **close**(4 <unfinished ...>

[pid 1693] **execve**("./child", ["child1"], 0x7ffc67548888 /\* 30 vars \*/ <unfinished ...>

[pid 1694] <... close resumed>) = 0

[pid 1694] **execve**("./child", ["child2"], 0x7ffc67548888 /\* 30 vars \*/) = 0

[pid 1694] brk(NULL) = 0x2101000

[pid 1694] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f7b3983e000

[pid 1694] access("/etc/ld.so.preload", R\_OK) = -1 ENOENT (No such file or directory)

[pid 1693] <... execve resumed>) = 0

[pid 1694] openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1693] brk(NULL <unfinished ...>

[pid 1694] <... openat resumed>) = 3

[pid 1693] <... brk resumed>) = 0x2279000

[pid 1694] newfstatat(3, "", {st\_mode=S\_IFREG|0644, st\_size=25258, ...}, AT\_EMPTY\_PATH) = 0

[pid 1693] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1694] mmap(NULL, 25258, PROT\_READ, MAP\_PRIVATE, 3, 0 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b964000

[pid 1694] <... mmap resumed>) = 0x7f7b39837000

[pid 1694] close(3 <unfinished ...>

[pid 1693] access("/etc/ld.so.preload", R\_OK <unfinished ...>

[pid 1694] <... close resumed>) = 0

[pid 1693] <... access resumed>) = -1 ENOENT (No such file or directory)

[pid 1694] openat(AT\_FDCWD, "/usr/local/lib64/libstdc++.so.6", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1693] openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1694] <... openat resumed>) = 3

[pid 1693] <... openat resumed>) = 3

[pid 1694] read(3, <unfinished ...>

[pid 1693] newfstatat(3, "", <unfinished ...>

[pid 1694] <... read resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

[pid 1693] <... newfstatat resumed>{st\_mode=S\_IFREG|0644, st\_size=25258, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] newfstatat(3, "", <unfinished ...>

[pid 1693] mmap(NULL, 25258, PROT\_READ, MAP\_PRIVATE, 3, 0 <unfinished ...>

[pid 1694] <... newfstatat resumed>{st\_mode=S\_IFREG|0755, st\_size=2530008, ...}, AT\_EMPTY\_PATH) = 0

[pid 1693] <... mmap resumed>) = 0x7fec8b95d000

[pid 1694] mmap(NULL, 2543808, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1693] close(3 <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b395c9000

[pid 1693] <... close resumed>) = 0

[pid 1694] mmap(0x7f7b3966e000, 1216512, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0xa5000 <unfinished ...>

[pid 1693] openat(AT\_FDCWD, "/usr/local/lib64/libstdc++.so.6", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b3966e000

[pid 1693] <... openat resumed>) = 3

[pid 1694] mmap(0x7f7b39797000, 581632, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1ce000 <unfinished ...>

[pid 1693] read(3, <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b39797000

[pid 1693] <... read resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

[pid 1694] mmap(0x7f7b39825000, 57344, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x25c000 <unfinished ...>

[pid 1693] newfstatat(3, "", <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b39825000

[pid 1694] mmap(0x7f7b39833000, 12480, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1693] <... newfstatat resumed>{st\_mode=S\_IFREG|0755, st\_size=2530008, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] <... mmap resumed>) = 0x7f7b39833000

[pid 1693] mmap(NULL, 2543808, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fec8b6ef000

[pid 1694] **close**(3 <unfinished ...>

[pid 1693] mmap(0x7fec8b794000, 1216512, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0xa5000 <unfinished ...>

[pid 1694] <... close resumed>) = 0

[pid 1694] openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libm.so.6", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b794000

[pid 1694] <... openat resumed>) = 3

[pid 1693] mmap(0x7fec8b8bd000, 581632, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1ce000 <unfinished ...>

[pid 1694] read(3, <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b8bd000

[pid 1694] <... read resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

[pid 1693] mmap(0x7fec8b94b000, 57344, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x25c000 <unfinished ...>

[pid 1694] newfstatat(3, "", <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b94b000

[pid 1694] <... newfstatat resumed>{st\_mode=S\_IFREG|0644, st\_size=907784, ...}, AT\_EMPTY\_PATH) = 0

[pid 1693] mmap(0x7fec8b959000, 12480, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1694] mmap(NULL, 909560, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b959000

[pid 1694] <... mmap resumed>) = 0x7f7b394ea000

[pid 1693] close(3 <unfinished ...>

[pid 1694] mmap(0x7f7b394fa000, 471040, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x10000 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1694] <... mmap resumed>) = 0x7f7b394fa000

[pid 1693] openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libm.so.6", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1694] mmap(0x7f7b3956d000, 368640, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x83000 <unfinished ...>

