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Факультет информационных технологий и прикладной математики

Кафедра вычислительной математики и программирования

Лабораторная работа №8 по курсу

**«Операционные системы»**

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Подпись: \_\_\_\_\_\_\_\_\_\_\_

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### Репозиторий

<https://github.com/Imariiii/os_labs>

### Постановка задачи

Приобретение практических навыков диагностики работы программного

обеспечения.

**Задание**

Продемонстрировать ключевые системные вызовы, используемые в лабораторной работе и то, что их использование соответствует варианту ЛР на примере лабораторной работы №3.

### Описание strace

Команда strace является инструментом диагностики в Linux. Она перехватывает и записывает любые системные вызовы, выполняемые командой.

Кроме того, также записывает любой сигнал Linux, отправляемый процессу.

Затем мы можем использовать эту информацию для отладки или диагностики

программы.

В самом простом варианте strace запускает переданную команду с её аргументами и выводит в стандартный поток ошибок все системные вызовы

команды.

Возможные флаги:

• -k - выводить стек вызовов для отслеживаемого процесса после каждого

системного вызова

• -o - выводить всю информацию о системных вызовах не в стандартный

поток ошибок, а в файл

• -c - подсчитывать количество ошибок, вызовов и время выполнения для

каждого системного вызова

• -T - выводить длительность выполнения системного вызова

• -y - выводить пути для файловых дескрипторов

• -yy - выводить информацию о протоколе для файловых дескрипторов

• -p - указывает pid процесса, к которому следует подключиться

• -f - отслеживать также дочерние процессы, если они будут созданы

Демонстрация работы

anna@anna-**virtual**-machine:~/labs\_3sem/os\_labs/build/lab3$ PATH\_TO\_CHILD=child\_lab3 strace -fyT ./lab3

execve("./lab3", ["./lab3"], 0x7ffd15d221c8 /\* 62 vars \*/) = 0 <0.000505>

brk(NULL) = 0x5612b008b000 <0.000021>

arch\_prctl(0x3001 /\* ARCH\_??? \*/, 0x7ffdc79919e0) = -1 EINVAL (Недопустимый аргумент) <0.000009>

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f1108914000 <0.000025>

access("/etc/ld.so.preload", R\_OK) = -1 ENOENT (Нет такого файла или каталога) <0.000020>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3</etc/ld.so.cache> <0.000033>

newfstatat(3</etc/ld.so.cache>, "", {st\_mode=S\_IFREG|0644, st\_size=112403, ...}, AT\_EMPTY\_PATH) = 0 <0.000018>

mmap(NULL, 112403, PROT\_READ, MAP\_PRIVATE, 3</etc/ld.so.cache>, 0) = 0x7f11088f8000 <0.000030>

close(3</etc/ld.so.cache>) = 0 <0.000008>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libstdc++.so.6", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30> <0.000033>

read(3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832 <0.000019>

newfstatat(3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, "", {st\_mode=S\_IFREG|0644, st\_size=2260296, ...}, AT\_EMPTY\_PATH) = 0 <0.000018>

mmap(NULL, 2275520, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0) = 0x7f1108600000 <0.000032>

mprotect(0x7f110869a000, 1576960, PROT\_NONE) = 0 <0.000035>

mmap(0x7f110869a000, 1118208, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0x9a000) = 0x7f110869a000 <0.000036>

mmap(0x7f11087ab000, 454656, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0x1ab000) = 0x7f11087ab000 <0.000030>

mmap(0x7f110881b000, 57344, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0x21a000) = 0x7f110881b000 <0.000028>

mmap(0x7f1108829000, 10432, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f1108829000 <0.000025>

close(3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>) = 0 <0.000015>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libgcc\_s.so.1", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1> <0.000021>

read(3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832 <0.000019>

newfstatat(3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, "", {st\_mode=S\_IFREG|0644, st\_size=125488, ...}, AT\_EMPTY\_PATH) = 0 <0.000017>

