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Лабораторная работа №8 по курсу “Операционные системы”

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Подпись: _____

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Содержание

1 Репозиторий

https://github.com/kr1st1na0/OS_labs

2 Цель работы

Приобретение практических навыков диагностики работы программного обеспечения.

3 Задание

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

4 Описание strace

Команда strace является инструментом диагностики в Linux. Она перехватывает и записывает любые системные вызовы, выполняемые командой. Кроме того, также записывает любой сигнал Linux, отправляемый процессу. Затем мы можем использовать эту информацию для отладки или диагностики программы.

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

Возможные флаги:

- -k - выводить стек вызовов для отслеживаемого процесса после каждого системного вызова
- -o - выводить всю информацию о системных вызовах не в стандартный поток ошибок, а в файл
- -c - подсчитывать количество ошибок, вызовов и время выполнения для каждого системного вызова
- -T - выводить длительность выполнения системного вызова
- -y - выводить пути для файловых дескрипторов
- -yy - выводить информацию о протоколе для файловых дескрипторов
- -p - указывает pid процесса, к которому следует подключиться
- -f - отслеживать также дочерние процессы, если они будут созданы

5 Демонстрация работы

```
kristinab@LAPTOP-SFU9B1F4:~/ubuntu_main/OS_labs/build$
   strace -f ./lab3/lab3
execve("./lab3/lab3", ["./lab3/lab3"], 0x7ffd71132798 /*
    51 vars */) = 0
brk(NULL)                                       = 0x56197b5bd000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffe32913560) = -1
   EINVAL (Invalid argument)
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No
   such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/x86_64/x86_64/
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
stat("/opt/ros/noetic/lib/tls/x86_64/x86_64", 0
   x7ffe329127b0) = -1 ENOENT (No such file or directory
   )
openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/x86_64/
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
stat("/opt/ros/noetic/lib/tls/x86_64", 0x7ffe329127b0) =
    -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/x86_64/
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
stat("/opt/ros/noetic/lib/tls/x86_64", 0x7ffe329127b0) =
    -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/libpthread.so
   .0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
    directory)
stat("/opt/ros/noetic/lib/tls", 0x7ffe329127b0) = -1
   ENOENT (No such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/x86_64/x86_64/
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
stat("/opt/ros/noetic/lib/x86_64/x86_64", 0x7ffe329127b0
   ) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/x86_64/libpthread.
   so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
   or directory)
stat("/opt/ros/noetic/lib/x86_64", 0x7ffe329127b0) = -1
   ENOENT (No such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/x86_64/libpthread.
   so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
   or directory)
stat("/opt/ros/noetic/lib/x86_64", 0x7ffe329127b0) = -1
   ENOENT (No such file or directory)
openat(AT_FDCWD, "/opt/ros/noetic/lib/libpthread.so.0",
   O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
```

```
   directory)
stat("/opt/ros/noetic/lib", {st_mode=S_IFDIR|0755,
   st_size=12288, ...}) = 0
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC)
    = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=239963, ...}) =
   0
mmap(NULL, 239963, PROT_READ, MAP_PRIVATE, 3, 0) = 0
   x7f34fc57e000
close(3)                                = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libpthread.so
   .0", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF
   \2\1\1\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220q
   \0\0\0\0\0\0"..., 832) = 832
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0{E6
   \364\34\332\245\210\204\10\350-\0106\343="..., 68,
   824) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=157224, ...}) =
   0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|
   MAP_ANONYMOUS, -1, 0) = 0x7f34fc57c000
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0{E6
   \364\34\332\245\210\204\10\350-\0106\343="..., 68,
   824) = 68
mmap(NULL, 140408, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE,
