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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Дата: 17.10.24

Москва, 2024

Постановка задачи

Вариант 18.

Родительский процесс создает 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: нечетные строки отправляются в pipe1, четные 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); – создает канал, используемый для межпроцессного взаимодействия.
- int open(const char *path, int oflag, …); – открывает файл и, возможно, создает его.
- int write(int filedes, const void *buf, size_t nbyte); – записывает данные из буфера в файловый дескриптор.
- int read(int filedes, void *buf, size_t nbyte); – читает данные из файлового дескриптора в буфер.
- int dup2(int oldfd, int newfd); – дублирует файловый дескриптор.
- int close(int filedes); – закрывает файловый дескриптор.
- pid_t wait(int *status); – ожидает завершения дочернего процесса.

Программа считывает из стандартного ввода несколько (2) путей к файлам, в которые будет записываться результат. Затем создаются каналы, куда будет направлен чётный/нечётный ввод. Создаются дочерние процессы, их вывод направляется в соответствующий файл. Родительская программа считывает строки из стандартного ввода и в зависимости от чётности направляет в соответствующий канал. Дочерняя программа считывает строки из стандартного ввода, удаляет латинские гласные буквы и направляет измененную строку в стандартный вывод. Дочерняя программа завершается, если был введен только символ переноса строки ('\n').

Код программы

client/main.c

```c
#include <stdbool.h>
#include <stdio.h>
#include <stdlib.h>

#include "bootleg_stdio.h"

inline static bool is_vowel(char c) {
    bool lowercase = c == 'a' || c == 'e' || c == 'o' || c == 'i' || c == 'u';
    bool uppercase = c == 'A' || c == 'E' || c == 'O' || c == 'I' || c == 'U';
    return lowercase || uppercase;
```

```c
}

bool remove_vowels(const char* in, size_t inLength, char** out, size_t* outLength) {
       if (in == NULL || inLength == 0 || out == NULL || outLength == NULL) {
             return false;
       }

       *out = malloc((inLength + 1) * sizeof(char));
       if (*out == NULL) return false;

       // Copy chars from |in|, excluding vowels.
       size_t j = 0;
       for (char* ptr = (char*)in; *ptr != '\0'; ++ptr) {
             if (!is_vowel(*ptr)) {
                   (*out)[j++] = *ptr;
             }
       }

       // Null-terminate the string.
       (*out)[j] = '\0';
       *outLength = j;

       return true;
}

int main(int argc, char** argv) {
       char* buffer = NULL;
       char* modified = NULL;
       ssize_t nRead;

       while ((nRead = blg_getline(&buffer, 0, STDIN_FILENO))) {
             if (nRead == -1) {
                   free(buffer);
                   blg_perrorf("[child] can't read from stdin\n");
             }

             // Exit condition.
             if (*buffer == '\n') {
                   free(buffer);
                   free(modified);
                   exit(EXIT_SUCCESS);
             }

             size_t newLength;
             if (!remove_vowels(buffer, nRead, &modified, &newLength)) {
                   free(buffer);
                   blg_perrorf("[child] can't modify the buffer\n");
             }
```

```
                if (write(STDOUT_FILENO, modified, newLength) == -1) {
                        free(buffer);
                        free(modified);
                        blg_perrorf("[child] can't write to stdout\n");
                }

                free(buffer);
                free(modified);
                buffer = NULL;
                modified = NULL;
        }
}
```

server/main.c

```
#include <limits.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/file.h>
#include <sys/wait.h>

#include "bootleg_stdio.h"

int open_file(int fileNo) {
        char msg[64];
        snprintf(msg, sizeof(msg), "Enter (%d) output file path: ", fileNo);
        if (write(STDIN_FILENO, msg, strlen(msg)) == -1) {
        blg_perrorf("can't write to stdout (1)");
        }

        char path[PATH_MAX];
        size_t nRead = read(STDIN_FILENO, &path, sizeof(path) - 1);
        if (nRead == -1) {
        blg_perrorf("can't read (%d) output file path\n", fileNo);
        }
        // Remove line separator if it's present
        if (nRead > 0 && path[nRead - 1] == '\n') {
        path[nRead - 1] = '\0';
        }

        int file = open(path, O_WRONLY | O_CREAT | O_TRUNC | O_APPEND, S_IRUSR |
S_IWUSR);
        if (file == -1) {
        blg_perrorf("can't open (%d) output file for writing\n", fileNo);
        }

        return file;
}

int main(int argc, char** argv) {
```

```c
if (argc != 2) {
blg_perrorf("usage: %s <client program>\n", argv[0]);
}

char* client = argv[1];
const int nChildren = 2;

int files[nChildren];
for (int i = 0; i != nChildren; ++i) {
files[i] = open_file(i + 1);
}

int pipes[nChildren][2];
for (int i = 0; i != nChildren; ++i) {
if (pipe(pipes[i]) == -1) {
    blg_perrorf("can't create pipe (%d)\n", i);
}
}

for (int i = 0; i != nChildren; ++i) {
pid_t child = fork();
if (child == -1) {
    blg_perrorf("can't fork on child %d\n", i);
}

if (child == 0) {
    if (dup2(pipes[i][STDIN_FILENO], STDIN_FILENO) == -1) {
    blg_perrorf("can't redirect child's stdin to pipe\n");
    }
    if (dup2(files[i], STDOUT_FILENO) == -1) {
    blg_perrorf("can't redirect child's stdout to file\n");
    }
    close(pipes[i][STDOUT_FILENO]);

    if (execl(/* path */ client, /* argv[0] */ client, (char*)NULL) == -1) {
    blg_perrorf("can't exec into child\n");
    }
}
}

char* buffer = NULL;
ssize_t nRead;

for (int i = 0; (nRead = blg_getline(&buffer, 0, STDIN_FILENO)) != 0; ++i) {
if (nRead == -1) {
    free(buffer);
    blg_perrorf("can't read from stdin\n");
}
```

```
        int* pipe = pipes[i % nChildren];
        if (write(pipe[STDOUT_FILENO], buffer, nRead) == -1) {
                free(buffer);
                blg_perrorf("can't write to pipe\n");
        }

        free(buffer);
        buffer = NULL;
        }

        // Wait for all children to exit.
