Московский Авиационный Институт

(Национальный Исследовательский Университет)

Институт №8 “Компьютерные науки и прикладная математика”

Кафедра №806 “Вычислительная математика и программирование”

Лабораторная работа №6 по курсу

«Операционные системы»

Группа: М8О-215Б-23

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Оценка: _____

Дата: 16.07.25

Москва, 2025

Постановка задачи

Вариант -.

Цель работы: приобретение практических навыков диагностики работы программного обеспечения.

Задание: при выполнении лабораторных работ по курсу ОС необходимо продемонстрировать ключевые системные вызовы, которые в них используются и то, что их использование соответствует варианту ЛР. По итогам выполнения всех лабораторных работ отчет по данной ЛР должен содержать краткую сводку по исследованию написанных программ.

Общий метод и алгоритм решения

Strace — это мощная утилита командной строки для диагностики, отладки и анализа программ в операционных системах семейства Linux. Она позволяет отслеживать взаимодействие между процессами и ядром Linux, перехватывая и отображая системные вызовы, которые делает программа, а также сигналы, которые она получает. Системные вызовы являются основным механизмом, через который программы запрашивают у ядра операционной системы выполнение различных операций, таких как чтение файлов, сетевое взаимодействие или управление процессами.

Использование strace позволяет "заглянуть под капот" работающей программы, даже не имея доступа к её исходному коду. Это делает её незаменимым инструментом для системных администраторов и разработчиков при поиске причин сбоев, анализе производительности и изучении поведения приложений.

В основе работы strace лежит механизм ядра Linux под названием ptrace. Этот механизм позволяет одному процессу контролировать выполнение другого процесса, перехватывая его системные вызовы и сигналы. Когда вы запускаете программу с помощью strace или подключаетесь к уже запущенному процессу, strace "прикрепляется" к этому процессу. После этого, каждый раз, когда отслеживаемый процесс делает системный вызов, ядро приостанавливает его выполнение и уведомляет strace. Strace, в свою очередь, считывает информацию о системном вызове, его аргументах, выводит её в удобном для чтения виде, а затем позволяет процессу продолжить выполнение.

Основные функции и возможности strace:

- Утилита strace предоставляет широкий спектр возможностей для анализа поведения программ:
- Отслеживание системных вызовов: это основная функция strace. Она показывает, какие именно системные вызовы делает программа, с какими параметрами они вызываются и какие значения возвращают.
- Подключение к запущенным процессам: strace может быть "прикреплена" к уже работающему процессу по его идентификатору (PID), что очень удобно для анализа долгоживущих или зависших программ.
- Фильтрация вывода: sывод strace может быть очень объемным. Для удобства анализа предусмотрены опции для фильтрации по имени системного вызова, по пути к файлу, а также по типам системных вызовов (например, только связанные с файловыми операциями или сетевым взаимодействием).

- Статистика по системным вызовам: strace может собирать и отображать статистику по каждому системному вызову, включая количество вызовов, общее время выполнения и количество ошибок.
- Анализ дочерних процессов: с помощью специальной опции strace может отслеживать не только основной процесс, но и все создаваемые им дочерние процессы.
- Запись вывода в файл: для последующего детального анализа вывод strace можно перенаправить в файл.
- Отображение временных меток: strace позволяет добавлять к каждой строке вывода временные метки, что помогает анализировать производительность и выявлять "узкие места" в работе программы.
- Внедрение ошибок: strace позволяет имитировать ошибки системных вызовов. Это мощная функция для тестирования того, как программа будет вести себя в нештатных ситуациях.

Основные флаги:

- -p PID: один из самых полезных флагов, позволяющий подключиться к уже запущенному процессу по его идентификатору (PID) и начать его трассировку.
- -f: отслеживать не только родительский процесс, но и все создаваемые им дочерние процессы.
- -ff: при использовании с флагом -o создает отдельные файлы трассировки для каждого дочернего процесса.
    - -o file: перенаправляет вывод strace в указанный файл вместо стандартного потока ошибок. Это удобно для анализа больших объемов данных.

Фильтрация вывода:

-e trace=set: Мощный флаг для фильтрации выводимой информации. В качестве set можно указывать:

    - Группы вызовов: например, -e trace=file для отслеживания всех вызовов, связанных с файлами, или -e trace=network для сетевых вызовов.
    - -P /путь/к/файлу: показывать только те системные вызовы, которые работают с указанным файлом или путем.
    - Имя системного вызова: например, -e trace=open,read будет отслеживать только системные вызовы open и read

Форматирование вывода:

- -t: добавляет в начало каждой строки время суток.
- -tt: добавляет время суток с точностью до микросекунд.
- -ttt: выводит время в формате UNIX (количество секунд с начала эпохи) с микросекундами.
- -T: показывает время, затраченное на выполнение каждого системного вызова.
- -s strsize: устанавливает максимальный размер строки для вывода. По умолчанию он равен 32 символам, что часто приводит к обрезанию путей к файлам или содержимого буферов.
- -i: выводит указатель инструкции в момент совершения системного вызова.

