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**Лабораторная работа №1**  
**по курсу «Операционные системы»**  
**III Семестр**

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# 1. Постановка задачи

Приобретение практических навыков диагностики работы программного обеспечения.

Используемое средство диагностики — утилита **strace**.

## 2. Демонстрация полного функционала утилиты strace на примере ЛР №2

**Strace** - это утилита для диагностики, отладки и поиска неисправностей программ для Linux. Она используется для мониторинга взаимодействиями между процессами и ядром Linux, которые включают в себя системные вызовы, доставку сигналов и изменение состояния процесса. Работа strace становится возможной благодаря функции ядра, известной как ptrace.

### Отображение всех вызовов:

```
[leo@pc src]$ strace ./main out1 out2 <test01.txt
execve("./main", ["/main", "out1", "out2"], 0x7fff8d5fa130 /* 58 vars */) = 0
brk(NULL)                               = 0x560c870ba000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffd7edef110) = -1 EINVAL (Invalid argument)
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=208114, ...}) = 0
mmap(NULL, 208114, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f77afd07000
close(3)                                = 0
openat(AT_FDCWD, "/usr/lib/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\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", 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\364[g\253(\257\25\201\313\250\344q>\17\323\262"..., 68, 880) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=2159552, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f77afd05000
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, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f77afb3c000
mmap(0x7f77afb62000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x26000) = 0x7f77afb62000
mmap(0x7f77afcaf000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x173000) = 0x7f77afcaf000
mmap(0x7f77afcfc000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1be000) = 0x7f77afcfc000
mmap(0x7f77afd01000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f77afd01000
close(3)                                = 0
```

```

mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7f77afb3a000
arch_prctl(ARCH_SET_FS, 0x7f77afd06580) = 0
mprotect(0x7f77afcfb000, 12288, PROT_READ) = 0
mprotect(0x560c85307000, 4096, PROT_READ) = 0
mprotect(0x7f77afd66000, 4096, PROT_READ) = 0
munmap(0x7f77afd07000, 208114) = 0
fstat(1, {st_mode=S_IFCHR|0600, st_rdev=makedev(0x88, 0x2), ...}) = 0
brk(NULL) = 0x560c870ba000
brk(0x560c870db000) = 0x560c870db000
write(1, "Name of the 1st child-output fil"..., 40Name of the 1st child-output file: out1
) = 40
write(1, "Name of the 2nd child-output fil"..., 40Name of the 2nd child-output file: out2
) = 40
pipe([3, 4]) = 0
pipe([5, 6]) = 0
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|
SIGCHLD, child_tidptr=0x7f77afd06850) = 13037
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|
SIGCHLD, child_tidptr=0x7f77afd06850) = 13038
close(3) = 0
close(5) = 0
write(1, "Enter strings to process: \n", 27Enter strings to process:
) = 27
fstat(0, {st_mode=S_IFREG|0644, st_size=286, ...}) = 0
read(0, "\342\200\234The unexamined life is not wo"..., 4096) = 286
write(6, "\342\200\234The unexamined life is not wo"..., 59) = 59
write(6, "https://www.google.com/search?q="..., 130) = 130
write(4, "123\n", 4) = 4
write(4, "...biba\n", 8) = 8
write(4, "boba...\n", 8) = 8
write(6, "\342\200\234If God did not exist, it woul"..., 77) = 77
read(0, "", 4096) = 0
close(4) = 0
close(6) = 0
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=13037, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=13038, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
wait4(13037, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 13037
write(1, "Child 1 exited, returned 0\n", 28Child 1 exited, returned 0
) = 28
wait4(13038, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 13038
write(1, "Child 2 exited, returned 0\n", 28Child 2 exited, returned 0
) = 28
exit_group(0) = ?
+++ exited with 0 +++

```

Очень «многословно» и не очень познавательно. Слишком много не интересующих нас вызовов. Исправим это.

### Отображение определенных вызовов:

Опция -е служит для отображения лишь определенных вызовов.

Например — отобразить только вызовы close():

```
[leo@pc src]$ strace -e close ./main out1 out2 <test01.txt
close(3)                = 0
close(3)                = 0
Name of the 1st child-output file: out1
Name of the 2nd child-output file: out2
close(3)                = 0
close(5)                = 0
Enter strings to process:
close(4)                = 0
close(6)                = 0
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=13590, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=13589, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
Child 1 exited, returned 0
Child 2 exited, returned 0
+++ exited with 0 +++
```

Можно и **несколько типов вызовов сразу**: -е trace= и через запятую — список вызовов.

```
[leo@pc src]$ strace -e trace=mmap,close ./main out1 out2 <test01.txt
mmap(NULL, 208114, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f5573d47000
close(3)                = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7f5573d45000
mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) =
0x7f5573b7c000
mmap(0x7f5573ba2000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x26000) = 0x7f5573ba2000
mmap(0x7f5573cef000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x173000) = 0x7f5573cef000
mmap(0x7f5573d3b000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x1be000) = 0x7f5573d3b000
mmap(0x7f5573d41000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f5573d41000
close(3)                = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7f5573b7a000
Name of the 1st child-output file: out1
Name of the 2nd child-output file: out2
close(3)                = 0
close(5)                = 0
Enter strings to process:
close(4)                = 0
close(6)                = 0
```

```

--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=16380, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=16379, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
Child 1 exited, returned 0
Child 2 exited, returned 0
+++ exited with 0 +++

```

Но на вызовы дочерних процессов взглянуть без определенного ключа не удастся.

## Отслеживание дочерних процессов:

Отслеживать дерево процессов целиком помогает флаг -f, с которым strace отслеживает системные вызовы в процессах-потомках. К каждой строке вывода при этом добавляется pid процесса, делающего системный вызов:

```

[leo@pc src]$ strace -f -e trace=write,read ./main out1 out2 <test01.txt
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0"..., 832) = 832
write(1, "Name of the 1st child-output fil"..., 40Name of the 1st child-output file: out1
) = 40
write(1, "Name of the 2nd child-output fil"..., 40Name of the 2nd child-output file: out2
) = 40
strace: Process 24231 attached
strace: Process 24232 attached
[pid 24230] write(1, "Enter strings to process: \n", 27Enter strings to process:
) = 27
[pid 24230] read(0, <unfinished ...>
[pid 24231] read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0"..., 832) =
832
[pid 24232] read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0"..., 832) =
832
[pid 24230] <... read resumed> "\342\200\234The unexamined life is not wo"..., 4096) = 286
[pid 24230] write(6, "\342\200\234The unexamined life is not wo"..., 59) = 59
[pid 24230] write(6, "https://www.google.com/search?q="..., 130) = 130
[pid 24230] write(4, "123\n", 4) = 4
[pid 24230] write(4, "...biba\n", 8) = 8
[pid 24230] write(4, "boba...\n", 8) = 8
[pid 24230] write(6, "\342\200\234If God did not exist, it woul"..., 77) = 77
[pid 24230] read(0, "", 4096) = 0
[pid 24231] read(0, "123\n...biba\nboba...\n", 4096) = 20
[pid 24231] read(0, "", 4096) = 0
[pid 24231] write(1, "1st Child 24231: Started!\nReceiv"..., 182 <unfinished ...>
[pid 24232] read(0, "\342\200\234The unexamined life is not wo"..., 4096) = 266
[pid 24231] <... write resumed> = 182
[pid 24232] read(0, "", 4096) = 0
[pid 24232] write(1, "2nd Child 24232: Started!\nReceiv"..., 608) = 608
[pid 24232] +++ exited with 0 +++
[pid 24230] --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=24232,
si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
[pid 24231] +++ exited with 0 +++

```

```

--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=24231, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
write(1, "Child 1 exited, returned  0\n", 28Child 1 exited, returned  0
) = 28
write(1, "Child 2 exited, returned  0\n", 28Child 2 exited, returned  0
) = 28
+++ exited with 0 +++

```

В данном случае будет полезной **фильтрация по группам вызовов:**

```

[leo@pc src]$ strace -f -e trace=%process ./main out1 out2 <test01.txt
execve("./main", ["/main", "out1", "out2"], 0x7ffea199a518 /* 60 vars */) = 0
Name of the 1st child-output file: out1
Name of the 2nd child-output file: out2
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|
SIGCHLD, child_tidptr=0x7f871c760850) = 17210
strace: Process 17210 attached
[pid 17209] clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|
CLONE_CHILD_SETTID|SIGCHLD, child_tidptr=0x7f871c760850) = 17211
strace: Process 17211 attached
Enter strings to process:
[pid 17211] execve("./child2", ["child2"], 0x7ffda96841a8 /* 60 vars */) = 0
[pid 17210] execve("./child1", ["child1"], 0x7ffda96841a8 /* 60 vars */) = 0
[pid 17209] wait4(17210, <unfinished ...>
[pid 17211] exit_group(0)           = ?
[pid 17211] +++ exited with 0 +++
[pid 17209] <... wait4 resumed>0x7ffda9683e34, 0, NULL) = ? ERESTARTSYS (To be restarted if
SA_RESTART is set)
[pid 17209] --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17211,
si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
[pid 17209] wait4(17210, <unfinished ...>
[pid 17210] exit_group(0)           = ?
[pid 17210] +++ exited with 0 +++
<... wait4 resumed>[{{WIFEXITED(s) && WEXITSTATUS(s) == 0}}, 0, NULL) = 17210
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17210, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
Child 1 exited, returned  0
wait4(17211, [{{WIFEXITED(s) && WEXITSTATUS(s) == 0}}, 0, NULL) = 17211
Child 2 exited, returned  0
exit_group(0)           = ?
+++ exited with 0 +++

```

**Пути к файлам вместо дескрипторов:**

Ключ -у позволяет взглянуть на название файлов, с которыми работает процесс, вместо файловых дескрипторов:

```

[leo@pc src]$ strace -y -e read ./main out1 out2 <test01.txt
read(3</usr/lib/libc-2.32.so>, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\
0\1\0\0\0\220\202\2\0\0\0\0"..., 832) = 832
Name of the 1st child-output file: out1

```

Name of the 2nd child-output file: out2

Enter strings to process:

```
read(0</home/leo/programming/OS/Lab1/src/test01.txt>, "\342\200\234The unexamined life is not wo"..., 4096) = 286
```

```
read(0</home/leo/programming/OS/Lab1/src/test01.txt>, "", 4096) = 0
```

```
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17353, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
```

```
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17352, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
```

Child 1 exited, returned 0

Child 2 exited, returned 0

+++ exited with 0 +++

## Отображение времени выполнения вызова:

Посмотреть время выполнения того или иного вызова позволяет ключ -t:

```
[leo@pc src]$ strace -y -t -e read ./main out1 out2 <test01.txt
```

```
18:05:03 read(3</usr/lib/libc-2.32.so>, "\177ELF\2\1\1\3\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0"..., 832) = 832
```

Name of the 1st child-output file: out1

Name of the 2nd child-output file: out2

Enter strings to process:

```
18:05:03 read(0</home/leo/programming/OS/Lab1/src/test01.txt>, "\342\200\234The unexamined life is not wo"..., 4096) = 286
```

```
18:05:03 read(0</home/leo/programming/OS/Lab1/src/test01.txt>, "", 4096) = 0
```

```
18:05:03 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17476, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
```

Child 1 exited, returned 0

```
18:05:03 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17477, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
```

Child 2 exited, returned 0

```
18:05:03 +++ exited with 0 +++
```

## Печать “относительной” времени вызова системных процессов:

```
[leo@pc src]$ strace -r -e close ./main out1 out2 <test01.txt
```

```
0.000000 close(3) = 0
```

```
0.001310 close(3) = 0
```

Name of the 1st child-output file: out1

Name of the 2nd child-output file: out2

```
0.002243 close(3) = 0
```

```
0.000141 close(5) = 0
```

Enter strings to process:

```
0.000794 close(4) = 0
```

```
0.000087 close(6) = 0
```

```
0.000901 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=27360, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
```

Child 1 exited, returned 0

```
0.002228 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=27361, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
```

```
Child 2 exited, returned 0
0.000541 +++ exited with 0 +++
```

## Сохранение вывода утилиты strace в файл

Ключ -o {filename} позволяет вывести лог в файл.

```
[leo@pc src]$ strace -o log.txt -e read ./main out1 out2 <test01.txt -o log.txt
Name of the 1st child-output file: out1
Name of the 2nd child-output file: out2
Enter strings to process:
Child 1 exited, returned 0
Child 2 exited, returned 0
[leo@pc src]$ cat log.txt
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0"..., 832) = 832
read(0, "\342\200\234The unexamined life is not wo"..., 4096) = 286
read(0, "", 4096) = 0
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=26803, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=26804, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
+++ exited with 0 +++
```

## Трассировка вызовов запущенного процесса:

Для подключения к уже работающему процессу — используется опция -p.

