Московский Авиационный Институт

(Национальный Исследовательский Университет)

Факультет информационных технологий и прикладной математики

Кафедра вычислительной математики и программирования

**Лабораторная работа №1 по курсу**

**«Операционные системы»**

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Дата: \_\_\_\_\_\_\_\_\_\_\_

Подпись: \_\_\_\_\_\_\_\_\_\_\_

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**Постановка задачи**.

Приобретение практических навыков диагностики программного обеспечения.

**Средство диагностики**

Утилита **strace.**

**Демонстрация работы программы.**

**Запустим утилиту strace для 2 лабораторной работы:**

user@DESKTOP-4RFVSK2:~/os/2lab$ strace ./a.out

execve("./a.out", ["./a.out"], 0x7fffd6f20960 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffdf53e000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f46eb27c000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030544, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f46eb270000

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f46eac00000

mprotect(0x7f46eade7000, 2097152, PROT\_NONE) = 0

mmap(0x7f46eafe7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7f46eafe7000

mmap(0x7f46eafed000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f46eafed000

close(3) = 0

arch\_prctl(ARCH\_SET\_FS, 0x7f46eb2714c0) = 0

mprotect(0x7f46eafe7000, 16384, PROT\_READ) = 0

mprotect(0x7f46eb601000, 4096, PROT\_READ) = 0

mprotect(0x7f46eb227000, 4096, PROT\_READ) = 0

munmap(0x7f46eb27c000, 30224) = 0

write(1, "Enter the number: \0", 19Enter the number: ) = 19

pipe([3, 4]) = 0

read(2, 5

"5\n", 10) = 2

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7f46eb271790) = 104

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7f46eb271790) = 106

wait4(106, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 106

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=106, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

read(3, "\2\0\0\0", 4) = 4

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=104, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

wait4(104, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 104

read(3, "\2\0\0\0", 4) = 4

write(1, "5\0 ", 105 ) = 10

write(1, "\n\0", 2

) = 2

exit\_group(0) = ?

+++ exited with 0 +++

Как видно из работы утилиты, наиболее часто выполняемыми системными вызовами являются вызовы read/write. Так же имеется вызов pipe.

**Запустим утилиту strace для 3 лабораторной работы:**

user@DESKTOP-4RFVSK2:~/os/3\_easy$ strace ./a.out

execve("./a.out", ["./a.out"], 0x7fffd54224b0 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffc5ff5000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f46f4639000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libpthread.so.0", 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\0000b\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=144976, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f46f4630000

mmap(NULL, 2221184, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f46f41e0000

mprotect(0x7f46f41fa000, 2093056, PROT\_NONE) = 0

mmap(0x7f46f43f9000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x19000) = 0x7f46f43f9000

mmap(0x7f46f43fb000, 13440, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f46f43fb000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030544, ...}) = 0

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f46f3de0000

mprotect(0x7f46f3fc7000, 2097152, PROT\_NONE) = 0

mmap(0x7f46f41c7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7f46f41c7000

mmap(0x7f46f41cd000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f46f41cd000

close(3) = 0

mmap(NULL, 12288, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f46f4620000

arch\_prctl(ARCH\_SET\_FS, 0x7f46f4620740) = 0

mprotect(0x7f46f41c7000, 16384, PROT\_READ) = 0

mprotect(0x7f46f43f9000, 4096, PROT\_READ) = 0

mprotect(0x7f46f4a01000, 4096, PROT\_READ) = 0

mprotect(0x7f46f4627000, 4096, PROT\_READ) = 0

munmap(0x7f46f4639000, 30224) = 0

set\_tid\_address(0x7f46f4620a10) = 315

set\_robust\_list(0x7f46f4620a20, 24) = 0

rt\_sigaction(SIGRTMIN, {sa\_handler=0x7f46f41e5cb0, sa\_mask=[], sa\_flags=SA\_RESTORER|SA\_SIGINFO, sa\_restorer=0x7f46f41f2890}, NULL, 8) = 0