        while (wait(NULL) > 0)
        ;
}
```

Протокол работы программы

Тестирование:

```
skidunion@apollo output % ./lab_1_server lab_1_client
Enter (1) output file path: 1
Enter (2) output file path: 2
aaaaaaaaaaaaaaaa
bbbbbbbbbbbbbbbb
AAAAAAAAAAAAAAAAAAAAA
abababababbababababa
jffjjffjfjfjfjf
gkgkgkgkg
kfjasdkfajs


skidunion@apollo output % cat 1


jffjjffjfjfjfjf
kfjsdkfjs
skidunion@apollo output % cat 2
bbbbbbbbbbbbbbbb
bbbbbbbbb
gkgkgkgkg


```

Dtrace:

```
skidunion@apollo output % sudo dtruss -a ./lab_1_server lab_1_client
Password:
        PID/THRD  RELATIVE  ELAPSD    CPU SYSCALL(args)             = return
Enter (1) output file path: 1560/0x3213:     170:        0:      0 fork()
= 0 0
```

```
    1560/0x3213:         174      29       4 munmap(0x100528000, 0x8C000)                    = 0 0

    1560/0x3213:         184      10       9 munmap(0x1005B4000, 0x8000)                     = 0 0

    1560/0x3213:         204      20      19 munmap(0x1005BC000, 0x4000)                     = 0 0

    1560/0x3213:         206       2       2 munmap(0x1005C0000, 0x4000)                     = 0 0

    1560/0x3213:         209       3       2 munmap(0x1005C4000, 0x50000)                    = 0 0

    1560/0x3213:         228       1       0 crossarch_trap(0x0, 0x0, 0x0)                   = -1
Err#45

    1560/0x3213:         251      22      21 open(".\0", 0x100000, 0x0)                      = 3 0

    1560/0x3213:         267      70       7 fcntl(0x3, 0x32, 0x16FC8F2A8)                   = 0 0

    1560/0x3213:         274      29       2 close(0x3)                   = 0 0

    1560/0x3213:         282       7       5 fsgetpath(0x16FC8F2B8, 0x400, 0x16FC8F298)
= 105 0

    1560/0x3213:         298      15      15 fsgetpath(0x16FC8F2C8, 0x400, 0x16FC8F2A8)
= 14 0

    1560/0x3213:         305       1       0 csrctl(0x0, 0x16FC8F6CC, 0x4)                   = -1
Err#1

    1560/0x3213:         312       5       3 __mac_syscall(0x18C2E1ACF, 0x2, 0x16FC8F610)
= 0 0

    1560/0x3213:         312       0       0 csrctl(0x0, 0x16FC8F6BC, 0x4)                   = -1
Err#1

    1560/0x3213:         318       5       4 __mac_syscall(0x18C2DE902, 0x5A, 0x16FC8F650)
= 0 0

    1560/0x3213:         333       7       6 sysctl([unknown, 3, 0, 0, 0, 0] (2),
0x16FC8EBD8, 0x16FC8EBD0, 0x18C2E0553, 0xD)           = 0 0

    1560/0x3213:         335       2       1 sysctl([CTL_KERN, 140, 0, 0, 0, 0] (2),
0x16FC8EC88, 0x16FC8EC80, 0x0, 0x0)            = 0 0

    1560/0x3213:         343       6       6 open("/\0", 0x20100000, 0x0)                    = 3 0

    1560/0x3213:         359      15      14 openat(0x3, "System/Cryptexes/OS\0", 0x100000,
0x0)              = 4 0

    1560/0x3213:         360       1       0 dup(0x4, 0x0, 0x0)                   = 5 0

    1560/0x3213:         366       5       4 fstatat64(0x4, 0x16FC8E761, 0x16FC8E6D0)
= 0 0

    1560/0x3213:         370       5       4 openat(0x4, "System/Library/dyld/\0", 0x100000,
0x0)             = 6 0

    1560/0x3213:         372       2       1 fcntl(0x6, 0x32, 0x16FC8E760)                   = 0 0

    1560/0x3213:         373       0       0 dup(0x6, 0x0, 0x0)                   = 7 0

    1560/0x3213:         373       0       0 dup(0x5, 0x0, 0x0)                   = 8 0

    1560/0x3213:         374       1       0 close(0x3)                   = 0 0

    1560/0x3213:         374       0       0 close(0x5)                   = 0 0

    1560/0x3213:         375       0       0 close(0x4)                   = 0 0

    1560/0x3213:         375       0       0 close(0x6)                   = 0 0
```

```
    1560/0x3213:        377        2        1 __mac_syscall(0x18C2E1ACF, 0x2, 0x16FC8F150)
= 0 0

    1560/0x3213:        379        2        1 shared_region_check_np(0x16FC8ED70, 0x0, 0x0)
= 0 0

    1560/0x3213:        384        3        2 fsgetpath(0x16FC8F2D0, 0x400, 0x16FC8F218)
= 82 0

    1560/0x3213:        386        1        0 fcntl(0x8, 0x32, 0x16FC8F2D0)            = 0 0

    1560/0x3213:        390        1        0 close(0x8)              = 0 0

    1560/0x3213:        390        0        0 close(0x7)              = 0 0

    1560/0x3213:        399        3        2 getfsstat64(0x0, 0x0, 0x2)            = 10 0

    1560/0x3213:        406        7        6 getfsstat64(0x100582110, 0x54B0, 0x2)
= 10 0

    1560/0x3213:        411        5        4 getattrlist("/\0", 0x16FC8F200, 0x16FC8F170)
= 0 0

    1560/0x3213:        422        8        7
stat64("/System/Volumes/Preboot/Cryptexes/OS/System/Library/dyld/dyld_shared_cache_arm64e\0"
, 0x16FC8F560, 0x0)         = 0 0

    dtrace: error on enabled probe ID 1690 (ID 845: syscall::stat64:return): invalid
address (0x0) in action #12 at DIF offset 12

    1560/0x3213:        662        6        5
stat64("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output/lab_1_server\0", 0x16FC8EA10, 0x0)    = 0 0

    1560/0x3213:        680        17       17
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/lab_1_server\0", 0x0, 0x0)            = 3 0

    1560/0x3213:        694        38       11 mmap(0x0, 0x89B0, 0x1, 0x40002, 0x3, 0x0)
= 0x1005C4000 0

    1560/0x3213:        696        2        1 fcntl(0x3, 0x32, 0x16FC8EB28)            = 0 0

    1560/0x3213:        697        1        0 close(0x3)              = 0 0

    1560/0x3213:        700        2        1 munmap(0x1005C4000, 0x89B0)            = 0 0

    1560/0x3213:        705        4        3
stat64("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output/lab_1_server\0", 0x16FC8EF80, 0x0)    = 0 0

    1560/0x3213:        790        4        3 stat64("/usr/lib/libSystem.B.dylib\0",
0x16FC8DEC0, 0x0)        = -1 Err#2

    1560/0x3213:        797        2        1
stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/libSystem.B.dylib\0", 0x16FC8DE70, 0x0)
= -1 Err#2

    1560/0x3213:        953        4        2 stat64("/usr/lib/system/libdispatch.dylib\0",
0x16FC8BAE0, 0x0)        = -1 Err#2

    1560/0x3213:        955        2        1
stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/system/libdispatch.dylib\0",