Запустим main и оставим его ожидать входные данные. Узнаем его PID и подключимся к нему в другой консоли.

```
[leo@pc src]$ ./main out1 out2
Name of the 1st child-output file: out1
Name of the 2nd child-output file: out2
Enter strings to process:
[pc src]# ps -a
  PID TTY          TIME CMD
 26363 pts/2    00:00:00 sudo
 26364 pts/2    00:00:00 bash
 26373 pts/2    00:00:00 sudo
 26374 pts/2    00:00:00 bash
 27293 pts/4    00:00:00 main
 27294 pts/4    00:00:00 child1
 27295 pts/4    00:00:00 child2
 27296 pts/2    00:00:00 ps
[pc src]# strace -f -p 27293
strace: Process 27293 attached
read(0, "good evening\n", 1024) = 13
write(6, "good evening\n", 13) = 13
read(0, "how are you\n", 1024) = 12
write(6, "how are you\n", 12) = 12
```



```

read(0, "ewe ty dremliw drug prilesny?\n", 1024) = 30
write(6, "ewe ty dremliw drug prilesny?\n", 30) = 30
read(0, "one\n", 1024) = 4
write(4, "one\n", 4) = 4
read(0, "two\n", 1024) = 4
write(4, "two\n", 4) = 4
read(0, "\n", 1024) = 1
write(4, "\n", 1) = 1
read(0, "three\n", 1024) = 6
write(4, "three\n", 6) = 6
read(0, "bye!\n", 1024) = 5
write(4, "bye!\n", 5) = 5
read(0, "", 1024) = 0
close(4) = 0
close(6) = 0
wait4(27294, 0x7ffe27d78c74, 0, NULL) = ? ERESTARTSYS (To be restarted if SA_RESTART
is set)
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=27295, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
wait4(27294, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 27294
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=27294, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
write(1, "Child 1 exited, returned 0\n", 28) = 28
wait4(27295, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 27295
write(1, "Child 2 exited, returned 0\n", 28) = 28
exit_group(0) = ?
+++ exited with 0 +++
[pc src]#

```

## Статистика системных вызовов:

С помощью опции -c — можно получить наглядную статистику выполнения программы:

```
[leo@pc src]$ strace -c ./main out1 out2 <test01.txt
```

Name of the 1st child-output file: out1

Name of the 2nd child-output file: out2

Enter strings to process:

Child 1 exited, returned 0

Child 2 exited, returned 0

% time	seconds	usecs/call	calls	errors	syscall
72.69	0.002167	1083	2		wait4
9.26	0.000276	138	2		clone
6.84	0.000204	18	11		write
2.65	0.000079	26	3		brk
1.85	0.000055	18	3		mprotect
1.61	0.000048	8	6		close
1.51	0.000045	45	1		munmap
1.51	0.000045	22	2		pipe
1.07	0.000032	8	4		fstat

1.01	0.000030	10	3	read
0.00	0.000000	0	8	mmap
0.00	0.000000	0	4	pread64
0.00	0.000000	0	1	1 access
0.00	0.000000	0	1	execve
0.00	0.000000	0	2	1 arch_prctl
0.00	0.000000	0	2	openat
-----				
100.00	0.002981	54	55	2 total

## 3. Диагностика Strace других ЛР

### 3.1. ЛР №3

Сразу продемонстрирую лог с ключами -f для отслеживания всех потоков и -r для демонстрации «относительного времени» вызовов:

```
0.000000 execve("./main", ["/main", "3", "1"], 0x7ffc61ba48d0 /* 58 vars
*/) = 0
0.000966 brk(NULL) = 0x562b34237000
0.000164 arch_prctl(0x3001 /* ARCH_??? */, 0x7ffdfecb8d90) = -1 EINVAL
(Invalid argument)
0.000510 access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or
directory)
0.000311 openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
0.000378 fstat(3, {st_mode=S_IFREG|0644, st_size=208296, ...}) = 0
0.000251 mmap(NULL, 208296, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fc19acdc000
0.000151 close(3) = 0
0.000115 openat(AT_FDCWD, "/usr/lib/libpthread.so.0", O_RDONLY|O_CLOEXEC) =
3
0.000139 read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\
0\1\0\0\0000\201\0\0\0\0\0\0"... , 832) = 832
0.000092 pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\307Y\373z\3054\277z\
21\35\225\341\273\304<\223"... , 68, 824) = 68
0.000093 fstat(3, {st_mode=S_IFREG|0755, st_size=158744, ...}) = 0
0.000092 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS,
-1, 0) = 0x7fc19acda000
0.000107 mmap(NULL, 135600, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) =
0x7fc19acb8000
0.000091 mmap(0x7fc19acbf000, 65536, PROT_READ|PROT_EXEC, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 3, 0x7000) = 0x7fc19acbf000
0.000108 mmap(0x7fc19accf000, 20480, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x17000) = 0x7fc19accf000
0.000093 mmap(0x7fc19acd4000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 3, 0x1b000) = 0x7fc19acd4000
0.000140 mmap(0x7fc19acd6000, 12720, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fc19acd6000
0.000379 close(3) = 0
0.000233 openat(AT_FDCWD, "/usr/lib/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
0.000235 read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\
0\1\0\0\0\220\202\2\0\0\0\0\0"... , 832) = 832
0.000222 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"... , 784, 64) = 784
0.000164 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
0.000209 pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\364[g\253(\
257\25\201\313\250\344q>\17\323\262"... , 68, 880) = 68
0.000206 fstat(3, {st_mode=S_IFREG|0755, st_size=2159552, ...}) = 0
0.000213 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"... , 784, 64) = 784
0.000098 mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) =
0x7fc19aaef000
```

```

0.000097 mmap(0x7fc19ab15000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 3, 0x26000) = 0x7fc19ab15000
0.000109 mmap(0x7fc19ac62000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x173000) = 0x7fc19ac62000
0.000094 mmap(0x7fc19acae000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 3, 0x1be000) = 0x7fc19acae000
0.000150 mmap(0x7fc19acb4000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fc19acb4000
0.000160 close(3) = 0
0.000227 mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS,
-1, 0) = 0x7fc19aaec000
0.000221 arch_prctl(ARCH_SET_FS, 0x7fc19aaec740) = 0
0.000287 mprotect(0x7fc19acae000, 12288, PROT_READ) = 0
0.000305 mprotect(0x7fc19acd4000, 4096, PROT_READ) = 0
0.000116 mprotect(0x562b33e8b000, 4096, PROT_READ) = 0
0.000095 mprotect(0x7fc19ad3b000, 4096, PROT_READ) = 0
0.000137 munmap(0x7fc19acdc000, 208296) = 0
0.000132 set_tid_address(0x7fc19aaeca10) = 26146
0.000080 set_robust_list(0x7fc19aaeca20, 24) = 0
0.000097 rt_sigaction(SIGRTMIN, {sa_handler=0x7fc19acbf90, sa_mask=[],
sa_flags=SA_RESTORER|SA_SIGINFO, sa_restorer=0x7fc19accc0f0}, NULL, 8) = 0
0.000114 rt_sigaction(SIGRT_1, {sa_handler=0x7fc19acbf90, sa_mask=[],
sa_flags=SA_RESTORER|SA_RESTART|SA_SIGINFO, sa_restorer=0x7fc19accc0f0}, NULL,
8) = 0
0.000096 rt_sigprocmask(SIG_UNBLOCK, [RTMIN RT_1], NULL, 8) = 0
0.000099 prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024,
rlim_max=RLIM64_INFINITY}) = 0
0.000166 clock_gettime(CLOCK_PROCESS_CPUTIME_ID, {tv_sec=0,
tv_nsec=3803310}) = 0
0.000114 mmap(NULL, 8392704, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|
MAP_STACK, -1, 0) = 0x7fc19a2eb000
0.000094 mprotect(0x7fc19a2ec000, 8388608, PROT_READ|PROT_WRITE) = 0
0.000197 brk(NULL) = 0x562b34237000
0.000079 brk(0x562b34258000) = 0x562b34258000
0.000097 rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0
0.000114 clone(child_stack=0x7fc19aaeaf0, flags=CLONE_VM|CLONE_FS|
CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|
CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID, trace: Process 26147 attached
, parent_tid=[26147], tls=0x7fc19aaeb640, child_tidptr=0x7fc19aaeb910) = 26147
[pid 26147] 0.000174 set_robust_list(0x7fc19aaeb920, 24 <unfinished ...>
[pid 26146] 0.000036 rt_sigprocmask(SIG_SETMASK, [], <unfinished ...>
[pid 26147] 0.000041 <... set_robust_list resumed>) = 0
[pid 26146] 0.000026 <... rt_sigprocmask resumed>NULL, 8) = 0
[pid 26147] 0.000027 rt_sigprocmask(SIG_SETMASK, [], <unfinished ...>
[pid 26146] 0.000040 futex(0x7fc19aaeb910, FUTEX_WAIT, 26147, NULL
<unfinished ...>
[pid 26147] 0.000037 <... rt_sigprocmask resumed>NULL, 8) = 0
[pid 26147] 0.000044 clock_gettime(CLOCK_PROCESS_CPUTIME_ID, {tv_sec=0,
tv_nsec=4344600}) = 0
[pid 26147] 0.000102 clock_gettime(CLOCK_PROCESS_CPUTIME_ID, {tv_sec=0,
tv_nsec=4386645}) = 0
[pid 26147] 0.000097 clock_gettime(CLOCK_PROCESS_CPUTIME_ID, {tv_sec=0,
tv_nsec=4424800}) = 0
[pid 26147] 0.000108 openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|
O_CLOEXEC) = 3
[pid 26147] 0.000107 fstat(3, {st_mode=S_IFREG|0644, st_size=208296, ...})
= 0
[pid 26147] 0.000094 mmap(NULL, 208296, PROT_READ, MAP_PRIVATE, 3, 0) =
0x7fc19acdc000
[pid 26147] 0.000090 close(3) = 0
[pid 26147] 0.000111 mmap(NULL, 134217728, PROT_NONE, MAP_PRIVATE|
MAP_ANONYMOUS|MAP_NORESERVE, -1, 0) = 0x7fc1922eb000
[pid 26147] 0.000088 munmap(0x7fc1922eb000, 30494720) = 0
[pid 26147] 0.000091 munmap(0x7fc198000000, 36614144) = 0

```

```

[pid 26147]      0.000085 mprotect(0x7fc194000000, 135168, PROT_READ|PROT_WRITE)
= 0
[pid 26147]      0.000099 openat(AT_FDCWD, "/usr/lib/libgcc_s.so.1", O_RDONLY|
O_CLOEXEC) = 3
[pid 26147]      0.000099 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\0\0"... , 832) = 832
[pid 26147]      0.000096 fstat(3, {st_mode=S_IFREG|0644, st_size=594704, ...})
= 0
[pid 26147]      0.000132 mmap(NULL, 103144, PROT_READ, MAP_PRIVATE|
MAP_DENYWRITE, 3, 0) = 0x7fc19a2d1000
[pid 26147]      0.000096 mmap(0x7fc19a2d4000, 69632, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0x7fc19a2d4000
[pid 26147]      0.000185 mmap(0x7fc19a2e5000, 16384, PROT_READ, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 3, 0x14000) = 0x7fc19a2e5000
[pid 26147]      0.000093 mmap(0x7fc19a2e9000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x17000) = 0x7fc19a2e9000
[pid 26147]      0.000130 close(3) = 0
[pid 26147]      0.000129 mprotect(0x7fc19a2e9000, 4096, PROT_READ) = 0
[pid 26147]      0.000108 munmap(0x7fc19acdc000, 208296) = 0
[pid 26147]      0.000134 futex(0x7fc19a2ea080, FUTEX_WAKE_PRIVATE, 2147483647)
= 0
[pid 26147]      0.000099 rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0
[pid 26147]      0.000109 madvise(0x7fc19a2eb000, 8368128, MADV_DONTNEED) = 0
[pid 26147]      0.000089 exit(0) = ?
[pid 26146]      0.000106 <... futex resumed> = 0
[pid 26147]      0.000020 +++ exited with 0 +++
0.000021 clock_gettime(CLOCK_PROCESS_CPUTIME_ID, {tv_sec=0,
tv_nsec=5531068}) = 0
0.000125 fstat(1, {st_mode=S_IFCHR|0600, st_rdev=makedev(0x88, 0x1), ...})
= 0
0.000111 write(1, "Probability equals to 0.000\n", 28Probability equals to
0.000
) = 28
0.000107 write(1, "Time spent: 0.001728 seconds\n", 29Time spent: 0.001728
seconds
) = 29
0.000102 exit_group(0) = ?
0.000263 +++ exited with 0 +++

```

**Наблюдательно, но не удивительно: мы запустили 3 потока, и, как и должно быть, наблюдаем 3 вызова функции `clock_gettime` (выделены жирным).**

**Видим также сис. вызов `clone` с ключом `CLONE_THREAD`.**

```

[leo@pc final]$ strace -f -r -y -c ./main 3 1
strace: -r/--relative-timestamps has no effect with -c/--summary-only
strace: -y/--decode-fds has no effect with -c/--summary-only
strace: Process 27692 attached
Probability equals to 0.000
Time spent: 0.000486 seconds
% time      seconds  usecs/call     calls    errors syscall
-----
 0.00      0.000000         0         3         0   read
 0.00      0.000000         0         2         0   write
 0.00      0.000000         0         5         0   close
 0.00      0.000000         0         6         0   fstat
 0.00      0.000000         0        20         0   mmap
 0.00      0.000000         0         7         0   mprotect
 0.00      0.000000         0         4         0   munmap
 0.00      0.000000         0         3         0   brk
 0.00      0.000000         0         2         0   rt_sigaction
 0.00      0.000000         0         5         0   rt_sigprocmask
 0.00      0.000000         0         5         0   pread64