mmap(NULL, 127720, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0) = 0x7f11088d8000 <0.000047>

mmap(0x7f11088db000, 94208, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0x3000) = 0x7f11088db000 <0.000044>

mmap(0x7f11088f2000, 16384, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0x1a000) = 0x7f11088f2000 <0.000031>

mmap(0x7f11088f6000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0x1d000) = 0x7f11088f6000 <0.000026>

close(3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>) = 0 <0.000014>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libc.so.6> <0.000021>

read(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832 <0.000016>

pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784 <0.000016>

pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\4\0\0\0 \0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0"..., 48, 848) = 48 <0.000015>

pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\302\211\332Pq\2439\235\350\223\322\257\201\326\243\f"..., 68, 896) = 68 <0.000015>

newfstatat(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "", {st\_mode=S\_IFREG|0755, st\_size=2220400, ...}, AT\_EMPTY\_PATH) = 0 <0.000016>

pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784 <0.000016>

mmap(NULL, 2264656, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0) = 0x7f1108200000 <0.000024>

mprotect(0x7f1108228000, 2023424, PROT\_NONE) = 0 <0.000032>

mmap(0x7f1108228000, 1658880, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0x28000) = 0x7f1108228000 <0.000028>

mmap(0x7f11083bd000, 360448, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0x1bd000) = 0x7f11083bd000 <0.000024>

mmap(0x7f1108416000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0x215000) = 0x7f1108416000 <0.000025>

mmap(0x7f110841c000, 52816, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f110841c000 <0.000023>

close(3</usr/lib/x86\_64-linux-gnu/libc.so.6>) = 0 <0.000014>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libm.so.6", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libm.so.6> <0.000020>

read(3</usr/lib/x86\_64-linux-gnu/libm.so.6>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832 <0.000016>

newfstatat(3</usr/lib/x86\_64-linux-gnu/libm.so.6>, "", {st\_mode=S\_IFREG|0644, st\_size=940560, ...}, AT\_EMPTY\_PATH) = 0 <0.000016>

mmap(NULL, 942344, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0) = 0x7f1108519000 <0.000026>

mmap(0x7f1108527000, 507904, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0xe000) = 0x7f1108527000 <0.000037>

mmap(0x7f11085a3000, 372736, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0x8a000) = 0x7f11085a3000 <0.000030>

mmap(0x7f11085fe000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0xe4000) = 0x7f11085fe000 <0.000028>

close(3</usr/lib/x86\_64-linux-gnu/libm.so.6>) = 0 <0.000014>

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f11088d6000 <0.000022>

arch\_prctl(ARCH\_SET\_FS, 0x7f11088d73c0) = 0 <0.000014>

set\_tid\_address(0x7f11088d7690) = 33152 <0.000014>

set\_robust\_list(0x7f11088d76a0, 24) = 0 <0.000014>

rseq(0x7f11088d7d60, 0x20, 0, 0x53053053) = 0 <0.000014>

mprotect(0x7f1108416000, 16384, PROT\_READ) = 0 <0.000030>

mprotect(0x7f11085fe000, 4096, PROT\_READ) = 0 <0.000025>

mprotect(0x7f11088f6000, 4096, PROT\_READ) = 0 <0.000030>

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f11088d4000 <0.000024>

mprotect(0x7f110881b000, 45056, PROT\_READ) = 0 <0.000038>

mprotect(0x5612afcf2000, 4096, PROT\_READ) = 0 <0.000032>

mprotect(0x7f110894e000, 8192, PROT\_READ) = 0 <0.000034>

prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0 <0.000015>

munmap(0x7f11088f8000, 112403) = 0 <0.000043>

getrandom("\xd7\x1d\xa4\xdf\x06\x2c\xba\x76", 8, GRND\_NONBLOCK) = 8 <0.000021>

brk(NULL) = 0x5612b008b000 <0.000014>

brk(0x5612b00ac000) = 0x5612b00ac000 <0.000019>

futex(0x7f110882977c, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0 <0.000014>