0x16FC8BA90, 0x0)            = -1 Err#2

    1560/0x3213:        956        1        0 stat64("/usr/lib/system/libdispatch.dylib\0",
0x16FC8BAE0, 0x0)        = -1 Err#2
```

```
    1560/0x3213:       1233      69      40 open("/dev/dtracehelper\0", 0x2, 0x0)
= 3 0

    1560/0x3213:       1633      408     399 ioctl(0x3, 0x80086804, 0x16FC8DAB8)
= 0 0

    1560/0x3213:       1637      5       3 close(0x3)                = 0 0

    1560/0x3213:       1841      20      18
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/lab_1_server\0", 0x0, 0x0)              = 3 0

    1560/0x3213:       1845      4       3 __mac_syscall(0x18C2E1ACF, 0x2, 0x16FC8D1C0)
= 0 0

    1560/0x3213:       1862      15      13 map_with_linking_np(0x16FC8D050, 0x1,
0x16FC8D080)            = 0 0

    1560/0x3213:       1863      1       0 close(0x3)               = 0 0

    1560/0x3213:       1867      3       2 mprotect(0x100174000, 0x4000, 0x1)
= 0 0

    1560/0x3213:       1910      6       0 shared_region_check_np(0xFFFFFFFFFFFFFFFF, 0x0,
0x0)              = 0 0

    1560/0x3213:       1917      6       3 mprotect(0x100580000, 0x40000, 0x1)
= 0 0

    1560/0x3213:       1970      4       2 access("/AppleInternal/XBS/.isChrooted\0", 0x0,
0x0)              = -1 Err#2

    1560/0x3213:       2008      4       2 bsdthread_register(0x18C5E4D2C, 0x18C5E4D20,
0x4000)            = 1073746399 0

    1560/0x3213:       2059      1       0 getpid(0x0, 0x0, 0x0)            = 1560 0

    1560/0x3213:       2064      4       3 shm_open(0x18C47FF51, 0x0, 0x69636573)
= 3 0

    1560/0x3213:       2065      1       0 fstat64(0x3, 0x16FC8DE50, 0x0)            = 0 0

    1560/0x3213:       2069      6       3 mmap(0x0, 0x4000, 0x1, 0x40001, 0x3, 0x0)
= 0x1005CC000 0

    1560/0x3213:       2071      1       0 close(0x3)               = 0 0

    1560/0x3213:       2083      2       1 ioctl(0x2, 0x4004667A, 0x16FC8DEFC)
= 0 0

    1560/0x3213:       2091      1       0 mprotect(0x1005D8000, 0x4000, 0x0)
= 0 0

    1560/0x3213:       2091      1       0 mprotect(0x1005E4000, 0x4000, 0x0)
= 0 0

    1560/0x3213:       2095      1       0 mprotect(0x1005E8000, 0x4000, 0x0)
= 0 0

    1560/0x3213:       2096      1       0 mprotect(0x1005F4000, 0x4000, 0x0)
= 0 0

    1560/0x3213:       2099      1       0 mprotect(0x1005F8000, 0x4000, 0x0)
= 0 0

    1560/0x3213:       2103      2       1 mprotect(0x100604000, 0x4000, 0x0)
= 0 0

    1560/0x3213:       2110      2       1 mprotect(0x1005D0000, 0xA0, 0x1)          = 0 0
```

```
    1560/0x3213:      2113      2      2 mprotect(0x1005D0000, 0xA0, 0x3)              = 0 0

    1560/0x3213:      2117      1      0 mprotect(0x1005D0000, 0xA0, 0x1)              = 0 0

    1560/0x3213:      2121      1      0 mprotect(0x100608000, 0x4000, 0x1)
= 0 0

    1560/0x3213:      2125      1      0 mprotect(0x10060C000, 0xA0, 0x1)              = 0 0

    1560/0x3213:      2151      4      3 mprotect(0x10060C000, 0xA0, 0x3)              = 0 0

    1560/0x3213:      2156      2      1 mprotect(0x10060C000, 0xA0, 0x1)              = 0 0

    1560/0x3213:      2158      2      2 mprotect(0x1005D0000, 0xA0, 0x3)              = 0 0

    1560/0x3213:      2162      2      1 mprotect(0x1005D0000, 0xA0, 0x1)              = 0 0

    1560/0x3213:      2163      2      1 mprotect(0x100608000, 0x4000, 0x3)
= 0 0

    1560/0x3213:      2166      1      1 mprotect(0x100608000, 0x4000, 0x1)
= 0 0

    1560/0x3213:      2168      1      1 mprotect(0x100580000, 0x40000, 0x3)
= 0 0

    1560/0x3213:      2173      1      0 mprotect(0x100580000, 0x40000, 0x1)
= 0 0

    1560/0x3213:      2183      1      0 objc_bp_assist_cfg_np(0x18C211000,
0x80000018001C1048, 0x0)              = -1 Err#5

    1560/0x3213:      2186      1      0 issetugid(0x0, 0x0, 0x0)           = 0 0

    1560/0x3213:      2267      2      2 mprotect(0x100580000, 0x40000, 0x3)
= 0 0

    1560/0x3213:      2338      7      6 getentropy(0x16FC8D568, 0x20, 0x0)
= 0 0

    1560/0x3213:      2378      2      1 mprotect(0x100580000, 0x40000, 0x1)
= 0 0

    1560/0x3213:      2429      3      2 mprotect(0x100580000, 0x40000, 0x3)
= 0 0

    1560/0x3213:      2433      1      0 mprotect(0x100580000, 0x40000, 0x1)
= 0 0

    1560/0x3213:      2444      8      6
getattrlist("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/s
erver/output/lab_1_server\0", 0x16FC8DDE0, 0x16FC8DDF8)              = 0 0

    1560/0x3213:      2458      11     10
access("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output\0", 0x4, 0x0)              = 0 0

    1560/0x3213:      2467      9      8
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput\0", 0x0, 0x0)           = 3 0

    1560/0x3213:      2469      1      0 fstat64(0x3, 0x13CF04240, 0x0)              = 0 0

    1560/0x3213:      2471      1      0 csrctl(0x0, 0x16FC8E00C, 0x4)              = 0 0

    1560/0x3213:      2485      71     7 fcntl(0x3, 0x32, 0x16FC8DCC8)              = 0 0

    1560/0x3213:      2500      3      1 close(0x3)              = 0 0
```

```
     1560/0x3213:        2516      12      11
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/Info.plist\0", 0x0, 0x0)                = -1 Err#2

     1560/0x3213:        2534       2       1 proc_info(0x2, 0x618, 0xD)                = 64 0

     1560/0x3213:        2612       4       2 csops_audittoken(0x618, 0x10, 0x16FC8E050)
= 0 0

     1560/0x3213:        2633       9       6 sysctl([unknown, 3, 0, 0, 0, 0] (2),
0x16FC8E3A8, 0x16FC8E3A0, 0x18FA16D3D, 0x15)              = 0 0

     1560/0x3213:        2635       2       1 sysctl([CTL_KERN, 138, 0, 0, 0, 0] (2),
0x16FC8E438, 0x16FC8E430, 0x0, 0x0)               = 0 0

     1560/0x3213:        2637       1       0 csops(0x618, 0x0, 0x16FC8E4DC)            = 0 0

     1560/0x3213:        2641       2       1 mprotect(0x100580000, 0x40000, 0x3)
= 0 0

     1560/0x3213:        2806       9       7 write(0x0, "Enter (1) output file path: \0",
0x1C)              = 28 0

     1

     Enter (2) output file path: 2

