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Факультет информационных технологий и прикладной математики
Кафедра вычислительной математики и программирования

Лабораторная работа №1 по курсу
«Операционные системы»

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Постановка задачи

Приобретение практических навыков диагностики программного обеспечения.

Средство диагностики

Утилита **strace**.

Демонстрация работы программы

ЛР2:

```
justp@Pavel:~/os/2lab$ strace ./a.out
execve("./a.out", [ "./a.out" ], 0x7fffd6f20960 /* 19 vars */) = 0
brk(NULL)                               = 0x7ffdf53e000
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\3\0>\0\1\0\0\0\260\34\2\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
```

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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.

JP3:

```
justp@Pavel:~/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\3\0>\0\1\0\0\0000b\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\3\0>\0\1\0\0\0260\34\2\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
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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

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"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|CLO
NE_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|CLO
NE_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

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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 +++

```

JP4:

```

justp@Pavel:~/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\3\0>\0\1\0\0\0\260\34\2\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 +++

JP5:

justp@Pavel:~/os/5lab\$ strace ./main

execve("./main", ["./main"], 0x7ffec5d5ef0 /* 19 vars */) = 0

brk(NULL) = 0x7ffe635f000

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", 0x7ffedeb6030) = -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", 0x7ffedeb6030) = -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", 0x7ffedeb6030) = -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", 0x7ffedeb6030) = -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", 0x7ffedeb6030) = -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", 0x7ffedeb6030) = -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)

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```

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 +++
justp@Pavel:~/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\3\0>\0\1\0\0\0P\16\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\3\0>\0\1\0\0\0\260\34\2\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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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", 0x7ffc4da0980) = -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) = 0x7ffbcf54000

brk(0x7ffbcf75000) = 0x7ffbcf75000

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 +++

```

JP6:

justp@Pavel:~/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\0220\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\3\0>\0\1\0\0\0\300*\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\3\0>\0\1\0\0\0\260\34\2\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\3\0>\0\1\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\3\0>\0\1\0\0\0000b\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\3\0>\0\1\0\0\0200\272\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

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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

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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=0x7f4daa5dff0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLO
NE_SYSVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEAR_TID,
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

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```

fcntl(7, F_GETFL) = 0x802 (flags O_RDONLY|O_NONBLOCK)
fcntl(7, F_SETFL, O_RDONLY|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|CLO
NE_SYVSEM|CLONE_SETTID|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARID,
parent_tidptr=0x7f4da9dd09d0, tls=0x7f4da9dd0700, child_tidptr=0x7f4da9dd09d0) = 349
openat(AT_FDCWD, "/proc/self/task/349/comm", O_RDONLY) = 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_RDONLY)
fcntl(9, F_SETFL, O_RDONLY|O_NONBLOCK) = 0
fcntl(9, F_GETFL) = 0x802 (flags O_RDONLY|O_NONBLOCK)
fcntl(9, F_SETFL, O_RDONLY|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_CLEARID|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", 8)      = 8
write(9, "\1\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", 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", 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", 8)        = 8
poll([{fd=9, events=POLLIN}], 1, 0)  = 0 (Timeout)
write(7, "\1\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", 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.