newfstatat(0</dev/pts/2>, "", {st\_mode=S\_IFCHR|0620, st\_rdev=makedev(0x88, 0x2), ...}, AT\_EMPTY\_PATH) = 0 <0.000017>

read(0</dev/pts/2>, qqq.txt

"qqq.txt\n", 1024) = 8 <8.232917>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "qqq.txt", O\_RDONLY) = 3</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt> <0.000021>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.shared\_memoryW", O\_RDWR|O\_NOFOLLOW) = -1 ENOENT (Нет такого файла или каталога) <0.000337>

getrandom("\x08\xf2\x8f\x5f\x23\xce\x63\xfb", 8, GRND\_NONBLOCK) = 8 <0.000016>

getrandom("\x89\xf9\x87\xdc\xae\x3a\xe4\x84", 8, GRND\_NONBLOCK) = 8 <0.000015>

newfstatat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.tjUO3b", 0x7ffdc7991550, AT\_SYMLINK\_NOFOLLOW) = -1 ENOENT (Нет такого файла или каталога) <0.000021>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.tjUO3b", O\_RDWR|O\_CREAT|O\_EXCL, 0600) = 4</dev/shm/sem.tjUO3b> <0.000031>

write(4</dev/shm/sem.tjUO3b>, "\1\0\0\0\0\0\0\0\200\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0", 32) = 32 <0.000025>

mmap(NULL, 32, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 4</dev/shm/sem.tjUO3b>, 0) = 0x7f110894d000 <0.000033>

link("/dev/shm/sem.tjUO3b", "/dev/shm/sem.shared\_memoryW") = 0 <0.000024>

newfstatat(4</dev/shm/sem.tjUO3b>, "", {st\_mode=S\_IFREG|0600, st\_size=32, ...}, AT\_EMPTY\_PATH) = 0 <0.000658>

unlink("/dev/shm/sem.tjUO3b") = 0 <0.000027>

close(4</dev/shm/sem.tjUO3b (deleted)>) = 0 <0.000016>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.shared\_memoryR", O\_RDWR|O\_NOFOLLOW) = -1 ENOENT (Нет такого файла или каталога) <0.000043>

getrandom("\xb6\x7c\xba\x13\x1e\xb4\x9e\x3c", 8, GRND\_NONBLOCK) = 8 <0.000022>

newfstatat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.aH4jcO", 0x7ffdc7991550, AT\_SYMLINK\_NOFOLLOW) = -1 ENOENT (Нет такого файла или каталога) <0.000027>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.aH4jcO", O\_RDWR|O\_CREAT|O\_EXCL, 0600) = 4</dev/shm/sem.aH4jcO> <0.000038>

write(4</dev/shm/sem.aH4jcO>, "\0\0\0\0\0\0\0\0\200\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0", 32) = 32 <0.000037>

mmap(NULL, 32, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 4</dev/shm/sem.aH4jcO>, 0) = 0x7f1108913000 <0.000045>

link("/dev/shm/sem.aH4jcO", "/dev/shm/sem.shared\_memoryR") = 0 <0.000033>

newfstatat(4</dev/shm/sem.aH4jcO>, "", {st\_mode=S\_IFREG|0600, st\_size=32, ...}, AT\_EMPTY\_PATH) = 0 <0.000025>

unlink("/dev/shm/sem.aH4jcO") = 0 <0.000027>

close(4</dev/shm/sem.aH4jcO (deleted)>) = 0 <0.000022>

openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/shared\_memory", O\_RDWR|O\_CREAT|O\_NOFOLLOW|O\_CLOEXEC, 0600) = 4</dev/shm/shared\_memory> <0.000035>

ftruncate(4</dev/shm/shared\_memory>, 8) = 0 <0.000026>

mmap(NULL, 8, PROT\_WRITE, MAP\_SHARED, 4</dev/shm/shared\_memory>, 0) = 0x7f1108912000 <0.000060>