    3, 0) = 0x7f34fc559000
mmap(0x7f34fc55f000, 69632, PROT_READ|PROT_EXEC,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x6000) = 0
   x7f34fc55f000
mmap(0x7f34fc570000, 24576, PROT_READ, MAP_PRIVATE|
   MAP_FIXED|MAP_DENYWRITE, 3, 0x17000) = 0x7f34fc570000
mmap(0x7f34fc576000, 8192, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c000) = 0
   x7f34fc576000
mmap(0x7f34fc578000, 13432, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0
   x7f34fc578000
close(3)                                = 0
openat(AT_FDCWD, "/opt/ros/noetic/lib/librt.so.1",
   O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
   directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/librt.so.1",
   O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0
   '\0\0\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=35960, ...}) = 0
mmap(NULL, 39904, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE,
   3, 0) = 0x7f34fc54f000
```

```
mmap(0x7f34fc551000, 16384, PROT_READ|PROT_EXEC,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0
   x7f34fc551000
mmap(0x7f34fc555000, 8192, PROT_READ, MAP_PRIVATE|
   MAP_FIXED|MAP_DENYWRITE, 3, 0x6000) = 0x7f34fc555000
mmap(0x7f34fc557000, 8192, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x7000) = 0
   x7f34fc557000
close(3)                                = 0
openat(AT_FDCWD, "/opt/ros/noetic/lib/libstdc++.so.6",
   O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
   directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libstdc++.so.6",
    O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF
   \2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0‘\341\t
   \0\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=1956992, ...}) =
    0
mmap(NULL, 1972224, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE
   , 3, 0) = 0x7f34fc36d000
mprotect(0x7f34fc403000, 1290240, PROT_NONE) = 0
mmap(0x7f34fc403000, 987136, PROT_READ|PROT_EXEC,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x96000) = 0
   x7f34fc403000
mmap(0x7f34fc4f4000, 299008, PROT_READ, MAP_PRIVATE|
   MAP_FIXED|MAP_DENYWRITE, 3, 0x187000) = 0
   x7f34fc4f4000
mmap(0x7f34fc53e000, 57344, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1d0000) = 0
   x7f34fc53e000
mmap(0x7f34fc54c000, 10240, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0
   x7f34fc54c000
close(3)                                = 0
openat(AT_FDCWD, "/opt/ros/noetic/lib/libgcc_s.so.1",
   O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
   directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libgcc_s.so.1",
   O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF
   \2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\3405\0\0\0\0\0\0"...,
    832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=104984, ...}) =
   0
mmap(NULL, 107592, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE,
    3, 0) = 0x7f34fc352000
mmap(0x7f34fc355000, 73728, PROT_READ|PROT_EXEC,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0
```

```
   x7f34fc355000
mmap(0x7f34fc367000, 16384, PROT_READ, MAP_PRIVATE|
   MAP_FIXED|MAP_DENYWRITE, 3, 0x15000) = 0x7f34fc367000
mmap(0x7f34fc36b000, 8192, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18000) = 0
   x7f34fc36b000
close(3)                                = 0
openat(AT_FDCWD, "/opt/ros/noetic/lib/libc.so.6",
   O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
   directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6",
   O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF
   \2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\300A
   \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\20\0\0\0\5\0\0\0GNU
   \0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0", 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\30x\346\264ur
   \f|Q\226\236i\253-'o"..., 68, 880) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=2029592, ...}) =
    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
pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU
   \0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0", 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\30x\346\264ur
   \f|Q\226\236i\253-'o"..., 68, 880) = 68
mmap(NULL, 2037344, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE
   , 3, 0) = 0x7f34fc160000
mmap(0x7f34fc182000, 1540096, PROT_READ|PROT_EXEC,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x22000) = 0
   x7f34fc182000
mmap(0x7f34fc2fa000, 319488, PROT_READ, MAP_PRIVATE|
