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Институт №8 “Компьютерные науки и прикладная математика”

Кафедра №806 “Вычислительная математика и
программирование”

**Лабораторная работа №8 по курсу
«Операционные системы»**

Группа: М8О-215Б-23

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Постановка задачи

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

Для демонстрации системных вызовов будем использовать утилиту `strace` в операционной системе `linux`.

`Strace` — это диагностическая, отладочная и обучающая утилита пользовательского пространства для `Linux`. Она используется для мониторинга и вмешательства во взаимодействия между процессами и ядром `Linux`, включая системные вызовы, доставку сигналов и изменение состояния процесса. Работа `strace` возможна благодаря функции ядра, известной как `ptrace`. Наиболее часто он используется для запуска программы и вывода списка системных вызовов, которые она выполняет. Это особенно полезно, когда программа часто аварийно завершает работу или ведет себя непредсказуемо; например, `strace` может показать, что программа пытается получить доступ к несуществующему или недоступному файлу.

Еще одно полезное применение `strace` — это использование флага `-p` для присоединения к уже запущенному процессу. Это может быть полезно, если процесс перестал отвечать, и `strace` может помочь определить, что процесс заблокирован при попытке установить сетевое соединение.

Кроме того, `strace` предоставляет множество других возможностей:

- **Фильтрация системных вызовов:** Вы можете указать, какие системные вызовы следует отслеживать, используя параметр `-e trace=`. Это можно сделать по имени (например, `clone`, `fork`, `vfork`), с использованием предопределенных групп (например, `%ipc` или `%file`) или с помощью регулярных выражений (начиная с версии `strace 4.17`, например, `-e trace=/clock_.*`).
- **Трассировка путей:** Вы можете указать список путей для трассировки, используя параметр `-P` (например, `-P /etc/ld.so.cache`).
- **Выгрузка ввода-вывода:** Вы можете указать список файловых дескрипторов для выгрузки ввода-вывода, используя параметры `-e read=` и `-e write=`.
- **Подсчет времени выполнения:** `Strace` позволяет подсчитывать время выполнения системных вызовов и их количество, используя параметры `-T`, `-s`, `-C` и `-w`. Параметр `-U` позволяет выводить дополнительную информацию, такую как минимальное и максимальное время выполнения системного вызова.
- **Временные метки:** `Strace` может печатать относительные или абсолютные временные метки, используя опции `-t` и `-r`.
- **Изменение системных вызовов:** `Strace` позволяет изменять выполняемые системные вызовы, включая изменение возвращаемого значения и кода ошибки, внедрение сигналов, задержек и изменение данных, на которые указывают аргументы системных вызовов. Это достигается с помощью опции `-e inject=syscall specification:tampering specification:retval=:error=:signal=:delay_enter=:delay_exit=:poke_enter=:poke_exit=`.
- **Информация о дескрипторах файлов:** `Strace` может извлекать информацию о дескрипторах файлов, включая сокеты, используя опцию `-y`. Опция `-yy` предоставляет дополнительную информацию, такую как адреса конечных точек для сокетов, пути и основные/дополнительные номера устройств для файлов.
- **Трассировка стека:** `Strace` может печатать трассировки стека, включая разборку символов (начиная с версии `strace 4.21`, используя опцию `-k`).

`Strace` также поддерживает множество других опций и параметров, которые делают его мощным инструментом