rt\_sigaction(SIGRT\_1, {sa\_handler=0x7f46f41e5d50, sa\_mask=[], sa\_flags=SA\_RESTORER|SA\_RESTART|SA\_SIGINFO, sa\_restorer=0x7f46f41f2890}, NULL, 8) = 0

rt\_sigprocmask(SIG\_UNBLOCK, [RTMIN RT\_1], NULL, 8) = 0

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

fstat(1, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 1), ...}) = 0

ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0

brk(NULL) = 0x7fffc5ff5000

brk(0x7fffc6016000) = 0x7fffc6016000

fstat(0, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 1), ...}) = 0

ioctl(0, TCGETS, {B38400 opost isig icanon echo ...}) = 0

write(1, "Enter thread count: ", 20Enter thread count: ) = 20

read(0, 4

"4\n", 4096) = 2

write(1, "\n", 1

) = 1

write(1, "Enter the number of throws: ", 28Enter the number of throws: ) = 28

read(0, 2

"2\n", 4096) = 2

write(1, "\n", 1

) = 1

write(1, "Enter the tour number: ", 23Enter the tour number: ) = 23

read(0, 2

"2\n", 4096) = 2

write(1, "\n", 1

) = 1

write(1, "Enter first and second player's "..., 39Enter first and second player's score: ) = 39

read(0, 2

"2\n", 4096) = 2

read(0, 2

"2\n", 4096) = 2

write(1, "\n", 1

) = 1

write(1, "Enter count of experiments to co"..., 39Enter count of experiments to conduct: ) = 39

read(0, 2

"2\n", 4096) = 2

write(1, "\n", 1

) = 1

mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|MAP\_STACK, -1, 0) = 0x7f46f35d0000

mprotect(0x7f46f35d1000, 8388608, PROT\_READ|PROT\_WRITE) = 0

clone(child\_stack=0x7f46f3dcffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7f46f3dd09d0, tls=0x7f46f3dd0700, child\_tidptr=0x7f46f3dd09d0) = 316

futex(0x7f46f3dd09d0, FUTEX\_WAIT, 316, NULL) = -1 EAGAIN (Resource temporarily unavailable)

clone(child\_stack=0x7f46f3dcffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7f46f3dd09d0, tls=0x7f46f3dd0700, child\_tidptr=0x7f46f3dd09d0) = 317

write(1, "First player's chances to win: 0"..., 40First player's chances to win: 0.500000

) = 40

write(1, "Second player's chances to win: "..., 41Second player's chances to win: 0.500000

) = 41

lseek(0, -1, SEEK\_CUR) = -1 ESPIPE (Illegal seek)

exit\_group(0) = ?

+++ exited with 0 +++

**Запустим утилиту strace для 4 лабораторной работы:**

user@DESKTOP-4RFVSK2:~/os/4lab$ strace ./a.out

execve("./a.out", ["./a.out"], 0x7fffdef54a50 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffe742a000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f75946b9000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030544, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f75946b0000

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f7594000000

mprotect(0x7f75941e7000, 2097152, PROT\_NONE) = 0

mmap(0x7f75943e7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7f75943e7000

mmap(0x7f75943ed000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f75943ed000

close(3) = 0

arch\_prctl(ARCH\_SET\_FS, 0x7f75946b1500) = 0

mprotect(0x7f75943e7000, 16384, PROT\_READ) = 0

mprotect(0x7f7594a01000, 4096, PROT\_READ) = 0

mprotect(0x7f7594627000, 4096, PROT\_READ) = 0

munmap(0x7f75946b9000, 30224) = 0

fstat(1, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 1), ...}) = 0

ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0

brk(NULL) = 0x7fffe742a000

brk(0x7fffe744b000) = 0x7fffe744b000

write(1, "Enter the number to calculate: \n", 32Enter the number to calculate:

) = 32

fstat(0, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 1), ...}) = 0

ioctl(0, TCGETS, {B38400 opost isig icanon echo ...}) = 0

read(0, 5

"5\n", 4096) = 2

openat(AT\_FDCWD, "in", O\_RDWR|O\_CREAT|O\_TRUNC, 0600) = 3

lseek(3, 1, SEEK\_SET) = 1

write(3, "\0", 1) = 1

mmap(NULL, 1, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 3, 0) = 0x7f75946c0000

msync(0x7f75946c0000, 1, MS\_SYNC) = 0

close(3) = 0

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7f75946b17d0) = 324

wait4(-1, NULL, 0, NULL) = 324

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=324, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

openat(AT\_FDCWD, "out", O\_RDONLY) = 3

fstat(3, {st\_mode=S\_IFREG|0600, st\_size=3, ...}) = 0

mmap(NULL, 3, PROT\_READ, MAP\_SHARED, 3, 0) = 0x7f75946bf000

munmap(0x7f75946bf000, 3) = 0

close(3) = 0

write(1, "Result: 15\n", 11Result: 15

) = 11

lseek(0, -1, SEEK\_CUR) = -1 ESPIPE (Illegal seek)

exit\_group(0) = ?

+++ exited with 0 +++

**Запустим утилиту strace для 5 лабораторной работы:**

user@DESKTOP-4RFVSK2:~/os/5lab$ strace ./main

execve("./main", ["./main"], 0x7fffec5d5ef0 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffe635f000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7fcd38224000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

openat(AT\_FDCWD, "/lib/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64", 0x7fffedeb6030) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

writev(2, [{iov\_base="./main", iov\_len=6}, {iov\_base=": ", iov\_len=2}, {iov\_base="error while loading shared libra"..., iov\_len=36}, {iov\_base=": ", iov\_len=2}, {iov\_base="stack.so", iov\_len=8}, {iov\_base=": ", iov\_len=2}, {iov\_base="cannot open shared object file", iov\_len=30}, {iov\_base=": ", iov\_len=2}, {iov\_base="No such file or directory", iov\_len=25}, {iov\_base="\n", iov\_len=1}], 10./main: error while loading shared libraries: stack.so: cannot open shared object file: No such file or directory

) = 114

exit\_group(127) = ?

+++ exited with 127 +++

user@DESKTOP-4RFVSK2:~/os/5lab$ strace ./main\_so

execve("./main\_so", ["./main\_so"], 0x7fffd76ed840 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffbcf54000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7fab0e56d000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libdl.so.2", 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\0P\16\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=14560, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7fab0e560000

mmap(NULL, 2109712, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fab0dff0000

mprotect(0x7fab0dff3000, 2093056, PROT\_NONE) = 0

mmap(0x7fab0e1f2000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x2000) = 0x7fab0e1f2000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030544, ...}) = 0

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fab0dbf0000

mprotect(0x7fab0ddd7000, 2097152, PROT\_NONE) = 0

mmap(0x7fab0dfd7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7fab0dfd7000

mmap(0x7fab0dfdd000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7fab0dfdd000

close(3) = 0

mmap(NULL, 12288, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7fab0e550000

arch\_prctl(ARCH\_SET\_FS, 0x7fab0e550740) = 0

mprotect(0x7fab0dfd7000, 16384, PROT\_READ) = 0

mprotect(0x7fab0e1f2000, 4096, PROT\_READ) = 0

mprotect(0x7fab0e801000, 4096, PROT\_READ) = 0

mprotect(0x7fab0e427000, 4096, PROT\_READ) = 0

munmap(0x7fab0e56d000, 30224) = 0

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7fab0e56d000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/tls", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64-linux-gnu", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/tls", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64-linux-gnu", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

openat(AT\_FDCWD, "/lib/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/tls", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/lib", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/tls", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib/x86\_64", 0x7fffc4da0980) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/stack.so", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

stat("/usr/lib", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}) = 0

brk(NULL) = 0x7fffbcf54000

brk(0x7fffbcf75000) = 0x7fffbcf75000

munmap(0x7fab0e56d000, 30224) = 0

write(2, "dlopen() error: stack.so: cannot"..., 84dlopen() error: stack.so: cannot open shared object file: No such file or directory

) = 84

exit\_group(1) = ?