   MAP_FIXED|MAP_DENYWRITE, 3, 0x19a000) = 0
   x7f34fc2fa000
mmap(0x7f34fc348000, 24576, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1e7000) = 0
   x7f34fc348000
mmap(0x7f34fc34e000, 13920, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0
   x7f34fc34e000
close(3)                                = 0
openat(AT_FDCWD, "/opt/ros/noetic/lib/libm.so.6",
   O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
   directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libm.so.6",
   O_RDONLY|O_CLOEXEC) = 3
```

```
read(3, "\177ELF
   \2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\300\323\0\0\0\0\0\0"...,
    832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=1369384, ...}) =
    0
mmap(NULL, 1368336, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE
   , 3, 0) = 0x7f34fc011000
mmap(0x7f34fc01e000, 684032, PROT_READ|PROT_EXEC,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xd000) = 0
   x7f34fc01e000
mmap(0x7f34fc0c5000, 626688, PROT_READ, MAP_PRIVATE|
   MAP_FIXED|MAP_DENYWRITE, 3, 0xb4000) = 0x7f34fc0c5000
mmap(0x7f34fc15e000, 8192, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x14c000) = 0
   x7f34fc15e000
close(3)                                = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|
   MAP_ANONYMOUS, -1, 0) = 0x7f34fc00f000
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|
   MAP_ANONYMOUS, -1, 0) = 0x7f34fc00c000
arch_prctl(ARCH_SET_FS, 0x7f34fc00c740) = 0
mprotect(0x7f34fc348000, 16384, PROT_READ) = 0
mprotect(0x7f34fc15e000, 4096, PROT_READ) = 0
mprotect(0x7f34fc36b000, 4096, PROT_READ) = 0
mprotect(0x7f34fc53e000, 45056, PROT_READ) = 0
mprotect(0x7f34fc576000, 4096, PROT_READ) = 0
mprotect(0x7f34fc557000, 4096, PROT_READ) = 0
mprotect(0x56197a78c000, 4096, PROT_READ) = 0
mprotect(0x7f34fc5e6000, 4096, PROT_READ) = 0
munmap(0x7f34fc57e000, 239963)          = 0
set_tid_address(0x7f34fc00ca10)         = 16879
set_robust_list(0x7f34fc00ca20, 24)     = 0
rt_sigaction(SIGRTMIN, {sa_handler=0x7f34fc55fbf0,
   sa_mask=[], sa_flags=SA_RESTORER|SA_SIGINFO,
   sa_restorer=0x7f34fc56d420}, NULL, 8) = 0
rt_sigaction(SIGRT_1, {sa_handler=0x7f34fc55fc90,
   sa_mask=[], sa_flags=SA_RESTORER|SA_RESTART|
   SA_SIGINFO, sa_restorer=0x7f34fc56d420}, NULL, 8) = 0
rt_sigprocmask(SIG_UNBLOCK, [RTMIN RT_1], NULL, 8) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024,
   rlim_max=RLIM64_INFINITY}) = 0
brk(NULL)                               = 0x56197b5bd000
brk(0x56197b5de000)                     = 0x56197b5de000
futex(0x7f34fc54c6bc, FUTEX_WAKE_PRIVATE, 2147483647) =
   0
futex(0x7f34fc54c6c8, FUTEX_WAKE_PRIVATE, 2147483647) =
   0
fstat(0, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0
   x8), ...}) = 0
```

```
read(0, file.txt
"file.txt\n", 1024)           = 9
statfs("/dev/shm/", {f_type=TMPFS_MAGIC, f_bsize=4096,
   f_blocks=978472, f_bfree=978468, f_bavail=978468,
   f_files=978472, f_ffree=978467, f_fsid={val
   =[2567178741, 3165115080]}, f_namelen=255, f_frsize
   =4096, f_flags=ST_VALID|ST_NOSUID|ST_NODEV|ST_NOATIME
   }) = 0
futex(0x7f34fc57b390, FUTEX_WAKE_PRIVATE, 2147483647) =
   0
openat(AT_FDCWD, "/dev/shm/sem.semaphore_1", O_RDWR|
   O_NOFOLLOW) = -1 ENOENT (No such file or directory)
getpid()                                = 16879
lstat("/dev/shm/yYM1Ow", 0x7ffe329131c0) = -1 ENOENT (No
    such file or directory)
openat(AT_FDCWD, "/dev/shm/yYM1Ow", O_RDWR|O_CREAT|
   O_EXCL, 0600) = 3
write(3,
   "\0\0\0\0\0\0\0\0\200\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\
    32) = 32
mmap(NULL, 32, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0) =
    0x7f34fc5e5000
link("/dev/shm/yYM1Ow", "/dev/shm/sem.semaphore_1") = 0
fstat(3, {st_mode=S_IFREG|0600, st_size=32, ...}) = 0
unlink("/dev/shm/yYM1Ow")               = 0
close(3)                                = 0
openat(AT_FDCWD, "/dev/shm/shared_memory_1", O_RDWR|
   O_CREAT|O_NOFOLLOW|O_CLOEXEC, 0600) = 3
ftruncate(3, 1024)                      = 0
mmap(NULL, 1024, PROT_READ|PROT_WRITE, MAP_SHARED, 3, 0)
    = 0x7f34fc5b8000
openat(AT_FDCWD, "/dev/shm/sem.semaphore_2", O_RDWR|
   O_NOFOLLOW) = -1 ENOENT (No such file or directory)
getpid()                                = 16879
lstat("/dev/shm/bp0Cqx", 0x7ffe329131c0) = -1 ENOENT (No
    such file or directory)
openat(AT_FDCWD, "/dev/shm/bp0Cqx", O_RDWR|O_CREAT|
   O_EXCL, 0600) = 4
write(4,
   "\0\0\0\0\0\0\0\0\200\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\
    32) = 32