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7f11088d7690) = 33191 <0.000304>

close(3</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt>) = 0 <0.000021>

futex(0x7f1108913000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANYstrace: Process 33191 attached

<unfinished ...>

[pid 33191] set\_robust\_list(0x7f11088d76a0, 24) = 0 <0.000021>

[pid 33191] dup2(3</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt>, 0</dev/pts/2>) = 0</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt> <0.000022>

[pid 33191] close(3</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt>) = 0 <0.000020>

[pid 33191] execve("child\_lab3", ["child"], 0x7ffdc7991bb8 /\* 62 vars \*/) = 0 <0.002102>

[pid 33191] brk(NULL) = 0x55c89ca65000 <0.000020>

[pid 33191] arch\_prctl(0x3001 /\* ARCH\_??? \*/, 0x7fffdd428f10) = -1 EINVAL (Недопустимый аргумент) <0.017080>

[pid 33191] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f6986ed8000 <0.000304>

[pid 33191] access("/etc/ld.so.preload", R\_OK) = -1 ENOENT (Нет такого файла или каталога) <0.000034>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3</etc/ld.so.cache> <0.000050>

[pid 33191] newfstatat(3</etc/ld.so.cache>, "", {st\_mode=S\_IFREG|0644, st\_size=112403, ...}, AT\_EMPTY\_PATH) = 0 <0.000038>

[pid 33191] mmap(NULL, 112403, PROT\_READ, MAP\_PRIVATE, 3</etc/ld.so.cache>, 0) = 0x7f6986ebc000 <0.000044>

[pid 33191] close(3</etc/ld.so.cache>) = 0 <0.000059>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libstdc++.so.6", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30> <0.000041>

[pid 33191] read(3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832 <0.000258>

[pid 33191] newfstatat(3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, "", {st\_mode=S\_IFREG|0644, st\_size=2260296, ...}, AT\_EMPTY\_PATH) = 0 <0.000044>

[pid 33191] mmap(NULL, 2275520, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0) = 0x7f6986c00000 <0.000045>

[pid 33191] mprotect(0x7f6986c9a000, 1576960, PROT\_NONE) = 0 <0.000062>

[pid 33191] mmap(0x7f6986c9a000, 1118208, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0x9a000) = 0x7f6986c9a000 <0.000043>

[pid 33191] mmap(0x7f6986dab000, 454656, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0x1ab000) = 0x7f6986dab000 <0.000039>

[pid 33191] mmap(0x7f6986e1b000, 57344, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>, 0x21a000) = 0x7f6986e1b000 <0.000048>

[pid 33191] mmap(0x7f6986e29000, 10432, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f6986e29000 <0.000046>

[pid 33191] close(3</usr/lib/x86\_64-linux-gnu/libstdc++.so.6.0.30>) = 0 <0.000024>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libgcc\_s.so.1", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1> <0.000032>

[pid 33191] read(3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832 <0.000025>

[pid 33191] newfstatat(3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, "", {st\_mode=S\_IFREG|0644, st\_size=125488, ...}, AT\_EMPTY\_PATH) = 0 <0.000029>

[pid 33191] mmap(NULL, 127720, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0) = 0x7f6986e9c000 <0.000087>

[pid 33191] mmap(0x7f6986e9f000, 94208, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0x3000) = 0x7f6986e9f000 <0.000064>

[pid 33191] mmap(0x7f6986eb6000, 16384, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0x1a000) = 0x7f6986eb6000 <0.000089>

[pid 33191] mmap(0x7f6986eba000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>, 0x1d000) = 0x7f6986eba000 <0.000037>

[pid 33191] close(3</usr/lib/x86\_64-linux-gnu/libgcc\_s.so.1>) = 0 <0.000023>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libc.so.6> <0.000037>

[pid 33191] read(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832 <0.000050>