Лабораторная работа №1

Strace:

```
strace -f ./parent
execve("./parent", ["/parent"], 0x7fffe49d7ba8 /* 19 vars */) = 0
brk(NULL)                               = 0x7fffd5911000
arch_prctl(0x3001 /* ARCH_??? */, 0x7fffdcf3240) = -1 EINVAL (Invalid argument)
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7ffd30090000
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
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7ffd3004b000
close(3)                                 = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF2\1\1\3\0\0\0\0\0\0\0\3\0\0\0\1\0\0\0P\237\2\0\0\0\0"..., 832) = 832
pread64(3, "\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
pread64(3, "\4\0\0\0\0\0\0\0\5\0\0\0GNU\02\0\0\0300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0302\211\332Pq\2439\235\350\223\322\257\201\326\243f"..., 68, 896) = 68
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
pread64(3, "\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
mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7ffd2fe20000
mprotect(0x7ffd2fe48000, 2023424, PROT_NONE) = 0
mmap(0x7ffd2fe48000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000)
= 0x7ffd2fe48000
mmap(0x7ffd2ffdd000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000) =
0x7ffd2ffdd000
mmap(0x7ffd30036000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x215000)
= 0x7ffd30036000
mmap(0x7ffd3003c000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) =
0x7ffd3003c000
close(3)                                 = 0
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7ffd2fe10000
arch_prctl(ARCH_SET_FS, 0x7ffd2fe10740) = 0
set_tid_address(0x7ffd2fe10a10)        = 447
set_robust_list(0x7ffd2fe10a20, 24)    = 0
rseq(0x7ffd2fe110e0, 0x20, 0, 0x53053053) = -1 ENOSYS (Function not implemented)
mprotect(0x7ffd30036000, 16384, PROT_READ) = 0
mprotect(0x7ffd30096000, 4096, PROT_READ) = 0
mprotect(0x7ffd30088000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
munmap(0x7ffd3004b000, 16555)          = 0
pipe2([3, 4], 0)                       = 0
pipe2([5, 6], 0)                       = 0
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD, strace: Process 448 attached
, child_tidptr=0x7ffd2fe10a10) = 448
[pid 448] set_robust_list(0x7ffd2fe10a20, 24 <unfinished ...>
[pid 447] clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD <unfinished ...>
[pid 448] <... set_robust_list resumed>) = 0
[pid 448] close(4)                      = 0
[pid 448] close(5)                      = 0
[pid 448] dup2(3, 0)                    = 0
[pid 448] dup2(6, 1)                    = 1
strace: Process 449 attached
[pid 448] close(3 <unfinished ...>
[pid 447] <... clone resumed>, child_tidptr=0x7ffd2fe10a10) = 449
[pid 449] set_robust_list(0x7ffd2fe10a20, 24 <unfinished ...>
[pid 447] close(3 <unfinished ...>
[pid 448] <... close resumed>)         = 0
[pid 447] <... close resumed>)         = 0
[pid 449] <... set_robust_list resumed>) = 0
[pid 447] close(5 <unfinished ...>
[pid 448] close(6 <unfinished ...>
[pid 447] <... close resumed>)         = 0
[pid 449] close(3 <unfinished ...>
[pid 447] close(6 <unfinished ...>
[pid 448] <... close resumed>)         = 0
[pid 447] <... close resumed>)         = 0
```

```

[pid 449] <... close resumed>      = 0
[pid 447] newfstatat(1, "", <unfinished ...>
[pid 448] execve("./child1", ["child1"], 0x7ffdcfd3418 /* 19 vars */ <unfinished ...>
[pid 447] <... newfstatat resumed> {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x2), ...}, AT_EMPTY_PATH) = 0
[pid 449] close(4 <unfinished ...>
[pid 447] ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0
[pid 449] <... close resumed>      = 0
[pid 447] getrandom(<unfinished ...>
[pid 449] close(6 <unfinished ...>
[pid 447] <... getrandom resumed> "\x4f\xdd\x39\xb3\x07\xd4\x0a\x81", 8, GRND_NONBLOCK) = 8
[pid 449] <... close resumed>      = 0
[pid 447] brk(NULL <unfinished ...>
[pid 449] dup2(5, 0 <unfinished ...>
[pid 447] <... brk resumed>        = 0x7fffd5911000
[pid 449] <... dup2 resumed>       = 0
[pid 447] brk(0x7fffd5932000 <unfinished ...>
[pid 449] close(5 <unfinished ...>
[pid 447] <... brk resumed>        = 0x7fffd5932000
[pid 448] <... execve resumed>     = 0
[pid 447] 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 (Ctrl+D для завершения):
<unfinished ...>
[pid 449] <... close resumed>      = 0
[pid 447] <... write resumed>     = 66
[pid 448] brk(NULL <unfinished ...>
[pid 447] newfstatat(0, "", <unfinished ...>
[pid 449] execve("./child2", ["child2"], 0x7ffdcfd3418 /* 19 vars */ <unfinished ...>
[pid 447] <... newfstatat resumed> {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x2), ...}, AT_EMPTY_PATH) = 0
[pid 448] <... brk resumed>        = 0x7ffe5373000
[pid 447] ioctl(0, TCGETS <unfinished ...>
[pid 448] arch_prctl(0x3001 /* ARCH_??? */ , 0x7ffec8864d0 <unfinished ...>
[pid 447] <... ioctl resumed>, {B38400 opost isig icanon echo ...}) = 0
[pid 448] <... arch_prctl resumed> = -1 EINVAL (Invalid argument)
[pid 447] read(0, <unfinished ...>
[pid 448] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f0c074d0000
[pid 448] access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
[pid 448] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
[pid 448] newfstatat(3, "", <unfinished ...>
[pid 449] <... execve resumed>      = 0
[pid 448] <... newfstatat resumed> {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
[pid 449] brk(NULL <unfinished ...>
[pid 448] mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0 <unfinished ...>
[pid 449] <... brk resumed>         = 0x7ffdf532000
[pid 448] <... mmap resumed>      = 0x7f0c074d4000
[pid 449] arch_prctl(0x3001 /* ARCH_??? */ , 0x7ffe6c79550 <unfinished ...>
[pid 448] close(3 <unfinished ...>
[pid 449] <... arch_prctl resumed> = -1 EINVAL (Invalid argument)
[pid 448] <... close resumed>      = 0
[pid 449] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 448] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 449] <... mmap resumed>        = 0x7fb3c8480000
[pid 448] <... openat resumed>     = 3
[pid 449] access("/etc/ld.so.preload", R_OK <unfinished ...>
[pid 448] read(3, <unfinished ...>
[pid 449] <... access resumed>      = -1 ENOENT (No such file or directory)
[pid 448] <... read resumed> "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0"..., 832) = 832
[pid 449] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 448] pread64(3, <unfinished ...>
[pid 449] <... openat resumed>       = 3
[pid 448] <... pread64 resumed> "\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"..., 784, 64) = 784
[pid 449] newfstatat(3, "", <unfinished ...>
[pid 448] pread64(3, <unfinished ...>
[pid 449] <... newfstatat resumed> {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
[pid 448] <... pread64 resumed> "\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"..., 48, 848) = 48
[pid 449] mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0 <unfinished ...>
[pid 448] pread64(3, <unfinished ...>
[pid 449] <... mmap resumed>         = 0x7fb3c8484000
[pid 448] <... pread64 resumed> "\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
[pid 449] close(3 <unfinished ...>
[pid 448] newfstatat(3, "", <unfinished ...>
[pid 449] <... close resumed>) = 0
[pid 448] <... newfstatat resumed> {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
[pid 449] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 448] pread64(3, <unfinished ...>
[pid 449] <... openat resumed>) = 3
[pid 448] <... pread64 resumed> "\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
[pid 449] read(3, <unfinished ...>
[pid 448] mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0 <unfinished ...>
[pid 449] <... read resumed> "\177ELF2\1\1\3\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832
[pid 448] <... mmap resumed>) = 0x7f0c07260000
[pid 449] pread64(3, <unfinished ...>
[pid 448] mprotect(0x7f0c07288000, 2023424, PROT_NONE <unfinished ...>
[pid 449] <... pread64 resumed> "\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
[pid 448] <... mprotect resumed>) = 0
[pid 449] pread64(3, <unfinished ...>
[pid 448] mmap(0x7f0c07288000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000 <unfinished ...>
[pid 449] <... pread64 resumed> "\4\0\0\0\0\0\0\5\0\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
[pid 448] <... mmap resumed>) = 0x7f0c07288000
[pid 449] pread64(3, <unfinished ...>
[pid 448] mmap(0x7f0c0741d000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000 <unfinished ...>
[pid 449] <... pread64 resumed> "\4\0\0\0\24\0\0\0\3\0\0\0\0GNU\0\302\211\332Pq\2439\235\350\223\322\257\201\326\243\ff"..., 68, 896) = 68
[pid 448] <... mmap resumed>) = 0x7f0c0741d000
[pid 449] newfstatat(3, "", <unfinished ...>
[pid 448] mmap(0x7f0c07476000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x215000 <unfinished ...>
[pid 449] <... newfstatat resumed> {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
[pid 448] <... mmap resumed>) = 0x7f0c07476000
[pid 449] pread64(3, <unfinished ...>
[pid 448] mmap(0x7f0c0747c000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 449] <... pread64 resumed> "\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
[pid 448] <... mmap resumed>) = 0x7f0c0747c000
[pid 449] mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0 <unfinished ...>
[pid 448] close(3 <unfinished ...>
[pid 449] <... mmap resumed>) = 0x7fb3c8210000
[pid 448] <... close resumed>) = 0
[pid 449] mprotect(0x7fb3c8238000, 2023424, PROT_NONE <unfinished ...>
[pid 448] mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 449] <... mprotect resumed>) = 0
[pid 448] <... mmap resumed>) = 0x7f0c07250000
[pid 449] mmap(0x7fb3c8238000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000 <unfinished ...>
[pid 448] arch_prctl(ARCH_SET_FS, 0x7f0c07250740 <unfinished ...>
[pid 449] <... mmap resumed>) = 0x7fb3c8238000
[pid 448] <... arch_prctl resumed>) = 0
[pid 449] mmap(0x7fb3c83cd000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000 <unfinished ...>
[pid 448] set_tid_address(0x7f0c07250a10 <unfinished ...>
[pid 449] <... mmap resumed>) = 0x7fb3c83cd000
[pid 448] <... set_tid_address resumed>) = 448
[pid 449] mmap(0x7fb3c8426000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x215000 <unfinished ...>
[pid 448] set_robust_list(0x7f0c07250a20, 24 <unfinished ...>
[pid 449] <... mmap resumed>) = 0x7fb3c8426000
[pid 448] <... set_robust_list resumed>) = 0
[pid 449] mmap(0x7fb3c842c000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 448] rseq(0x7f0c072510e0, 0x20, 0, 0x53053053 <unfinished ...>
[pid 449] <... mmap resumed>) = 0x7fb3c842c000
[pid 448] <... rseq resumed>) = -1 ENOSYS (Function not implemented)
[pid 449] close(3) = 0
[pid 448] mprotect(0x7f0c07476000, 16384, PROT_READ <unfinished ...>
```

```

[pid 449] mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 448] <... mprotect resumed>) = 0
[pid 449] <... mmap resumed>) = 0x7fb3c8200000
[pid 448] mprotect(0x7f0c074dc000, 4096, PROT_READ <unfinished ...>
[pid 449] arch_prctl(ARCH_SET_FS, 0x7fb3c8200740 <unfinished ...>
[pid 448] <... mprotect resumed>) = 0
[pid 449] <... arch_prctl resumed>) = 0
[pid 448] mprotect(0x7f0c074c8000, 8192, PROT_READ <unfinished ...>
[pid 449] set_tid_address(0x7fb3c8200a10 <unfinished ...>
[pid 448] <... mprotect resumed>) = 0
[pid 449] <... set_tid_address resumed>) = 449
[pid 448] prlimit64(0, RLIMIT_STACK, NULL, <unfinished ...>
[pid 449] set_robust_list(0x7fb3c8200a20, 24 <unfinished ...>
[pid 448] <... prlimit64 resumed>{rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
[pid 449] <... set_robust_list resumed>) = 0
[pid 448] munmap(0x7f0c074d4000, 16555 <unfinished ...>
[pid 449] rseq(0x7fb3c82010e0, 0x20, 0, 0x53053053 <unfinished ...>
[pid 448] <... munmap resumed>) = 0
[pid 449] <... rseq resumed>) = -1 ENOSYS (Function not implemented)
[pid 448] read(0, <unfinished ...>
[pid 449] mprotect(0x7fb3c8426000, 16384, PROT_READ) = 0
[pid 449] mprotect(0x7fb3c848c000, 4096, PROT_READ) = 0
[pid 449] mprotect(0x7fb3c8478000, 8192, PROT_READ) = 0
[pid 449] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
[pid 449] munmap(0x7fb3c8484000, 16555) = 0
[pid 449] read(0, text prob <unfinished ...>
[pid 447] <... read resumed>"text prob", 4096) = 12
[pid 447] read(0, "", 4096) = 0
[pid 447] write(4, "text prob\375\177", 14) = 14
[pid 448] <... read resumed>"text prob\375\177", 1000) = 14
[pid 447] close(4 <unfinished ...>
[pid 448] write(1, "TEXT PROB\375\177", 14 <unfinished ...>
[pid 447] <... close resumed>) = 0
[pid 448] <... write resumed>) = 14
[pid 449] <... read resumed>"TEXT PROB\375\177", 1000) = 14
[pid 447] wait4(-1, <unfinished ...>
[pid 448] read(0, <unfinished ...>
[pid 449] write(1, "TEXT___PROB\375\177", 14TEXT___PROB <unfinished ...>
[pid 448] <... read resumed>"", 1000) = 0
[pid 449] <... write resumed>) = 14
[pid 448] exit_group(0 <unfinished ...>
[pid 449] read(0, <unfinished ...>
[pid 448] <... exit_group resumed>) = ?
[pid 448] +++ exited with 0 +++
[pid 449] <... read resumed>"", 1000) = 0
[pid 447] <... wait4 resumed>NULL, 0, NULL) = 448
[pid 449] exit_group(0 <unfinished ...>
[pid 447] --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=448, si_uid=0, si_status=0, si_etime=0, si_stime=0} ---
[pid 449] <... exit_group resumed>) = ?
[pid 447] wait4(-1, <unfinished ...>
[pid 449] +++ exited with 0 +++
<... wait4 resumed>NULL, 0, NULL) = 449
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=449, si_uid=0, si_status=0, si_etime=0, si_stime=0} ---
write(1, "\n", 1
)
= 1
write(1, "\320\222\321\201\320\265 \320\277\321\200\320\276\321\206\320\265\321\201\321\201\321\213
\320\267\320\260\320\262\320\265"..., 44Все процессы завершены.
) = 44
exit_group(0)
= ?
+++ exited with 0 +++