Протокол работы программы

Лабораторная работа №1

root@2273a6f3c6af:/workspace/lab1/src# strace -f ./parent

execve("./parent", ["./parent"], 0xffffd4e144b8 /* 12 vars */) = 0

brk(NULL) = 0x1eb96000

mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffb003e000

faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffffb0037000

close(3) = 0

openat(AT_FDCWD, "/lib/aarch64-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\267\0\1\0\0\0000y\2\0\0\0\0"..., 832) = 832

newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffafe46000

mmap(0xffffafe50000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffafe50000

munmap(0xffffafe46000, 40960) = 0

munmap(0xffffaffff000, 20576) = 0

mprotect(0xffffaffd7000, 86016, PROT_NONE) = 0

mmap(0xffffaffec000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffffaffec000

mmap(0xffffafff2000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffffafff2000

close(3) = 0

set_tid_address(0xffffb003f050) = 38

set_robust_list(0xffffb003f060, 24) = 0

rseq(0xffffb003f6a0, 0x20, 0, 0xd428bc00) = 0

mprotect(0xffffaffec000, 16384, PROT_READ) = 0

mprotect(0x41f000, 4096, PROT_READ) = 0

mprotect(0xffffb0043000, 8192, PROT_READ) = 0

prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

munmap(0xffffb0037000, 25959) = 0

newfstatat(1, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

getrandom("\x98\xbf\xce\x16\x9b\x3b\x43\xe0", 8, GRND_NONBLOCK) = 8

brk(NULL) = 0x1eb96000

brk(0x1ebb7000) = 0x1ebb7000

newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

write(1, "\320\222\320\262\320\265\320\264\320\270\321\202\320\265 \320\270\320\274\321\217 \321\204\320\260\320\271\320\273\320\260"..., 54Введите имя файла для вывода:) = 54

read(0, result.txt

"result.txt\n", 1024) = 11

pipe2([3, 4], 0) = 0

clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLDstrace: Process 39 attached

, child_tidptr=0xffffb003f050) = 39

[pid 39] set_robust_list(0xffffb003f060, 24 <unfinished ...>

[pid 38] close(3 <unfinished ...>

[pid 39] <... set_robust_list resumed>) = 0

[pid 38] <... close resumed>) = 0

[pid 39] close(4 <unfinished ...>

[pid 38] write(1, "\320\222\320\262\320\265\320\264\320\270\321\202\320\265 \321\201\321\202\321\200\320\276\320\272\320\270 \321\201 \321"..., 107 <unfinished ...>

[pid 39] <... close resumed>) = 0

Введите строки с числами (float). Пустая строка — завершение.

[pid 38] <... write resumed>) = 107

[pid 39] dup3(3, 0, 0 <unfinished ...>

[pid 38] read(0, <unfinished ...>

[pid 39] <... dup3 resumed>) = 0

[pid 39] close(3) = 0

[pid 39] execve("./child", ["child", "result.txt"], 0xffffdacef928 /* 12 vars */) = 0

[pid 39] brk(NULL) = 0x74f3000

[pid 39] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8c093000

[pid 39] faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

[pid 39] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

[pid 39] newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

[pid 39] mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffff8c08c000

[pid 39] close(3) = 0

[pid 39] openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3

[pid 39] read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0000y\2\0\0\0\0"..., 832) = 832

[pid 39] newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

[pid 39] mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8be9b000

[pid 39] mmap(0xffff8bea0000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff8bea0000

[pid 39] munmap(0xffff8be9b000, 20480) = 0

[pid 39] munmap(0xffff8c04f000, 41056) = 0

[pid 39] mprotect(0xffff8c027000, 86016, PROT_NONE) = 0

[pid 39] mmap(0xffff8c03c000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffff8c03c000

[pid 39] mmap(0xffff8c042000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffff8c042000

[pid 39] close(3) = 0

[pid 39] set_tid_address(0xffff8c094050) = 39

[pid 39] set_robust_list(0xffff8c094060, 24) = 0

[pid 39] rseq(0xffff8c0946a0, 0x20, 0, 0xd428bc00) = 0

[pid 39] mprotect(0xffff8c03c000, 16384, PROT_READ) = 0

[pid 39] mprotect(0x41f000, 4096, PROT_READ) = 0

[pid 39] mprotect(0xffff8c098000, 8192, PROT_READ) = 0

[pid 39] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

[pid 39] munmap(0xffff8c08c000, 25959) = 0

[pid 39] getrandom("\x23\x09\xba\xfa\xf8\x1d\x16\xd1", 8, GRND_NONBLOCK) = 8

[pid 39] brk(NULL) = 0x74f3000

[pid 39] brk(0x7514000) = 0x7514000

[pid 39] openat(AT_FDCWD, "result.txt", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 3

[pid 39] newfstatat(0, "", {st_mode=S_IFIFO|0600, st_size=0, ...}, AT_EMPTY_PATH) = 0

[pid 39] read(0, 1.0 2.0

<unfinished ...>

[pid 38] <... read resumed>"1.0 2.0\n", 1024) = 8

[pid 38] write(4, "1.0 2.0\n", 8) = 8

[pid 39] <... read resumed>"1.0 2.0\n", 4096) = 8

[pid 38] read(0, <unfinished ...>

[pid 39] newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=0, ...}, AT_EMPTY_PATH) = 0