mmap(NULL, 32, PROT_READ|PROT_WRITE, MAP_SHARED, 4, 0) =
    0x7f34fc5b7000
link("/dev/shm/bp0Cqx", "/dev/shm/sem.semaphore_2") = 0
fstat(4, {st_mode=S_IFREG|0600, st_size=32, ...}) = 0
unlink("/dev/shm/bp0Cqx")               = 0
close(4)                                = 0
openat(AT_FDCWD, "/dev/shm/shared_memory_2", O_RDWR|
   O_CREAT|O_NOFOLLOW|O_CLOEXEC, 0600) = 4
```

```
ftruncate(4, 1024)                      = 0
mmap(NULL, 1024, PROT_READ|PROT_WRITE, MAP_SHARED, 4, 0)
    = 0x7f34fc5b6000
read(0, aaa;
"aaa;\n", 1024)                 = 5
read(0, ff.
"ff.\n", 1024)                  = 4
read(0, ggg
"ggg\n", 1024)                  = 4
read(0,
"\n", 1024)                     = 1
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|
   CLONE_CHILD_SETTID|SIGCHLDstrace: Process 16973
   attached
, child_tidptr=0x7f34fc00ca10) = 16973
[pid 16973] set_robust_list(0x7f34fc00ca20, 24 <
   unfinished ...>
[pid 16879] futex(0x7f34fc5b7000, FUTEX_WAIT_BITSET|
   FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY
    <unfinished ...>
[pid 16973] <... set_robust_list resumed>) = 0
[pid 16973] execve("/home/kristinab/ubuntu_main/OS_labs/
   build/lab3/child3", ["/home/kristinab/ubuntu_main/
   OS_l"..., "file.txt"], 0x7ffe32913648 /* 51 vars */)
   = 0
[pid 16973] brk(NULL)                   = 0x558a6cf5a000
[pid 16973] arch_prctl(0x3001 /* ARCH_??? */, 0
   x7ffc54686ea0) = -1 EINVAL (Invalid argument)
[pid 16973] access("/etc/ld.so.preload", R_OK) = -1
   ENOENT (No such file or directory)
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/
   x86_64/x86_64/libpthread.so.0", O_RDONLY|O_CLOEXEC) =
    -1 ENOENT (No such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/tls/x86_64/x86_64
   ", 0x7ffc546860f0) = -1 ENOENT (No such file or
   directory)
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/
   x86_64/libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1
   ENOENT (No such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/tls/x86_64", 0
   x7ffc546860f0) = -1 ENOENT (No such file or directory
   )
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/
   x86_64/libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1
   ENOENT (No such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/tls/x86_64", 0
   x7ffc546860f0) = -1 ENOENT (No such file or directory
   )
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/tls/
```

```
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/tls", 0
   x7ffc546860f0) = -1 ENOENT (No such file or directory
   )
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/x86_64
   /x86_64/libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1
   ENOENT (No such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/x86_64/x86_64", 0
   x7ffc546860f0) = -1 ENOENT (No such file or directory
   )
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/x86_64
   /libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (
   No such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/x86_64", 0
   x7ffc546860f0) = -1 ENOENT (No such file or directory
   )
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/x86_64
   /libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (
   No such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib/x86_64", 0
   x7ffc546860f0) = -1 ENOENT (No such file or directory
   )
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
    such file or directory)
[pid 16973] stat("/opt/ros/noetic/lib", {st_mode=S_IFDIR
   |0755, st_size=12288, ...}) = 0
[pid 16973] openat(AT_FDCWD, "/etc/ld.so.cache",
   O_RDONLY|O_CLOEXEC) = 3
[pid 16973] fstat(3, {st_mode=S_IFREG|0644, st_size
   =239963, ...}) = 0
[pid 16973] mmap(NULL, 239963, PROT_READ, MAP_PRIVATE,
   3, 0) = 0x7f9274413000
[pid 16973] close(3)                    = 0
[pid 16973] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/
   libpthread.so.0", O_RDONLY|O_CLOEXEC) = 3
[pid 16973] read(3, "\177ELF
   \2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220q
   \0\0\0\0\0\0"..., 832) = 832
[pid 16973] pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0{
   E6\364\34\332\245\210\204\10\350-\0106\343="..., 68,
   824) = 68
[pid 16973] fstat(3, {st_mode=S_IFREG|0755, st_size
   =157224, ...}) = 0
[pid 16973] mmap(NULL, 8192, PROT_READ|PROT_WRITE,
   MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f9274411000
[pid 16973] pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0{
   E6\364\34\332\245\210\204\10\350-\0106\343="..., 68,
```

```
   824) = 68