```

0.00	0.000000	0	1	1 access
0.00	0.000000	0	1	madvise
0.00	0.000000	0	1	clone
0.00	0.000000	0	1	execve
0.00	0.000000	0	2	1 arch_prctl
0.00	0.000000	0	2	futex
0.00	0.000000	0	1	set_tid_address
0.00	0.000000	0	5	clock_gettime
0.00	0.000000	0	5	openat
0.00	0.000000	0	2	set_robust_list
0.00	0.000000	0	1	prlimit64
-----				
100.00	0.000000	0	84	2 total

## 3.2. ЛП №4

### Отображение вызовов моей программы:

```
[leo@pc final]$ strace -f -e trace="%process,read,write,dup2,mmap" -o strace.log
./main out1 out2
Enter strings to process:
zdravia jelayu
tovarisch podpolpolpodpolpodpodkovnik
bye-bye!
Child 1 exited, returned 0
Child 2 exited, returned 0
[leo@pc final]$ cat out1
b-b!
[leo@pc final]$ cat out2
zdrv jl
tvrsch pdplplpdplpdpdvknk
[leo@pc final]$ cat strace.log
486540 execve("./main", ["./main", "out1", "out2"], 0x7fff9e739a58 /* 75 vars
*/) = 0
486540 mmap(NULL, 188453, PROT_READ, MAP_PRIVATE, 6, 0) = 0x7ffb880e1000
486540 read(6, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\0\3\0>\
0\1\0\0\0\220\202\2\0\0\0\0\0"... , 832) = 832
486540 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7ffb880df000
486540 mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) =
0x7ffb87f16000
486540 mmap(0x7ffb87f3c000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x26000) = 0x7ffb87f3c000
486540 mmap(0x7ffb88089000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x173000) = 0x7ffb88089000
486540 mmap(0x7ffb880d5000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1be000) = 0x7ffb880d5000
486540 mmap(0x7ffb880db000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7ffb880db000
486540 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7ffb87f14000
486540 write(1, "Enter strings to process: \n", 27) = 27
486540 read(0, "zdravia jelayu\n", 1024) = 15
486540 write(6, "zdravia jelayu\n", 15) = 15
486540 read(0, "tovarisch podpolpolpodpolpodpodk"... , 1024) = 38
486540 write(6, "tovarisch podpolpolpodpolpodpodk"... , 38) = 38
486540 read(0, "bye-bye!\n", 1024) = 9
486540 write(6, "bye-bye!\n", 9) = 9
486540 read(0, "", 1024) = 0
486540 clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|
SIGCHLD, child_tidptr=0x7ffb880e0850) = 486580
486540 clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|
SIGCHLD, child_tidptr=0x7ffb880e0850) = 486581
486580 dup2(7, 1 <unfinished ...>
486540 wait4(486580, <unfinished ...>
486580 <... dup2 resumed>) = 1
```

```

486580 execve("./child", ["child", "0"], 0x7ffded24f0f8 /* 75 vars */
<unfinished ...>
486581 dup2(7, 1) = 1
486581 execve("./child", ["child", "1"], 0x7ffded24f0f8 /* 75 vars */
<unfinished ...>
486580 <... execve resumed>) = 0
486581 <... execve resumed>) = 0
486580 mmap(NULL, 188453, PROT_READ, MAP_PRIVATE, 7, 0) = 0x7f6a440e8000
486581 mmap(NULL, 188453, PROT_READ, MAP_PRIVATE, 7, 0) = 0x7f7094a03000
486580 read(7, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\
0\1\0\0\0\220\202\2\0\0\0\0\0"... , 832) = 832
486581 read(7, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\
0\1\0\0\0\220\202\2\0\0\0\0\0"... , 832) = 832
486580 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
486581 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
486580 <... mmap resumed>) = 0x7f6a440e6000
486581 <... mmap resumed>) = 0x7f7094a01000
486580 mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 7, 0) =
0x7f6a43f1d000
486581 mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 7, 0
<unfinished ...>
486580 mmap(0x7f6a43f43000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x26000 <unfinished ...>
486581 <... mmap resumed>) = 0x7f7094838000
486580 <... mmap resumed>) = 0x7f6a43f43000
486581 mmap(0x7f709485e000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x26000 <unfinished ...>
486580 mmap(0x7f6a44090000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x173000 <unfinished ...>
486581 <... mmap resumed>) = 0x7f709485e000
486580 <... mmap resumed>) = 0x7f6a44090000
486581 mmap(0x7f70949ab000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x173000 <unfinished ...>
486580 mmap(0x7f6a440dc000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x1be000 <unfinished ...>
486581 <... mmap resumed>) = 0x7f70949ab000
486580 <... mmap resumed>) = 0x7f6a440dc000
486581 mmap(0x7f70949f7000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x1be000 <unfinished ...>
486580 mmap(0x7f6a440e2000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0 <unfinished ...>
486581 <... mmap resumed>) = 0x7f70949f7000
486580 <... mmap resumed>) = 0x7f6a440e2000
486581 mmap(0x7f70949fd000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f70949fd000
486581 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
486580 mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0)
= 0x7f6a43f1b000
486581 <... mmap resumed>) = 0x7f7094836000
486580 mmap(NULL, 62, PROT_READ|PROT_WRITE, MAP_SHARED, 7, 0) = 0x7f6a44116000
486581 mmap(NULL, 62, PROT_READ|PROT_WRITE, MAP_SHARED, 7, 0) = 0x7f7094a31000
486580 write(1, "b-b!\n", 5 <unfinished ...>
486581 write(1, "zdrv jl\ntvrsch pdplplpdpdpdkvn"... , 34 <unfinished ...>
486580 <... write resumed>) = 5
486581 <... write resumed>) = 34
486580 exit_group(0) = ?
486581 exit_group(0 <unfinished ...>
486580 +++ exited with 0 +++
486540 <... wait4 resumed>[{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) =
486580
486581 <... exit_group resumed>) = ?

```

```

486540 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=486580,
si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
486540 write(1, "Child 1 exited, returned 0\n", 28 <unfinished ...>
486581 +++ exited with 0 +++
486540 <... write resumed>                = 28
486540 --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=486581,
si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
486540 wait4(486581, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 486581
486540 write(1, "Child 2 exited, returned 0\n", 28) = 28
486540 exit_group(0)                        = ?
486540 +++ exited with 0 +++

```

### Отображение всех вызовов:

```

[leo@pc final]$ strace ./main out1 out2 <test01.txt
execve("./main", ["/main", "out1", "out2"], 0x7ffcad2f8690 /* 69 vars */) = 0
brk(NULL)                                = 0x56225074b000
arch_prctl(0x3001 /* ARCH_??? */, 0x7fffc8b7f480) = -1 EINVAL (Invalid argument)
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) = 6
fstat(6, {st_mode=S_IFREG|0644, st_size=221255, ...}) = 0
mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 6, 0) = 0x7f232a63c000
close(6)                                  = 0
openat(AT_FDCWD, "/usr/lib/libc.so.6", O_RDONLY|O_CLOEXEC) = 6
read(6, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0\0"...,
832) = 832
pread64(6, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...,
784, 64) = 784
pread64(6, "\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
pread64(6, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\207\360\21\247\344\314?\306\nT\
320\323\335i\16t"..., 68, 880) = 68
fstat(6, {st_mode=S_IFREG|0755, st_size=2159552, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f232a63a000
pread64(6, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...,
784, 64) = 784
mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f232a471000
mmap(0x7f232a497000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x26000) = 0x7f232a497000
mmap(0x7f232a5e4000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x173000) = 0x7f232a5e4000
mmap(0x7f232a630000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1be000) = 0x7f232a630000
mmap(0x7f232a636000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f232a636000
close(6)                                  = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f232a46f000
arch_prctl(ARCH_SET_FS, 0x7f232a63b580) = 0
mprotect(0x7f232a630000, 12288, PROT_READ) = 0
mprotect(0x5622503e9000, 4096, PROT_READ) = 0
mprotect(0x7f232a69f000, 4096, PROT_READ) = 0
munmap(0x7f232a63c000, 221255)            = 0
openat(AT_FDCWD, "./input.txt", O_RDWR|O_CREAT|O_TRUNC, 0777) = 6
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0x4), ...}) = 0
brk(NULL)                                = 0x56225074b000
brk(0x56225076c000)                      = 0x56225076c000
write(1, "Enter strings to process: \n", 27)Enter strings to process:
) = 27
fstat(0, {st_mode=S_IFREG|0644, st_size=286, ...}) = 0
read(0, "\342\200\234The unexamined life is not wo"..., 4096) = 286
write(6, "\342\200\234The unexamined life is not wo"..., 59) = 59
write(6, "https://www.google.com/search?q="..., 130) = 130
write(6, "123\n", 4)                          = 4

```

```

write(6, "...biba\n", 8) = 8
write(6, "boba...\n", 8) = 8
write(6, "\342\200\234If God did not exist, it woul"... , 77) = 77
read(0, "", 4096) = 0
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD,
child_tidptr=0x7f232a63b850) = 4174
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD,
child_tidptr=0x7f232a63b850) = 4175
close(6) = 0
wait4(4174, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 4174
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4174, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
write(1, "Child 1 exited, returned 0\n", 28Child 1 exited, returned 0
) = 28
wait4(4175, [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 4175
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4175, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
write(1, "Child 2 exited, returned 0\n", 28Child 2 exited, returned 0
) = 28
exit_group(0) = ?
+++ exited with 0 +++

```

### Отображение определенных вызовов:

Опция -e служит для отображения лишь определенных вызовов.

Например – отобразить только вызовы mmap:

```

[leo@pc final]$ strace -e mmap ./main out1 out2 <test01.txt
mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 6, 0) = 0x7f8bade31000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f8bade2f000
mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f8badc66000
mmap(0x7f8badc8c000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x26000) = 0x7f8badc8c000
mmap(0x7f8badd9000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x173000) = 0x7f8badd9000
mmap(0x7f8bade25000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1be000) = 0x7f8bade25000
mmap(0x7f8bade2b000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f8bade2b000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f8badc64000
Enter strings to process:
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4663, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
Child 1 exited, returned 0
Child 2 exited, returned 0
+++ exited with 0 +++

```

### Отслеживание дочерних процессов:

Отслеживать дерево процессов целиком помогает флаг -f, с которым strace отслеживает системные вызовы в процессах-потомках. К каждой строке вывода при этом добавляется pid процесса, делающего системный вывод:

```

[leo@pc final]$ strace -f -e mmap ./main out1 out2 <test01.txt
mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 6, 0) = 0x7f29ffc01000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f29ffbff000
mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f29ffa36000
mmap(0x7f29ffa5c000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x26000) = 0x7f29ffa5c000
mmap(0x7f29ffb9000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x173000) = 0x7f29ffb9000
mmap(0x7f29ffb5000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1be000) = 0x7f29ffb5000
mmap(0x7f29ffbfb000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f29ffbfb000

```



```

mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f29ffa34000
Enter strings to process:
strace: Process 4697 attached
[pid 4697] mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 7, 0) = 0x7f72ad80e000
[pid 4697] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7f72ad80c000
[pid 4697] mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 7, 0) =
0x7f72ad643000
[pid 4697] mmap(0x7f72ad669000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x26000) = 0x7f72ad669000
[pid 4697] mmap(0x7f72ad7b6000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x173000) = 0x7f72ad7b6000
[pid 4697] mmap(0x7f72ad802000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x1be000) = 0x7f72ad802000
[pid 4697] mmap(0x7f72ad808000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f72ad808000
[pid 4697] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7f72ad641000
[pid 4697] mmap(NULL, 286, PROT_READ|PROT_WRITE, MAP_SHARED, 7, 0) =
0x7f72ad844000
[pid 4697] +++ exited with 0 +++
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4697, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
strace: Process 4696 attached
[pid 4696] mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 7, 0) = 0x7f19942ed000
[pid 4696] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7f19942eb000
[pid 4696] mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 7, 0) =
0x7f1994122000
[pid 4696] mmap(0x7f1994148000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x26000) = 0x7f1994148000
[pid 4696] mmap(0x7f1994295000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x173000) = 0x7f1994295000
[pid 4696] mmap(0x7f19942e1000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x1be000) = 0x7f19942e1000
[pid 4696] mmap(0x7f19942e7000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f19942e7000
[pid 4696] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7f1994120000
[pid 4696] mmap(NULL, 286, PROT_READ|PROT_WRITE, MAP_SHARED, 7, 0) =
0x7f1994323000
[pid 4696] +++ exited with 0 +++
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4696, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
Child 1 exited, returned 0
Child 2 exited, returned 0
+++ exited with 0 +++

```

**В данном случае будет полезной фильтрация по группам вызовов:**

```

[leo@pc final]$ strace -f -e trace=%memory ./main out1 out2 <test01.txt
brk(NULL) = 0x5581b6fa5000
mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 6, 0) = 0x7f3d683b2000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f3d683b0000
mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f3d681e7000
mmap(0x7f3d6820d000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x26000) = 0x7f3d6820d000
mmap(0x7f3d6835a000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x173000) = 0x7f3d6835a000
mmap(0x7f3d683a6000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1be000) = 0x7f3d683a6000