[pid 39] read(0, 2.0

<unfinished ...>

[pid 38] <... read resumed>"2.0\n", 1024) = 4

[pid 38] write(4, "2.0\n", 4) = 4

[pid 39] <... read resumed>"2.0\n", 4096) = 4

[pid 38] read(0, <unfinished ...>

[pid 39] read(0,

<unfinished ...>

[pid 38] <... read resumed>"\n", 1024) = 1

[pid 38] close(4) = 0

[pid 39] <... read resumed>"", 4096) = 0

[pid 38] wait4(-1, <unfinished ...>

[pid 39] write(3, "3.000000\n2.000000\n", 18) = 18

[pid 39] close(3) = 0

[pid 39] exit_group(0) = ?

[pid 39] +++ exited with 0 +++

<... wait4 resumed>NULL, 0, NULL) = 39

--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=39, si_uid=0, si_status=0, si_utime=0, si_stime=0} ---

exit_group(0) = ?

+++ exited with 0 +++

Лабораторная работа №2

204 execve("./main", ["./main", "200", "200", "5", "1", "2"], 0xfffff3ec3410 /* 12 vars */) = 0

204 brk(NULL) = 0x6b35000

204 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffa8a25000

204 faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

204 openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

204 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

204 mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffffa8a1e000

204 close(3) = 0

204 openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3

204 read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0000y\2\0\0\0\0\0"..., 832) = 832

204 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

204 mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffa882d000

204 mmap(0xffffa8830000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffa8830000

204 munmap(0xffffa882d000, 12288) = 0

204 munmap(0xffffa89df000, 49248) = 0

204 mprotect(0xffffa89b7000, 86016, PROT_NONE) = 0

204 mmap(0xffffa89cc000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffffa89cc000

204 mmap(0xffffa89d2000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffffa89d2000

204 close(3) = 0

204 set_tid_address(0xffffa8a26050) = 204

204 set_robust_list(0xffffa8a26060, 24) = 0

204 rseq(0xffffa8a266a0, 0x20, 0, 0xd428bc00) = 0

204 mprotect(0xffffa89cc000, 16384, PROT_READ) = 0

204 mprotect(0x41f000, 4096, PROT_READ) = 0

204 mprotect(0xffffa8a2a000, 8192, PROT_READ) = 0

204 prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

204 munmap(0xffffa8a1e000, 25959) = 0

```
204   getrandom("\x78\x11\xcf\x13\x63\x2f\x5d\xaa", 8, GRND_NONBLOCK) = 8

204   brk(NULL)                         = 0x6b35000

204   brk(0x6b56000)                    = 0x6b56000

204   mmap(NULL, 163840, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffa8808000

204   mmap(NULL, 163840, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffa87e0000

204   rt_sigaction(SIGRT_1, {sa_handler=0xffffa88ac0a0, sa_mask=[],
sa_flags=SA_ONSTACK|SA_RESTART|SA_SIGINFO}, NULL, 8) = 0

204   rt_sigprocmask(SIG_UNBLOCK, [RTMIN RT_1], NULL, 8) = 0

204   mmap(NULL, 8454144, PROT_NONE,
MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) = 0xffffa7e00000

204   mprotect(0xffffa7e10000, 8388608, PROT_READ|PROT_WRITE) = 0

204   rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0

204   clone(child_stack=0xffffa860ea60,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SY
SVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID,
parent_tid=[205], tls=0xffffa860f8e0, child_tidptr=0xffffa860f270) = 205

204   rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0

205   rseq(0xffffa860f8c0, 0x20, 0, 0xd428bc00 <unfinished ...>

204   mmap(NULL, 8454144, PROT_NONE,
MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) = 0xffffa7400000

205   <... rseq resumed>)               = 0

204   mprotect(0xffffa7410000, 8388608, PROT_READ|PROT_WRITE <unfinished ...>

205   set_robust_list(0xffffa860f280, 24 <unfinished ...>

204   <... mprotect resumed>)           = 0

205   <... set_robust_list resumed>)    = 0

204   rt_sigprocmask(SIG_BLOCK, ~[],  <unfinished ...>

205   rt_sigprocmask(SIG_SETMASK, [],  <unfinished ...>

204   <... rt_sigprocmask resumed>[], 8) = 0

205   <... rt_sigprocmask resumed>NULL, 8) = 0

204   clone(child_stack=0xffffa7c0ea60,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SY
SVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID,
parent_tid=[206], tls=0xffffa7c0f8e0, child_tidptr=0xffffa7c0f270) = 206

204   rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0
```

204 futex(0xffffa860f270, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 205, NULL, FUTEX_BITSET_MATCH_ANY <unfinished ...>

206 rseq(0xffffa7c0f8c0, 0x20, 0, 0xd428bc00) = 0

206 set_robust_list(0xffffa7c0f280, 24) = 0

206 rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0

205 rt_sigprocmask(SIG_BLOCK, ~[RT_1], NULL, 8) = 0

205 madvise(0xffffa7e00000, 8314880, MADV_DONTNEED) = 0

205 exit(0) = ?