[pid 1693] <... openat resumed>) = 3

[pid 1694] <... mmap resumed>) = 0x7f7b3956d000

[pid 1693] read(3, <unfinished ...>

[pid 1694] mmap(0x7f7b395c7000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0xdc000 <unfinished ...>

[pid 1693] <... read resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

[pid 1694] <... mmap resumed>) = 0x7f7b395c7000

[pid 1693] newfstatat(3, "", <unfinished ...>

[pid 1694] **close**(3 <unfinished ...>

[pid 1693] <... newfstatat resumed>{st\_mode=S\_IFREG|0644, st\_size=907784, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] <... close resumed>) = 0

[pid 1693] mmap(NULL, 909560, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1694] openat(AT\_FDCWD, "/usr/local/lib64/libgcc\_s.so.1", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b610000

[pid 1694] <... openat resumed>) = 3

[pid 1693] mmap(0x7fec8b620000, 471040, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x10000 <unfinished ...>

[pid 1694] read(3, <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b620000

[pid 1694] <... read resumed>"\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

[pid 1693] mmap(0x7fec8b693000, 368640, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x83000 <unfinished ...>

[pid 1694] newfstatat(3, "", <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b693000

[pid 1694] <... newfstatat resumed>{st\_mode=S\_IFREG|0644, st\_size=906528, ...}, AT\_EMPTY\_PATH) = 0

[pid 1693] mmap(0x7fec8b6ed000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0xdc000 <unfinished ...>

[pid 1694] mmap(NULL, 181160, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b6ed000

[pid 1694] <... mmap resumed>) = 0x7f7b394bd000

[pid 1693] **close**(3 <unfinished ...>

[pid 1694] mmap(0x7f7b394c1000, 143360, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x4000 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1694] <... mmap resumed>) = 0x7f7b394c1000

[pid 1694] mmap(0x7f7b394e4000, 16384, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x27000 <unfinished ...>

[pid 1693] openat(AT\_FDCWD, "/usr/local/lib64/libgcc\_s.so.1", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b394e4000

[pid 1693] <... openat resumed>) = 3

[pid 1694] mmap(0x7f7b394e8000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x2b000 <unfinished ...>

[pid 1693] read(3, <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b394e8000

[pid 1693] <... read resumed>"\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

[pid 1694] **close**(3 <unfinished ...>

[pid 1693] newfstatat(3, "", <unfinished ...>

[pid 1694] <... close resumed>) = 0

[pid 1693] <... newfstatat resumed>{st\_mode=S\_IFREG|0644, st\_size=906528, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1693] mmap(NULL, 181160, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1694] <... openat resumed>) = 3

[pid 1693] <... mmap resumed>) = 0x7fec8b5e3000

[pid 1694] read(3, <unfinished ...>

[pid 1693] mmap(0x7fec8b5e7000, 143360, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x4000 <unfinished ...>

[pid 1694] <... read resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\20t\2\0\0\0\0\0"..., 832) = 832

[pid 1693] <... mmap resumed>) = 0x7fec8b5e7000

[pid 1694] pread64(3, <unfinished ...>

[pid 1693] mmap(0x7fec8b60a000, 16384, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x27000 <unfinished ...>

[pid 1694] <... pread64 resumed>"\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

[pid 1693] <... mmap resumed>) = 0x7fec8b60a000

[pid 1694] newfstatat(3, "", <unfinished ...>

[pid 1693] mmap(0x7fec8b60e000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x2b000 <unfinished ...>

[pid 1694] <... newfstatat resumed>{st\_mode=S\_IFREG|0755, st\_size=1922136, ...}, AT\_EMPTY\_PATH) = 0

[pid 1693] <... mmap resumed>) = 0x7fec8b60e000

[pid 1694] pread64(3, <unfinished ...>

[pid 1693] **close**(3 <unfinished ...>

[pid 1694] <... pread64 resumed>"\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

[pid 1693] <... close resumed>) = 0

[pid 1694] mmap(NULL, 1970000, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1693] openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC <unfinished ...>

[pid 1694] <... mmap resumed>) = 0x7f7b392dc000

[pid 1693] <... openat resumed>) = 3

[pid 1693] read(3, <unfinished ...>

[pid 1694] mmap(0x7f7b39302000, 1396736, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x26000 <unfinished ...>

[pid 1693] <... read resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\20t\2\0\0\0\0\0"..., 832) = 832

[pid 1694] <... mmap resumed>) = 0x7f7b39302000

[pid 1693] pread64(3, <unfinished ...>

[pid 1694] mmap(0x7f7b39457000, 339968, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x17b000 <unfinished ...>

[pid 1693] <... pread64 resumed>"\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

[pid 1694] <... mmap resumed>) = 0x7f7b39457000

[pid 1693] newfstatat(3, "", <unfinished ...>

[pid 1694] mmap(0x7f7b394aa000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1ce000 <unfinished ...>