     1560/0x3213:        2819 7994807      12 read(0x0, "1\n\0", 0x3FF)              = 2 0

     1560/0x3213:        2926     170      99 open("1\0", 0x609, 0x180)                = 3 0

     1560/0x3213:        2956      11       8 write(0x0, "Enter (2) output file path: \0",
0x1C)              = 28 0


     1560/0x3213:        2970 1463912      13 read(0x0, "2\n\0", 0x3FF)                = 2 0

     1560/0x3213:        3080     175     108 open("2\0", 0x609, 0x180)                = 4 0

     1560/0x3213:        3088       7       5 pipe(0x0, 0x0, 0x0)              = 5 0

     1560/0x3213:        3091       3       2 pipe(0x0, 0x0, 0x0)              = 7 0

     1560/0x3213:        3889     647     645 fork()          = 1665 0

     1665/0x3514:         61:       0:      0 fork()                = 0 0

     1665/0x3514:         62      73       0 thread_selfid(0x0, 0x0, 0x0)                =
13588 0

     1665/0x3514:         64       4       1 bsdthread_register(0x18C5E4D2C, 0x18C5E4D20,
0x4000)          = -1 Err#22

     1665/0x3514:         73       7       4 mprotect(0x10060C000, 0xA0, 0x3)         = 0 0

     1665/0x3514:         83       7       4 mprotect(0x10060C000, 0xA0, 0x1)         = 0 0

     1665/0x3514:        393       5       3 dup2(0x5, 0x0, 0x0)              = 0 0

     1665/0x3514:        394       2       0 dup2(0x3, 0x1, 0x0)              = 1 0

     1665/0x3514:        396       2       0 close(0x6)              = 0 0

     1560/0x3213:        4438     458     456 fork()          = 1666 0

     1666/0x3515:         52:       0:      0 fork()                = 0 0
```

```
    1666/0x3515:       53      70       0 thread_selfid(0x0, 0x0, 0x0)                =
13589 0

    1666/0x3515:       55       4       0 bsdthread_register(0x18C5E4D2C, 0x18C5E4D20,
0x4000)              = -1 Err#22

    1666/0x3515:       62       6       4 mprotect(0x10060C000, 0xA0, 0x3)           = 0 0

    1666/0x3515:       69       3       1 mprotect(0x10060C000, 0xA0, 0x1)           = 0 0

    1666/0x3515:      286       3       1 dup2(0x7, 0x0, 0x0)                  = 0 0

    1666/0x3515:      287       1       0 dup2(0x4, 0x1, 0x0)                  = 1 0

    1666/0x3515:      289       2       0 close(0x8)                  = 0 0

    dtrace: error on enabled probe ID 1688 (ID 287: syscall::execve:return): invalid
address (0x16fc8fb17) in action #12 at DIF offset 12

    dtrace: error on enabled probe ID 1688 (ID 287: syscall::execve:return): invalid
address (0x16fc8fb17) in action #12 at DIF offset 12

    1665/0x3516:      978:      0:      0 fork()                  = 0 0

    1666/0x3517:      793:      0:      0 fork()                  = 0 0

    1666/0x3517:      795       5       2 mprotect(0x102F08000, 0x8000, 0x1)
= 0 0

    1666/0x3517:      799       2       0 thread_selfid(0x0, 0x0, 0x0)                =
13591 0

    1665/0x3516:      981      64       2 mprotect(0x104F78000, 0x8000, 0x1)
= 0 0

    1666/0x3517:      832       3       0 crossarch_trap(0x0, 0x0, 0x0)               = -1
Err#45

    1665/0x3516:      984       3       0 thread_selfid(0x0, 0x0, 0x0)                =
13590 0

    1665/0x3516:      994       2       0 crossarch_trap(0x0, 0x0, 0x0)               = -1
Err#45

    1666/0x3517:      894      62      59 shared_region_check_np(0x16CF9F7F0, 0x0, 0x0)
= 0 0

    1666/0x3517:      913       2       0 thread_selfid(0x0, 0x0, 0x0)                =
13591 0

    1666/0x3517:      924       2       0 getpid(0x0, 0x0, 0x0)               = 1666 0

    1666/0x3517:      925       3       0 proc_info(0xF, 0x682, 0x0)                 = 0 0

    1665/0x3516:     1054      96      58 shared_region_check_np(0x16B1877F0, 0x0, 0x0)
= 0 0

    1666/0x3517:      936       7       5 munmap(0x102E7C000, 0x8C000)                = 0 0

    1666/0x3517:      940       4       3 munmap(0x102F08000, 0x8000)                = 0 0

    1665/0x3516:     1072       2       0 thread_selfid(0x0, 0x0, 0x0)                =
13590 0

    1666/0x3517:      942       3       1 munmap(0x102F10000, 0x4000)                = 0 0

    1666/0x3517:      944       3       1 munmap(0x102F14000, 0x4000)                = 0 0

    1665/0x3516:     1081       2       0 getpid(0x0, 0x0, 0x0)               = 1665 0
```

```
   1666/0x3517:        947      3      1 munmap(0x102F18000, 0x50000)              = 0 0

   1665/0x3516:       1082      2      0 proc_info(0xF, 0x681, 0x0)               = 0 0

   1665/0x3516:       1090      5      4 munmap(0x104EEC000, 0x8C000)             = 0 0

   1666/0x3517:        970      2      0 crossarch_trap(0x0, 0x0, 0x0)            = -1
Err#45

   1665/0x3516:       1094      4      2 munmap(0x104F78000, 0x8000)              = 0 0

   1665/0x3516:       1096      3      1 munmap(0x104F80000, 0x4000)              = 0 0

   1665/0x3516:       1098      3      1 munmap(0x104F84000, 0x4000)              = 0 0

   1665/0x3516:       1104      6      5 munmap(0x104F88000, 0x50000)             = 0 0

   1666/0x3517:       1011     40     38 open(".\0", 0x100000, 0x0)               = 8 0

   1665/0x3516:       1123      2      0 crossarch_trap(0x0, 0x0, 0x0)            = -1
Err#45

   1666/0x3517:       1015      4      2 fcntl(0x8, 0x32, 0x16CF9F2B8)            = 0 0

   1666/0x3517:       1018      4      2 close(0x8)               = 0 0

   1666/0x3517:       1026      8      6 fsgetpath(0x16CF9F2C8, 0x400, 0x16CF9F2A8)
= 105 0

   1665/0x3516:       1152     28     26 open(".\0", 0x100000, 0x0)               = 6 0

   1665/0x3516:       1154      3      2 fcntl(0x6, 0x32, 0x16B1872B8)            = 0 0

   1666/0x3517:       1040     13     11 fsgetpath(0x16CF9F2D8, 0x400, 0x16CF9F2B8)
= 14 0

   1665/0x3516:       1157      3      1 close(0x6)               = 0 0

   1666/0x3517:       1046      2      0 csrctl(0x0, 0x16CF9F6DC, 0x4)            = -1
Err#1

   1665/0x3516:       1163      6      3 fsgetpath(0x16B1872C8, 0x400, 0x16B1872A8)
= 105 0

   1666/0x3517:       1052      7      4 __mac_syscall(0x18C2E1ACF, 0x2, 0x16CF9F620)
= 0 0

   1666/0x3517:       1054      1      0 csrctl(0x0, 0x16CF9F6CC, 0x4)            = -1