[pid 33191] pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784 <0.000010>

[pid 33191] pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\4\0\0\0 \0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0"..., 48, 848) = 48 <0.000009>

[pid 33191] pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\302\211\332Pq\2439\235\350\223\322\257\201\326\243\f"..., 68, 896) = 68 <0.000044>

[pid 33191] newfstatat(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "", {st\_mode=S\_IFREG|0755, st\_size=2220400, ...}, AT\_EMPTY\_PATH) = 0 <0.000030>

[pid 33191] pread64(3</usr/lib/x86\_64-linux-gnu/libc.so.6>, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784 <0.000036>

[pid 33191] mmap(NULL, 2264656, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0) = 0x7f6986800000 <0.000033>

[pid 33191] mprotect(0x7f6986828000, 2023424, PROT\_NONE) = 0 <0.000028>

[pid 33191] mmap(0x7f6986828000, 1658880, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0x28000) = 0x7f6986828000 <0.000319>

[pid 33191] mmap(0x7f69869bd000, 360448, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0x1bd000) = 0x7f69869bd000 <0.000023>

[pid 33191] mmap(0x7f6986a16000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libc.so.6>, 0x215000) = 0x7f6986a16000 <0.000302>

[pid 33191] mmap(0x7f6986a1c000, 52816, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f6986a1c000 <0.000014>

[pid 33191] close(3</usr/lib/x86\_64-linux-gnu/libc.so.6>) = 0 <0.000010>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/lib/x86\_64-linux-gnu/libm.so.6", O\_RDONLY|O\_CLOEXEC) = 3</usr/lib/x86\_64-linux-gnu/libm.so.6> <0.000015>

[pid 33191] read(3</usr/lib/x86\_64-linux-gnu/libm.so.6>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832 <0.000011>

[pid 33191] newfstatat(3</usr/lib/x86\_64-linux-gnu/libm.so.6>, "", {st\_mode=S\_IFREG|0644, st\_size=940560, ...}, AT\_EMPTY\_PATH) = 0 <0.000018>

[pid 33191] mmap(NULL, 942344, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0) = 0x7f6986b19000 <0.000032>

[pid 33191] mmap(0x7f6986b27000, 507904, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0xe000) = 0x7f6986b27000 <0.000042>

[pid 33191] mmap(0x7f6986ba3000, 372736, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0x8a000) = 0x7f6986ba3000 <0.000032>

[pid 33191] mmap(0x7f6986bfe000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3</usr/lib/x86\_64-linux-gnu/libm.so.6>, 0xe4000) = 0x7f6986bfe000 <0.000029>

[pid 33191] close(3</usr/lib/x86\_64-linux-gnu/libm.so.6>) = 0 <0.000019>

[pid 33191] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f6986e9a000 <0.000028>

[pid 33191] arch\_prctl(ARCH\_SET\_FS, 0x7f6986e9b3c0) = 0 <0.000018>

[pid 33191] set\_tid\_address(0x7f6986e9b690) = 33191 <0.000018>

[pid 33191] set\_robust\_list(0x7f6986e9b6a0, 24) = 0 <0.000017>

[pid 33191] rseq(0x7f6986e9bd60, 0x20, 0, 0x53053053) = 0 <0.000018>

[pid 33191] mprotect(0x7f6986a16000, 16384, PROT\_READ) = 0 <0.000032>

[pid 33191] mprotect(0x7f6986bfe000, 4096, PROT\_READ) = 0 <0.000035>

[pid 33191] mprotect(0x7f6986eba000, 4096, PROT\_READ) = 0 <0.000029>

[pid 33191] mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f6986e98000 <0.000029>