204 <... futex resumed>) = 0

205 +++ exited with 0 +++

204 futex(0xffffa7c0f270, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 206, NULL, FUTEX_BITSET_MATCH_ANY <unfinished ...>

206 rt_sigprocmask(SIG_BLOCK, ~[RT_1], NULL, 8) = 0

206 madvise(0xffffa7400000, 8314880, MADV_DONTNEED) = 0

206 exit(0) = ?

204 <... futex resumed>) = 0

204 newfstatat(1, "", <unfinished ...>

206 +++ exited with 0 +++

204 <... newfstatat resumed>{st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

204 write(1, "Time taken: 6.772 ms\n", 21) = 21

204 munmap(0xffffa8808000, 163840) = 0

204 munmap(0xffffa87e0000, 163840) = 0

204 exit_group(0) = ?

204 +++ exited with 0 +++

Лабораторная работа №3

execve("./parent", ["./parent"], 0xffffd75a0228 /* 12 vars */) = 0

brk(NULL) = 0x35959000

mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffa36f0000

faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffffa36e9000

close(3) = 0

openat(AT_FDCWD, "/lib/aarch64-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\267\0\1\0\0\0000y\2\0\0\0\0\0"..., 832) = 832

newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffa34f8000

mmap(0xffffa3500000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffa3500000

munmap(0xffffa34f8000, 32768) = 0

munmap(0xffffa36af000, 28768) = 0

mprotect(0xffffa3687000, 86016, PROT_NONE) = 0

mmap(0xffffa369c000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffffa369c000

mmap(0xffffa36a2000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffffa36a2000

close(3) = 0

set_tid_address(0xffffa36f1050) = 31

set_robust_list(0xffffa36f1060, 24) = 0

rseq(0xffffa36f16a0, 0x20, 0, 0xd428bc00) = 0

mprotect(0xffffa369c000, 16384, PROT_READ) = 0

mprotect(0x41f000, 4096, PROT_READ) = 0

mprotect(0xffffa36f5000, 8192, PROT_READ) = 0

prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

munmap(0xffffa36e9000, 25959) = 0

newfstatat(1, "", {st_mode=S_IFREG|0644, st_size=1819, ...}, AT_EMPTY_PATH) = 0

getrandom("\xac\x55\x86\x13\x2c\x2f\x48\x5a", 8, GRND_NONBLOCK) = 8

brk(NULL) = 0x35959000

brk(0x3597a000) = 0x3597a000

newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

read(0, "result.txt\n", 1024) = 11

openat(AT_FDCWD, "/dev/shm/my_shared_memory", O_RDWR|O_CREAT|O_NOFOLLOW|O_CLOEXEC, 0666) = 3

ftruncate(3, 1024) = 0

mmap(NULL, 1024, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0) = 0xffffa36ef000

close(3) = 0

unlinkat(AT_FDCWD, "/dev/shm/sem.my_sem_write", 0) = -1 ENOENT (No such file or directory)

unlinkat(AT_FDCWD, "/dev/shm/sem.my_sem_read", 0) = -1 ENOENT (No such file or directory)

openat(AT_FDCWD, "/dev/shm/sem.my_sem_write", O_RDWR|O_NOFOLLOW) = -1 ENOENT (No such file or directory)

getrandom("\x54\x94\xab\x3e\x1a\x5f\x51\x80", 8, GRND_NONBLOCK) = 8

newfstatat(AT_FDCWD, "/dev/shm/sem.q6oG8C", 0xffffdf02c638, AT_SYMLINK_NOFOLLOW) = -1 ENOENT (No such file or directory)

openat(AT_FDCWD, "/dev/shm/sem.q6oG8C", O_RDWR|O_CREAT|O_EXCL, 0666) = 3

write(3, "\1\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\0", 32) = 32

mmap(NULL, 32, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0) = 0xffffa36ee000

linkat(AT_FDCWD, "/dev/shm/sem.q6oG8C", AT_FDCWD, "/dev/shm/sem.my_sem_write", 0) = 0

newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=32, ...}, AT_EMPTY_PATH) = 0

unlinkat(AT_FDCWD, "/dev/shm/sem.q6oG8C", 0) = 0

close(3) = 0

openat(AT_FDCWD, "/dev/shm/sem.my_sem_read", O_RDWR|O_NOFOLLOW) = -1 ENOENT (No such file or directory)

getrandom("\x60\x79\xd4\x93\x9f\xa9\xc1\x98", 8, GRND_NONBLOCK) = 8

newfstatat(AT_FDCWD, "/dev/shm/sem.ofnd2n", 0xffffdf02c638, AT_SYMLINK_NOFOLLOW) = -1 ENOENT (No such file or directory)

openat(AT_FDCWD, "/dev/shm/sem.ofnd2n", O_RDWR|O_CREAT|O_EXCL, 0666) = 3

write(3, "\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\0", 32) = 32

mmap(NULL, 32, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0) = 0xffffa36ed000

linkat(AT_FDCWD, "/dev/shm/sem.ofnd2n", AT_FDCWD, "/dev/shm/sem.my_sem_read", 0) = 0

newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=32, ...}, AT_EMPTY_PATH) = 0

unlinkat(AT_FDCWD, "/dev/shm/sem.ofnd2n", 0) = 0

close(3) = 0

clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD, child_tidptr=0xffffa36f1050) = 32

strace: Process 32 attached

[pid 31] read(0, <unfinished ...>

[pid 32] set_robust_list(0xffffa36f1060, 24) = 0

[pid 32] execve("./child", ["child", "result.txt"], 0xffffdf02d068 /* 12 vars */) = 0