[pid 16973] mmap(NULL, 140408, PROT_READ, MAP_PRIVATE|
   MAP_DENYWRITE, 3, 0) = 0x7f92743ee000
[pid 16973] mmap(0x7f92743f4000, 69632, PROT_READ|
   PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x6000) = 0x7f92743f4000
[pid 16973] mmap(0x7f9274405000, 24576, PROT_READ,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x17000) = 0
   x7f9274405000
[pid 16973] mmap(0x7f927440b000, 8192, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x1c000) = 0x7f927440b000
[pid 16973] mmap(0x7f927440d000, 13432, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1,
   0) = 0x7f927440d000
[pid 16973] close(3)                    = 0
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/librt.
   so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
   or directory)
[pid 16973] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/
   librt.so.1", O_RDONLY|O_CLOEXEC) = 3
[pid 16973] read(3, "\177ELF
   \2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0
   '\0\0\0\0\0\0"..., 832) = 832
[pid 16973] fstat(3, {st_mode=S_IFREG|0644, st_size
   =35960, ...}) = 0
[pid 16973] mmap(NULL, 39904, PROT_READ, MAP_PRIVATE|
   MAP_DENYWRITE, 3, 0) = 0x7f92743e4000
[pid 16973] mmap(0x7f92743e6000, 16384, PROT_READ|
   PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x2000) = 0x7f92743e6000
[pid 16973] mmap(0x7f92743ea000, 8192, PROT_READ,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x6000) = 0
   x7f92743ea000
[pid 16973] mmap(0x7f92743ec000, 8192, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x7000) = 0x7f92743ec000
[pid 16973] close(3)                    = 0
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/
   libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
   such file or directory)
[pid 16973] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/
   libstdc++.so.6", O_RDONLY|O_CLOEXEC) = 3
[pid 16973] read(3, "\177ELF
   \2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0`\341\t
   \0\0\0\0\0"..., 832) = 832
[pid 16973] fstat(3, {st_mode=S_IFREG|0644, st_size
   =1956992, ...}) = 0
[pid 16973] mmap(NULL, 1972224, PROT_READ, MAP_PRIVATE|
```

```
   MAP_DENYWRITE, 3, 0) = 0x7f9274202000
[pid 16973] mprotect(0x7f9274298000, 1290240, PROT_NONE)
    = 0
[pid 16973] mmap(0x7f9274298000, 987136, PROT_READ|
   PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x96000) = 0x7f9274298000
[pid 16973] mmap(0x7f9274389000, 299008, PROT_READ,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x187000) = 0
   x7f9274389000
[pid 16973] mmap(0x7f92743d3000, 57344, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x1d0000) = 0x7f92743d3000
[pid 16973] mmap(0x7f92743e1000, 10240, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1,
   0) = 0x7f92743e1000
[pid 16973] close(3)                    = 0
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/
   libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
   such file or directory)
[pid 16973] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/
   libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = 3
[pid 16973] read(3, "\177ELF
   \2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\3405\0\0\0\0\0\0"...,
    832) = 832
[pid 16973] fstat(3, {st_mode=S_IFREG|0644, st_size
   =104984, ...}) = 0
[pid 16973] mmap(NULL, 107592, PROT_READ, MAP_PRIVATE|
   MAP_DENYWRITE, 3, 0) = 0x7f92741e7000
[pid 16973] mmap(0x7f92741ea000, 73728, PROT_READ|
   PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x3000) = 0x7f92741ea000
[pid 16973] mmap(0x7f92741fc000, 16384, PROT_READ,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x15000) = 0
   x7f92741fc000
[pid 16973] mmap(0x7f9274200000, 8192, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x18000) = 0x7f9274200000
[pid 16973] close(3)                    = 0
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/libc.
   so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
   or directory)
[pid 16973] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc
   .so.6", O_RDONLY|O_CLOEXEC) = 3
[pid 16973] read(3, "\177ELF
   \2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\300A
   \2\0\0\0\0\0"..., 832) = 832
[pid 16973] 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
[pid 16973] pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU
```

```
   \0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0", 32, 848) = 32
[pid 16973] pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU
   \0\30x\346\264ur\f|Q\226\236i\253-'o"..., 68, 880) =
   68