```

Лабораторная работа №2

```

root@LAPTOP-CGCBKBHR:/home/OS/OS_labs/lab2/src# strace -f ./evenodd 2
execve("./evenodd", ["/evenodd", "2"], 0x7fffd37c6a20 /* 19 vars */) = 0
brk(NULL)
= 0x7ffdcbe000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffe3e65ba0) = -1 EINVAL (Invalid argument)

```

```

mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd7c3590000
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
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fd7c354b000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\13\0\0\0\0\0\0\0\0\0\0\0\0\0\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832
pread64(3, "\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
pread64(3, "\4\0\0\0\0\0\0\0\5\0\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0\0GNU\0\302\211\332Pq\2439\235\350\223\322\257\201\326\243\1f"..., 68, 896) = 68
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
pread64(3, "\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
mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd7c3320000
mprotect(0x7fd7c3348000, 2023424, PROT_NONE) = 0
mmap(0x7fd7c3348000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000)
= 0x7fd7c3348000
mmap(0x7fd7c34dd000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000) =
0x7fd7c34dd000
mmap(0x7fd7c3536000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x215000)
= 0x7fd7c3536000
mmap(0x7fd7c353c000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) =
0x7fd7c353c000
close(3) = 0
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd7c3310000
arch_prctl(ARCH_SET_FS, 0x7fd7c3310740) = 0
set_tid_address(0x7fd7c3310a10) = 1845
set_robust_list(0x7fd7c3310a20, 24) = 0
rseq(0x7fd7c33110e0, 0x20, 0, 0x53053053) = -1 ENOSYS (Function not implemented)
mprotect(0x7fd7c3536000, 16384, PROT_READ) = 0
mprotect(0x7fd7c3597000, 4096, PROT_READ) = 0
mprotect(0x7fd7c3588000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
munmap(0x7fd7c354b000, 16555) = 0
newfstatat(1, "", {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x2), ...}, AT_EMPTY_PATH) = 0
ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0
getrandom("\x3f\x95\x12\xdb\xcf\xdf\xe4\x50", 8, GRND_NONBLOCK) = 8
brk(NULL) = 0x7ffdcbeb000
brk(0x7ffdc0c000) = 0x7ffdc0c000
newfstatat(0, "", {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x2), ...}, AT_EMPTY_PATH) = 0
ioctl(0, TCGETS, {B38400 opost isig icanon echo ...}) = 0
write(1, "\320\222\320\262\320\265\320\264\320\270\321\202\320\265\321\207\320\270\321\201\320\273\320\276
\321\215\320\273\320\265"..., 61Введите число элементов массива: ) = 61
read(0, 4
"4\n", 4096) = 2
time(NULL) = 1741239525 (2025-03-06T08:38:45+0300)
write(1, "\320\236\321\200\320\270\320\263\320\270\320\275\320\260\320\273:\n", 18Оригинал:
) = 18
write(1, "64 36 37 11 \n", 1364 36 37 11
) = 13
gettimeofday({tv_sec=1741239525, tv_usec=916798}, NULL) = 0
rt_sigaction(SIGRT_1, {sa_handler=0x7fd7c33b1870, sa_mask=[],
sa_flags=SA_RESTORER|SA_ONSTACK|SA_RESTART|SA_SIGINFO, sa_restorer=0x7fd7c3362520}, NULL, 8) = 0
rt_sigprocmask(SIG_UNBLOCK, [RTMIN RT_1], NULL, 8) = 0
mmap(NULL, 8392704, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) = 0x7fd7c2b00000
mprotect(0x7fd7c2b01000, 8388608, PROT_READ|PROT_WRITE) = 0
rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0
clone3({flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_S
ETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID, child_tid=0x7fd7c3300910, parent_tid=0x7fd7c3300910,
exit_signal=0, stack=0x7fd7c2b00000, stack_size=0x7fff00, tls=0x7fd7c3300640}, 88) = -1 ENOSYS (Function not implemented)
clone(child_stack=0x7fd7c32ffe0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|
CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID, &strace: Process 1846 attached
, parent_tid=[1846], tls=0x7fd7c3300640, child_tidptr=0x7fd7c3300910) = 1846
[pid 1846] set_robust_list(0x7fd7c3300920, 24 <unfinished ...>
[pid 1845] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...>
[pid 1846] <... set_robust_list resumed>) = 0
[pid 1845] <... rt_sigprocmask resumed>NULL, 8) = 0

```

[illegible]


```

FUTEX_BITSET_MATCH_ANY <unfinished ...>
[pid 1847] rt_sigprocmask(SIG_BLOCK, ~[RT_1], NULL, 8) = 0
[pid 1847] madvise(0x7fd7c22f0000, 8368128, MADV_DONTNEED) = 0
[pid 1847] exit(0) = ?
[pid 1847] +++ exited with 0 +++
<... futex resumed> = 0
gettimeofday({tv_sec=1741239526, tv_usec=3414}, NULL) = 0
write(1,
"320\236\321\202\321\201\320\276\321\200\321\202\320\270\321\200\320\276\320\262\320\260\320\275\320\275\321\213\320\27
1:\n", 32Отсортированный:
) = 32
write(1, "11 36 37 64 \n", 1311 36 37 64
) = 13
write(1, "320\227\320\260\320\275\321\217\320\273\320\276 \320\262\321\200\320\265\320\274\320\265\320\275\320\270:
0.0"... , 51Заняло времени: 0.086616 секунд
) = 51
write(1, "320\232\320\276\320\273\320\270\321\207\320\265\321\201\321\202\320\262\320\276
\320\277\320\276\321\202\320\276\320\272\320"... , 39Количество потоков: 2
) = 39
lseek(0, -1, SEEK_CUR) = -1 ESPIPE (Illegal seek)
exit_group(0) = ?
+++ exited with 0 +++

```

Лабораторная работа №3

```

root@LAPTOP-CGCBKBHR:/home/OS/OS_labs/lab3/src# strace -f ./parent
execve("./parent", ["/parent"], 0x7fffe01bb868 /* 19 vars */) = 0
brk(NULL) = 0x7ffbfaf66000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffc3554ce0) = -1 EINVAL (Invalid argument)
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fba783c0000
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
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fba783cb000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF2\1\13\0\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0"... , 832) = 832
pread64(3, "\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
pread64(3, "\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
pread64(3, "\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\1f"... , 68, 896) =
68
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
pread64(3, "\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
mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fba78190000
mprotect(0x7fba781b8000, 2023424, PROT_NONE) = 0
mmap(0x7fba781b8000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000)
= 0x7fba781b8000
mmap(0x7fba7834d000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000) =
0x7fba7834d000
mmap(0x7fba783a6000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x215000)
= 0x7fba783a6000
mmap(0x7fba783ac000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) =
0x7fba783ac000
close(3) = 0
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fba78180000
arch_prctl(ARCH_SET_FS, 0x7fba78180740) = 0
set_tid_address(0x7fba78180a10) = 917
set_robust_list(0x7fba78180a20, 24) = 0
rseq(0x7fba781810e0, 0x20, 0, 0x53053053) = -1 ENOSYS (Function not implemented)
mprotect(0x7fba783a6000, 16384, PROT_READ) = 0
mprotect(0x7fba78411000, 4096, PROT_READ) = 0
mprotect(0x7fba78408000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
munmap(0x7fba783cb000, 16555) = 0
openat(AT_FDCWD, "shared_memory.bin", O_RDWR|O_CREAT|O_TRUNC, 0666) = 3
ftruncate(3, 1096) = 0
mmap(NULL, 1096, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0) = 0x7fba7840d000
close(3) = 0