[pid 32] brk(NULL) = 0x294dd000

[pid 32] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff9933d000

[pid 32] faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

[pid 32] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

[pid 32] newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

[pid 32] mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffff99336000

[pid 32] close(3) = 0

[pid 32] openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3

[pid 32] read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0000y\2\0\0\0\0"..., 832) = 832

[pid 32] newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

[pid 32] mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff99145000

[pid 32] mmap(0xffff99150000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff99150000

[pid 32] munmap(0xffff99145000, 45056) = 0

[pid 32] munmap(0xffff992ff000, 16480) = 0

[pid 32] mprotect(0xffff992d7000, 86016, PROT_NONE) = 0

[pid 32] mmap(0xffff992ec000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffff992ec000

[pid 32] mmap(0xffff992f2000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffff992f2000

[pid 32] close(3) = 0

[pid 32] set_tid_address(0xffff9933e050) = 32

[pid 32] set_robust_list(0xffff9933e060, 24) = 0

[pid 32] rseq(0xffff9933e6a0, 0x20, 0, 0xd428bc00) = 0

[pid 32] mprotect(0xffff992ec000, 16384, PROT_READ) = 0

[pid 32] mprotect(0x41f000, 4096, PROT_READ) = 0

[pid 32] mprotect(0xffff99342000, 8192, PROT_READ) = 0

[pid 32] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

[pid 32] munmap(0xffff99336000, 25959) = 0

[pid 32] getrandom("\xf7\x50\xe0\x1a\x1f\x50\x15\x5e", 8, GRND_NONBLOCK) = 8

[pid 32] brk(NULL) = 0x294dd000

[pid 32] brk(0x294fe000) = 0x294fe000

[pid 32] openat(AT_FDCWD, "result.txt", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 3

[pid 32] openat(AT_FDCWD, "/dev/shm/my_shared_memory", O_RDWR|O_NOFOLLOW|O_CLOEXEC) = 4

[pid 32] mmap(NULL, 1024, PROT_READ|PROT_WRITE, MAP_SHARED, 4, 0) = 0xffff9933c000

[pid 32] close(4) = 0

[pid 32] openat(AT_FDCWD, "/dev/shm/sem.my_sem_write", O_RDWR|O_NOFOLLOW) = 4

[pid 32] newfstatat(4, "", {st_mode=S_IFREG|0644, st_size=32, ...}, AT_EMPTY_PATH) = 0

[pid 32] mmap(NULL, 32, PROT_READ|PROT_WRITE, MAP_SHARED, 4, 0) = 0xffff9933b000

[pid 32] close(4) = 0

[pid 32] openat(AT_FDCWD, "/dev/shm/sem.my_sem_read", O_RDWR|O_NOFOLLOW) = 4

[pid 32] newfstatat(4, "", {st_mode=S_IFREG|0644, st_size=32, ...}, AT_EMPTY_PATH) = 0

[pid 32] mmap(NULL, 32, PROT_READ|PROT_WRITE, MAP_SHARED, 4, 0) = 0xffff9933a000

[pid 32] close(4) = 0

[pid 32] futex(0xffff9933a000, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY <unfinished ...>

[pid 31] <... read resumed>"1.0 2.0\n", 1024) = 8

[pid 31] futex(0xffffa36ed000, FUTEX_WAKE, 1) = 1

[pid 32] <... futex resumed>)   = 0

[pid 31] read(0, <unfinished ...>

[pid 32] newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=0, ...}, AT_EMPTY_PATH) = 0

[pid 32] write(3, "3.000000\n", 9) = 9

[pid 32] futex(0xffff9933a000, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY <unfinished ...>

[pid 31] <... read resumed>"0.0\n", 1024) = 4

[pid 31] futex(0xffffa36ed000, FUTEX_WAKE, 1) = 1

[pid 31] read(0, <unfinished ...>

[pid 32] <... futex resumed>)   = 0

[pid 32] write(3, "0.000000\n", 9) = 9

[pid 32] futex(0xffff9933a000, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY <unfinished ...>

[pid 31] <... read resumed>"\n", 1024) = 1

[pid 31] futex(0xffffa36ed000, FUTEX_WAKE, 1) = 1

[pid 31] wait4(-1, <unfinished ...>

[pid 32] <... futex resumed>)   = 0

[pid 32] munmap(0xffff9933b000, 32) = 0

[pid 32] munmap(0xffff9933a000, 32) = 0

[pid 32] close(3)   = 0

[pid 32] munmap(0xffff9933c000, 1024) = 0

[pid 32] exit_group(0)   = ?