```

```

mmap(0x7f3d683ac000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f3d683ac000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f3d681e5000
mprotect(0x7f3d683a6000, 12288, PROT_READ) = 0
mprotect(0x5581b67b7000, 4096, PROT_READ) = 0
mprotect(0x7f3d68415000, 4096, PROT_READ) = 0
munmap(0x7f3d683b2000, 221255) = 0
brk(NULL) = 0x5581b6fa5000
brk(0x5581b6fc6000) = 0x5581b6fc6000
Enter strings to process:
strace: Process 4713 attached
strace: Process 4714 attached
[pid 4713] brk(NULL) = 0x55dd79782000
[pid 4713] mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 7, 0) = 0x7fdcf19ba000
[pid 4714] brk(NULL) = 0x564dd37db000
[pid 4713] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7fdcf19b8000
[pid 4714] mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 7, 0) = 0x7f5c3efbc000
[pid 4713] mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 7, 0) =
0x7fdcf17ef000
[pid 4713] mmap(0x7fdcf1815000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x26000) = 0x7fdcf1815000
[pid 4713] mmap(0x7fdcf1962000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x173000) = 0x7fdcf1962000
[pid 4713] mmap(0x7fdcf19ae000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x1be000) = 0x7fdcf19ae000
[pid 4713] mmap(0x7fdcf19b4000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fdcf19b4000
[pid 4713] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7fdcf17ed000
[pid 4714] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0) = 0x7f5c3efba000
[pid 4713] mprotect(0x7fdcf19ae000, 12288, PROT_READ) = 0
[pid 4713] mprotect(0x55dd77eda000, 4096, PROT_READ <unfinished ...>
[pid 4714] mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 7, 0
<unfinished ...>
[pid 4713] <... mprotect resumed>) = 0
[pid 4714] <... mmap resumed>) = 0x7f5c3edf1000
[pid 4713] mprotect(0x7fdcf1a1d000, 4096, PROT_READ <unfinished ...>
[pid 4714] mmap(0x7f5c3ee17000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x26000 <unfinished ...>
[pid 4713] <... mprotect resumed>) = 0
[pid 4714] <... mmap resumed>) = 0x7f5c3ee17000
[pid 4713] munmap(0x7fdcf19ba000, 221255 <unfinished ...>
[pid 4714] mmap(0x7f5c3ef64000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 7, 0x173000 <unfinished ...>
[pid 4713] <... munmap resumed>) = 0
[pid 4714] <... mmap resumed>) = 0x7f5c3ef64000
[pid 4714] mmap(0x7f5c3efb0000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_DENYWRITE, 7, 0x1be000) = 0x7f5c3efb0000
[pid 4714] mmap(0x7f5c3efb6000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|
MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f5c3efb6000
[pid 4713] mmap(NULL, 286, PROT_READ|PROT_WRITE, MAP_SHARED, 7, 0) =
0x7fdcf19f0000
[pid 4713] brk(NULL) = 0x55dd79782000
[pid 4713] brk(0x55dd797a3000 <unfinished ...>
[pid 4714] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -
1, 0 <unfinished ...>
[pid 4713] <... brk resumed>) = 0x55dd797a3000
[pid 4714] <... mmap resumed>) = 0x7f5c3edef000
[pid 4713] munmap(0x7fdcf19f0000, 286) = 0
[pid 4714] mprotect(0x7f5c3efb0000, 12288, PROT_READ) = 0
[pid 4714] mprotect(0x564dd1a71000, 4096, PROT_READ) = 0

```

```
[pid 4713] +++ exited with 0 +++
[pid 4714] mprotect(0x7f5c3f01f000, 4096, PROT_READ <unfinished ...>
[pid 4712] --- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4713,
si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
[pid 4714] <... mprotect resumed>          = 0
Child 1 exited, returned 0
[pid 4714] munmap(0x7f5c3efbc000, 221255) = 0
[pid 4714] mmap(NULL, 286, PROT_READ|PROT_WRITE, MAP_SHARED, 7, 0) =
0x7f5c3eff2000
[pid 4714] brk(NULL)                        = 0x564dd37db000
[pid 4714] brk(0x564dd37fc000)              = 0x564dd37fc000
[pid 4714] munmap(0x7f5c3eff2000, 286) = 0
[pid 4714] +++ exited with 0 +++
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=4714, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
Child 2 exited, returned 0
+++ exited with 0 +++
```

#### Статистика системных вызовов:

С помощью опции -c — можно получить наглядную статистику выполнения программы:

```
[leo@pc final]$ strace -cf ./main out1 out2 <test01.txt
```

Enter strings to process:

strace: Process 4740 attached

strace: Process 4741 attached

Child 1 exited, returned 0

Child 2 exited, returned 0

% time	seconds	usecs/call	calls	errors	syscall
42.88	0.000331	30	11		write
42.10	0.000325	162	2		clone
7.51	0.000058	29	2		wait4
4.79	0.000037	7	5		read
2.72	0.000021	2	9		close
0.00	0.000000	0	12		fstat
0.00	0.000000	0	26		mmap
0.00	0.000000	0	9		mprotect
0.00	0.000000	0	5		munmap
0.00	0.000000	0	9		brk
0.00	0.000000	0	12		pread64
0.00	0.000000	0	3	3	access
0.00	0.000000	0	2		dup2
0.00	0.000000	0	3		execve
0.00	0.000000	0	6	3	arch_prctl
0.00	0.000000	0	11		openat
100.00	0.000772	6	127	6	total

### 3.3. ЛР №5: Strace & Ltrace

#### Отображение всех вызовов – Strace:

```
[leo@pc final]$ strace -f ./main2
```

```
execve("./main2", ["/main2"], 0x7fffca8a66f8 /* 70 vars */) = 0
```

```
brk(NULL) = 0x556e3492f000
```

```
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffd75fb18b0) = -1 EINVAL (Invalid argument)
```

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

```
openat(AT_FDCWD, "tls/haswell/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1
```

```
ENOENT (No such file or directory)
openat(AT_FDCWD, "tls/haswell/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
```

```
openat(AT_FDCWD, "tls/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
```

```
openat(AT_FDCWD, "tls/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
or directory)
```

```
openat(AT_FDCWD, "haswell/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
```

```

openat(AT_FDCWD, "haswell/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "./tls/haswell/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "./tls/haswell/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "./tls/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "./tls/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "./haswell/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "./haswell/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "./x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "./libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 6
fstat(6, {st_mode=S_IFREG|0644, st_size=221255, ...}) = 0
mmap(NULL, 221255, PROT_READ, MAP_PRIVATE, 6, 0) = 0x7f555515f000
close(6) = 0
openat(AT_FDCWD, "/usr/lib/libdl.so.2", O_RDONLY|O_CLOEXEC) = 6
read(6, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\20\22\0\0\0\0\0\0"...
, 832) = 832
fstat(6, {st_mode=S_IFREG|0755, st_size=18608, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f555515d000
mmap(NULL, 20624, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f5555157000
mmap(0x7f5555158000, 8192, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1000) = 0x7f5555158000
mmap(0x7f555515a000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x3000) = 0x7f555515a000
mmap(0x7f555515b000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x3000) = 0x7f555515b000
close(6) = 0
openat(AT_FDCWD, "tls/haswell/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "tls/haswell/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, "tls/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file
or directory)
openat(AT_FDCWD, "haswell/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "haswell/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, "./tls/haswell/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "./tls/haswell/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, "./tls/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)

```

```

openat(AT_FDCWD, "./haswell/x86_64/libc.so.6", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "./haswell/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, "/usr/lib/libc.so.6", O_RDONLY|O_CLOEXEC) = 6
read(6, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0\0"...
, 832) = 832
pread64(6, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...
, 784, 64) = 784
pread64(6, "\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
pread64(6, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\207\360\21\247\344\314?\306\nT\
320\323\335i\16t"... , 68, 880) = 68
fstat(6, {st_mode=S_IFREG|0755, st_size=2159552, ...}) = 0
pread64(6, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...
, 784, 64) = 784
mmap(NULL, 1868448, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f5554f8e000
mmap(0x7f5554fb4000, 1363968, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x26000) = 0x7f5554fb4000
mmap(0x7f5555101000, 311296, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x173000) = 0x7f5555101000
mmap(0x7f555514d000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1be000) = 0x7f555514d000
mmap(0x7f5555153000, 12960, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f5555153000
close(6) = 0
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f5554f8b000
arch_prctl(ARCH_SET_FS, 0x7f5554f8b740) = 0
mprotect(0x7f555514d000, 12288, PROT_READ) = 0
mprotect(0x7f555515b000, 4096, PROT_READ) = 0
mprotect(0x5556e34784000, 4096, PROT_READ) = 0
mprotect(0x7f55551c2000, 4096, PROT_READ) = 0
munmap(0x7f555515f000, 221255) = 0
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0x2), ...}) = 0
brk(NULL) = 0x5556e3492f000
brk(0x5556e34950000) = 0x5556e34950000
fstat(0, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0x2), ...}) = 0
write(1, "Enter function type: ", 21Enter function type: ) = 21
read(0, 1
"1\n", 1024) = 2
openat(AT_FDCWD, "tls/haswell/x86_64/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "tls/haswell/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "tls/x86_64/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "tls/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "haswell/x86_64/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "haswell/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "x86_64/libSolyanka1.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "libSolyanka1.so", O_RDONLY|O_CLOEXEC) = 6
read(6, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\20\0\0\0\0\0\0"...
, 832) = 832
fstat(6, {st_mode=S_IFREG|0755, st_size=16176, ...}) = 0
getcwd("/home/leo/programming/University/OS/Lab5/final", 128) = 47

```

```

mmap(NULL, 16472, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f5555191000
mmap(0x7f5555192000, 4096, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1000) = 0x7f5555192000
mmap(0x7f5555193000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x2000) = 0x7f5555193000
mmap(0x7f5555194000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x2000) = 0x7f5555194000
close(6) = 0
mprotect(0x7f5555194000, 4096, PROT_READ) = 0
write(1, "Enter x: ", 9Enter x: ) = 9
read(0, 3.14
"3.14\n", 1024) = 5
write(1, "Enter dx: ", 10Enter dx: ) = 10
read(0, 0.01
"0.01\n", 1024) = 5
write(1, "0.003392\n", 90.003392
) = 9
write(1, "Enter function type: ", 21Enter function type: ) = 21
read(0, 0
"0\n", 1024) = 2
munmap(0x7f5555191000, 16472) = 0
write(1, "Implementations switched. Enter "..., 53Implementations switched.
Enter function type again: ) = 53
read(0, 1
"1\n", 1024) = 2
openat(AT_FDCWD, "tls/haswell/x86_64/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "tls/haswell/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "tls/x86_64/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "tls/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "haswell/x86_64/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "haswell/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "x86_64/libSolyanka2.so", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "libSolyanka2.so", O_RDONLY|O_CLOEXEC) = 6
read(6, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\200\20\0\0\0\0\0"...
, 832) = 832
fstat(6, {st_mode=S_IFREG|0755, st_size=16096, ...}) = 0
getcwd("/home/leo/programming/University/OS/Lab5/final", 128) = 47
mmap(NULL, 16464, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 6, 0) = 0x7f5555191000
mmap(0x7f5555192000, 4096, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x1000) = 0x7f5555192000
mmap(0x7f5555193000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 6,
0x2000) = 0x7f5555193000
mmap(0x7f5555194000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 6, 0x2000) = 0x7f5555194000
close(6) = 0
mprotect(0x7f5555194000, 4096, PROT_READ) = 0
write(1, "Enter x: ", 9Enter x: ) = 9
read(0, 3.14
"3.14\n", 1024) = 5
write(1, "Enter dx: ", 10Enter dx: ) = 10
read(0, 0.01
"0.01\n", 1024) = 5
write(1, "-0.001591\n", 10-0.001591
) = 10
write(1, "Enter function type: ", 21Enter function type: ) = 21
read(0, "", 1024) = 0
munmap(0x7f5555191000, 16464) = 0