[pid 1693] <... newfstatat resumed>{st\_mode=S\_IFREG|0755, st\_size=1922136, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] <... mmap resumed>) = 0x7f7b394aa000

[pid 1693] pread64(3, <unfinished ...>

[pid 1694] mmap(0x7f7b394b0000, 53072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1693] <... pread64 resumed>"\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

[pid 1694] <... mmap resumed>) = 0x7f7b394b0000

[pid 1693] mmap(NULL, 1970000, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0 <unfinished ...>

[pid 1694] **close**(3 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b402000

[pid 1694] <... close resumed>) = 0

[pid 1693] mmap(0x7fec8b428000, 1396736, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x26000 <unfinished ...>

[pid 1694] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b428000

[pid 1694] <... mmap resumed>) = 0x7f7b392da000

[pid 1693] mmap(0x7fec8b57d000, 339968, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x17b000 <unfinished ...>

[pid 1694] arch\_prctl(ARCH\_SET\_FS, 0x7f7b392db480 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b57d000

[pid 1694] <... arch\_prctl resumed>) = 0

[pid 1693] mmap(0x7fec8b5d0000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1ce000 <unfinished ...>

[pid 1694] set\_tid\_address(0x7f7b392db750 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b5d0000

[pid 1694] <... set\_tid\_address resumed>) = 1694

[pid 1693] mmap(0x7fec8b5d6000, 53072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1694] set\_robust\_list(0x7f7b392db760, 24 <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b5d6000

[pid 1694] <... set\_robust\_list resumed>) = 0

[pid 1693] **close**(3 <unfinished ...>

[pid 1694] rseq(0x7f7b392dbda0, 0x20, 0, 0x53053053 <unfinished ...>

[pid 1693] <... close resumed>) = 0

[pid 1694] <... rseq resumed>) = 0

[pid 1694] mprotect(0x7f7b394aa000, 16384, PROT\_READ <unfinished ...>

[pid 1693] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1694] <... mprotect resumed>) = 0

[pid 1693] <... mmap resumed>) = 0x7fec8b400000

[pid 1694] mprotect(0x7f7b394e8000, 4096, PROT\_READ <unfinished ...>

[pid 1693] arch\_prctl(ARCH\_SET\_FS, 0x7fec8b401480 <unfinished ...>

[pid 1694] <... mprotect resumed>) = 0

[pid 1693] <... arch\_prctl resumed>) = 0

[pid 1693] set\_tid\_address(0x7fec8b401750 <unfinished ...>

[pid 1694] mprotect(0x7f7b395c7000, 4096, PROT\_READ <unfinished ...>

[pid 1693] <... set\_tid\_address resumed>) = 1693

[pid 1694] <... mprotect resumed>) = 0

[pid 1693] set\_robust\_list(0x7fec8b401760, 24) = 0

[pid 1693] rseq(0x7fec8b401da0, 0x20, 0, 0x53053053) = 0

[pid 1694] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1693] mprotect(0x7fec8b5d0000, 16384, PROT\_READ) = 0

[pid 1694] <... mmap resumed>) = 0x7f7b392d8000

[pid 1693] mprotect(0x7fec8b60e000, 4096, PROT\_READ) = 0

[pid 1693] mprotect(0x7fec8b6ed000, 4096, PROT\_READ <unfinished ...>

[pid 1694] mprotect(0x7f7b39825000, 45056, PROT\_READ <unfinished ...>

[pid 1693] <... mprotect resumed>) = 0

[pid 1694] <... mprotect resumed>) = 0

[pid 1694] mprotect(0x403000, 4096, PROT\_READ) = 0

[pid 1693] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0 <unfinished ...>

[pid 1694] mprotect(0x7f7b39870000, 8192, PROT\_READ <unfinished ...>

[pid 1693] <... mmap resumed>) = 0x7fec8b3fe000

[pid 1694] <... mprotect resumed>) = 0

[pid 1694] prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0

[pid 1694] munmap(0x7f7b39837000, 25258) = 0

[pid 1693] mprotect(0x7fec8b94b000, 45056, PROT\_READ <unfinished ...>

[pid 1694] futex(0x7f7b3983373c, FUTEX\_WAKE\_PRIVATE, 2147483647 <unfinished ...>

[pid 1693] <... mprotect resumed>) = 0

[pid 1694] <... futex resumed>) = 0

[pid 1693] mprotect(0x403000, 4096, PROT\_READ <unfinished ...>

[pid 1694] getrandom( <unfinished ...>

[pid 1693] <... mprotect resumed>) = 0

[pid 1694] <... getrandom resumed>"\x35\x59\x63\x5b\xfe\xf6\xa8\x8f", 8, GRND\_NONBLOCK) = 8