Err#1

   1665/0x3516:       1174     11     10 fsgetpath(0x16B1872D8, 0x400, 0x16B1872B8)
= 14 0

   1666/0x3517:       1059      4      2 __mac_syscall(0x18C2DE902, 0x5A, 0x16CF9F660)
= 0 0

   1665/0x3516:       1180      2      0 csrctl(0x0, 0x16B1876DC, 0x4)            = -1
Err#1

   1665/0x3516:       1185      6      4 __mac_syscall(0x18C2E1ACF, 0x2, 0x16B187620)
= 0 0

   1665/0x3516:       1187      1      0 csrctl(0x0, 0x16B1876CC, 0x4)            = -1
Err#1

   1666/0x3517:       1077     12      8 sysctl([unknown, 3, 0, 0, 0, 0] (2),
0x16CF9EBE8, 0x16CF9EBE0, 0x18C2E0553, 0xD)          = 0 0
```

```
      1665/0x3516:         1191        3        2 __mac_syscall(0x18C2DE902, 0x5A, 0x16B187660)
= 0 0

      1665/0x3516:         1205        9        5 sysctl([unknown, 140, 0, 0, 0, 0] (2),
0x16B186BE8, 0x16B186BE0, 0x18C2E0553, 0xD)               = 0 0

      1666/0x3517:         1080        4        2 sysctl([CTL_KERN, 140, 0, 0, 0, 0] (2),
0x16CF9EC98, 0x16CF9EC90, 0x0, 0x0)                 = 0 0

      1665/0x3516:         1208        4        2 sysctl([CTL_KERN, 140, 0, 0, 0, 0] (2),
0x16B186C98, 0x16B186C90, 0x0, 0x0)                 = 0 0

      1666/0x3517:         1092        9        7 open("/\0", 0x20100000, 0x0)            = 8 0

      1665/0x3516:         1220       10        8 open("/\0", 0x20100000, 0x0)            = 6 0

      1666/0x3517:         1116       25       22 openat(0x8, "System/Cryptexes/OS\0", 0x100000,
0x0)              = 9 0

      1666/0x3517:         1118        2        0 dup(0x9, 0x0, 0x0)                 = 10 0

      1665/0x3516:         1238       20       17 openat(0x6, "System/Cryptexes/OS\0", 0x100000,
0x0)              = 9 0

      1666/0x3517:         1125        8        6 fstatat64(0x9, 0x16CF9E771, 0x16CF9E6E0)
= 0 0

      1665/0x3516:         1240        2        0 dup(0x9, 0x0, 0x0)                 = 10 0

      1666/0x3517:         1136       11        9 openat(0x9, "System/Library/dyld/\0", 0x100000,
0x0)              = 11 0

      1665/0x3516:         1246        7        5 fstatat64(0x9, 0x16B186771, 0x16B1866E0)
= 0 0

      1666/0x3517:         1138        2        1 fcntl(0xB, 0x32, 0x16CF9E770)            = 0 0

      1666/0x3517:         1139        1        0 dup(0xB, 0x0, 0x0)                 = 12 0

      1665/0x3516:         1257       11        9 openat(0x9, "System/Library/dyld/\0", 0x100000,
0x0)              = 11 0

      1666/0x3517:         1140        1        0 dup(0xA, 0x0, 0x0)                 = 13 0

      1666/0x3517:         1142        2        1 close(0x8)              = 0 0

      1665/0x3516:         1259        3        1 fcntl(0xB, 0x32, 0x16B186770)            = 0 0

      1666/0x3517:         1143        1        0 close(0xA)              = 0 0

      1665/0x3516:         1260        1        0 dup(0xB, 0x0, 0x0)                 = 12 0

      1666/0x3517:         1144        1        0 close(0x9)              = 0 0

      1665/0x3516:         1261        1        0 dup(0xA, 0x0, 0x0)                 = 13 0

      1666/0x3517:         1145        1        0 close(0xB)              = 0 0

      1665/0x3516:         1263        2        1 close(0x6)              = 0 0

      1665/0x3516:         1264        1        0 close(0xA)              = 0 0

      1666/0x3517:         1149        4        2 __mac_syscall(0x18C2E1ACF, 0x2, 0x16CF9F160)
= 0 0

      1665/0x3516:         1265        1        0 close(0x9)              = 0 0

      1666/0x3517:         1150        3        0 shared_region_check_np(0x16CF9ED80, 0x0, 0x0)
= 0 0
```

```
    1665/0x3516:        1266        1        0 close(0xB)                    = 0 0

    1665/0x3516:        1269        4        2 __mac_syscall(0x18C2E1ACF, 0x2, 0x16B187160)
= 0 0

    1666/0x3517:        1156        6        4 fsgetpath(0x16CF9F2E0, 0x400, 0x16CF9F228)
= 82 0

    1665/0x3516:        1271        3        0 shared_region_check_np(0x16B186D80, 0x0, 0x0)
= 0 0

    1666/0x3517:        1159        2        1 fcntl(0xD, 0x32, 0x16CF9F2E0)           = 0 0

    1666/0x3517:        1161        2        1 close(0xD)                = 0 0

    1665/0x3516:        1275        4        2 fsgetpath(0x16B1872E0, 0x400, 0x16B187228)
= 82 0

    1666/0x3517:        1162        2        0 close(0xC)                = 0 0

    1665/0x3516:        1278        2        1 fcntl(0xD, 0x32, 0x16B1872E0)           = 0 0

    1665/0x3516:        1280        2        1 close(0xD)                = 0 0

    1666/0x3517:        1173        5        3 getfsstat64(0x0, 0x0, 0x2)             = 10 0

    1665/0x3516:        1281        2        0 close(0xC)                = 0 0

    1665/0x3516:        1295       10        8 getfsstat64(0x0, 0x0, 0x2)             = 10 0

    1666/0x3517:        1190       17       16 getfsstat64(0x103272110, 0x54B0, 0x2)
= 10 0

    1666/0x3517:        1198        9        7 getattrlist("/\0", 0x16CF9F210, 0x16CF9F180)
= 0 0

    1665/0x3516:        1308       14       12 getfsstat64(0x10508A110, 0x54B0, 0x2)
= 10 0

    1665/0x3516:        1314        7        5 getattrlist("/\0", 0x16B187210, 0x16B187180)
= 0 0

    1666/0x3517:        1215       13       11
stat64("/System/Volumes/Preboot/Cryptexes/OS/System/Library/dyld/dyld_shared_cache_arm64e\0"
, 0x16CF9F570, 0x0)          = 0 0

    1665/0x3516:        1331       12       10
stat64("/System/Volumes/Preboot/Cryptexes/OS/System/Library/dyld/dyld_shared_cache_arm64e\0"
, 0x16B187570, 0x0)          = 0 0

    dtrace: error on enabled probe ID 1690 (ID 845: syscall::stat64:return): invalid
address (0x0) in action #12 at DIF offset 12

    dtrace: error on enabled probe ID 1690 (ID 845: syscall::stat64:return): invalid
address (0x0) in action #12 at DIF offset 12

    1666/0x3517:        1259        9        7
stat64("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output/lab_1_client\0", 0x16CF9EA20, 0x0)    = 0 0

    1665/0x3516:        1364        6        5
stat64("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output/lab_1_client\0", 0x16B186A20, 0x0)    = 0 0