[pid 33191] mprotect(0x7f6986e1b000, 45056, PROT\_READ) = 0 <0.000033>

[pid 33191] mprotect(0x55c89c69e000, 4096, PROT\_READ) = 0 <0.000066>

[pid 33191] mprotect(0x7f6986f12000, 8192, PROT\_READ) = 0 <0.000051>

[pid 33191] prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0 <0.000018>

[pid 33191] munmap(0x7f6986ebc000, 112403) = 0 <0.000088>

[pid 33191] getrandom("\x07\xa0\xad\x23\xc3\x72\x9f\x71", 8, GRND\_NONBLOCK) = 8 <0.000021>

[pid 33191] brk(NULL) = 0x55c89ca65000 <0.000060>

[pid 33191] brk(0x55c89ca86000) = 0x55c89ca86000 <0.000063>

[pid 33191] futex(0x7f6986e2977c, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0 <0.000019>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.shared\_memoryW", O\_RDWR|O\_NOFOLLOW) = 3</dev/shm/sem.shared\_memoryW> <0.000037>

[pid 33191] newfstatat(3</dev/shm/sem.shared\_memoryW>, "", {st\_mode=S\_IFREG|0600, st\_size=32, ...}, AT\_EMPTY\_PATH) = 0 <0.000035>

[pid 33191] mmap(NULL, 32, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 3</dev/shm/sem.shared\_memoryW>, 0) = 0x7f6986f11000 <0.000063>

[pid 33191] close(3</dev/shm/sem.shared\_memoryW>) = 0 <0.000028>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/sem.shared\_memoryR", O\_RDWR|O\_NOFOLLOW) = 3</dev/shm/sem.shared\_memoryR> <0.000033>

[pid 33191] newfstatat(3</dev/shm/sem.shared\_memoryR>, "", {st\_mode=S\_IFREG|0600, st\_size=32, ...}, AT\_EMPTY\_PATH) = 0 <0.000353>

[pid 33191] mmap(NULL, 32, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 3</dev/shm/sem.shared\_memoryR>, 0) = 0x7f6986ed7000 <0.000034>

[pid 33191] close(3</dev/shm/sem.shared\_memoryR>) = 0 <0.000022>

[pid 33191] openat(AT\_FDCWD</home/anna/labs\_3sem/os\_labs/build/lab3>, "/dev/shm/shared\_memory", O\_RDWR|O\_CREAT|O\_NOFOLLOW|O\_CLOEXEC, 0600) = 3</dev/shm/shared\_memory> <0.001982>

[pid 33191] ftruncate(3</dev/shm/shared\_memory>, 8) = 0 <0.000025>

[pid 33191] mmap(NULL, 8, PROT\_WRITE, MAP\_SHARED, 3</dev/shm/shared\_memory>, 0) = 0x7f6986ed6000 <0.000036>

[pid 33191] newfstatat(0</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt>, "", {st\_mode=S\_IFREG|0664, st\_size=28, ...}, AT\_EMPTY\_PATH) = 0 <0.000033>

[pid 33191] read(0</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt>, "10 1 5\n22 11 1\n53 53 1\n1 1 1", 4096) = 28 <0.000038>

[pid 33191] futex(0x7f6986ed7000, FUTEX\_WAKE, 1 <unfinished ...>

[pid 33152] <... futex resumed>) = 0 <0.038057>

[pid 33191] <... futex resumed>) = 1 <0.000053>

[pid 33152] newfstatat(1</dev/pts/2>, "", <unfinished ...>

[pid 33191] futex(0x7f6986f11000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>

[pid 33152] <... newfstatat resumed>{st\_mode=S\_IFCHR|0620, st\_rdev=makedev(0x88, 0x2), ...}, AT\_EMPTY\_PATH) = 0 <0.000039>

[pid 33152] write(1</dev/pts/2>, "2\n", 22

) = 2 <0.000017>

[pid 33152] futex(0x7f110894d000, FUTEX\_WAKE, 1) = 1 <0.000018>

[pid 33191] <... futex resumed>) = 0 <0.000185>

[pid 33152] futex(0x7f1108913000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>