[pid 32] +++ exited with 0 +++

<... wait4 resumed>NULL, 0, NULL)   = 32

--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=32, si_uid=0, si_status=0, si_utime=0, si_stime=0} ---

munmap(0xffffa36ee000, 32)   = 0

munmap(0xffffa36ed000, 32)   = 0

unlinkat(AT_FDCWD, "/dev/shm/sem.my_sem_write", 0) = 0

unlinkat(AT_FDCWD, "/dev/shm/sem.my_sem_read", 0) = 0

munmap(0xffffa36ef000, 1024)   = 0

unlinkat(AT_FDCWD, "/dev/shm/my_shared_memory", 0) = 0

write(1, "\320\222\320\262\320\265\320\264\320\270\321\202\320\265 \320\270\320\274\321\217 \321\204\320\260\320\271\320\273\320\260"..., 161Введите имя файла для вывода: Введите строки с числами (float). Пустая строка — завершение.

) = 161

exit_group(0) = ?

+++ exited with 0 +++

Лабораторная работа №4

strace_program1.txt

211 execve("./program1", ["./program1"], 0xffffced24f98 /* 13 vars */) = 0

211 brk(NULL) = 0x19e3e000

211 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e640000

211 faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64/atomics", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls/atomics", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/aarch64/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/aarch64/atomics", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/aarch64/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/aarch64", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/atomics", 0xffffc2c6bad0, 0) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/workspace/lab4/src/build/libimpl1.so", O_RDONLY|O_CLOEXEC) = 3

211 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

211 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=69536, ...}, AT_EMPTY_PATH) = 0

211 mmap(NULL, 196656, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e5d6000

211 mmap(0xffff8e5e0000, 131120, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff8e5e0000

211 munmap(0xffff8e5d6000, 40960) = 0

211 munmap(0xffff8e601000, 20528) = 0

211 mprotect(0xffff8e5e1000, 122880, PROT_NONE) = 0

211 mmap(0xffff8e5ff000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xf000) = 0xffff8e5ff000

211 close(3) = 0

211 openat(AT_FDCWD, "/workspace/lab4/src/build/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

211 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

211 mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffff8e639000

211 close(3) = 0

211 openat(AT_FDCWD, "/usr/local/lib64/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = 3

211 read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

211 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2436000, ...}, AT_EMPTY_PATH) = 0

211 mmap(NULL, 2583688, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e200000

211 mmap(0xffff8e200000, 2518152, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff8e200000

211 munmap(0xffff8e467000, 64648) = 0

211 mprotect(0xffff8e445000, 65536, PROT_NONE) = 0

211 mmap(0xffff8e455000, 57344, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x245000) = 0xffff8e455000

211 mmap(0xffff8e463000, 15496, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffff8e463000

211 close(3) = 0

211 openat(AT_FDCWD, "/workspace/lab4/src/build/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libm.so.6", O_RDONLY|O_CLOEXEC) = 3

211 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

211 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=591960, ...}, AT_EMPTY_PATH) = 0

211 mmap(NULL, 655472, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e53f000

211 mmap(0xffff8e540000, 589936, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff8e540000

211 munmap(0xffff8e53f000, 4096) = 0

211 munmap(0xffff8e5d1000, 57456) = 0

211 mprotect(0xffff8e5c0000, 61440, PROT_NONE) = 0

211 mmap(0xffff8e5cf000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x8f000) = 0xffff8e5cf000

211 close(3) = 0

211 openat(AT_FDCWD, "/workspace/lab4/src/build/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/usr/local/lib64/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = 3

211 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

211 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=726416, ...}, AT_EMPTY_PATH) = 0

211 mmap(NULL, 263104, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e4ff000

211 mmap(0xffff8e500000, 197568, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff8e500000

211 munmap(0xffff8e4ff000, 4096) = 0

211 munmap(0xffff8e531000, 58304) = 0

211 mprotect(0xffff8e51f000, 65536, PROT_NONE) = 0

211 mmap(0xffff8e52f000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1f000) = 0xffff8e52f000

211 close(3) = 0

211 openat(AT_FDCWD, "/workspace/lab4/src/build/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/aarch64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/tls/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/aarch64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "build/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

211 openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3

211 read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0000y\2\0\0\0\0\0"..., 832) = 832

211 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

211 mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e041000

211 mmap(0xffff8e050000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffff8e050000

211 munmap(0xffff8e041000, 61440) = 0

211 munmap(0xffff8e1ff000, 96) = 0

211 mprotect(0xffff8e1d7000, 86016, PROT_NONE) = 0

211 mmap(0xffff8e1ec000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffff8e1ec000

211 mmap(0xffff8e1f2000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffff8e1f2000