+++ exited with 1 +++

**Запустим утилиту strace для 6 лабораторной работы:**

user@DESKTOP-4RFVSK2:~/os/6lab$ strace ./client

execve("./client", ["./client"], 0x7fffd1ec9c50 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffeb67c000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=30224, ...}) = 0

mmap(NULL, 30224, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f4dabd48000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/local/lib/libzmq.so.5", 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\0p \1\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=9356744, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f4dabd40000

mmap(NULL, 2655728, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4dab777000

mprotect(0x7f4dab7fa000, 2093056, PROT\_NONE) = 0

mmap(0x7f4dab9f9000, 28672, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x82000) = 0x7f4dab9f9000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/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\220\304\10\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=1594864, ...}) = 0

mmap(NULL, 3702848, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4dab3e0000

mprotect(0x7f4dab559000, 2097152, PROT\_NONE) = 0

mmap(0x7f4dab759000, 49152, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x179000) = 0x7f4dab759000

mmap(0x7f4dab765000, 12352, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f4dab765000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/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\300\*\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=96616, ...}) = 0

mmap(NULL, 2192432, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4dab1c0000

mprotect(0x7f4dab1d7000, 2093056, PROT\_NONE) = 0

mmap(0x7f4dab3d6000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x16000) = 0x7f4dab3d6000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030544, ...}) = 0

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4daadc0000

mprotect(0x7f4daafa7000, 2097152, PROT\_NONE) = 0

mmap(0x7f4dab1a7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7f4dab1a7000

mmap(0x7f4dab1ad000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f4dab1ad000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=31680, ...}) = 0

mmap(NULL, 2128864, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4daabb0000

mprotect(0x7f4daabb7000, 2093056, PROT\_NONE) = 0

mmap(0x7f4daadb6000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x6000) = 0x7f4daadb6000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libpthread.so.0", 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\0000b\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=144976, ...}) = 0

mmap(NULL, 2221184, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4daa990000

mprotect(0x7f4daa9aa000, 2093056, PROT\_NONE) = 0

mmap(0x7f4daaba9000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x19000) = 0x7f4daaba9000

mmap(0x7f4daabab000, 13440, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f4daabab000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/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\200\272\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=1700792, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f4dabd30000

mmap(NULL, 3789144, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f4daa5f0000

mprotect(0x7f4daa78d000, 2093056, PROT\_NONE) = 0

mmap(0x7f4daa98c000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x19c000) = 0x7f4daa98c000

close(3) = 0

mmap(NULL, 12288, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f4dabd20000

arch\_prctl(ARCH\_SET\_FS, 0x7f4dabd20740) = 0

mprotect(0x7f4dab1a7000, 16384, PROT\_READ) = 0

mprotect(0x7f4daa98c000, 4096, PROT\_READ) = 0

mprotect(0x7f4daaba9000, 4096, PROT\_READ) = 0

mprotect(0x7f4daadb6000, 4096, PROT\_READ) = 0

mprotect(0x7f4dab3d6000, 4096, PROT\_READ) = 0

mprotect(0x7f4dab759000, 40960, PROT\_READ) = 0

mprotect(0x7f4dab9f9000, 24576, PROT\_READ) = 0

mprotect(0x7f4dac00d000, 4096, PROT\_READ) = 0

mprotect(0x7f4dabc27000, 4096, PROT\_READ) = 0

munmap(0x7f4dabd48000, 30224) = 0

set\_tid\_address(0x7f4dabd20a10) = 347

set\_robust\_list(0x7f4dabd20a20, 24) = 0

rt\_sigaction(SIGRTMIN, {sa\_handler=0x7f4daa995cb0, sa\_mask=[], sa\_flags=SA\_RESTORER|SA\_SIGINFO, sa\_restorer=0x7f4daa9a2890}, NULL, 8) = 0