```

```

clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLDstrace: Process 918 attached
, child_tidptr=0x7fba78180a10) = 918
[pid 918] set_robust_list(0x7fba78180a20, 24 <unfinished ...>
[pid 917] clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD <unfinished ...>
[pid 918] <... set_robust_list resumed>) = 0
[pid 918] execve("./child1", ["child1", "shared_memory.bin"], 0x7fffc3554eb8 /* 19 vars */strace: Process 919
attached
<unfinished ...>
[pid 917] <... clone resumed>, child_tidptr=0x7fba78180a10) = 919
[pid 919] set_robust_list(0x7fba78180a20, 24 <unfinished ...>
[pid 917] newfstatat(1, "", <unfinished ...>
[pid 919] <... set_robust_list resumed>) = 0
[pid 917] <... newfstatat resumed> {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x5), ...}, AT_EMPTY_PATH) = 0
[pid 919] execve("./child2", ["child2", "shared_memory.bin"], 0x7fffc3554eb8 /* 19 vars */ <unfinished ...>
[pid 917] ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0
[pid 918] <... execve resumed>) = 0
[pid 917] getrandom(<unfinished ...>
[pid 918] brk(NULL <unfinished ...>
[pid 917] <... getrandom resumed> "\x40\x82\x2b\x1b\x9b\xf6\x04\x78", 8, GRND_NONBLOCK) = 8
[pid 918] <... brk resumed>) = 0x7fffc844e000
[pid 917] brk(NULL <unfinished ...>
[pid 918] arch_prctl(0x3001 /* ARCH_??? */, 0x7fffd010f160 <unfinished ...>
[pid 917] <... brk resumed>) = 0x7fffbaf66000
[pid 918] <... arch_prctl resumed>) = -1 EINVAL (Invalid argument)
[pid 917] brk(0x7fffbaf87000 <unfinished ...>
[pid 918] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 917] <... brk resumed>) = 0x7fffbaf87000
[pid 918] <... mmap resumed>) = 0x7f8b09fa0000
[pid 917] 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 (Ctrl+D для завершения):
<unfinished ...>
[pid 918] access("/etc/ld.so.preload", R_OK <unfinished ...>
[pid 917] <... write resumed>) = 66
[pid 918] <... access resumed>) = -1 ENOENT (No such file or directory)
[pid 917] newfstatat(0, "", <unfinished ...>
[pid 918] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 917] <... newfstatat resumed> {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x5), ...}, AT_EMPTY_PATH) = 0
[pid 918] <... openat resumed>) = 3
[pid 917] ioctl(0, TCGETS <unfinished ...>
[pid 918] newfstatat(3, "", <unfinished ...>
[pid 917] <... ioctl resumed>, {B38400 opost isig icanon echo ...}) = 0
[pid 918] <... newfstatat resumed> {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
[pid 917] read(0, <unfinished ...>
[pid 918] mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f8b09fab000
[pid 918] close(3) = 0
[pid 919] <... execve resumed>) = 0
[pid 918] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 919] brk(NULL <unfinished ...>
[pid 918] <... openat resumed>) = 3
[pid 919] <... brk resumed>) = 0x7fffd8fba000
[pid 918] read(3, <unfinished ...>
[pid 919] arch_prctl(0x3001 /* ARCH_??? */, 0x7ffe15005a0 <unfinished ...>
[pid 918] <... read resumed> "\177ELF2\1\1\3\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0"..., 832) = 832
[pid 919] <... arch_prctl resumed>) = -1 EINVAL (Invalid argument)
[pid 918] pread64(3, <unfinished ...>
[pid 919] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 918] <... pread64 resumed> "\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"..., 784, 64) =
784
[pid 919] <... mmap resumed>) = 0x7f81c0bc0000
[pid 918] pread64(3, <unfinished ...>
[pid 919] access("/etc/ld.so.preload", R_OK <unfinished ...>
[pid 918] <... pread64 resumed> "\4\0\0\0\0\0\0\5\0\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
[pid 919] <... access resumed>) = -1 ENOENT (No such file or directory)
[pid 918] pread64(3, <unfinished ...>
[pid 919] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 918] <... pread64 resumed> "\4\0\0\0\24\0\0\0\3\0\0\0\0GNU\0\302\211\332Pq\2439\235\350\223\322\257\201\326\243\0"..., 68,
896) = 68
[pid 919] <... openat resumed>) = 3

```

```

[pid 918] newfstatat(3, "", <unfinished ...>
[pid 919] newfstatat(3, "", <unfinished ...>
[pid 918] <... newfstatat resumed> {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
[pid 919] <... newfstatat resumed> {st_mode=S_IFREG|0644, st_size=16555, ...}, AT_EMPTY_PATH) = 0
[pid 918] pread64(3, <unfinished ...>
[pid 919] mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0 <unfinished ...>
[pid 918] <... pread64 resumed> "\6\0\0\4\0\0\0@\0\0\0\0\0\0@\0\0\0\0\0\0@\0\0\0\0\0\0"..., 784, 64) =
784
[pid 919] <... mmap resumed>      = 0x7f81c0bcb000
[pid 918] mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0 <unfinished ...>
[pid 919] close(3 <unfinished ...>
[pid 918] <... mmap resumed>      = 0x7f8b09d70000
[pid 919] <... close resumed>     = 0
[pid 918] mprotect(0x7f8b09d98000, 2023424, PROT_NONE <unfinished ...>
[pid 919] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 918] <... mprotect resumed>   = 0
[pid 919] <... openat resumed>    = 3
[pid 918] mmap(0x7f8b09d98000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE,
3, 0x28000 <unfinished ...>
[pid 919] read(3, <unfinished ...>
[pid 918] <... mmap resumed>      = 0x7f8b09d98000
[pid 919] <... read resumed> "\177ELF\2\1\1\3\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0"..., 832) = 832
[pid 918] mmap(0x7f8b09f2d000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000
<unfinished ...>
[pid 919] pread64(3, <unfinished ...>
[pid 918] <... mmap resumed>      = 0x7f8b09f2d000
[pid 919] <... pread64 resumed> "\6\0\0\4\0\0\0@\0\0\0\0\0\0@\0\0\0\0\0\0@\0\0\0\0\0\0"..., 784, 64) =
784
[pid 918] mmap(0x7f8b09f86000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x215000 <unfinished ...>
[pid 919] pread64(3, <unfinished ...>
[pid 918] <... mmap resumed>      = 0x7f8b09f86000
[pid 919] <... pread64 resumed> "\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"..., 48, 848) = 48
[pid 918] mmap(0x7f8b09f8c000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS,
-1, 0 <unfinished ...>
[pid 919] pread64(3, <unfinished ...>
[pid 918] <... mmap resumed>      = 0x7f8b09f8c000
[pid 919] <... pread64 resumed> "\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\xf"..., 68,
896) = 68
[pid 918] close(3 <unfinished ...>
[pid 919] newfstatat(3, "", <unfinished ...>
[pid 918] <... close resumed>      = 0
[pid 919] <... newfstatat resumed> {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
[pid 918] mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 919] pread64(3, <unfinished ...>
[pid 918] <... mmap resumed>      = 0x7f8b09d60000
[pid 919] <... pread64 resumed> "\6\0\0\4\0\0\0@\0\0\0\0\0\0@\0\0\0\0\0\0@\0\0\0\0\0\0"..., 784, 64) =
784
[pid 918] arch_prctl(ARCH_SET_FS, 0x7f8b09d60740 <unfinished ...>
[pid 919] mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0 <unfinished ...>
[pid 918] <... arch_prctl resumed>) = 0
[pid 919] <... mmap resumed>      = 0x7f81c0990000
[pid 918] set_tid_address(0x7f8b09d60a10 <unfinished ...>
[pid 919] mprotect(0x7f81c09b8000, 2023424, PROT_NONE <unfinished ...>
[pid 918] <... set_tid_address resumed>) = 918
[pid 919] <... mprotect resumed>   = 0
[pid 918] set_robust_list(0x7f8b09d60a20, 24 <unfinished ...>
[pid 919] mmap(0x7f81c09b8000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x28000 <unfinished ...>
[pid 918] <... set_robust_list resumed>) = 0
[pid 919] <... mmap resumed>      = 0x7f81c09b8000
[pid 918] rseq(0x7f8b09d610e0, 0x20, 0, 0x53053053 <unfinished ...>
[pid 919] mmap(0x7f81c0b4d000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000
<unfinished ...>
[pid 918] <... rseq resumed>      = -1 ENOSYS (Function not implemented)
[pid 919] <... mmap resumed>      = 0x7f81c0b4d000
[pid 918] mprotect(0x7f8b09f86000, 16384, PROT_READ <unfinished ...>
[pid 919] mmap(0x7f81c0ba6000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,