    1666/0x3517:        1286       27       26
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/lab_1_client\0", 0x0, 0x0)              = 8 0
```

```
    1665/0x3516:      1396     32     30
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/lab_1_client\0", 0x0, 0x0)                    = 6 0

    1666/0x3517:      1296     11      8 mmap(0x0, 0x88C0, 0x1, 0x40002, 0x8, 0x0)
= 0x1032B4000 0

    1665/0x3516:      1403      9      6 mmap(0x0, 0x88C0, 0x1, 0x40002, 0x6, 0x0)
= 0x1050CC000 0

    1666/0x3517:      1298      3      1 fcntl(0x8, 0x32, 0x16CF9EB38)          = 0 0

    1665/0x3516:      1407      4      3 fcntl(0x6, 0x32, 0x16B186B38)          = 0 0

    1666/0x3517:      1301      3      2 close(0x8)              = 0 0

    1665/0x3516:      1409      2      1 close(0x6)              = 0 0

    1666/0x3517:      1307      3      2 munmap(0x1032B4000, 0x88C0)            = 0 0

    1665/0x3516:      1414      3      2 munmap(0x1050CC000, 0x88C0)            = 0 0

    1666/0x3517:      1311      5      3
stat64("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output/lab_1_client\0", 0x16CF9EF90, 0x0)    = 0 0

    1665/0x3516:      1419      5      4
stat64("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output/lab_1_client\0", 0x16B186F90, 0x0)    = 0 0

    1666/0x3517:      1345      4      2 stat64("/usr/lib/libSystem.B.dylib\0",
0x16CF9DED0, 0x0)        = -1 Err#2

    1665/0x3516:      1449      5      3 stat64("/usr/lib/libSystem.B.dylib\0",
0x16B185ED0, 0x0)        = -1 Err#2

    1666/0x3517:      1355      4      2
stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/libSystem.B.dylib\0", 0x16CF9DE80, 0x0)
= -1 Err#2

    1665/0x3516:      1458      4      2
stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/libSystem.B.dylib\0", 0x16B185E80, 0x0)
= -1 Err#2

    1666/0x3517:      1410      4      2 stat64("/usr/lib/system/libdispatch.dylib\0",
0x16CF9BAF0, 0x0)        = -1 Err#2

    1665/0x3516:      1510      4      2 stat64("/usr/lib/system/libdispatch.dylib\0",
0x16B183AF0, 0x0)        = -1 Err#2

    1666/0x3517:      1413      3      2
stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/system/libdispatch.dylib\0",
0x16CF9BAA0, 0x0)              = -1 Err#2

    1665/0x3516:      1514      4      3
stat64("/System/Volumes/Preboot/Cryptexes/OS/usr/lib/system/libdispatch.dylib\0",
0x16B183AA0, 0x0)              = -1 Err#2

    1666/0x3517:      1416      2      1 stat64("/usr/lib/system/libdispatch.dylib\0",
0x16CF9BAF0, 0x0)        = -1 Err#2

    1665/0x3516:      1516      2      1 stat64("/usr/lib/system/libdispatch.dylib\0",
0x16B183AF0, 0x0)        = -1 Err#2

    1666/0x3517:      1575     50     48 open("/dev/dtracehelper\0", 0x2, 0x0)
= 8 0
```

```
    1665/0x3516:      1677    52     50 open("/dev/dtracehelper\0", 0x2, 0x0)
= 6 0

    1666/0x3517:      1967    563    391 ioctl(0x8, 0x80086804, 0x16CF9DAC8)
= 0 0

    1666/0x3517:      1971    4      2 close(0x8)                  = 0 0

    1666/0x3517:      2114    20     19
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/lab_1_client\0", 0x0, 0x0)            = 8 0

    1666/0x3517:      2118    4      2 __mac_syscall(0x18C2E1ACF, 0x2, 0x16CF9D1D0)
= 0 0

    1666/0x3517:      2133    14     11 map_with_linking_np(0x16CF9D0A0, 0x1,
0x16CF9D0D0)            = 0 0

    1666/0x3517:      2135    2      0 close(0x8)                  = 0 0

    1666/0x3517:      2138    3      1 mprotect(0x102E64000, 0x4000, 0x1)
= 0 0

    1666/0x3517:      2165    3      0 shared_region_check_np(0xFFFFFFFFFFFFFFFF, 0x0,
0x0)            = 0 0

    1666/0x3517:      2168    3      1 mprotect(0x103270000, 0x40000, 0x1)
= 0 0

    1666/0x3517:      2185    4      2 access("/AppleInternal/XBS/.isChrooted\0", 0x0,
0x0)            = -1 Err#2

    1665/0x3516:      2070    866    392 ioctl(0x6, 0x80086804, 0x16B185AC8)
= 0 0

    1665/0x3516:      2075    5      3 close(0x6)                  = 0 0

    1666/0x3517:      2209    4      1 bsdthread_register(0x18C5E4D2C, 0x18C5E4D20,
0x4000)            = 1073746399 0

    1666/0x3517:      2247    1      0 getpid(0x0, 0x0, 0x0)            = 1666 0

    1666/0x3517:      2254    6      4 shm_open(0x18C47FF51, 0x0, 0x0)            = 8 0

    1666/0x3517:      2256    3      1 fstat64(0x8, 0x16CF9DE60, 0x0)            = 0 0

    1666/0x3517:      2261    6      3 mmap(0x0, 0x4000, 0x1, 0x40001, 0x8, 0x0)
= 0x1032BC000 0

    1666/0x3517:      2264    2      0 close(0x8)                  = 0 0

    1666/0x3517:      2280    2      1 ioctl(0x2, 0x4004667A, 0x16CF9DF0C)
= 0 0

    1666/0x3517:      2293    2      1 mprotect(0x1032C8000, 0x4000, 0x0)
= 0 0

    1666/0x3517:      2294    2      1 mprotect(0x1032D4000, 0x4000, 0x0)
= 0 0

    1665/0x3516:      2221    28     27
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/lab_1_client\0", 0x0, 0x0)            = 6 0

    1666/0x3517:      2301    2      0 mprotect(0x1032D8000, 0x4000, 0x0)
= 0 0

    1666/0x3517:      2303    2      0 mprotect(0x1032E4000, 0x4000, 0x0)
= 0 0
```

```
    1665/0x3516:        2225       6       3 __mac_syscall(0x18C2E1ACF, 0x2, 0x16B1851D0)
= 0 0

    1666/0x3517:        2309       2       0 mprotect(0x1032E8000, 0x4000, 0x0)
= 0 0

    1666/0x3517:        2311       2       0 mprotect(0x1032F4000, 0x4000, 0x0)
= 0 0

    1665/0x3516:        2240      14      11 map_with_linking_np(0x16B1850A0, 0x1,
0x16B1850D0)                = 0 0

    1666/0x3517:        2319       2       1 mprotect(0x1032C0000, 0xA0, 0x1)          = 0 0

    1665/0x3516:        2242       2       1 close(0x6)                = 0 0

    1666/0x3517:        2322       3       1 mprotect(0x1032C0000, 0xA0, 0x3)          = 0 0

    1665/0x3516:        2245       3       1 mprotect(0x104C7C000, 0x4000, 0x1)
= 0 0

    1666/0x3517:        2327       3       1 mprotect(0x1032C0000, 0xA0, 0x1)          = 0 0

    1666/0x3517:        2333       2       1 mprotect(0x1032F8000, 0x4000, 0x1)
= 0 0

    1666/0x3517:        2339       2       1 mprotect(0x1032FC000, 0xA0, 0x1)          = 0 0