211 close(3) = 0

211 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e637000

211 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e635000

211 set_tid_address(0xffff8e6350f0) = 211

211 set_robust_list(0xffff8e635100, 24) = 0

211 rseq(0xffff8e635740, 0x20, 0, 0xd428bc00) = 0

211 mprotect(0xffff8e1ec000, 16384, PROT_READ) = 0

211 mprotect(0xffff8e52f000, 4096, PROT_READ) = 0

211 mprotect(0xffff8e5cf000, 4096, PROT_READ) = 0

211 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffff8e633000

211 mprotect(0xffff8e455000, 45056, PROT_READ) = 0

211 mprotect(0xffff8e5ff000, 4096, PROT_READ) = 0

211 mprotect(0x41f000, 4096, PROT_READ) = 0

211 mprotect(0xffff8e645000, 8192, PROT_READ) = 0

211 prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

211 munmap(0xffff8e639000, 25959) = 0

211 futex(0xffff8e4637ec, FUTEX_WAKE_PRIVATE, 2147483647) = 0

211 getrandom("\x06\x68\xec\x53\x75\xca\xf1\x8b", 8, GRND_NONBLOCK) = 8

211 brk(NULL) = 0x19e3e000

211 brk(0x19e5f000) = 0x19e5f000

211 newfstatat(1, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

211 write(1, "\320\237\321\200\320\276\320\263\321\200\320\260\320\274\320\274\320\260 1 (\320\241\321\202\320\260\321\202\320\270"..., 95) = 95

211 write(1, "\320\230\321\201\320\277\320\276\320\273\321\214\320\267\320\276\320\262\320\260\320\275\320\270\320\265 \320\277\321\200\320"..., 47) = 47

211 write(1, "1 <A> <B> - \320\237\320\276\320\264\321\201\321\207\321\221\321\202 \320\277\321"..., 65) = 65

211 write(1, "2 <X> - \320\222\321\213\321\207\320\270\321\201\320\273\320\270\321\202\321\214"..., 59) = 59

211 write(1, "exit - \320\222\321\213\321\205\320\276\320\264\n", 25) = 25

211 newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

211 read(0, "1 10 100\n", 1024) = 9

211 write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202: 21\n", 23) = 23

211 read(0, "2 10\n", 1024) = 5

211 write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202: 2.59374\n", 28) = 28

211 read(0, "exit\n", 1024) = 5

211 lseek(0, -5, SEEK_CUR) = -1 ESPIPE (Illegal seek)

211 exit_group(0) = ?

211 +++ exited with 0 +++

strace_program2.txt

216 execve("./program2", ["./program2"], 0xffffed959a28 /* 13 vars */) = 0

216 brk(NULL) = 0x40337000

216 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffface3b000

216 faccessat(AT_FDCWD, "/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64/atomics", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls/aarch64", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls/atomics", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/tls/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/tls", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/aarch64/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/aarch64/atomics", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/aarch64/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/aarch64", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/atomics/libimpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 newfstatat(AT_FDCWD, "/workspace/lab4/src/build/atomics", 0xffffe49c2ad0, 0) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/workspace/lab4/src/build/libimpl1.so", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=69536, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 196656, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffacdd1000

216 mmap(0xffffacde0000, 131120, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffacde0000

216 munmap(0xffffacdd1000, 61440) = 0

216 munmap(0xffffface01000, 48) = 0

216 mprotect(0xffffacde1000, 122880, PROT_NONE) = 0

216 mmap(0xffffacdff000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xf000) = 0xffffacdff000

216 close(3) = 0

216 openat(AT_FDCWD, "/workspace/lab4/src/build/libimpl2.so", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=74400, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 197032, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffacdaf000

216 mmap(0xffffacdb0000, 131496, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffacdb0000

216 munmap(0xffffacdaf000, 4096) = 0

216 munmap(0xffffacdd1000, 57768) = 0

216 mprotect(0xffffacdb4000, 110592, PROT_NONE) = 0

216 mmap(0xffffacdcf000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xf000) = 0xffffacdcf000

216 close(3) = 0

216 openat(AT_FDCWD, "/workspace/lab4/src/build/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/atomics/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3

216 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=25959, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 25959, PROT_READ, MAP_PRIVATE, 3, 0) = 0xffffface34000

216 close(3) = 0

216 openat(AT_FDCWD, "/usr/local/lib64/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2436000, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 2583688, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffaca00000

216 mmap(0xffffaca00000, 2518152, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffaca00000

216 munmap(0xffffacc67000, 64648) = 0

216 mprotect(0xffffacc45000, 65536, PROT_NONE) = 0

216 mmap(0xffffacc55000, 57344, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x245000) = 0xffffacc55000

216 mmap(0xffffacc63000, 15496, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffffacc63000

216 close(3) = 0

216 openat(AT_FDCWD, "/workspace/lab4/src/build/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/atomics/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/libm.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libm.so.6", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=591960, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 655472, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffacd0f000

216 mmap(0xffffacd10000, 589936, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffacd10000

216 munmap(0xffffacd0f000, 4096) = 0

216 munmap(0xffffacda1000, 57456) = 0

216 mprotect(0xffffacd90000, 61440, PROT_NONE) = 0

216 mmap(0xffffacd9f000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x8f000) = 0xffffacd9f000

216 close(3) = 0

216 openat(AT_FDCWD, "/workspace/lab4/src/build/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/atomics/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/usr/local/lib64/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=726416, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 263104, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffacccf000

216 mmap(0xffffaccd0000, 197568, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffaccd0000