```

```

0x215000 <unfinished ...>
[pid 918] <... mprotect resumed>) = 0
[pid 919] <... mmap resumed>) = 0x7f81c0ba6000
[pid 918] mprotect(0x7f8b09fef000, 4096, PROT_READ <unfinished ...>
[pid 919] mmap(0x7f81c0bac000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS,
-1, 0 <unfinished ...>
[pid 918] <... mprotect resumed>) = 0
[pid 919] <... mmap resumed>) = 0x7f81c0bac000
[pid 918] mprotect(0x7f8b09fe8000, 8192, PROT_READ <unfinished ...>
[pid 919] close(3 <unfinished ...>
[pid 918] <... mprotect resumed>) = 0
[pid 919] <... close resumed>) = 0
[pid 918] prlimit64(0, RLIMIT_STACK, NULL, <unfinished ...>
[pid 919] mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 918] <... prlimit64 resumed>){rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
[pid 919] <... mmap resumed>) = 0x7f81c0980000
[pid 918] munmap(0x7f8b09fab000, 16555 <unfinished ...>
[pid 919] arch_prctl(ARCH_SET_FS, 0x7f81c0980740 <unfinished ...>
[pid 918] <... munmap resumed>) = 0
[pid 919] <... arch_prctl resumed>) = 0
[pid 918] openat(AT_FDCWD, "shared_memory.bin", O_RDWR <unfinished ...>
[pid 919] set_tid_address(0x7f81c0980a10) = 919
[pid 919] set_robust_list(0x7f81c0980a20, 24) = 0
[pid 919] rseq(0x7f81c09810e0, 0x20, 0, 0x53053053) = -1 ENOSYS (Function not implemented)
[pid 919] mprotect(0x7f81c0ba6000, 16384, PROT_READ <unfinished ...>
[pid 918] <... openat resumed>) = 3
[pid 919] <... mprotect resumed>) = 0
[pid 918] mmap(NULL, 1096, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0 <unfinished ...>
[pid 919] mprotect(0x7f81c0c13000, 4096, PROT_READ <unfinished ...>
[pid 918] <... mmap resumed>) = 0x7f8b09fe7000
[pid 919] <... mprotect resumed>) = 0
[pid 918] close(3 <unfinished ...>
[pid 919] mprotect(0x7f81c0c08000, 8192, PROT_READ <unfinished ...>
[pid 918] <... close resumed>) = 0
[pid 919] <... mprotect resumed>) = 0
[pid 918] futex(0x7f8b09fe73e8, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL,
FUTEX_BITSET_MATCH_ANY <unfinished ...>
[pid 919] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
[pid 919] munmap(0x7f81c0bcb000, 16555) = 0
[pid 919] openat(AT_FDCWD, "shared_memory.bin", O_RDWR) = 3
[pid 919] mmap(NULL, 1096, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0) = 0x7f81c0c0f000
[pid 919] close(3) = 0
[pid 919] futex(0x7f81c0c0f408, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL,
FUTEX_BITSET_MATCH_ANYtext text <unfinished ...>
[pid 917] <... read resumed>"text text", 4096) = 9
[pid 917] read(0, text pr"text pr", 4096) = 8
[pid 917] read(0, "", 4096) = 0
[pid 917] futex(0x7fba7840d3e8, FUTEX_WAKE, 1) = 1
[pid 918] <... futex resumed>) = 0
[pid 917] futex(0x7fba7840d428, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL,
FUTEX_BITSET_MATCH_ANY <unfinished ...>
[pid 918] futex(0x7f8b09fe7408, FUTEX_WAKE, 1) = 1
[pid 919] <... futex resumed>) = 0
[pid 918] futex(0x7f8b09fe73e8, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL,
FUTEX_BITSET_MATCH_ANY <unfinished ...>
[pid 919] futex(0x7f81c0c0f428, FUTEX_WAKE, 1 <unfinished ...>
[pid 917] <... futex resumed>) = 0
[pid 919] <... futex resumed>) = 1
[pid 917] write(1, "\n", 1
<unfinished ...>
[pid 919] futex(0x7f81c0c0f408, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL,
FUTEX_BITSET_MATCH_ANY <unfinished ...>
[pid 917] <... write resumed>) = 1
[pid 917] write(1, "\320\240\320\265\320\267\321\203\320\273\321\214\321\202\320\260\321\202: TEXT_TEXTTTEX"...,
38Результат: TEXT_TEXTTTEXT__PR
) = 38
[pid 917] futex(0x7fba7840d3e8, FUTEX_WAKE, 1) = 1
[pid 918] <... futex resumed>) = 0

```

```
[pid 917] futex(0x7fba7840d428, FUTEX_WAIT_BITSET|FUTEX_CLOCK_REALTIME, 0, NULL,
FUTEX_BITSET_MATCH_ANY <unfinished ...>
[pid 918] futex(0x7f8b09fe7408, FUTEX_WAKE, 1) = 1
[pid 919] <... futex resumed>) = 0
[pid 918] munmap(0x7f8b09fe7000, 1096 <unfinished ...>
[pid 919] futex(0x7f81c0c0f428, FUTEX_WAKE, 1 <unfinished ...>
[pid 918] <... munmap resumed>) = 0
[pid 917] <... futex resumed>) = 0
[pid 919] <... futex resumed>) = 1
[pid 917] wait4(918, <unfinished ...>
[pid 918] exit_group(0 <unfinished ...>
[pid 919] munmap(0x7f81c0c0f000, 1096 <unfinished ...>
[pid 918] <... exit_group resumed>) = ?
[pid 919] <... munmap resumed>) = 0
[pid 917] <... wait4 resumed>[{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 918
[pid 918] +++ exited with 0 +++
[pid 917] --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=918, si_uid=0, si_status=0, si_etime=0,
si_stime=0} ---
[pid 919] exit_group(0 <unfinished ...>
[pid 917] wait4(919, <unfinished ...>
[pid 919] <... exit_group resumed>) = ?
[pid 919] +++ exited with 0 +++
<... wait4 resumed>[{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 919
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=919, si_uid=0, si_status=0, si_etime=0, si_stime=0} ---
munmap(0x7fba7840d000, 1096) = 0
write(1, "\n", 1
) = 1
write(1, "\320\222\321\201\320\265 \320\277\321\200\320\276\321\206\320\265\321\201\321\201\321\213
\320\267\320\260\320\262\320\265"..., 44Все процессы завершены.
) = 44
exit_group(0) = ?
+++ exited with 0 +++
```