    1665/0x3516:        2272       3       0 shared_region_check_np(0xFFFFFFFFFFFFFFFF, 0x0,
0x0)                = 0 0

    1665/0x3516:        2275       3       1 mprotect(0x105088000, 0x40000, 0x1)
= 0 0

    1666/0x3517:        2348       3       1 mprotect(0x1032FC000, 0xA0, 0x3)          = 0 0

    1666/0x3517:        2352       2       1 mprotect(0x1032FC000, 0xA0, 0x1)          = 0 0

    1665/0x3516:        2291       4       2 access("/AppleInternal/XBS/.isChrooted\0", 0x0,
0x0)                = -1 Err#2

    1666/0x3517:        2354       2       1 mprotect(0x1032C0000, 0xA0, 0x3)          = 0 0

    1666/0x3517:        2358       2       1 mprotect(0x1032C0000, 0xA0, 0x1)          = 0 0

    1666/0x3517:        2360       3       1 mprotect(0x1032F8000, 0x4000, 0x3)
= 0 0

    1666/0x3517:        2364       2       0 mprotect(0x1032F8000, 0x4000, 0x1)
= 0 0

    1665/0x3516:        2315       3       1 bsdthread_register(0x18C5E4D2C, 0x18C5E4D20,
0x4000)                = 1073746399 0

    1666/0x3517:        2366       2       1 mprotect(0x103270000, 0x40000, 0x3)
= 0 0

    1666/0x3517:        2371       2       1 mprotect(0x103270000, 0x40000, 0x1)
= 0 0

    1666/0x3517:        2387       3       0 objc_bp_assist_cfg_np(0x18C211000,
0x80000018001C1048, 0x0)                = -1 Err#5

    1665/0x3516:        2351       2       0 getpid(0x0, 0x0, 0x0)              = 1665 0

    1666/0x3517:        2392       2       0 issetugid(0x0, 0x0, 0x0)          = 0 0

    1665/0x3516:        2355       5       3 shm_open(0x18C47FF51, 0x0, 0x0)          = 6 0
```

```
   1665/0x3516:      2356     2     0 fstat64(0x6, 0x16B185E60, 0x0)        = 0 0

   1665/0x3516:      2360     6     3 mmap(0x0, 0x4000, 0x1, 0x40001, 0x6, 0x0)
 = 0x1050D4000 0

   1665/0x3516:      2364     2     0 close(0x6)                = 0 0

   1666/0x3517:      2422     2     1 mprotect(0x103270000, 0x40000, 0x3)
 = 0 0

   1665/0x3516:      2378     3     1 ioctl(0x2, 0x4004667A, 0x16B185F0C)
 = 0 0

   1665/0x3516:      2388     3     1 mprotect(0x1050E0000, 0x4000, 0x0)
 = 0 0

   1665/0x3516:      2390     2     1 mprotect(0x1050EC000, 0x4000, 0x0)
 = 0 0

   1665/0x3516:      2396     2     0 mprotect(0x1050F0000, 0x4000, 0x0)
 = 0 0

   1665/0x3516:      2398     2     0 mprotect(0x1050FC000, 0x4000, 0x0)
 = 0 0

   1666/0x3517:      2484     4     2 getentropy(0x16CF9D578, 0x20, 0x0)
 = 0 0

   1665/0x3516:      2404     2     1 mprotect(0x105100000, 0x4000, 0x0)
 = 0 0

   1665/0x3516:      2406     2     0 mprotect(0x10510C000, 0x4000, 0x0)
 = 0 0

   1665/0x3516:      2415     3     1 mprotect(0x1050D8000, 0xA0, 0x1)      = 0 0

   1665/0x3516:      2417     3     1 mprotect(0x1050D8000, 0xA0, 0x3)      = 0 0

   1665/0x3516:      2422     2     1 mprotect(0x1050D8000, 0xA0, 0x1)      = 0 0

   1665/0x3516:      2428     2     1 mprotect(0x105110000, 0x4000, 0x1)
 = 0 0

   1666/0x3517:      2545     3     1 mprotect(0x103270000, 0x40000, 0x1)
 = 0 0

   1665/0x3516:      2434     2     1 mprotect(0x105114000, 0xA0, 0x1)      = 0 0

   1665/0x3516:      2444     3     2 mprotect(0x105114000, 0xA0, 0x3)      = 0 0

   1665/0x3516:      2447     2     1 mprotect(0x105114000, 0xA0, 0x1)      = 0 0

   1666/0x3517:      2575     2     1 mprotect(0x103270000, 0x40000, 0x3)
 = 0 0

   1665/0x3516:      2449     2     1 mprotect(0x1050D8000, 0xA0, 0x3)      = 0 0

   1666/0x3517:      2579     2     1 mprotect(0x103270000, 0x40000, 0x1)
 = 0 0

   1665/0x3516:      2453     2     1 mprotect(0x1050D8000, 0xA0, 0x1)      = 0 0

   1665/0x3516:      2455     2     1 mprotect(0x105110000, 0x4000, 0x3)
 = 0 0

   1665/0x3516:      2458     2     1 mprotect(0x105110000, 0x4000, 0x1)
 = 0 0
```

```
        1666/0x3517:      2594      11       9
getattrlist("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/s
erver/output/lab_1_client\0", 0x16CF9DDF0, 0x16CF9DE08)              = 0 0

        1665/0x3516:      2460       2       1 mprotect(0x105088000, 0x40000, 0x3)
= 0 0

        1665/0x3516:      2466       2       1 mprotect(0x105088000, 0x40000, 0x1)
= 0 0

        1666/0x3517:      2612      16      14
access("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output\0", 0x4, 0x0)              = 0 0

        1665/0x3516:      2478       3       0 objc_bp_assist_cfg_np(0x18C211000,
0x80000018001C1048, 0x0)          = -1 Err#5

        1665/0x3516:      2482       2       0 issetugid(0x0, 0x0, 0x0)          = 0 0

        1666/0x3517:      2625      14      12
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput\0", 0x0, 0x0)          = 8 0

        1666/0x3517:      2627       3       1 fstat64(0x8, 0x154604450, 0x0)          = 0 0

        1665/0x3516:      2506       3       1 mprotect(0x105088000, 0x40000, 0x3)
= 0 0

        1666/0x3517:      2628       1       0 csrctl(0x0, 0x16CF9E01C, 0x4)          = 0 0

        1666/0x3517:      2630       2       1 fcntl(0x8, 0x32, 0x16CF9DCD8)          = 0 0

        1666/0x3517:      2632       2       0 close(0x8)              = 0 0

        1666/0x3517:      2640       4       3
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/Info.plist\0", 0x0, 0x0)              = -1 Err#2

        1665/0x3516:      2556       4       1 getentropy(0x16B185578, 0x20, 0x0)
= 0 0

        1666/0x3517:      2660       4       2 proc_info(0x2, 0x682, 0xD)              = 64 0

        1666/0x3517:      2681       4       2 csops_audittoken(0x682, 0x10, 0x16CF9E060)
= 0 0

        1665/0x3516:      2609       3       1 mprotect(0x105088000, 0x40000, 0x1)
= 0 0

        1666/0x3517:      2696       7       4 sysctl([unknown, 3, 0, 0, 0, 0] (2),
0x16CF9E3B8, 0x16CF9E3B0, 0x18FA16D3D, 0x15)              = 0 0

        1665/0x3516:      2635       2       1 mprotect(0x105088000, 0x40000, 0x3)
= 0 0

        1666/0x3517:      2699       4       2 sysctl([CTL_KERN, 138, 0, 0, 0, 0] (2),
0x16CF9E448, 0x16CF9E440, 0x0, 0x0)              = 0 0

        1665/0x3516:      2639       2       1 mprotect(0x105088000, 0x40000, 0x1)
= 0 0