216 munmap(0xffffacccf000, 4096) = 0

216 munmap(0xffffacd01000, 58304) = 0

216 mprotect(0xffffaccef000, 65536, PROT_NONE) = 0

216 mmap(0xffffaccff000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1f000) = 0xffffaccff000

216 close(3) = 0

216 openat(AT_FDCWD, "/workspace/lab4/src/build/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/aarch64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/tls/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/aarch64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/atomics/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "build/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

216 openat(AT_FDCWD, "/lib/aarch64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0000y\2\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=1651408, ...}, AT_EMPTY_PATH) = 0

216 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffface32000

216 mmap(NULL, 1826912, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffac841000

216 mmap(0xffffac850000, 1761376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0) = 0xffffac850000

216 munmap(0xffffac841000, 61440) = 0

216 munmap(0xffffac9ff000, 96) = 0

216 mprotect(0xffffac9d7000, 86016, PROT_NONE) = 0

216 mmap(0xffffac9ec000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18c000) = 0xffffac9ec000

216 mmap(0xffffac9f2000, 49248, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xffffac9f2000

216 close(3) = 0

216 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffface30000

216 set_tid_address(0xffffface300f0) = 216

216 set_robust_list(0xffffface30100, 24) = 0

216 rseq(0xffffface30740, 0x20, 0, 0xd428bc00) = 0

216 mprotect(0xffffac9ec000, 16384, PROT_READ) = 0

216 mprotect(0xffffaccff000, 4096, PROT_READ) = 0

216 mprotect(0xffffacd9f000, 4096, PROT_READ) = 0

216 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xffffface2e000

216 mprotect(0xffffacc55000, 45056, PROT_READ) = 0

216 mprotect(0xffffacdcf000, 4096, PROT_READ) = 0

216 mprotect(0xffffacdff000, 4096, PROT_READ) = 0

216 mprotect(0x41f000, 4096, PROT_READ) = 0

216 mprotect(0xffffface40000, 8192, PROT_READ) = 0

216 prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0

216 munmap(0xffffface34000, 25959) = 0

216 futex(0xffffacc637ec, FUTEX_WAKE_PRIVATE, 2147483647) = 0

216 getrandom("\x7b\x84\xa6\xee\xfb\x08\x25\x13", 8, GRND_NONBLOCK) = 8

216 brk(NULL) = 0x40337000

216 brk(0x40358000) = 0x40358000

216 openat(AT_FDCWD, "./libimpl1.so", O_RDONLY|O_CLOEXEC) = 3

216 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216 newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=69536, ...}, AT_EMPTY_PATH) = 0

216 close(3) = 0

216 newfstatat(1, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}, AT_EMPTY_PATH) = 0

216 write(1, "\320\237\321\200\320\276\320\263\321\200\320\260\320\274\320\274\320\260 2 (\320\224\320\270\320\275\320\260\320\274"..., 105) = 105

```
216   write(1,
"\320\230\321\201\320\277\320\276\320\273\321\214\320\267\320\276\320\262\320\260\320\275\320\2
70\320\265 \320\277\321\200\320"..., 47) = 47

216   write(1, "0          -
\320\237\320\265\321\200\320\265\320\272\320\273\321\216\321\207\320\265"..., 60) = 60

216   write(1, "1 <A> <B>   - \320\237\320\276\320\264\321\201\321\207\321\221\321\202
\320\277\321"..., 65) = 65

216   write(1, "2 <X>       -
\320\222\321\213\321\207\320\270\321\201\320\273\320\270\321\202\321\214"..., 59) = 59

216   write(1, "exit        - \320\222\321\213\321\205\320\276\320\264\n", 25) = 25

216   newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0

216   read(0, "1 10 100\n", 1024)       = 9

216   write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202:
21\n", 23) = 23

216   read(0, "2 10\n", 1024)           = 5

216   write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202:
2.59374\n", 28) = 28

216   read(0, "0\n", 1024)              = 2

216   openat(AT_FDCWD, "./libimpl2.so", O_RDONLY|O_CLOEXEC) = 3

216   read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0\267\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832) = 832

216   newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=74400, ...}, AT_EMPTY_PATH) = 0

216   close(3)                          = 0

216   write(1, "\320\237\320\265\321\200\320\265\321\210\321\221\320\273 \320\272
\321\200\320\265\320\260\320\273\320\270\320\267\320\260"..., 41) = 41

216   read(0, "1 10 100\n", 1024)       = 9

216   write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202:
21\n", 23) = 23

216   read(0, "2 10\n", 1024)           = 5

216   write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202:
2.71828\n", 28) = 28

216   read(0, "exit\n", 1024)           = 5

216   lseek(0, -5, SEEK_CUR)            = -1 ESPIPE (Illegal seek)

216   exit_group(0)                     = ?

216   +++ exited with 0 +++
```

Вывод

В результате выполнения лабораторной работы были освоены практические навыки диагностики программного обеспечения с использованием утилиты strace в среде Linux. Применение данной утилиты позволило наглядно продемонстрировать ключевые системные вызовы, используемые программой, и подтвердить, что их использование соответствует логике работы, описанной в варианте лабораторной работы.