```

```

exit_group(0)                                = ?
+++ exited with 0 +++
Отображение всех вызовов -- ltrace:
[leo@pc final]$ ltrace ./main1
printf("Enter function type: ")
= 21
__isoc99_scanf(0x55913d3ed043, 0x7ffc99264b40, 0, 0Enter function type: 1
)                                           = 1
printf("Enter x: ")
= 9
__isoc99_scanf(0x55913d3ed016, 0x7ffc99264b44, 0, 0Enter x: 3.14
)                                           = 1
printf("Enter dx: ")
= 10
__isoc99_scanf(0x55913d3ed016, 0x7ffc99264b48, 0, 0Enter dx: 0.01
)                                           = 1
printf("%f\n", 0.0033920.003392
)
= 9
printf("Enter function type: ")
= 21
__isoc99_scanf(0x55913d3ed043, 0x7ffc99264b40, 0, 0Enter function type: )
= 0xffffffff
+++ exited (status 0) +++
-----
[leo@pc final]$ ltrace ./main2
printf("Enter function type: ")
= 21
__isoc99_scanf(0x55cd6c98803e, 0x7ffeffff95e14, 0, 0Enter function type: 1
)                                           = 1
dlopen("libSolyanka1.so", 1)
= 0x55cd6d75aae0
dlsym(0x55cd6d75aae0, "sort")
= 0x7f8c52484449
dlsym(0x55cd6d75aae0, "der")
= 0x7f8c52484287
printf("Enter x: ")
= 9
__isoc99_scanf(0x55cd6c988088, 0x7ffeffff95e18, 0, 0Enter x: 3.14
)                                           = 1
printf("Enter dx: ")
= 10
__isoc99_scanf(0x55cd6c988088, 0x7ffeffff95e1c, 0, 0Enter dx: 0.01
)                                           = 1
printf("%f\n", 0.0033920.003392
)
= 9
printf("Enter function type: ")
= 21
__isoc99_scanf(0x55cd6c98803e, 0x7ffeffff95e14, 0, 0Enter function type: 0
)                                           = 1
dlclose(0x55cd6d75aae0)
= 0
printf("Implementations switched. Enter "...
)
= 53
__isoc99_scanf(0x55cd6c98803e, 0x7ffeffff95e14, 0, 0Implementations switched.
Enter function type again: 1
)                                           = 1
dlopen("libSolyanka2.so", 1)
= 0x55cd6d75aae0
dlsym(0x55cd6d75aae0, "sort")
= 0x7f8c524843cc

```

```

dlsym(0x55cd6d75aae0, "der")
= 0x7f8c52484277
printf("Enter x: ")
= 9
__isoc99_scanf(0x55cd6c988088, 0x7ffeffff95e18, 0, 0Enter x: 3.14
)
printf("Enter dx: ")
= 10
__isoc99_scanf(0x55cd6c988088, 0x7ffeffff95e1c, 0, 0Enter dx: 0.01
)
printf("%f\n", -0.001591-0.001591
)
= 10
printf("Enter function type: ")
= 21
__isoc99_scanf(0x55cd6c98803e, 0x7ffeffff95e14, 0, 0Enter function type: 1
)
dlopen("libSolyanka2.so", 1)
= 0x55cd6d75aae0
dlsym(0x55cd6d75aae0, "sort")
= 0x7f8c524843cc
dlsym(0x55cd6d75aae0, "der")
= 0x7f8c52484277
printf("Enter x: ")

```

#### Статистика системных вызовов - strace:

```
[leo@pc final]$ strace -c ./main2
```

```
Enter function type: 0
```

```
Implementations switched. Enter function type again: 1
```

```
Enter x: 3.14
```

```
Enter dx: 0.01
```

```
-0.001591
```

```
Enter function type: 0
```

```
Implementations switched. Enter function type again: 1
```

```
Enter x: 3.14
```

```
Enter dx: 0.01
```

```
0.003392
```

Enter function type:	% time	seconds	usecs/call	calls	errors	syscall
26.65	0.000504	9	51	46		openat
23.22	0.000439	33	13			read
15.34	0.000290	14	20			mmap
11.85	0.000224	20	11			write
6.29	0.000119	19	6			mprotect
5.92	0.000112	37	3			munmap
3.12	0.000059	8	7			fstat
3.07	0.000058	14	4			pread64
1.64	0.000031	10	3			brk
1.48	0.000028	5	5			close
0.74	0.000014	7	2			getcwd
0.69	0.000013	6	2	1		arch_prctl
0.00	0.000000	0	1	1		access
0.00	0.000000	0	1			execve
100.00	0.001891	14	129	48		total

#### Статистика системных вызовов - ltrace:

```
[leo@pc final]$ ltrace -c ./main2
```

```
Enter function type: 0
```

```
Implementations switched. Enter function type again: 1
```

```
Enter x: 3.14
```

```
Enter dx: 0.01
```

```
-0.001591
```

```
Enter function type: 0
```





```
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\360q\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"... ,
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",
32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\363\377?\332\200\270\27\304d\245n\
355Y\377\t\334"... , 68, 880) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=2029224, ...}) = 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"... ,
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",
32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\363\377?\332\200\270\27\304d\245n\
355Y\377\t\334"... , 68, 880) = 68
mmap(NULL, 2036952, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464fdb5000
mprotect(0x7f464fdda000, 1847296, PROT_NONE) = 0
mmap(0x7f464fdda000, 1540096, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x25000) = 0x7f464fdda000
mmap(0x7f464ff52000, 303104, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x19d000) = 0x7f464ff52000
mmap(0x7f464ff9d000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x1e7000) = 0x7f464ff9d000
mmap(0x7f464ffa3000, 13528, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464ffa3000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libsodium.so.23", 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\200\302\0\0\0\0\0"... ,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=355016, ...}) = 0
mmap(NULL, 357384, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464fd5d000
mmap(0x7f464fd69000, 229376, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xc000) = 0x7f464fd69000
mmap(0x7f464fda1000, 73728, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x44000) = 0x7f464fda1000
mmap(0x7f464fdb3000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x55000) = 0x7f464fdb3000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libpgm-5.2.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\240L\0\0\0\0\0\0"... ,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=302056, ...}) = 0
mmap(NULL, 321584, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464fd0e000
mmap(0x7f464fd12000, 163840, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x4000) = 0x7f464fd12000
mmap(0x7f464fd3a000, 118784, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x2c000) = 0x7f464fd3a000
mmap(0x7f464fd57000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x48000) = 0x7f464fd57000
mmap(0x7f464fd59000, 14384, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464fd59000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libnorm.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\257\0\0\0\0\0\0"... ,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=690344, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f464fd0c000
mmap(NULL, 1420000, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464fbb1000
mmap(0x7f464fbbb000, 421888, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xa000) = 0x7f464fbbb000
```

```

mmap(0x7f464fc22000, 217088, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x71000) = 0x7f464fc22000
mmap(0x7f464fc57000, 16384, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xa5000) = 0x7f464fc57000
mmap(0x7f464fc5b000, 723680, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464fc5b000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libgssapi_krb5.so.2", O_RDONLY|
O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\321\0\0\0\0\0"...,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=309712, ...}) = 0
mmap(NULL, 312128, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464fb64000
mmap(0x7f464fb6f000, 204800, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xb000) = 0x7f464fb6f000
mmap(0x7f464fba1000, 49152, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x3d000) = 0x7f464fba1000
mmap(0x7f464fbad000, 16384, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x48000) = 0x7f464fbad000
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\0\3\0>\0\1\0\0\0\220\201\0\0\0\0\0"...,
832) = 832
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\00\305\3743\364B\2216\244\224\306@\
261\23\327o"..., 68, 824) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=157224, ...}) = 0
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\00\305\3743\364B\2216\244\224\306@\
261\23\327o"..., 68, 824) = 68
mmap(NULL, 140408, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464fb41000
mmap(0x7f464fb48000, 69632, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x7000) = 0x7f464fb48000
mmap(0x7f464fb59000, 20480, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x18000) = 0x7f464fb59000
mmap(0x7f464fb5e000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x1c000) = 0x7f464fb5e000
mmap(0x7f464fb60000, 13432, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464fb60000
close(3) = 0
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\363\0\0\0\0\0"...,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=1369352, ...}) = 0
mmap(NULL, 1368336, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f9f2000
mmap(0x7f464fa01000, 684032, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xf000) = 0x7f464fa01000
mmap(0x7f464faa8000, 618496, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0xb6000) = 0x7f464faa8000
mmap(0x7f464fb3f000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x14c000) = 0x7f464fb3f000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libkrb5.so.3", 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 ?\2\0\0\0\0\0"..., 832)
= 832
fstat(3, {st_mode=S_IFREG|0644, st_size=902016, ...}) = 0
mmap(NULL, 904640, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f915000
mprotect(0x7f464f937000, 700416, PROT_NONE) = 0
mmap(0x7f464f937000, 397312, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x22000) = 0x7f464f937000
mmap(0x7f464f998000, 299008, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x83000) = 0x7f464f998000
mmap(0x7f464f9e2000, 65536, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xcc000) = 0x7f464f9e2000
close(3) = 0

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openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libk5crypto.so.3", 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\240D\0\0\0\0\0"...,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=191040, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f464f913000
mmap(NULL, 196696, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f8e2000
mprotect(0x7f464f8e6000, 172032, PROT_NONE) = 0
mmap(0x7f464f8e6000, 114688, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x4000) = 0x7f464f8e6000
mmap(0x7f464f902000, 53248, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x20000) = 0x7f464f902000
mmap(0x7f464f910000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x2d000) = 0x7f464f910000
mmap(0x7f464f912000, 88, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464f912000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libcom_err.so.2", 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\200$\0\0\0\0\0"...,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=22600, ...}) = 0
mmap(NULL, 24744, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f8db000
mmap(0x7f464f8dd000, 8192, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x2000) = 0x7f464f8dd000
mmap(0x7f464f8df000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x4000) = 0x7f464f8df000
mmap(0x7f464f8e0000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x4000) = 0x7f464f8e0000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libkrb5support.so.0", 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\3605\0\0\0\0\0"...,
832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=56096, ...}) = 0
mmap(NULL, 58344, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f8cc000
mmap(0x7f464f8cf000, 28672, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x3000) = 0x7f464f8cf000
mmap(0x7f464f8d6000, 12288, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0xa000) = 0x7f464f8d6000
mmap(0x7f464f8d9000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xc000) = 0x7f464f8d9000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libkeyutils.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@\0\0\0\0\0"..., 832)
= 832
fstat(3, {st_mode=S_IFREG|0644, st_size=22600, ...}) = 0
mmap(NULL, 24592, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f8c5000
mmap(0x7f464f8c7000, 8192, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x2000) = 0x7f464f8c7000
mmap(0x7f464f8c9000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x4000) = 0x7f464f8c9000
mmap(0x7f464f8ca000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x4000) = 0x7f464f8ca000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libresolv.so.2", 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 G\0\0\0\0\0"..., 832)
= 832
fstat(3, {st_mode=S_IFREG|0644, st_size=101320, ...}) = 0
mmap(NULL, 113280, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f8a9000
mprotect(0x7f464f8ad000, 81920, PROT_NONE) = 0

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mmap(0x7f464f8ad000, 65536, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x4000) = 0x7f464f8ad000
mmap(0x7f464f8bd000, 12288, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x14000) = 0x7f464f8bd000
mmap(0x7f464f8c1000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x17000) = 0x7f464f8c1000
mmap(0x7f464f8c3000, 6784, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464f8c3000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libdl.so.2", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0 \22\0\0\0\0\0\0"...
, 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=18816, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f464f8a7000
mmap(NULL, 20752, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f8a1000
mmap(0x7f464f8a2000, 8192, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x1000) = 0x7f464f8a2000
mmap(0x7f464f8a4000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x3000) = 0x7f464f8a4000
mmap(0x7f464f8a5000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x3000) = 0x7f464f8a5000
close(3) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f464f89f000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f464f89d000
arch_prctl(ARCH_SET_FS, 0x7f464f8a0600) = 0
mprotect(0x7f464ff9d000, 12288, PROT_READ) = 0
mprotect(0x7f464f8a5000, 4096, PROT_READ) = 0
mprotect(0x7f464f8c1000, 4096, PROT_READ) = 0
mprotect(0x7f464f8ca000, 4096, PROT_READ) = 0
mprotect(0x7f464f8d9000, 4096, PROT_READ) = 0
mprotect(0x7f464fb5e000, 4096, PROT_READ) = 0
mprotect(0x7f464f8e0000, 4096, PROT_READ) = 0
mprotect(0x7f464f910000, 4096, PROT_READ) = 0
mprotect(0x7f464f9e2000, 57344, PROT_READ) = 0
mprotect(0x7f464fb3f000, 4096, PROT_READ) = 0
mprotect(0x7f464fbad000, 8192, PROT_READ) = 0
mprotect(0x7f464ffc0000, 4096, PROT_READ) = 0
mprotect(0x7f4650192000, 45056, PROT_READ) = 0
mprotect(0x7f464fc57000, 12288, PROT_READ) = 0
mprotect(0x7f464fd57000, 4096, PROT_READ) = 0
mprotect(0x7f464fdb3000, 4096, PROT_READ) = 0
mprotect(0x7f4650241000, 28672, PROT_READ) = 0
mprotect(0x56127b0b1000, 4096, PROT_READ) = 0
mprotect(0x7f4650289000, 4096, PROT_READ) = 0
munmap(0x7f465024b000, 68833) = 0
set_tid_address(0x7f464f8a08d0) = 5080
set_robust_list(0x7f464f8a08e0, 24) = 0
rt_sigaction(SIGRTMIN, {sa_handler=0x7f464fb48bf0, sa_mask=[],
sa_flags=SA_RESTORER|SA_SIGINFO, sa_restorer=0x7f464fb563c0}, NULL, 8) = 0
rt_sigaction(SIGRT_1, {sa_handler=0x7f464fb48c90, sa_mask=[],
sa_flags=SA_RESTORER|SA_RESTART|SA_SIGINFO, sa_restorer=0x7f464fb563c0}, 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) = 0x56127b7c5000
brk(0x56127b7e6000) = 0x56127b7e6000
futexp(0x7f46501a06bc, FUTEX_WAKE_PRIVATE, 2147483647) = 0
futexp(0x7f46501a06c8, FUTEX_WAKE_PRIVATE, 2147483647) = 0
openat(AT_FDCWD, "/sys/devices/system/cpu/online", O_RDONLY|O_CLOEXEC) = 3
read(3, "0\n", 8192) = 2