rt\_sigaction(SIGRT\_1, {sa\_handler=0x7f4daa995d50, sa\_mask=[], sa\_flags=SA\_RESTORER|SA\_RESTART|SA\_SIGINFO, sa\_restorer=0x7f4daa9a2890}, NULL, 8) = 0

rt\_sigprocmask(SIG\_UNBLOCK, [RTMIN RT\_1], NULL, 8) = 0

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

brk(NULL) = 0x7fffeb67c000

brk(0x7fffeb69d000) = 0x7fffeb69d000

futex(0x7f4dab76609c, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0

futex(0x7f4dab7660a8, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0

eventfd2(0, EFD\_CLOEXEC) = 3

fcntl(3, F\_GETFL) = 0x2 (flags O\_RDWR)

fcntl(3, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

fcntl(3, F\_GETFL) = 0x802 (flags O\_RDWR|O\_NONBLOCK)

fcntl(3, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

openat(AT\_FDCWD, "/dev/urandom", O\_RDONLY|O\_CLOEXEC) = 4

fstat(1, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 1), ...}) = 0

ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0

write(1, "Client starting...\n", 19Client starting...

) = 19

write(1, "List of commands: \n", 19List of commands:

) = 19

write(1, "1) create id [parent] - create n"..., 471) create id [parent] - create new server node

) = 47

write(1, "2) remove id - remove existing s"..., 432) remove id - remove existing server node

) = 43

write(1, "3) exec id n k1...kn - evaluate "..., 493) exec id n k1...kn - evaluate sum of n numbers

) = 49

write(1, "4) ping id - check if server sti"..., 454) ping id - check if server still available

) = 45

write(1, "5) exit - exit program\n", 235) exit - exit program

) = 23

write(1, "6) print - print menu\n", 226) print - print menu

) = 22

fstat(0, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 1), ...}) = 0

ioctl(0, TCGETS, {B38400 opost isig icanon echo ...}) = 0

read(0, create 1 -1

"create 1 -1\n", 4096) = 12

eventfd2(0, EFD\_CLOEXEC) = 5

fcntl(5, F\_GETFL) = 0x2 (flags O\_RDWR)

fcntl(5, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

fcntl(5, F\_GETFL) = 0x802 (flags O\_RDWR|O\_NONBLOCK)

fcntl(5, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=95114, tv\_nsec=431190700}) = 0

epoll\_create1(EPOLL\_CLOEXEC) = 6

epoll\_ctl(6, EPOLL\_CTL\_ADD, 5, {0, {u32=3949538320, u64=140737142926352}}) = 0

epoll\_ctl(6, EPOLL\_CTL\_MOD, 5, {EPOLLIN, {u32=3949538320, u64=140737142926352}}) = 0

mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|MAP\_STACK, -1, 0) = 0x7f4da9de0000

mprotect(0x7f4da9de1000, 8388608, PROT\_READ|PROT\_WRITE) = 0

clone(child\_stack=0x7f4daa5dffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7f4daa5e09d0, tls=0x7f4daa5e0700, child\_tidptr=0x7f4daa5e09d0) = 348

openat(AT\_FDCWD, "/proc/self/task/348/comm", O\_RDWR) = 7

write(7, "ZMQbg/0", 7) = 7

close(7) = 0

eventfd2(0, EFD\_CLOEXEC) = 7

fcntl(7, F\_GETFL) = 0x2 (flags O\_RDWR)

fcntl(7, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

fcntl(7, F\_GETFL) = 0x802 (flags O\_RDWR|O\_NONBLOCK)

fcntl(7, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=95114, tv\_nsec=571588400}) = 0