[pid 33191] futex(0x7f6986ed7000, FUTEX\_WAKE, 1 <unfinished ...>

[pid 33152] <... futex resumed>) = -1 EAGAIN (Ресурс временно недоступен) <0.000036>

[pid 33191] <... futex resumed>) = 0 <0.000049>

[pid 33152] write(1</dev/pts/2>, "2\n", 2 <unfinished ...>

[pid 33191] futex(0x7f6986f11000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY2

<unfinished ...>

[pid 33152] <... write resumed>) = 2 <0.000037>

[pid 33152] futex(0x7f110894d000, FUTEX\_WAKE, 1) = 1 <0.000019>

[pid 33191] <... futex resumed>) = 0 <0.000109>

[pid 33152] futex(0x7f1108913000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>

[pid 33191] futex(0x7f6986ed7000, FUTEX\_WAKE, 1 <unfinished ...>

[pid 33152] <... futex resumed>) = -1 EAGAIN (Ресурс временно недоступен) <0.000042>

[pid 33191] <... futex resumed>) = 0 <0.000044>

[pid 33152] write(1</dev/pts/2>, "1\n", 2 <unfinished ...>

1

[pid 33191] read(0</home/anna/labs\_3sem/os\_labs/build/lab3/qqq.txt>, <unfinished ...>

[pid 33152] <... write resumed>) = 2 <0.000063>

[pid 33191] <... read resumed>"", 4096) = 0 <0.000041>

[pid 33152] futex(0x7f1108913000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>

[pid 33191] futex(0x7f6986ed7000, FUTEX\_WAKE, 1 <unfinished ...>

[pid 33152] <... futex resumed>) = -1 EAGAIN (Ресурс временно недоступен) <0.000042>

[pid 33191] <... futex resumed>) = 0 <0.000044>

[pid 33152] write(1</dev/pts/2>, "1\n", 2 <unfinished ...>

1

[pid 33191] futex(0x7f6986f11000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>

[pid 33152] <... write resumed>) = 2 <0.000052>

[pid 33152] futex(0x7f110894d000, FUTEX\_WAKE, 1) = 1 <0.000018>

[pid 33191] <... futex resumed>) = 0 <0.000141>

[pid 33152] futex(0x7f1108913000, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 0, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>

[pid 33191] futex(0x7f6986ed7000, FUTEX\_WAKE, 1 <unfinished ...>

[pid 33152] <... futex resumed>) = -1 EAGAIN (Ресурс временно недоступен) <0.000055>

[pid 33191] <... futex resumed>) = 0 <0.000058>

[pid 33152] wait4(-1, <unfinished ...>

[pid 33191] munmap(0x7f6986ed7000, 32) = 0 <0.000043>

[pid 33191] munmap(0x7f6986f11000, 32) = 0 <0.000034>

[pid 33191] munmap(0x7f6986ed6000, 8) = 0 <0.000023>

[pid 33191] exit\_group(0) = ?

[pid 33191] +++ exited with 0 +++

<... wait4 resumed>NULL, 0, NULL) = 33191 <0.000726>

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=33191, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

unlink("/dev/shm/shared\_memory") = 0 <0.000022>

unlink("/dev/shm/sem.shared\_memoryW") = 0 <0.000017>

unlink("/dev/shm/sem.shared\_memoryR") = 0 <0.000015>

munmap(0x7f1108913000, 32) = 0 <0.000074>

munmap(0x7f110894d000, 32) = 0 <0.000049>

munmap(0x7f1108912000, 8) = 0 <0.000021>

lseek(0</dev/pts/2>, -1, SEEK\_CUR) = -1 ESPIPE (Недопустимая операция смещения) <0.000018>

exit\_group(0) = ?

+++ exited with 0 +++

**Выводы**

В результате выполнения данной лабораторной работы получены навыки использования средства диагностики strace, с помощью которого можно отследить системные вызовы, выполняемые программой. Были улучшены навыки диагностики работы программного обеспечения.