```

```

close(3) = 0
openat(AT_FDCWD, "/sys/devices/system/cpu", O_RDONLY|O_NONBLOCK|O_CLOEXEC|
O_DIRECTORY) = 3
fstat(3, {st_mode=S_IFDIR|0755, st_size=0, ...}) = 0
getdents64(3, /* 17 entries *//, 32768) = 520
getdents64(3, /* 0 entries *//, 32768) = 0
close(3) = 0
getpid() = 5080
sched_getaffinity(5080, 128, [0]) = 8
openat(AT_FDCWD, "/etc/nsswitch.conf", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=542, ...}) = 0
read(3, "# /etc/nsswitch.conf\n#\n# Example"..., 4096) = 542
read(3, "", 4096) = 0
close(3) = 0
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=68833, ...}) = 0
mmap(NULL, 68833, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f465024b000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/tls/x86_64/x86_64/libnss_db.so.2",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu/tls/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/tls/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu/tls/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/tls/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu/tls", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/x86_64/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file
or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file
or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -
1 ENOENT (No such file or directory)
stat("/lib/x86_64-linux-gnu", {st_mode=S_IFDIR|0755, st_size=69632, ...}) = 0
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/tls/x86_64/x86_64/libnss_db.so.2",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64-linux-gnu/tls/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/tls/x86_64/libnss_db.so.2",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64-linux-gnu/tls/x86_64", 0x7ffca8d67120) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/tls/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)

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```
stat("/usr/lib/x86_64-linux-gnu/tls", 0x7ffca8d67120) = -1 ENOENT (No such file
or directory)
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/x86_64/x86_64/libnss_db.so.2",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64-linux-gnu/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64-linux-gnu/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64-linux-gnu/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such
file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64-linux-gnu/libnss_db.so.2", O_RDONLY|O_CLOEXEC)
= -1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64-linux-gnu", {st_mode=S_IFDIR|0755, st_size=69632, ...}) =
0
openat(AT_FDCWD, "/lib/tls/x86_64/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) =
-1 ENOENT (No such file or directory)
stat("/lib/tls/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/lib/tls/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/lib/tls/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/tls/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/lib/tls/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/tls/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
stat("/lib/tls", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/x86_64/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/lib/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/lib/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
stat("/lib/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
stat("/lib/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such
file or directory)
stat("/lib", {st_mode=S_IFDIR|0755, st_size=4096, ...}) = 0
openat(AT_FDCWD, "/usr/lib/tls/x86_64/x86_64/libnss_db.so.2", O_RDONLY|
O_CLOEXEC) = -1 ENOENT (No such file or directory)
stat("/usr/lib/tls/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/usr/lib/tls/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/usr/lib/tls/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/usr/lib/tls/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/usr/lib/tls/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
openat(AT_FDCWD, "/usr/lib/tls/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
stat("/usr/lib/tls", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) =
-1 ENOENT (No such file or directory)
stat("/usr/lib/x86_64/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or
directory)
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openat(AT_FDCWD, "/usr/lib/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/usr/lib/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/usr/lib/x86_64/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
stat("/usr/lib/x86_64", 0x7ffca8d67120) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/usr/lib/libnss_db.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
stat("/usr/lib", {st_mode=S_IFDIR|0755, st_size=4096, ...}) = 0
munmap(0x7f465024b000, 68833) = 0
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=68833, ...}) = 0
mmap(NULL, 68833, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f465024b000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libnss_files.so.2", 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\3005\0\0\0\0\0"...
, 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=51832, ...}) = 0
mmap(NULL, 79672, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f464f889000
mmap(0x7f464f88c000, 28672, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0x3000) = 0x7f464f88c000
mmap(0x7f464f893000, 8192, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0xa000) = 0x7f464f893000
mmap(0x7f464f895000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_DENYWRITE, 3, 0xb000) = 0x7f464f895000
mmap(0x7f464f897000, 22328, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|
MAP_ANONYMOUS, -1, 0) = 0x7f464f897000
close(3) = 0
mprotect(0x7f464f895000, 4096, PROT_READ) = 0
munmap(0x7f465024b000, 68833) = 0
openat(AT_FDCWD, "/etc/protocols", O_RDONLY|O_CLOEXEC) = 3
lseek(3, 0, SEEK_CUR) = 0
fstat(3, {st_mode=S_IFREG|0644, st_size=2932, ...}) = 0
read(3, "# Internet (IP) protocols\n#\n# Up"... , 4096) = 2932
lseek(3, 0, SEEK_CUR) = 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
getrandom("\x6a\x60\x7f\x78\xa4\x7d\x85\x3d\x90\x4a\xcf\x22\x34\x7a\xef\x33",
16, 0) = 16
getrandom("\x8c\xc6\xf3\xdf\x9e\x54\x10\x55\x9c\x9e\x8b\x08\xf8\xa7\x50\x81",
16, 0) = 16
eventfd2(0, EFD_CLOEXEC) = 4
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl(4, F_GETFL) = 0x802 (flags O_RDWR|O_NONBLOCK)
fcntl(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
epoll_create1(EPOCH_CLOEXEC) = 5
epoll_ctl(5, EPOLL_CTL_ADD, 4, {0, {u32=2071821664, u64=94637381221728}}) = 0
epoll_ctl(5, EPOLL_CTL_MOD, 4, {EPOLLIN, {u32=2071821664, u64=94637381221728}})
= 0
mmap(NULL, 8392704, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0x7f464f088000
mprotect(0x7f464f089000, 8388608, PROT_READ|PROT_WRITE) = 0
clone(child_stack=0x7f464f887d30, flags=CLONE_VM|CLONE_FS|CLONE_FILES|
CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|
CLONE_CHILD_CLEARTID, parent_tid=[5081], tls=0x7f464f888700,
child_tidptr=0x7f464f8889d0) = 5081
eventfd2(0, EFD_CLOEXEC) = 6

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fcntl(6, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(6, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl(6, F_GETFL) = 0x802 (flags O_RDWR|O_NONBLOCK)
fcntl(6, F_SETFL, O_RDWR|O_NONBLOCK) = 0
epoll_create1(EPoll_CLOEXEC) = 7
epoll_ctl(7, EPOLL_CTL_ADD, 6, {0, {u32=2071839328, u64=94637381239392}}) = 0
epoll_ctl(7, EPOLL_CTL_MOD, 6, {EPOLLIN, {u32=2071839328, u64=94637381239392}}) = 0
mmap(NULL, 8392704, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) = 0x7f464e887000
mprotect(0x7f464e888000, 8388608, PROT_READ|PROT_WRITE) = 0
clone(child_stack=0x7f464f086d30, flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID, parent_tid=[5082], tls=0x7f464f087700, child_tidptr=0x7f464f0879d0) = 5082
eventfd2(0, EFD_CLOEXEC) = 8
fcntl(8, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(8, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl(8, F_GETFL) = 0x802 (flags O_RDWR|O_NONBLOCK)
fcntl(8, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=8, events=POLLIN}], 1, 0) = 0 (Timeout)
socket(AF_NETLINK, SOCK_RAW|SOCK_CLOEXEC, NETLINK_ROUTE) = 9
bind(9, {sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000}, 12) = 0
getsockname(9, {sa_family=AF_NETLINK, nl_pid=5080, nl_groups=00000000}, [12]) = 0
sendto(9, [{len=20, type=RTM_GETLINK, flags=NLM_F_REQUEST|NLM_F_DUMP, seq=1608927735, pid=0}, {ifi_family=AF_UNSPEC, ...}], 20, 0, {sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000}, 12) = 20