[pid 1693] mprotect(0x7fec8b996000, 8192, PROT\_READ <unfinished ...>

[pid 1694] brk(NULL <unfinished ...>

[pid 1693] <... mprotect resumed>) = 0

[pid 1694] <... brk resumed>) = 0x2101000

[pid 1693] prlimit64(0, RLIMIT\_STACK, NULL, <unfinished ...>

[pid 1694] brk(0x2122000 <unfinished ...>

[pid 1693] <... prlimit64 resumed>{rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0

[pid 1694] <... brk resumed>) = 0x2122000

[pid 1693] munmap(0x7fec8b95d000, 25258 <unfinished ...>

[pid 1694] newfstatat(0, "", <unfinished ...>

[pid 1693] <... munmap resumed>) = 0

[pid 1694] <... newfstatat resumed>{st\_mode=S\_IFIFO|0600, st\_size=0, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] read(0, <unfinished ...>

[pid 1693] futex(0x7fec8b95973c, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0

[pid 1693] getrandom("\x88\x71\x0f\xdf\x15\x10\xd0\x33", 8, GRND\_NONBLOCK) = 8

[pid 1693] brk(NULL) = 0x2279000

[pid 1693] brk(0x229a000) = 0x229a000

[pid 1693] newfstatat(0, "", {st\_mode=S\_IFIFO|0600, st\_size=0, ...}, AT\_EMPTY\_PATH) = 0

[pid 1693] read(0, apple

<unfinished ...>

[pid 1651] <... read resumed>"apple\n", 1024) = 6

[pid 1651] **write**(1, "pip2\n", 5pip2

) = 5

[pid 1651] **write**(8, "apple\n", 6) = 6

[pid 1694] <... read resumed>"apple\n", 4096) = 6

[pid 1651] **write**(8, "\n", 1) = 1

[pid 1694] newfstatat(1, "", <unfinished ...>

[pid 1651] read(0, <unfinished ...>

[pid 1694] <... newfstatat resumed>{st\_mode=S\_IFREG|0644, st\_size=0, ...}, AT\_EMPTY\_PATH) = 0

[pid 1694] **write**(1, "ppl\n", 4) = 4

[pid 1694] read(0, "\n", 4096) = 1

[pid 1694] read(0, google

<unfinished ...>

[pid 1651] <... read resumed>"google\n", 1024) = 7

[pid 1651] **write**(1, "pip2\n", 5pip2

) = 5

[pid 1651] **write**(8, "google\n", 7) = 7

[pid 1694] <... read resumed>"google\n", 4096) = 7

[pid 1651] **write**(8, "\n", 1) = 1

[pid 1694] **write**(1, "ggl\n", 4 <unfinished ...>

[pid 1651] read(0, <unfinished ...>

[pid 1694] <... write resumed>) = 4

[pid 1694] read(0, "\n", 4096) = 1

[pid 1694] read(0, q

<unfinished ...>

[pid 1651] <... read resumed>"q\n", 1024) = 2

[pid 1651] **write**(6, "q\n", 2) = 2

[pid 1693] <... read resumed>"q\n", 4096) = 2

[pid 1651] **write**(8, "q\n", 2 <unfinished ...>

[pid 1693] lseek(0, -1, SEEK\_CUR <unfinished ...>

[pid 1651] <... write resumed>) = 2

[pid 1694] <... read resumed>"q\n", 4096) = 2

[pid 1693] <... lseek resumed>) = -1 ESPIPE (Illegal seek)

[pid 1651] **close**(6 <unfinished ...>

[pid 1693] exit\_group(0 <unfinished ...>

[pid 1651] <... close resumed>) = 0

[pid 1694] lseek(0, -1, SEEK\_CUR <unfinished ...>

[pid 1651] **close**(8 <unfinished ...>

[pid 1693] <... exit\_group resumed>) = ?

[pid 1651] <... close resumed>) = 0

[pid 1694] <... lseek resumed>) = -1 ESPIPE (Illegal seek)

[pid 1651] **wait4**(1693, <unfinished ...>

[pid 1694] exit\_group(0) = ?

**[pid 1693] +++ exited with 0 +++**

[pid 1651] <... wait4 resumed>[{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 1693

[pid 1651] --- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=1693, si\_uid=0, si\_status=0, si\_utime=0, si\_stime=1 /\* 0.01 s \*/} ---

[pid 1651] **wait4**(1694, <unfinished ...>

[pid 1694] **+++ exited with 0 +++**

<... wait4 resumed>[{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 1694

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=1694, 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 +++**

**Вывод**

Мне удалось успешно выполнить данную лабораторную работу и получить функционирующий код. Было очень интересно изучать незнакомые инструменты для работы с процессами и потоками. Было трудно и работа заняла очень большое количество времени, но я получил новые знания.