[pid 16973] fstat(3, {st_mode=S_IFREG|0755, st_size
   =2029592, ...}) = 0
[pid 16973] 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
[pid 16973] pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU
   \0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0", 32, 848) = 32
[pid 16973] pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU
   \0\30x\346\264ur\f|Q\226\236i\253-'o"..., 68, 880) =
   68
[pid 16973] mmap(NULL, 2037344, PROT_READ, MAP_PRIVATE|
   MAP_DENYWRITE, 3, 0) = 0x7f9273ff5000
[pid 16973] mmap(0x7f9274017000, 1540096, PROT_READ|
   PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x22000) = 0x7f9274017000
[pid 16973] mmap(0x7f927418f000, 319488, PROT_READ,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x19a000) = 0
   x7f927418f000
[pid 16973] mmap(0x7f92741dd000, 24576, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x1e7000) = 0x7f92741dd000
[pid 16973] mmap(0x7f92741e3000, 13920, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1,
   0) = 0x7f92741e3000
[pid 16973] close(3)                    = 0
[pid 16973] openat(AT_FDCWD, "/opt/ros/noetic/lib/libm.
   so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
   or directory)
[pid 16973] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libm
   .so.6", O_RDONLY|O_CLOEXEC) = 3
[pid 16973] read(3, "\177ELF
   \2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\300\323\0\0\0\0\0\0"...,
    832) = 832
[pid 16973] fstat(3, {st_mode=S_IFREG|0644, st_size
   =1369384, ...}) = 0
[pid 16973] mmap(NULL, 1368336, PROT_READ, MAP_PRIVATE|
   MAP_DENYWRITE, 3, 0) = 0x7f9273ea6000
[pid 16973] mmap(0x7f9273eb3000, 684032, PROT_READ|
   PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   xd000) = 0x7f9273eb3000
[pid 16973] mmap(0x7f9273f5a000, 626688, PROT_READ,
   MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xb4000) = 0
   x7f9273f5a000
[pid 16973] mmap(0x7f9273ff3000, 8192, PROT_READ|
   PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0
   x14c000) = 0x7f9273ff3000
```

```
[pid 16973] close(3)                    = 0
[pid 16973] mmap(NULL, 8192, PROT_READ|PROT_WRITE,
  MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f9273ea4000
[pid 16973] mmap(NULL, 12288, PROT_READ|PROT_WRITE,
  MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f9273ea1000
[pid 16973] arch_prctl(ARCH_SET_FS, 0x7f9273ea1740) = 0
[pid 16973] mprotect(0x7f92741dd000, 16384, PROT_READ) =
   0
[pid 16973] mprotect(0x7f9273ff3000, 4096, PROT_READ) =
  0
[pid 16973] mprotect(0x7f9274200000, 4096, PROT_READ) =
  0
[pid 16973] mprotect(0x7f92743d3000, 45056, PROT_READ) =
   0
[pid 16973] mprotect(0x7f927440b000, 4096, PROT_READ) =
  0
[pid 16973] mprotect(0x7f92743ec000, 4096, PROT_READ) =
  0
[pid 16973] mprotect(0x558a6ce7a000, 4096, PROT_READ) =
  0
[pid 16973] mprotect(0x7f927447b000, 4096, PROT_READ) =
  0
[pid 16973] munmap(0x7f9274413000, 239963) = 0
[pid 16973] set_tid_address(0x7f9273ea1a10) = 16973
[pid 16973] set_robust_list(0x7f9273ea1a20, 24) = 0
[pid 16973] rt_sigaction(SIGRTMIN, {sa_handler=0
  x7f92743f4bf0, sa_mask=[], sa_flags=SA_RESTORER|
  SA_SIGINFO, sa_restorer=0x7f9274402420}, NULL, 8) = 0
[pid 16973] rt_sigaction(SIGRT_1, {sa_handler=0
  x7f92743f4c90, sa_mask=[], sa_flags=SA_RESTORER|
  SA_RESTART|SA_SIGINFO, sa_restorer=0x7f9274402420},
  NULL, 8) = 0
[pid 16973] rt_sigprocmask(SIG_UNBLOCK, [RTMIN RT_1],
  NULL, 8) = 0
[pid 16973] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur
  =8192*1024, rlim_max=RLIM64_INFINITY}) = 0
[pid 16973] brk(NULL)                   = 0x558a6cf5a000
[pid 16973] brk(0x558a6cf7b000)         = 0x558a6cf7b000
[pid 16973] futex(0x7f92743e16bc, FUTEX_WAKE_PRIVATE,
  2147483647) = 0
[pid 16973] futex(0x7f92743e16c8, FUTEX_WAKE_PRIVATE,
  2147483647) = 0
[pid 16973] openat(AT_FDCWD, "file.txt", O_WRONLY|
  O_CREAT|O_APPEND, 0666) = 3
[pid 16973] lseek(3, 0, SEEK_END)       = 0
[pid 16973] statfs("/dev/shm/", {f_type=TMPFS_MAGIC,
  f_bsize=4096, f_blocks=978472, f_bfree=978465,
  f_bavail=978465, f_files=978472, f_ffree=978463,
  f_fsid={val=[2567178741, 3165115080]}, f_namelen=255,
```

```
    f_frsize=4096, f_flags=ST_VALID|ST_NOSUID|ST_NODEV|
   ST_NOATIME}) = 0
[pid 16973] futex(0x7f9274410390, FUTEX_WAKE_PRIVATE,
   2147483647) = 0
[pid 16973] openat(AT_FDCWD, "/dev/shm/sem.semaphore_1",
    O_RDWR|O_NOFOLLOW) = 4
[pid 16973] fstat(4, {st_mode=S_IFREG|0600, st_size=32,
   ...}) = 0
[pid 16973] mmap(NULL, 32, PROT_READ|PROT_WRITE,
   MAP_SHARED, 4, 0) = 0x7f927447a000