recvmsg(9, {msg_name={sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000}, msg_namelen=12, msg_iov=[{iov_base=[{len=1316, type=RTM_NEWLINK, flags=NLM_F_MULTI, seq=1608927735, pid=5080}, {ifi_family=AF_UNSPEC, ifi_type=ARPHRD_LOOPBACK, ifi_index=if_nametoindex("lo"), ifi_flags=IFF_UP|IFF_LOOPBACK|IFF_RUNNING|IFF_LOWER_UP, ifi_change=0}, [{nla_len=7, nla_type=IFLA_IFNAME}, "lo"], [{nla_len=8, nla_type=IFLA_TXQLEN}, 1000}, [{nla_len=5, nla_type=IFLA_OPERSTATE}, 0}, [{nla_len=5, nla_type=IFLA_LINKMODE}, 0}, [{nla_len=8, nla_type=IFLA_MTU}, 65536}, [{nla_len=8, nla_type=IFLA_MIN_MTU}, 0}, [{nla_len=8, nla_type=IFLA_MAX_MTU}, 0}, [{nla_len=8, nla_type=IFLA_GROUP}, 0}, [{nla_len=8, nla_type=IFLA_PROMISCUITY}, 0}, [{nla_len=8, nla_type=IFLA_NUM_TX_QUEUES}, 1}, [{nla_len=8, nla_type=IFLA_GSO_MAX_SEGS}, 65535}, [{nla_len=8, nla_type=IFLA_GSO_MAX_SIZE}, 65536}, [{nla_len=8, nla_type=IFLA_NUM_RX_QUEUES}, 1}, [{nla_len=5, nla_type=IFLA_CARRIER}, 1}, [{nla_len=12, nla_type=IFLA_QDISC}, "noqueue"}, [{nla_len=8, nla_type=IFLA_CARRIER_CHANGES}, 0}, [{nla_len=5, nla_type=IFLA_PROTO_DOWN}, 0}, [{nla_len=8, nla_type=IFLA_CARRIER_UP_COUNT}, 0}, [{nla_len=8, nla_type=IFLA_CARRIER_DOWN_COUNT}, 0}, [{nla_len=36, nla_type=IFLA_MAP}, {mem_start=0, mem_end=0, base_addr=0, irq=0, dma=0, port=0}], [{nla_len=10, nla_type=IFLA_ADDRESS}, "\x00\x00\x00\x00\x00\x00"}, [{nla_len=10, nla_type=IFLA_BROADCAST}, "\x00\x00\x00\x00\x00\x00"}, [{nla_len=196, nla_type=IFLA_STATS64}, {rx_packets=168132, tx_packets=168132, rx_bytes=8439716, tx_bytes=8439716, rx_errors=0, tx_errors=0, rx_dropped=0, tx_dropped=0, multicast=0, collisions=0, rx_length_errors=0, rx_over_errors=0, rx_crc_errors=0, rx_frame_errors=0, rx_fifo_errors=0, rx_missed_errors=0, tx_aborted_errors=0, tx_carrier_errors=0, tx_fifo_errors=0, tx_heartbeat_errors=0, tx_window_errors=0, rx_compressed=0, tx_compressed=0, rx_nohandler=0}], [{nla_len=100, nla_type=IFLA_STATS}, {rx_packets=168132, tx_packets=168132, rx_bytes=8439716, tx_bytes=8439716, rx_errors=0, tx_errors=0, rx_dropped=0, tx_dropped=0, multicast=0, collisions=0, rx_length_errors=0, rx_over_errors=0, rx_crc_errors=0, rx_frame_errors=0, rx_fifo_errors=0, rx_missed_errors=0, tx_aborted_errors=0, tx_carrier_errors=0, tx_fifo_errors=0, tx_heartbeat_errors=0, tx_window_errors=0, rx_compressed=0, tx_compressed=0, rx_nohandler=0}], [{nla_len=12, nla_type=IFLA_XDP}, {nla_len=5, nla_type=IFLA_XDP_ATTACHED}, XDP_ATTACHED_NONE}], [{nla_len=760, nla_type=IFLA_AF_SPEC}, [{nla_len=136, nla_type=AF_INET}, {nla_len=132, nla_type=IFLA_INET_CONF}, [{IPV4_DEVCONF_FORWARDING-1} = 0,

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[IPV4_DEVCONF_MC_FORWARDING-1] = 0, [IPV4_DEVCONF_PROXY_ARP-1] = 0,
[IPV4_DEVCONF_ACCEPT_REDIRECTS-1] = 1, [IPV4_DEVCONF_SECURE_REDIRECTS-1] = 1,
[IPV4_DEVCONF_SEND_REDIRECTS-1] = 1, [IPV4_DEVCONF_SHARED_MEDIA-1] = 1,
[IPV4_DEVCONF_RP_FILTER-1] = 0, [IPV4_DEVCONF_ACCEPT_SOURCE_ROUTE-1] = 1,
[IPV4_DEVCONF_BOOTP_RELAY-1] = 0, [IPV4_DEVCONF_LOG_MARTIANS-1] = 0,
[IPV4_DEVCONF_TAG-1] = 0, [IPV4_DEVCONF_ARPFILTER-1] = 0,
[IPV4_DEVCONF_MEDIUM_ID-1] = 0, [IPV4_DEVCONF_NOXFRM-1] = 1,
[IPV4_DEVCONF_NOPOLICY-1] = 1, [IPV4_DEVCONF_FORCE_IGMP_VERSION-1] = 0,
[IPV4_DEVCONF_ARP_ANNOUNCE-1] = 0, [IPV4_DEVCONF_ARP_IGNORE-1] = 0,
[IPV4_DEVCONF_PROMOTE_SECONDARIES-1] = 1, [IPV4_DEVCONF_ARP_ACCEPT-1] = 0,
[IPV4_DEVCONF_ARP_NOTIFY-1] = 0, [IPV4_DEVCONF_ACCEPT_LOCAL-1] = 0,
[IPV4_DEVCONF_SRC_VMARK-1] = 0, [IPV4_DEVCONF_PROXY_ARP_PVLAN-1] = 0,
[IPV4_DEVCONF_ROUTE_LOCALNET-1] = 0,
[IPV4_DEVCONF_IGMPV2_UN SOLICITED_REPORT_INTERVAL-1] = 10000,
[IPV4_DEVCONF_IGMPV3_UN SOLICITED_REPORT_INTERVAL-1] = 1000,
[IPV4_DEVCONF_IGNORE_ROUTES_WITH_LINKDOWN-1] = 0,
[IPV4_DEVCONF_DROP_UNICAST_IN_L2_MULTICAST-1] = 0,
[IPV4_DEVCONF_DROP_GRATUITOUS_ARP-1] = 0, [IPV4_DEVCONF_BC_FORWARDING-1] = 0]]},
{{nla_len=620, nla_type=AF_INET6}, [{nla_len=8, nla_type=IFLA_INET6_FLAGS},
IF_READY}, {{nla_len=20, nla_type=IFLA_INET6_CACHEINFO}, {max_reasm_len=65535,
tstamp=160, reachable_time=42812, retrans_time=1000}}, {{nla_len=208,
nla_type=IFLA_INET6_CONF}, [[DEVCONF_FORWARDING] = 0, [DEVCONF_HOPLIMIT] = 64,
[DEVCONF_MTU6] = 65536, [DEVCONF_ACCEPT_RA] = 1, [DEVCONF_ACCEPT_REDIRECTS] = 1,
[DEVCONF_AUTOCONF] = 1, [DEVCONF_DAD_TRANSMITS] = 1, [DEVCONF_RTR_SOLICITS] = -
1, [DEVCONF_RTR_SOLICIT_INTERVAL] = 4000, [DEVCONF_RTR_SOLICIT_DELAY] = 1000,
[DEVCONF_USE_TEMPADDR] = -1, [DEVCONF_TEMP_VALID_LFT] = 604800,
[DEVCONF_TEMP_PREFERRED_LFT] = 86400, [DEVCONF_REGEN_MAX_RETRY] = 3,
[DEVCONF_MAX_DESYNC_FACTOR] = 600, [DEVCONF_MAX_ADDRESSES] = 16,
[DEVCONF_FORCE_MLD_VERSION] = 0, [DEVCONF_ACCEPT_RA_DEFRTR] = 1,
[DEVCONF_ACCEPT_RA_PINFO] = 1, [DEVCONF_ACCEPT_RA_RTR_PREF] = 1,
[DEVCONF_RTR_PROBE_INTERVAL] = 60000, [DEVCONF_ACCEPT_RA_RT_INFO_MAX_PLEN] = 0,
[DEVCONF_PROXY_NDP] = 0, [DEVCONF_OPTIMISTIC_DAD] = 0,
[DEVCONF_ACCEPT_SOURCE_ROUTE] = 0, [DEVCONF_MC_FORWARDING] = 0,
[DEVCONF_DISABLE_IPV6] = 0, [DEVCONF_ACCEPT_DAD] = -1, [DEVCONF_FORCE_TLLAO] =
0, [DEVCONF_NDISC_NOTIFY] = 0, [DEVCONF_MLDV1_UN SOLICITED_REPORT_INTERVAL] =
10000, [DEVCONF_MLDV2_UN SOLICITED_REPORT_INTERVAL] = 1000, ...]}, {{nla_len=300,
nla_type=IFLA_INET6_STATS}, [[IPSTATS_MIB_NUM] = 37, [IPSTATS_MIB_INPKTS] = 4,
[IPSTATS_MIB_INOCTETS] = 292, [IPSTATS_MIB_INDELIVERS] = 4,
[IPSTATS_MIB_OUTFORWDATAGRAMS] = 0, [IPSTATS_MIB_OUTPKTS] = 4,
[IPSTATS_MIB_OUTOCTETS] = 292, [IPSTATS_MIB_INHDRERRORS] = 0,
[IPSTATS_MIB_INTOOBIGERRORS] = 0, [IPSTATS_MIB_INNOROUTES] = 0,
[IPSTATS_MIB_INADDRERRORS] = 0, [IPSTATS_MIB_INUNKNOWNPROTOS] = 0,
[IPSTATS_MIB_INTRUNCATEDPKTS] = 0, [IPSTATS_MIB_INDISCARDS] = 0,
[IPSTATS_MIB_OUTDISCARDS] = 0, [IPSTATS_MIB_OUTNOROUTES] = 0,
[IPSTATS_MIB_REASMTIMEOUT] = 0, [IPSTATS_MIB_REASMREQDS] = 0,
[IPSTATS_MIB_REASMOKS] = 0, [IPSTATS_MIB_REASMFAILS] = 0, [IPSTATS_MIB_FRAGOKS]
= 0, [IPSTATS_MIB_FRAGFAILS] = 0, [IPSTATS_MIB_FRAGCREATES] = 0,
[IPSTATS_MIB_INMCASTPKTS] = 0, [IPSTATS_MIB_OUTMCASTPKTS] = 2,
[IPSTATS_MIB_INBCASTPKTS] = 0, [IPSTATS_MIB_OUTBCASTPKTS] = 0,
[IPSTATS_MIB_INMCASTOCTETS] = 0, [IPSTATS_MIB_OUTMCASTOCTETS] = 152,
[IPSTATS_MIB_INBCASTOCTETS] = 0, [IPSTATS_MIB_OUTBCASTOCTETS] = 0,
[IPSTATS_MIB_CSUMERRORS] = 0, ...]}, {{nla_len=52,
nla_type=IFLA_INET6_ICMP6STATS}, [[ICMP6_MIB_NUM] = 6, [ICMP6_MIB_INMSGS] = 2,
[ICMP6_MIB_INERRORS] = 0, [ICMP6_MIB_OUTMSGS] = 2, [ICMP6_MIB_OUTERRORS] = 0,
[ICMP6_MIB_CSUMERRORS] = 0]}, {{nla_len=20, nla_type=IFLA_INET6_TOKEN},
inet_pton(AF_INET6, ":::")}}, {{nla_len=5, nla_type=IFLA_INET6_ADDR_GEN_MODE},
IN6_ADDR_GEN_MODE_EUI64}}]]}}], {{len=1324, type=RTM_NEWLINK, flags=NLM_F_MULTI,
seq=1608927735, pid=5080}, {ifi_family=AF_UNSPEC, ifi_type=ARPHRD_ETHER,
ifi_index=if_nametoindex("enp0s3"), ifi_flags=IFF_UP|IFF_BROADCAST|IFF_RUNNING|
IFF_MULTICAST|IFF_LOWER_UP, ifi_change=0}, [{nla_len=11, nla_type=IFLA_IFNAME},
"enp0s3"}, {{nla_len=8, nla_type=IFLA_TXQLEN}, 1000}, {{nla_len=5,
nla_type=IFLA_OPERSTATE}, 6}, {{nla_len=5, nla_type=IFLA_LINKMODE}, 0},
{{nla_len=8, nla_type=IFLA_MTU}, 1500}, {{nla_len=8, nla_type=IFLA_MIN_MTU},
46}, {{nla_len=8, nla_type=IFLA_MAX_MTU}, 16110}, {{nla_len=8,

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nla_type=IFLA_GROUP}, 0}, {{nla_len=8, nla_type=IFLA_PROMISCUITY}, 0},
{{nla_len=8, nla_type=IFLA_NUM_TX_QUEUES}, 1}, {{nla_len=8,
nla_type=IFLA_GSO_MAX_SEGS}, 65535}, {{nla_len=8, nla_type=IFLA_GSO_MAX_SIZE},
65536}, {{nla_len=8, nla_type=IFLA_NUM_RX_QUEUES}, 1}, {{nla_len=5,
nla_type=IFLA_CARRIER}, 1}, {{nla_len=13, nla_type=IFLA_QDISC}, "fq_codel"},
{{nla_len=8, nla_type=IFLA_CARRIER_CHANGES}, 8}, {{nla_len=5,
nla_type=IFLA_PROTO_DOWN}, 0}, {{nla_len=8, nla_type=IFLA_CARRIER_UP_COUNT}, 4},
{{nla_len=8, nla_type=IFLA_CARRIER_DOWN_COUNT}, 4}, {{nla_len=36,
nla_type=IFLA_MAP}, {mem_start=0, mem_end=0, base_addr=0, irq=0, dma=0,
port=0}}, {{nla_len=10, nla_type=IFLA_ADDRESS}, "\x08\x00\x27\x7c\x08\x1d"},
{{nla_len=10, nla_type=IFLA_BROADCAST}, "\xff\xff\xff\xff\xff\xff"},
{{nla_len=196, nla_type=IFLA_STATS64}, {rx_packets=6364, tx_packets=3302,
rx_bytes=5692447, tx_bytes=654659, rx_errors=0, tx_errors=0, rx_dropped=0,
tx_dropped=0, multicast=0, collisions=0, rx_length_errors=0, rx_over_errors=0,
rx_crc_errors=0, rx_frame_errors=0, rx_fifo_errors=0, rx_missed_errors=0,
tx_aborted_errors=0, tx_carrier_errors=0, tx_fifo_errors=0,
tx_heartbeat_errors=0, tx_window_errors=0, rx_compressed=0, tx_compressed=0,
rx_nohandler=0}}, {{nla_len=100, nla_type=IFLA_STATS}, {rx_packets=6364,
tx_packets=3302, rx_bytes=5692447, tx_bytes=654659, rx_errors=0, tx_errors=0,
rx_dropped=0, tx_dropped=0, multicast=0, collisions=0, rx_length_errors=0,
rx_over_errors=0, rx_crc_errors=0, rx_frame_errors=0, rx_fifo_errors=0,
rx_missed_errors=0, tx_aborted_errors=0, tx_carrier_errors=0, tx_fifo_errors=0,
tx_heartbeat_errors=0, tx_window_errors=0, rx_compressed=0, tx_compressed=0,
rx_nohandler=0}}, {{nla_len=12, nla_type=IFLA_XDP}, {{nla_len=5,
nla_type=IFLA_XDP_ATTACHED}, XDP_ATTACHED_NONE}}, {{nla_len=760,
nla_type=IFLA_AF_SPEC}, [{nla_len=136, nla_type=AF_INET}, {{nla_len=132,
nla_type=IFLA_INET_CONF}, [[IPV4_DEVCONF_FORWARDING-1] = 0,
[IPV4_DEVCONF_MC_FORWARDING-1] = 0, [IPV4_DEVCONF_PROXY_ARP-1] = 0,
[IPV4_DEVCONF_ACCEPT_REDIRECTS-1] = 1, [IPV4_DEVCONF_SECURE_REDIRECTS-1] = 1,