Лабораторная работа №4

```
root@LAPTOP-CGCBKBHR:/home/OS/OS_labs/lab4/src# strace -f ./progone
execve("./progone", ["/progone"], 0x7fffd2475ab8 /* 18 vars */) = 0
brk(NULL) = 0x7ffbc026000
arch_prctl(0x3001 /* ARCH_??? */, 0x7fffc4a6b430) = -1 EINVAL (Invalid argument)
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd273130000
access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/glibc-hwcap/x86-64-v3/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/glibc-hwcap/x86-64-v2/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/tls/x86_64/x86_64/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/tls/x86_64/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/tls/x86_64/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/tls/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/x86_64/x86_64/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/x86_64/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/x86_64/libImpl1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/libImpl1.so", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF2\1\1\0\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
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=15568, ...}, AT_EMPTY_PATH) = 0
getcwd("/home/OS/OS_labs/lab4/src", 128) = 26
mmap(NULL, 16432, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd2730e0000
mmap(0x7fd2730e1000, 4096, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1000) =
0x7fd2730e1000mmap(0x7fd2730e2000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) =
0x7fd2730e2000
mmap(0x7fd2730e3000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) =
0x7fd2730e3000
close(3) = 0
openat(AT_FDCWD, "/glibc-hwcap/x86-64-v3/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/glibc-hwcap/x86-64-v2/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/tls/x86_64/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/tls/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
```

```

openat(AT_FDCWD, "/tls/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/x86_64/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/libc.so.6", O_RDONLY|O_CLOEXEC) = -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=16555, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16555, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fd2730eb000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF2\1\13\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0"..., 832) = 832
pread64(3, "\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
pread64(3, "\4\0\0\0\0\0\0\5\0\0\0GNU\02\0\0\0300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0302\211\332Pq\2439\235\350\223\322\257\201\326\243\2f"..., 68, 896) =
68
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2220400, ...}, AT_EMPTY_PATH) = 0
pread64(3, "\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
mmap(NULL, 2264656, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd272eb0000
mprotect(0x7fd272ed8000, 2023424, PROT_NONE) = 0
mmap(0x7fd272ed8000, 1658880, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000)
= 0x7fd272ed8000
mmap(0x7fd27306d000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1bd000) =
0x7fd27306d000
mmap(0x7fd2730c6000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x215000)
= 0x7fd2730c6000
mmap(0x7fd2730cc000, 52816, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) =
0x7fd2730cc000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libm.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF2\1\13\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0"..., 832) = 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=940560, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 942344, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd272dc0000
mmap(0x7fd272dce000, 507904, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe000) =
0x7fd272dce000
mmap(0x7fd272e4a000, 372736, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x8a000) =
0x7fd272e4a000
mmap(0x7fd272ea5000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe4000) =
0x7fd272ea5000
close(3) = 0
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd272db0000
arch_prctl(ARCH_SET_FS, 0x7fd272db0740) = 0
set_tid_address(0x7fd272db0a10) = 3065
set_robust_list(0x7fd272db0a20, 24) = 0
rseq(0x7fd272db10e0, 0x20, 0, 0x53053053) = -1 ENOSYS (Function not implemented)
mprotect(0x7fd2730c6000, 16384, PROT_READ) = 0
mprotect(0x7fd272ea5000, 4096, PROT_READ) = 0
mprotect(0x7fd2730e3000, 4096, PROT_READ) = 0
mprotect(0x7fd273136000, 4096, PROT_READ) = 0
mprotect(0x7fd273128000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=8192*1024}) = 0
munmap(0x7fd2730eb000, 16555) = 0
newfstatat(1, "", {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x2), ...}, AT_EMPTY_PATH) = 0
ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0
getrandom("\xa9\x77\x25\x57\x61\xdc\xdd\x9f", 8, GRND_NONBLOCK) = 8
brk(NULL) = 0x7ffbc026000
brk(0x7ffbc047000) = 0x7ffbc047000
write(1, "Input program code:\n", 20Input program code:
) = 20
write(1, " 1 -> PrimeCount\n", 17 1 -> PrimeCount
) = 17
write(1, " 2 -> GCF\n", 10 2 -> GCF
) = 10
write(1, "-1 -> Exit\n", 11-1 -> Exit
) = 11
newfstatat(0, "", {st_mode=S_IFCHR|0640, st_rdev=makedev(0x4, 0x2), ...}, AT_EMPTY_PATH) = 0
ioctl(0, TCGETS, {B38400 opost isig icanon echo ...}) = 0
read(0, 2
"2\n", 4096) = 2

```

```

write(1, "Enter C and D: ", 15Enter C and D: )      = 15
read(0, 5 10
"5 10\n", 4096)      = 5
write(1, "GCF(5, 10) = 5\n", 15GCF(5, 10) = 5
)      = 15
write(1, "Input program code:\n", 20Input program code:
)      = 20
write(1, " 1 -> PrimeCount\n", 17 1 -> PrimeCount
)      = 17
write(1, " 2 -> GCF\n", 10 2 -> GCF
)      = 10
write(1, "-1 -> Exit\n", 11-1 -> Exit
)      = 11
read(0, -1
"-1\n", 4096)      = 3
lseek(0, -1, SEEK_CUR)      = -1 ESPIPE (Illegal seek)
exit_group(0)      = ?
+++ exited with 0 +++

```

Лабораторная работа №5-7

```

...
openat(AT_FDCWD, "/lib/libnss_db-2.35.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
directory) openat(AT_FDCWD, "/usr/lib/libnss_db-2.35.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory) munmap(0xffff84b42000, 13859) = 0
openat(AT_FDCWD, "/etc/protocols", O_RDONLY|O_CLOEXEC) = 3

newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=2932, ...}, AT_EMPTY_PATH) =

lseek(3, 0, SEEK_SET)      = 0

read(3, "# Internet (IP) protocols\n#\n# Up"..., 4096) = 2932 read(3, "", 4096)      = 0
close(3)      = 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

getpid()      = 5151

getpid()      = 5151

...
5153 strace: Process 5153 attached

[pid 5151] clock_nanosleep(CLOCK_REALTIME, 0, {tv_sec=1, tv_nsec=0}, <unfinished ...> [pid 5153]
set_robust_list(0xffff84b0c100, 24) = 0
[pid 5153] eventfd2(0, EFD_CLOEXEC) = 4

[pid 5153] fcntl(4, F_GETFL)      = 0x2 (flags O_RDWR) [pid 5153] fcntl(4, F_SETFL,
O_RDWR|O_NONBLOCK) = 0
[pid 5153] fcntl(4, F_GETFL)      = 0x802 (flags O_RDWR|O_NONBLOCK) [pid 5153] fcntl(4, F_SETFL,
O_RDWR|O_NONBLOCK) = 0

[pid 5153] getpid() = 5153

[pid 5153] getpid() = 5153

[pid 5153] eventfd2(0, EFD_CLOEXEC) = 5

[pid 5153] fcntl(5, F_GETFL)      = 0x2 (flags O_RDWR) [pid 5153] fcntl(5, F_SETFL,
O_RDWR|O_NONBLOCK) = 0
[pid 5153] fcntl(5, F_GETFL)      = 0x802 (flags O_RDWR|O_NONBLOCK) [pid 5153] fcntl(5, F_SETFL,

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O_RDWR|O_NONBLOCK) = 0

[pid 5153] getpid() = 5153

[pid 5153] epoll_create1(EPOLL_CLOEXEC) = 6

[pid 5153] epoll_ctl(6, EPOLL_CTL_ADD, 5, {events=0, data={u32=3664091408, u64=187650785253648}})
= 0

[pid 5153] epoll_ctl(6, EPOLL_CTL_MOD, 5, {events=EPOLLIN, data={u32=3664091408,
u64=187650785253648}}) = 0

[pid 5153] getpid() = 5153

[pid 5153] rt_sigaction(SIGRT_1, {sa_handler=0xffff8493a700, sa_mask=[],
sa_flags=SA_ONSTACK|SA_RESTART|SA_SIGINFO}, NULL, 8) = 0 [pid 5153] rt_sigprocmask(SIG_UNBLOCK,
[RTMIN RT_1], NULL, 8) = 0
[pid 5153] mmap(NULL, 8454144, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0xfffff83800000

[pid 5153] mprotect(0xfffff83810000, 8388608, PROT_READ|PROT_WRITE) = 0

[pid 5153] rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0

[pid 5153] clone(child_stack=0xffff8400e6e0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|CLONE_P
ARENT_SETTID|C
LONE_CHILD_CLEAR_TID|strace: Process 5154 attached

<unfinished ...>

[pid 5154] rseq(0xffff8400f640, 0x20, 0, 0xd428bc00 <unfinished ...>

[pid 5153] <... clone resumed>, parent_tid=[5154], tls=0xffff8400f660,
child_tidptr=0xffff8400ef70) = 5154 [pid 5154] <... rseq resumed> = 0
[pid 5153] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...> [pid 5154]
set_robust_list(0xffff8400ef80, 24 <unfinished ...>
[pid 5153] <... rt_sigprocmask resumed>NULL, 8) = 0 [pid 5154] <... set_robust_list resumed> = 0
[pid 5153] eventfd2(0, EFD_CLOEXEC <unfinished ...>

[pid 5154] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...> [pid 5153] <... eventfd2 resumed>) =
7
[pid 5154] <... rt_sigprocmask resumed>NULL, 8) = 0 [pid 5153] fcntl(7, F_GETFL <unfinished ...>
[pid 5154] rt_sigprocmask(SIG_BLOCK, ~[RTMIN RT_1], <unfinished ...> [pid 5153] <... fcntl
resumed> = 0x2 (flags O_RDWR)
[pid 5154] <... rt_sigprocmask resumed>NULL, 8) = 0

[pid 5153] fcntl(7, F_SETFL, O_RDWR|O_NONBLOCK <unfinished ...> [pid 5154] sched_getparam(5154,
<unfinished ...>
[pid 5153] <... fcntl resumed>) = 0

[pid 5154] <... sched_getparam resumed>[0]) = 0 [pid 5153] fcntl(7, F_GETFL <unfinished ...>
[pid 5154] sched_getscheduler(5154 <unfinished ...>

[pid 5153] <... fcntl resumed>) = 0x802 (flags O_RDWR|O_NONBLOCK) [pid 5154] <...
sched_getscheduler resumed>) = 0 (SCHED_OTHER)
[pid 5153] fcntl(7, F_SETFL, O_RDWR|O_NONBLOCK <unfinished ...> [pid 5154]
sched_setscheduler(5154, SCHED_OTHER, [0] <unfinished ...> [pid 5153] <... fcntl resumed>) = 0

[pid 5154] <... sched_setscheduler resumed>) = 0 [pid 5153] getpid( <unfinished ...>
[pid 5154] prctl(PR_SET_NAME, "ZMQbg/Reaper" <unfinished ...> [pid 5153] <... getpid resumed>)
= 5153
[pid 5154] <... prctl resumed>) = 0

[pid 5153] epoll_create1(EPOLL_CLOEXEC <unfinished ...> [pid 5154] epoll_pwait(6, <unfinished
...>
[pid 5153] <... epoll_create1 resumed>) = 8