[pid 16973] close(4)                    = 0
[pid 16973] openat(AT_FDCWD, "/dev/shm/shared_memory_1",
    O_RDWR|O_CREAT|O_NOFOLLOW|O_CLOEXEC, 0600) = 4
[pid 16973] ftruncate(4, 1024)          = 0
[pid 16973] mmap(NULL, 1024, PROT_READ|PROT_WRITE,
   MAP_SHARED, 4, 0) = 0x7f927444d000
[pid 16973] openat(AT_FDCWD, "/dev/shm/sem.semaphore_2",
    O_RDWR|O_NOFOLLOW) = 5
[pid 16973] fstat(5, {st_mode=S_IFREG|0600, st_size=32,
   ...}) = 0
[pid 16973] mmap(NULL, 32, PROT_READ|PROT_WRITE,
   MAP_SHARED, 5, 0) = 0x7f927444c000
[pid 16973] close(5)                    = 0
[pid 16973] openat(AT_FDCWD, "/dev/shm/shared_memory_2",
    O_RDWR|O_CREAT|O_NOFOLLOW|O_CLOEXEC, 0600) = 5
[pid 16973] ftruncate(5, 1024)          = 0
[pid 16973] mmap(NULL, 1024, PROT_READ|PROT_WRITE,
   MAP_SHARED, 5, 0) = 0x7f927444b000
[pid 16973] write(3, "aaa;\n", 5)       = 5
[pid 16973] futex(0x7f927444c000, FUTEX_WAKE, 1 <
   unfinished ...>
[pid 16879] <... futex resumed>)        = 0
[pid 16973] <... futex resumed>)        = 1
[pid 16879] futex(0x7f34fc5b7000, FUTEX_WAIT_BITSET|
   FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY
    <unfinished ...>
[pid 16973] write(3, "ff.\n", 4)        = 4
[pid 16973] futex(0x7f927444c000, FUTEX_WAKE, 1 <
   unfinished ...>
[pid 16879] <... futex resumed>)        = 0
[pid 16973] <... futex resumed>)        = 1
[pid 16879] futex(0x7f34fc5b7000, FUTEX_WAIT_BITSET|
   FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY
    <unfinished ...>
[pid 16973] futex(0x7f927444c000, FUTEX_WAKE, 1 <
   unfinished ...>
[pid 16879] <... futex resumed>)        = -1 EAGAIN (
   Resource temporarily unavailable)
[pid 16973] <... futex resumed>)        = 0
```

```
[pid 16973] futex(0x7f927447a000, FUTEX_WAIT_BITSET|
  FUTEX_CLOCK_REALTIME, 0, NULL, FUTEX_BITSET_MATCH_ANY
   <unfinished ...>
[pid 16879] write(2, "Error: ", 7Error: )      = 7
[pid 16879] write(2, "ggg", 3ggg)          = 3
[pid 16879] write(2, "\n", 1
)           = 1
[pid 16879] futex(0x7f34fc5e5000, FUTEX_WAKE, 1) = 1
[pid 16973] <... futex resumed>)        = 0
[pid 16879] munmap(0x7f34fc5e5000, 32 <unfinished ...>
[pid 16973] munmap(0x7f927447a000, 32 <unfinished ...>
[pid 16879] <... munmap resumed>)       = 0
[pid 16973] <... munmap resumed>)       = 0
[pid 16879] unlink("/dev/shm/sem.semaphore_1" <
  unfinished ...>
[pid 16973] unlink("/dev/shm/sem.semaphore_1" <
  unfinished ...>
[pid 16879] <... unlink resumed>)       = 0
[pid 16973] <... unlink resumed>)       = -1 ENOENT (No
  such file or directory)
[pid 16879] unlink("/dev/shm/shared_memory_1" <
  unfinished ...>
[pid 16973] unlink("/dev/shm/shared_memory_1" <
  unfinished ...>
[pid 16879] <... unlink resumed>)       = 0
[pid 16973] <... unlink resumed>)       = -1 ENOENT (No
  such file or directory)
[pid 16879] munmap(0x7f34fc5b8000, 1024 <unfinished ...>
[pid 16973] munmap(0x7f927444d000, 1024 <unfinished ...>
[pid 16879] <... munmap resumed>)       = 0
[pid 16973] <... munmap resumed>)       = 0
[pid 16879] close(3 <unfinished ...>
[pid 16973] close(4 <unfinished ...>
[pid 16879] <... close resumed>)        = 0
[pid 16973] <... close resumed>)        = 0
[pid 16879] munmap(0x7f34fc5b7000, 32 <unfinished ...>
[pid 16973] munmap(0x7f927444c000, 32 <unfinished ...>
[pid 16879] <... munmap resumed>)       = 0
[pid 16973] <... munmap resumed>)       = 0
[pid 16879] unlink("/dev/shm/sem.semaphore_2" <
  unfinished ...>
[pid 16973] unlink("/dev/shm/sem.semaphore_2" <
  unfinished ...>
[pid 16879] <... unlink resumed>)       = 0
[pid 16973] <... unlink resumed>)       = -1 ENOENT (No
  such file or directory)
[pid 16879] unlink("/dev/shm/shared_memory_2" <
  unfinished ...>
[pid 16973] unlink("/dev/shm/shared_memory_2" <
```

```
   unfinished ...>
[pid 16879] <... unlink resumed>)       = 0
[pid 16973] <... unlink resumed>)       = -1 ENOENT (No
   such file or directory)
[pid 16879] munmap(0x7f34fc5b6000, 1024 <unfinished ...>
[pid 16973] munmap(0x7f927444b000, 1024 <unfinished ...>
[pid 16879] <... munmap resumed>)       = 0
[pid 16973] <... munmap resumed>)       = 0
[pid 16879] close(4 <unfinished ...>
[pid 16973] close(5 <unfinished ...>
[pid 16879] <... close resumed>)        = 0
[pid 16973] <... close resumed>)        = 0
[pid 16879] exit_group(0 <unfinished ...>
[pid 16973] exit_group(0 <unfinished ...>
[pid 16879] <... exit_group resumed>)   = ?
[pid 16973] <... exit_group resumed>)   = ?
[pid 16879] +++ exited with 0 +++
+++ exited with 0 +++
```