        1665/0x3516:      2652      10       8
getattrlist("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/s
erver/output/lab_1_client\0", 0x16B185DF0, 0x16B185E08)              = 0 0

        1666/0x3517:      2702       3       1 csops(0x682, 0x0, 0x16CF9E4EC)          = 0 0

        1666/0x3517:      2708       3       1 mprotect(0x103270000, 0x40000, 0x3)
= 0 0
```

```
       1665/0x3516:       2669      16      15
access("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server
/output\0", 0x4, 0x0)                   = 0 0

       1665/0x3516:       2685      16      14
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput\0", 0x0, 0x0)           = 6 0

       1665/0x3516:       2687       3       1 fstat64(0x6, 0x13EE04450, 0x0)          = 0 0

       1665/0x3516:       2688       2       0 csrctl(0x0, 0x16B18601C, 0x4)           = 0 0

       1665/0x3516:       2690       3       1 fcntl(0x6, 0x32, 0x16B185CD8)           = 0 0

       1665/0x3516:       2692       2       1 close(0x6)                = 0 0

       1665/0x3516:       2700       4       3
open("/Users/skidunion/Work/Depot/Personal/mai-os-3-sem/cmake-build-debug/src/lab-1/server/o
utput/Info.plist\0", 0x0, 0x0)            = -1 Err#2

       1665/0x3516:       2717       3       1 proc_info(0x2, 0x681, 0xD)          = 64 0

       1665/0x3516:       2733       4       1 csops_audittoken(0x681, 0x10, 0x16B186060)
= 0 0

       1665/0x3516:       2746       7       4 sysctl([unknown, 3, 0, 0, 0, 0] (2),
0x16B1863B8, 0x16B1863B0, 0x18FA16D3D, 0x15)                = 0 0

       1665/0x3516:       2749       4       2 sysctl([CTL_KERN, 138, 0, 0, 0, 0] (2),
0x16B186448, 0x16B186440, 0x0, 0x0)            = 0 0

       1665/0x3516:       2752       2       1 csops(0x681, 0x0, 0x16B1864EC)          = 0 0

       1665/0x3516:       2757       3       1 mprotect(0x105088000, 0x40000, 0x3)
= 0 0

    aaaaaaaaaaaaaaaa

    b 1560/0x3213:       4555 6207514      14 read(0x0, "aaaaaaaaaaaaaaaa\n2\0", 0x100)
= 17 0

       1560/0x3213:       4576      60       4 write(0x6, "aaaaaaaaaaaaaaaa\n2\0", 0x11)
= 17 0

       1665/0x3516:       2805 6202993      10 read(0x0, "aaaaaaaaaaaaaaaa\n\0", 0x100)
= 17 0

       1665/0x3516:       2985    1015     160 write(0x1, "\n\0", 0x1)          = 1 0

    bbbbbbbbbbbbbbbb

       1560/0x3213:       4593 1835021      16 read(0x0, "bbbbbbbbbbbbbbbb\n\0", 0x100)
= 18 0

       1560/0x3213:       4640      76      13 write(0x8, "bbbbbbbbbbbbbbbb\n\0", 0x12)
= 18 0

       1666/0x3517:       2813 8038563      16 read(0x0, "bbbbbbbbbbbbbbbb\n\0", 0x100)
= 18 0

       1666/0x3517:       2959     165     101 write(0x1, "bbbbbbbbbbbbbbbb\n\0", 0x12)
= 18 0

          AAAAAAAAAAAAAAAAAAAAAA

       1560/0x3213:       4664 3389692      18 read(0x0, "AAAAAAAAAAAAAAAAAAAAAA\n\0", 0x100)
= 23 0
```

```
     1560/0x3213:       4693        81      11 write(0x6, "AAAAAAAAAAAAAAAAAAAAAA\n\0", 0x17)
= 23 0

     1665/0x3516:       3002 5224083       8 read(0x0, "AAAAAAAAAAAAAAAAAAAAAA\n\0", 0x100)
= 23 0

     1665/0x3516:       3070       102     43 write(0x1, "\n\0", 0x1)           = 1 0

     abababababbabababababa

     1560/0x3213:       4734 1809822      16 read(0x0, "ababababbabababababa\n\0", 0x100)
= 19 0

     1560/0x3213:       4778        76     19 write(0x8, "ababababbabababababa\n\0", 0x13)
= 19 0

     1666/0x3517:       2969 5199370       7 read(0x0, "ababababbabababababa\n\0", 0x100)
= 19 0

     1666/0x3517:       3033       102     45 write(0x1, "bbbbbbbbb\n\265\350AAAAAAAAAA\n\0",
0xA)           = 10 0

     jffjjffjfjfjfjf

     k 1560/0x3213:      4804 1745125      15 read(0x0, "jffjjffjfjfjfjf\n\0", 0x100)
= 16 0

     1560/0x3213:       4829        85     13 write(0x6, "jffjjffjfjfjfjf\n\0", 0x10)
= 16 0

     1665/0x3516:       3085 3555565       9 read(0x0, "jffjjffjfjfjfjf\n\0275\0", 0x100)
= 16 0

     1665/0x3516:       3143        94     36 write(0x1, "jffjjffjfjfjfjf\nAAAAAA\n\0", 0x10)
= 16 0

     gkgkgkgkg

     1560/0x3213:       4875 1285971      17 read(0x0, "kgkgkgkgkg\n\253\030\006\0", 0x100)
= 11 0

     1560/0x3213:       4889        66     11 write(0x8, "kgkgkgkgkg\n\265aaaa\001\0", 0xB)
= 11 0

     1666/0x3517:       3052 3031170       9 read(0x0, "kgkgkgkgkg\n\265aaaa\001\0", 0x100)
= 11 0

     1666/0x3517:       3108        98     43 write(0x1, "kgkgkgkgkg\n\0", 0xB)
= 11 0

     kfjasdkfajs

     1560/0x3213:       4905 1261330      13 read(0x0, "kfjasdkfajs\n\0", 0x100)
= 12 0

     1560/0x3213:       4923        84     10 write(0x6, "kfjasdkfajs\n\0", 0xC)
= 12 0

     1665/0x3516:       3153 2547238       8 read(0x0, "kfjasdkfajs\n\0", 0x100)
= 12 0

     1665/0x3516:       3234       119     48 write(0x1, "kfjsdkfjs\n\314\030\030\006\0", 0xA)
= 10 0


     1560/0x3213:       4944 2610230      18 read(0x0, "\n\006\0", 0x100)           = 1 0

     1560/0x3213:       4968        84     11 write(0x8, "\n\006\0", 0x1)           = 1 0
```

```
    1666/0x3517:      3121 3872168      8 read(0x0, "\n\001\0", 0x100)              = 1 0


    1560/0x3213:      4993 1017805     21 read(0x0, "\n\006\0", 0x100)              = 1 0

    1560/0x3213:      5010      72     12 write(0x6, "\n\001\0", 0x1)               = 1 0

    1665/0x3516:      3245 3627630      8 read(0x0, "\n\006\0", 0x100)              = 1 0

    1560/0x3213:      5043 4469536     26 read(0x0, "\367\001\0", 0x100)           = 0 0

    1560/0x3213:      5059      66      8 wait4(0xFFFFFFFFFFFFFFFF, 0x0, 0x0)
= 1666 0

    1560/0x3213:      5061       3      2 wait4(0xFFFFFFFFFFFFFFFF, 0x0, 0x0)
= 1665 0

    1560/0x3213:      5062       1      0 wait4(0xFFFFFFFFFFFFFFFF, 0x0, 0x0)
= -1 Err#10
```

Вывод

В ходе выполнения этой лабораторной работы я познакомился с системными вызовами POSIX чтения и записи в файлы, создания каналов и процессов. Я отработал перенаправление потоков ввода и вывода в произвольные файловые дескрипторы: потоки и файлы. Мне было трудно организовать правильный ввод и вывод в каналах: я перепутал концы в родительском и дочернем процессе и долго отлаживал эту ошибку.