```



```

[pid 5153] epoll_ctl(8, EPOLL_CTL_ADD, 7, {events=0, data={u32=3664093488, u64=187650785255728}})
= 0

[pid 5153] epoll_ctl(8, EPOLL_CTL_MOD, 7, {events=EPOLLIN, data={u32=3664093488,
u64=187650785255728}}) = 0

[pid 5153] mmap(NULL, 8454144, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0xfffff82e00000

[pid 5153] mprotect(0xfffff82e10000, 8388608, PROT_READ|PROT_WRITE) = 0

[pid 5153] rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0

[pid 5153] clone(child_stack=0xfffff8360e6e0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|CLONE_P
ARENT_SETTID|C
LONE_CHILD_CLEAR_TID|strace: Process 5155 attached

<unfinished ...>

[pid 5155] rseq(0xfffff8360f640, 0x20, 0, 0xd428bc00 <unfinished ...>

[pid 5153] <... clone resumed>, parent_tid=[5155], tls=0xfffff8360f660,
child_tidptr=0xfffff8360ef70) = 5155 [pid 5155] <... rseq resumed> = 0
[pid 5153] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...> [pid 5155]
set_robust_list(0xfffff8360ef80, 24 <unfinished ...>
[pid 5153] <... rt_sigprocmask resumed>NULL, 8) = 0 [pid 5155] <... set_robust_list resumed> = 0
[pid 5153] eventfd2(0, EFD_CLOEXEC <unfinished ...>

[pid 5155] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...> [pid 5153] <... eventfd2 resumed>) =
9
[pid 5155] <... rt_sigprocmask resumed>NULL, 8) = 0 [pid 5153] fcntl(9, F_GETFL <unfinished ...>
[pid 5155] rt_sigprocmask(SIG_BLOCK, ~[RTMIN RT_1], <unfinished ...> [pid 5153] <... fcntl
resumed>) = 0x2 (flags O_RDWR)
[pid 5155] <... rt_sigprocmask resumed>NULL, 8) = 0

[pid 5153] fcntl(9, F_SETFL, O_RDWR|O_NONBLOCK <unfinished ...> [pid 5155] sched_getparam(5155,
<unfinished ...>
[pid 5153] <... fcntl resumed>) = 0

[pid 5155] <... sched_getparam resumed>[0]) = 0 [pid 5153] fcntl(9, F_GETFL <unfinished ...>
[pid 5155] sched_getscheduler(5155 <unfinished ...>

[pid 5153] <... fcntl resumed>) = 0x802 (flags O_RDWR|O_NONBLOCK) [pid 5155] <...
sched_getscheduler resumed>) = 0 (SCHED_OTHER)
[pid 5153] fcntl(9, F_SETFL, O_RDWR|O_NONBLOCK <unfinished ...> [pid 5155]
sched_setscheduler(5155, SCHED_OTHER, [0] <unfinished ...> [pid 5153] <... fcntl resumed>) = 0
[pid 5155] <... sched_setscheduler resumed>) = 0 [pid 5153] getpid( <unfinished ...>
[pid 5155] prctl(PR_SET_NAME, "ZMQbg/IO/0" <unfinished ...> [pid 5153] <... getpid resumed>)
= 5153
[pid 5155] <... prctl resumed>) = 0 [pid 5153] getpid( <unfinished ...>
[pid 5155] epoll_wait(8, <unfinished ...> [pid 5153] <... getpid resumed>) = 5153
[pid 5153] ppoll([fd=9, events=POLLIN], 1, {tv_sec=0, tv_nsec=0}, NULL, 0) = 0 (Timeout) [pid
5153] socket(AF_NETLINK, SOCK_RAW|SOCK_CLOEXEC, NETLINK_ROUTE) = 10
[pid 5153] bind(10, {sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000}, 12) = 0

[pid 5153] getsockname(10, {sa_family=AF_NETLINK, nl_pid=5153, nl_groups=00000000}, [12]) = 0

[pid 5153] sendto(10, [{nlmsg_len=20, nlmsg_type=RTM_GETLINK,
nlmsg_flags=NLM_F_REQUEST|NLM_F_DUMP, nlmsg_seq=1741222074, nlmsg_pid=0}, {ifi_family=AF_UNSPEC,
...}], 20, 0, {sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000}, 12) = 20

...
[pid 5153] getsockname(10, {sa_family=AF_INET, sin_port=htons(5551),
sin_addr=inet_addr("127.0.0.1")}, [128 => 16]) = 0