epoll\_create1(EPOLL\_CLOEXEC) = 8

epoll\_ctl(8, EPOLL\_CTL\_ADD, 7, {0, {u32=3949540256, u64=140737142928288}}) = 0

epoll\_ctl(8, EPOLL\_CTL\_MOD, 7, {EPOLLIN, {u32=3949540256, u64=140737142928288}}) = 0

mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|MAP\_STACK, -1, 0) = 0x7f4da95d0000

mprotect(0x7f4da95d1000, 8388608, PROT\_READ|PROT\_WRITE) = 0

clone(child\_stack=0x7f4da9dcffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7f4da9dd09d0, tls=0x7f4da9dd0700, child\_tidptr=0x7f4da9dd09d0) = 349

openat(AT\_FDCWD, "/proc/self/task/349/comm", O\_RDWR) = 9

write(9, "ZMQbg/1", 7) = 7

close(9) = 0

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=95114, tv\_nsec=669321900}) = 0

eventfd2(0, EFD\_CLOEXEC) = 9

fcntl(9, F\_GETFL) = 0x2 (flags O\_RDWR)

fcntl(9, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

fcntl(9, F\_GETFL) = 0x802 (flags O\_RDWR|O\_NONBLOCK)

fcntl(9, F\_SETFL, O\_RDWR|O\_NONBLOCK) = 0

write(1, "Enter the port to connect: ", 27Enter the port to connect: ) = 27

read(0, 8080

"8080\n", 4096) = 5

write(1, "Enter the executable file: (\"./s"..., 37Enter the executable file: ("./smth")) = 37

read(0, ./server

"./server\n", 4096) = 9

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7f4dabd20a10) = 350

poll([{fd=9, events=POLLIN}], 1, 0) = 0 (Timeout)

brk(0x7fffeb6be000) = 0x7fffeb6be000

write(7, "\1\0\0\0\0\0\0\0", 8) = 8

write(9, "\1\0\0\0\0\0\0\0", 8) = 8

poll([{fd=9, events=POLLIN}], 1, 0) = 1 ([{fd=9, revents=POLLIN}])

read(9, "\1\0\0\0\0\0\0\0", 8) = 8

poll([{fd=9, events=POLLIN}], 1, 0) = 0 (Timeout)

poll([{fd=9, events=POLLIN}], 1, -1) = 1 ([{fd=9, revents=POLLIN}])

read(9, "\1\0\0\0\0\0\0\0", 8) = 8

poll([{fd=9, events=POLLIN}], 1, 0) = 0 (Timeout)

poll([{fd=9, events=POLLIN}], 1, -1) = 1 ([{fd=9, revents=POLLIN}])

read(9, "\1\0\0\0\0\0\0\0", 8) = 8

poll([{fd=9, events=POLLIN}], 1, 0) = 0 (Timeout)

write(7, "\1\0\0\0\0\0\0\0", 8) = 8

write(1, "Ok: 350\n", 8Ok: 350

) = 8

read(0, remove 1

"remove 1\n", 4096) = 9

kill(350, SIGKILL) = 0

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_KILLED, si\_pid=350, si\_uid=1000, si\_status=SIGKILL, si\_utime=0, si\_stime=0} ---

write(1, "Ok\n", 3Ok

) = 3

read(0, exit

"exit\n", 4096) = 5

write(9, "\1\0\0\0\0\0\0\0", 8) = 8

poll([{fd=3, events=POLLIN}], 1, -1

^Cstrace: Process 347 detached

<detached ...>

**Вывод.**

Я научился наблюдать за системными вызовами Unix, используя утилиту strace. Данная утилита имеет много ключей, тем самым она является гибким инструментом для нахождения ошибок, связанных с системными вызовами. Утилита идеально подходит для отслеживания дочерних процессов, присоединению к процессу на лету и для других задач, возникающих при отладке программы. Помимо этого, с помощью данной утилиты можно получить много информации о программе еще до изучения кода самой программы.