1. execve("./lab3/lab3 ["./lab3/lab3"], 0x7ffd71132798 /* 51 vars */) = 0: Этот вызов execve, который выполняет программу lab3. Значение 0 означает успешное выполнение.

2. brk(NULL) = 0x56197b5bd000: Этот вызов brk используется для расширения размера кучи программы. Здесь он устанавливает верхний предел кучи на адрес 0x56197b5bd000.

3. openat(AT_FDCWD, "/etc/ld.so.cache O_RDONLY|O_CLOEXEC) = 3: Этот вызов открывает файл /etc/ld.so.cache для чтения. Данный файл содержит кэш динамически загружаемых библиотек, которые используются для быстрого поиска библиотек при выполнении программ.

4. fstat(3, st_mode=S_IFREG|0644, st_size=239963, ...) = 0: Этот вызов получает информацию о файле, который открыт дескриптором 3.

5. mmap(NULL, 239963, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f34fc57e000: Выделение памяти с использованием системного вызова mmap. Этот вызов создает отображение виртуальной памяти для чтения (PROT_READ) размером 239963 байт, начиная с адреса 0x7f34fc57e000. Отображение является частным и открыто только для чтения. Файловый дескриптор 3 указывает на файл, откуда происходит отображение.

6. close(3) = 0: Этот вызов закрывает файловый дескриптор 3 (который был использован для ld.so.cache).

7. read(3, "..."..., 832) = 832: Чтение 832 битов из файла /lib/x86_64-linux-gnu/librt.so.1

8. arch_prctl(ARCH_SET_FS, 0x7f34fc00c740) = 0: Задаёт состояние процесса.

9. mprotect(0x7f34fc348000, 16384, PROT_READ) = 0: Этот вызов изменяет права доступа к памяти. Здесь он делает доступной для чтения область памяти, начинающуюся с адреса 0x7f34fc348000 и имеющую размер 16384 байта.

10. munmap(0x7f34fc57e000, 239963) = 0: Снимает отражение файла или устройства в памяти.

11. set_tid_address(0x7f34fc00ca10) = 16879: Этот вызов устанавливает адрес переменной в адресное пространство потока.

12. prlimit64(0, RLIMIT_STACK, NULL, rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY) = = 0: Этот вызов изменяет ограничения ресурсов процесса. Здесь он изменяет текущий размер стека в 8192*1024 байт и максимальный размер стека в бесконечность.

13. futex(0x7f34fc57b390, FUTEX_WAKE_PRIVATE, 2147483647) = 0: Этот вызов реализует операции с futex (Fast Userspace Mutex). Здесь он пробуждает ожидающий поток (FUTEX_WAKE_PRIVATE).

14. read(0, file.txt "file.txt 1024) = 9: Этот вызов производит чтение из стандартного ввода в буфер размером 1024 байта. Прочитанная строка имеет длину 9 байт.

15. ftruncate(3, 1024) = 0: Этот вызов устанавливает размер файла, связанного с файловым дескриптором 3, в 1024 байта.

16. getpid() = 16879: Получение идентификатора текущего процесса.

17. write(4, "0...0 32) = 32: Запись 32 байт нулей в файл, связанный с файловым дескриптором 4.

18. clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLDstrace, child_tidptr=0x7f34fc00ca10) = 16973: Создание нового процесса с помощью системного вызова clone.

6 Выводы

В результате выполнения данной лабораторной работы я ознакомилась с таким средством диагностики как strace, с помощью которой можно отследить системные вызовы, выполняемые программой. Я приобрела практические навыки диагностики работы программного обеспечения.