```

```

[pid 5153] getsockname(10, {sa_family=AF_INET, sin_port=htons(5551),
sin_addr=inet_addr("127.0.0.1")}, [128 => 16]) = 0

[pid 5153] getpid() = 5153

[pid 5153] write(7, "\1\0\0\0\0\0\0", 8 <unfinished ...>

[pid 5155] <... epoll_pwait resumed>[{events=EPOLLIN, data={u32=3664093488,
u64=187650785255728}}], 256, -1, NULL, 8) = 1 [pid 5153] <... write resumed> = 8
[pid 5155] getpid( <unfinished ...> [pid 5153] getpid( <unfinished ...> [pid 5155] <... getpid
resumed>) = 5153 [pid 5153] <... getpid resumed>
=
5153

[pid 5155] ppoll([{fd=7, events=POLLIN}], 1, {tv_sec=0, tv_nsec=0}, NULL, 0 <unfinished ...> [pid
5153] write(9, "\1\0\0\0\0\0\0", 8 <unfinished ...>
[pid 5155] <... ppoll resumed>) = 1 ([{fd=7, revents=POLLIN}], left {tv_sec=0, tv_nsec=0}) [pid
5153] <... write resumed> = 8
[pid 5155] getpid( <unfinished ...>

[pid 5153] write(1, "Compute Node 1 started, listenin"... , 58 <unfinished ...> [pid 5155] <...
getpid resumed>) = 5153
[pid 5153] <... write resumed> = 58 [pid 5155] read(7, <unfinished ...> [pid 5153] getpid(
<unfinished ...>
[pid 5155] <... read resumed> "\1\0\0\0\0\0\0", 8) = 8

[pid 5153] <... getpid resumed> = 5153

[pid 5155] mmap(NULL, 134217728, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_NORESERVE, -1, 0
<unfinished ...>

[pid 5153] ppoll([{fd=9, events=POLLIN}], 1, NULL, NULL, 0 <unfinished ...> [pid 5155] <... mmap
resumed>) = 0xffff7ae00000
[pid 5153] <... ppoll resumed>) = 1 ([{fd=9, revents=POLLIN}]) [pid 5155] munmap(0xffff7ae00000,
18874368
<unfinished ...>

[pid 5153] getpid( <unfinished ...>

[pid 5155] <... munmap resumed>) = 0 [pid 5153] <... getpid resumed>) = 5153
[pid 5155] munmap(0xffff80000000, 48234496 <unfinished ...> [pid 5153] read(9, <unfinished ...>
[pid 5155] <... munmap resumed>) = 0

[pid 5153] <... read resumed> "\1\0\0\0\0\0\0", 8) = 8

[pid 5155] mprotect(0xffff7c000000, 135168, PROT_READ|PROT_WRITE <unfinished ...> [pid 5153]
getpid( <unfinished ...>
[pid 5155] <... mprotect resumed>) = 0 [pid 5153] <... getpid resumed>) = 5153
[pid 5155] epoll_ctl(8, EPOLL_CTL_ADD, 10, {events=0, data={u32=2080377712, u64=281472762121072}}
<unfinished ...> [pid 5153] ppoll([{fd=9, events=POLLIN}], 1, {tv_sec=0, tv_nsec=0}, NULL, 0
<unfinished ...>
[pid 5155] <... epoll_ctl resumed>) = 0

[pid 5153] <... ppoll resumed>) = 0 (Timeout)

[pid 5155] epoll_ctl(8, EPOLL_CTL_MOD, 10, {events=EPOLLIN, data={u32=2080377712,
u64=281472762121072}} <unfinished ...> [pid 5153] getpid( <unfinished ...>
[pid 5155] <... epoll_ctl resumed>) = 0 [pid 5153] <... getpid resumed>) = 5153 [pid 5155] getpid(
<unfinished ...>
[pid 5153] ppoll([{fd=9, events=POLLIN}], 1, NULL, NULL, 0 <unfinished ...> [pid 5155] <...
getpid resumed>) = 5153
[pid 5155] ppoll([{fd=7, events=POLLIN}], 1, {tv_sec=0, tv_nsec=0}, NULL, 0) = 0 (Timeout) [pid
5155] epoll_pwait(8, <unfinished ...>
[pid 5151] <... clock_nanosleep resumed> 0xffffe4f67958) = 0 [pid 5151] eventfd2(0, EFD_CLOEXEC) =
4
[pid 5151] fcntl(4, F_GETFL) = 0x2 (flags O_RDWR) [pid 5151] fcntl(4, F_SETFL,

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O_RDWR|O_NONBLOCK) = 0
[pid 5151] fcntl(4, F_GETFL)      = 0x802 (flags

O_RDWR|O_NONBLOCK) [pid 5151] fcntl(4, F_SETFL,

O_RDWR|O_NONBLOCK) = 0

[pid 5151] getpid() = 515

[pid 5151] epoll_create1(EPOLL_CLOEXEC) = 5

[pid 5151] epoll_ctl(5, EPOLL_CTL_ADD, 4, {events=0, data={u32=3664068656, u64=187650785230896}})
= 0

[pid 5151] epoll_ctl(5, EPOLL_CTL_MOD, 4, {events=EPOLLIN, data={u32=3664068656,
u64=187650785230896}}) = 0

[pid 5151] getpid() = 5151

[pid 5151] rt_sigaction(SIGRT_1, {sa_handler=0xffff8493a700, sa_mask=[],
sa_flags=SA_ONSTACK|SA_RESTART|SA_SIGINFO}, NULL, 8) = 0 [pid 5151] rt_sigprocmask(SIG_UNBLOCK,
[RTMIN RT_1], NULL, 8) = 0
[pid 5151] mmap(NULL, 8454144, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0xffff83800000

[pid 5151] mprotect(0xffff83810000, 8388608, PROT_READ|PROT_WRITE) = 0

[pid 5151] rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0

[pid 5151] clone(child_stack=0xffff8400e6e0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|CLONE_P
ARENT_SETTID|C
LONE_CHILD_CLEAR_TID, parent_tid=[5172], tls=0xffff8400f660, child_tidptr=0xffff8400ef70) = 5172
strace: Process 5172 attached
[pid 5151] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...>

[pid 5172] rseq(0xffff8400f640, 0x20, 0, 0xd428bc00 <unfinished ...> [pid 5151] <...
rt_sigprocmask resumed>NULL, 8) = 0
[pid 5172] <... rseq resumed>    = 0

[pid 5151] eventfd2(0, EFD_CLOEXEC <unfinished ...>

[pid 5172] set_robust_list(0xffff8400ef80, 24 <unfinished ...> [pid 5151] <... eventfd2 resumed>)
= 6
[pid 5172] <... set_robust_list resumed>) = 0 [pid 5151] fcntl(6, F_GETFL <unfinished ...>
[pid 5172] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...> [pid 5151] <... fcntl resumed>) = 0x2
(flags O_RDWR) [pid 5172] <... rt_sigprocmask resumed>NULL, 8) = 0
[pid 5151] fcntl(6, F_SETFL, O_RDWR|O_NONBLOCK <unfinished ...> [pid 5172]
rt_sigprocmask(SIG_BLOCK, ~[RTMIN RT_1], <unfinished ...> [pid 5151] <... fcntl resumed>) = 0
[pid 5172] <... rt_sigprocmask resumed>NULL, 8) = 0 [pid 5151] fcntl(6, F_GETFL <unfinished ...>
[pid 5172] sched_getparam(5172, <unfinished ...>

[pid 5151] <... fcntl resumed>) = 0x802 (flags O_RDWR|O_NONBLOCK) [pid 5172] <... sched_getparam
resumed>[0]) = 0 [pid 5151] fcntl(6, F_SETFL, O_RDWR|O_NONBLOCK <unfinished ...> [pid 5172]
sched_getscheduler(5172 <unfinished ...>
[pid 5151] <... fcntl resumed>) = 0

[pid 5172] <... sched_getscheduler resumed>) = 0 (SCHED_OTHER) [pid 5151] getpid( <unfinished
...>

[pid 5172] sched_setscheduler(5172, SCHED_OTHER, [0] <unfinished ...> [pid 5151] <... getpid
resumed>)    = 5151
[pid 5172] <... sched_setscheduler resumed>) = 0

[pid 5151] epoll_create1(EPOLL_CLOEXEC <unfinished ...>

[pid 5172] prctl(PR_SET_NAME, "ZMQbg/Reaper" <unfinished ...> [pid 5151] <... epoll_create1

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resumed>) = 7
[pid 5172] <... prctl resumed>) = 0

[pid 5151] epoll_ctl(7, EPOLL_CTL_ADD, 6, {events=0, data={u32=3664090192, u64=187650785252432}}
<unfinished ...> [pid 5172] epoll_pwait(5, <unfinished ...>
[pid 5151] <... epoll_ctl resumed>) = 0

[pid 5151] epoll_ctl(7, EPOLL_CTL_MOD, 6, {events=EPOLLIN, data={u32=3664090192,
u64=187650785252432}}) = 0

[pid 5151] mmap(NULL, 8454144, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0xffff82e00000

[pid 5151] mprotect(0xffff82e10000, 8388608, PROT_READ|PROT_WRITE) = 0

[pid 5151] rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0

[pid 5151] clone(child_stack=0xffff8360e6e0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|CLONE_P
ARENT_SETTID|C
LONE_CHILD_CLEAR_TID, parent_tid=[5173], tls=0xffff8360f660, child_tidptr=0xffff8360ef70) = 5173
strace: Process 5173 attached
[pid 5151] rt_sigprocmask(SIG_SETMASK, [], <unfinished ...>

[pid 5173] rseq(0xffff8360f640, 0x20, 0, 0xd428bc00 <unfinished ...> [pid 5151] <...
rt_sigprocmask resumed>NULL, 8) = 0
[pid 5173] <... rseq resumed>) = 0

[pid 5151] eventfd2(0, EFD_CLOEXEC) = 8

[pid 5173] set_robust_list(0xffff8360ef80, 24 <unfinished ...> [pid 5151] fcntl(8, F_GETFL
<unfinished ...>
[pid 5173] <... set_robust_list resumed>) = 0

[pid 5151] <... fcntl resumed>) = 0x2 (flags O_RDWR) [pid 5173] rt_sigprocmask(SIG_SETMASK, [],
<unfinished ...>
[pid 5151] fcntl(8, F_SETFL, O_RDWR|O_NONBLOCK <unfinished
...

```