[IPV4_DEVCONF_SEND_REDIRECTS-1] = 1, [IPV4_DEVCONF_SHARED_MEDIA-1] = 1,
[IPV4_DEVCONF_RP_FILTER-1] = 2, [IPV4_DEVCONF_ACCEPT_SOURCE_ROUTE-1] = 1,
[IPV4_DEVCONF_BOOTP_RELAY-1] = 0, [IPV4_DEVCONF_LOG_MARTIANS-1] = 0,
[IPV4_DEVCONF_TAG-1] = 0, [IPV4_DEVCONF_ARPFILTER-1] = 0,
[IPV4_DEVCONF_MEDIUM_ID-1] = 0, [IPV4_DEVCONF_NOXFRM-1] = 0,
[IPV4_DEVCONF_NOPOLICY-1] = 0, [IPV4_DEVCONF_FORCE_IGMP_VERSION-1] = 0,
[IPV4_DEVCONF_ARP_ANNOUNCE-1] = 0, [IPV4_DEVCONF_ARP_IGNORE-1] = 0,
[IPV4_DEVCONF_PROMOTE_SECONDARIES-1] = 1, [IPV4_DEVCONF_ARP_ACCEPT-1] = 0,
[IPV4_DEVCONF_ARP_NOTIFY-1] = 0, [IPV4_DEVCONF_ACCEPT_LOCAL-1] = 0,
[IPV4_DEVCONF_SRC_VMARK-1] = 0, [IPV4_DEVCONF_PROXY_ARP_PVLAN-1] = 0,
[IPV4_DEVCONF_ROUTE_LOCALNET-1] = 0,
[IPV4_DEVCONF_IGMPV2_UNSOLICITED_REPORT_INTERVAL-1] = 10000,
[IPV4_DEVCONF_IGMPV3_UNSOLICITED_REPORT_INTERVAL-1]
= 1000, [IPV4_DEVCONF_IGNORE_ROUTES_WITH_LINKDOWN-1] = 0,
[IPV4_DEVCONF_DROP_UNICAST_IN_L2_MULTICAST-1] = 0,
[IPV4_DEVCONF_DROP_GRATUITOUS_ARP-1] = 0, [IPV4_DEVCONF_BC_FORWARDING-1] = 0]]}},
{{nla_len=620, nla_type=AF_INET6}, [{nla_len=8, nla_type=IFLA_INET6_FLAGS},
IF_READY}, {{nla_len=20, nla_type=IFLA_INET6_CACHEINFO}, {max_reasm_len=65535,
tstamp=778, reachable_time=23112, retrans_time=1000}}, {{nla_len=208,
nla_type=IFLA_INET6_CONF}, [[DEVCONF_FORWARDING] = 0, [DEVCONF_HOPLIMIT] = 64,
[DEVCONF_MTU6] = 1500, [DEVCONF_ACCEPT_RA] = 0, [DEVCONF_ACCEPT_REDIRECTS] = 1,
[DEVCONF_AUTOCONF] = 1, [DEVCONF_DAD_TRANSMITS] = 1, [DEVCONF_RTR_SOLICITS] = -
1, [DEVCONF_RTR_SOLICIT_INTERVAL] = 4000, [DEVCONF_RTR_SOLICIT_DELAY] = 1000,
[DEVCONF_USE_TEMPADDR] = 2, [DEVCONF_TEMP_VALID_LFT] = 604800,
[DEVCONF_TEMP_PREFERRED_LFT] = 86400, [DEVCONF_REGEN_MAX_RETRY] = 3,
[DEVCONF_MAX_DESYNC_FACTOR] = 600, [DEVCONF_MAX_ADDRESSES] = 16,
[DEVCONF_FORCE_MLD_VERSION] = 0, [DEVCONF_ACCEPT_RA_DEFRTR] = 1,
[DEVCONF_ACCEPT_RA_PINFO] = 1, [DEVCONF_ACCEPT_RA_RTR_PREF] = 1,
[DEVCONF_RTR_PROBE_INTERVAL] = 60000, [DEVCONF_ACCEPT_RA_RT_INFO_MAX_PLEN] = 0,
[DEVCONF_PROXY_NDP] = 0, [DEVCONF_OPTIMISTIC_DAD] = 0,
[DEVCONF_ACCEPT_SOURCE_ROUTE] = 0, [DEVCONF_MC_FORWARDING] = 0,
[DEVCONF_DISABLE_IPV6] = 0, [DEVCONF_ACCEPT_DAD] = 1, [DEVCONF_FORCE_TLLAO] = 0,
[DEVCONF_NDISC_NOTIFY] = 0, [DEVCONF_MLDV1_UNSOLICITED_REPORT_INTERVAL] = 10000,
[DEVCONF_MLDV2_UNSOLICITED_REPORT_INTERVAL] = 1000, ...]}, {{nla_len=300,
nla_type=IFLA_INET6_STATS}, [[IPSTATS_MIB_NUM] = 37, [IPSTATS_MIB_INPKTS] = 39,

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[IPSTATS_MIB_INOCTETS] = 3724, [IPSTATS_MIB_INDELIVERS] = 39,
[IPSTATS_MIB_OUTFORWDATAGRAMS] = 0, [IPSTATS_MIB_OUTPKTS] = 55,
[IPSTATS_MIB_OUTOCTETS] = 5092, [IPSTATS_MIB_INHDRERRORS] = 0,
[IPSTATS_MIB_INTTOOBIGERRORS] = 0, [IPSTATS_MIB_INNOROUTES] = 0,
[IPSTATS_MIB_INADDRERRORS] = 0, [IPSTATS_MIB_INUNKNOWNPROTOS] = 0,
[IPSTATS_MIB_INTRUNCATEDPKTS] = 0, [IPSTATS_MIB_INDISCARDS] = 0,
[IPSTATS_MIB_OUTDISCARDS] = 0, [IPSTATS_MIB_OUTNOROUTES] = 0,
[IPSTATS_MIB_REASMTIMEOUT] = 0, [IPSTATS_MIB_REASMREQDS] = 0,
[IPSTATS_MIB_REASMOKS] = 0, [IPSTATS_MIB_REASMFAILS] = 0, [IPSTATS_MIB_FRAGOKS]
= 0, [IPSTATS_MIB_FRAGFAILS] = 0, [IPSTATS_MIB_FRAGCREATES] = 0,
[IPSTATS_MIB_INMCASTPKTS] = 39, [IPSTATS_MIB_OUTMCASTPKTS] = 55,
[IPSTATS_MIB_INBCASTPKTS] = 0, [IPSTATS_MIB_OUTBCASTPKTS] = 0,
[IPSTATS_MIB_INMCASTOCTETS] = 3724, [IPSTATS_MIB_OUTMCASTOCTETS] = 5092,
[IPSTATS_MIB_INBCASTOCTETS] = 0, [IPSTATS_MIB_OUTBCASTOCTETS] = 0,
[IPSTATS_MIB_CSUMERRORS] = 0, ...]], {{nla_len=52,
nla_type=IFLA_INET6_ICMP6STATS}}, [[ICMP6_MIB_NUM] = 6, [ICMP6_MIB_INMSGS] = 0,
[ICMP6_MIB_INERRORS] = 0, [ICMP6_MIB_OUTMSGS] = 16, [ICMP6_MIB_OUTERRORS] = 0,
[ICMP6_MIB_CSUMERRORS] = 0]], {{nla_len=20, nla_type=IFLA_INET6_TOKEN},
inet_pton(AF_INET6, ":::")}], {{nla_len=5, nla_type=IFLA_INET6_ADDR_GEN_MODE},
IN6_ADDR_GEN_MODE_NONE}}]]]]], iov_len=4096]], msg_iovlen=1, msg_controllen=0,
msg_flags=0}, 0) = 2640
recvmsg(9, {msg_name={sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000},
msg_namelen=12, msg_iov=[{iov_base={{len=20, type=NLMMSG_DONE, flags=NLM_F_MULTII,
seq=1608927735, pid=5080}, 0}, {iov_len=4096}], msg_iovlen=1, msg_controllen=0,
msg_flags=0}, 0) = 20
sendto(9, {{len=20, type=RTM_GETADDR, flags=NLM_F_REQUEST|NLM_F_DUMP,
seq=1608927736, pid=0}, {ifa_family=AF_UNSPEC, ...}}, 20, 0,
{sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000}, 12) = 20
recvmsg(9, {msg_name={sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000},
msg_namelen=12, msg_iov=[{iov_base=[{len=76, type=RTM_NEWADDR,
flags=NLM_F_MULTII, seq=1608927736, pid=5080}, {ifa_family=AF_INET,
ifa_prefixlen=8, ifa_flags=IFA_F_PERMANENT, ifa_scope=RT_SCOPE_HOST,
ifa_index=if_nametoindex("lo")}, [{nla_len=8, nla_type=IFA_ADDRESS},
inet_addr("127.0.0.1")}, {nla_len=8, nla_type=IFA_LOCAL},
inet_addr("127.0.0.1")}, {nla_len=7, nla_type=IFA_LABEL}, "lo", {nla_len=8,
nla_type=IFA_FLAGS}, IFA_F_PERMANENT}, {nla_len=20, nla_type=IFA_CACHEINFO},
{ifa_preferred=4294967295, ifa_valid=4294967295, cstamp=160, tstamp=160}]]],
{{len=88, type=RTM_NEWADDR, flags=NLM_F_MULTII, seq=1608927736, pid=5080},
{ifa_family=AF_INET, ifa_prefixlen=24, ifa_flags=0, ifa_scope=RT_SCOPE_UNIVERSE,
ifa_index=if_nametoindex("enp0s3")}, [{nla_len=8, nla_type=IFA_ADDRESS},
inet_addr("10.0.2.15")}, {nla_len=8, nla_type=IFA_LOCAL},
inet_addr("10.0.2.15")}, {nla_len=8, nla_type=IFA_BROADCAST},
inet_addr("10.0.2.255")}, {nla_len=11, nla_type=IFA_LABEL}, "enp0s3",
{nla_len=8, nla_type=IFA_FLAGS}, IFA_F_NOPREFIXROUTE}, {nla_len=20,
nla_type=IFA_CACHEINFO}, {ifa_preferred=85829, ifa_valid=85829, cstamp=780,
tstamp=1566634}]]]], iov_len=4096]], msg_iovlen=1, msg_controllen=0,
msg_flags=0}, 0) = 164
recvmsg(9, {msg_name={sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000},
msg_namelen=12, msg_iov=[{iov_base=[{len=72, type=RTM_NEWADDR,
flags=NLM_F_MULTII, seq=1608927736, pid=5080}, {ifa_family=AF_INET6,
ifa_prefixlen=128, ifa_flags=IFA_F_PERMANENT, ifa_scope=RT_SCOPE_HOST,
ifa_index=if_nametoindex("lo")}, [{nla_len=20, nla_type=IFA_ADDRESS},
inet_pton(AF_INET6, ":::1")}, {nla_len=20, nla_type=IFA_CACHEINFO},
{ifa_preferred=4294967295, ifa_valid=4294967295, cstamp=160, tstamp=160}],
{nla_len=8, nla_type=IFA_FLAGS}, IFA_F_PERMANENT}]]], {{len=72,
type=RTM_NEWADDR, flags=NLM_F_MULTII, seq=1608927736, pid=5080},
{ifa_family=AF_INET6, ifa_prefixlen=64, ifa_flags=IFA_F_PERMANENT,
ifa_scope=RT_SCOPE_LINK, ifa_index=if_nametoindex("enp0s3")}, [{nla_len=20,
nla_type=IFA_ADDRESS}, inet_pton(AF_INET6, "fe80::18ac:705b:f24b:491c")},
{nla_len=20, nla_type=IFA_CACHEINFO}, {ifa_preferred=4294967295,
ifa_valid=4294967295, cstamp=779, tstamp=928}], {nla_len=8,
nla_type=IFA_FLAGS}, IFA_F_PERMANENT|IFA_F_NOPREFIXROUTE}]]]], iov_len=4096]],
msg_iovlen=1, msg_controllen=0, msg_flags=0}, 0) = 144

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recvmsg(9, {msg_name={sa_family=AF_NETLINK, nl_pid=0, nl_groups=00000000},
msg_namelen=12, msg_iov=[{iov_base={{len=20, type=NLMMSG_DONE, flags=NLM_F_MULTI,
seq=1608927736, pid=5080}, 0}, iov_len=4096}], msg_iovlen=1, msg_controllen=0,
msg_flags=0}, 0) = 20
close(9) = 0
socket(AF_INET, SOCK_STREAM|SOCK_CLOEXEC, IPPROTO_TCP) = 9
setsockopt(9, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(9, {sa_family=AF_INET, sin_port=htons(8080),
sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(9, 100) = 0
getsockname(9, {sa_family=AF_INET, sin_port=htons(8080),
sin_addr=inet_addr("127.0.0.1")}, [128->16]) = 0
getsockname(9, {sa_family=AF_INET, sin_port=htons(8080),
sin_addr=inet_addr("127.0.0.1")}, [128->16]) = 0
write(6, "\1\0\0\0\0\0\0\0", 8) = 8
write(8, "\1\0\0\0\0\0\0\0", 8) = 8
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}) = 0
write(1, "> ", 2) = 2
fstat(0, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}) = 0
read(0, "create 1\n", 1024) = 9
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD,
child_tidptr=0x7f464f8a08d0) = 5083
poll([{fd=8, events=POLLIN}], 1, 0) = 1 ([{fd=8, revents=POLLIN}])
read(8, "\1\0\0\0\0\0\0\0", 8) = 8
poll([{fd=8, events=POLLIN}], 1, 0) = 0 (Timeout)
poll([{fd=8, events=POLLIN}], 1, 2000) = 1 ([{fd=8, revents=POLLIN}])
read(8, "\1\0\0\0\0\0\0\0", 8) = 8
poll([{fd=8, events=POLLIN}], 1, 0) = 0 (Timeout)
poll([{fd=8, events=POLLIN}], 1, -1) = 1 ([{fd=8, revents=POLLIN}])
read(8, "\1\0\0\0\0\0\0\0", 8) = 8
poll([{fd=8, events=POLLIN}], 1, 0) = 0 (Timeout)
poll([{fd=8, events=POLLIN}], 1, -1) = 1 ([{fd=8, revents=POLLIN}])
read(8, "\1\0\0\0\0\0\0\0", 8) = 8
poll([{fd=8, events=POLLIN}], 1, 0) = 0 (Timeout)
write(6, "\1\0\0\0\0\0\0\0", 8) = 8
write(1, "OK:5083\n", 8) = 8
write(1, "> ", 2) = 2
read(0, "remove 1\n", 1024) = 9
kill(5083, SIGTERM) = 0
kill(5083, SIGKILL) = 0
write(1, "OK\n", 3) = 3
write(1, "> ", 2) = 2
read(0, 0x56127b7ddf10, 1024) = ? ERESTARTSYS (To be restarted if
SA_RESTART is set)
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_KILLED, si_pid=5083, si_uid=1000,
si_status=SIGTERM, si_utime=0, si_stime=0} ---
read(0, "exit\n", 1024) = 5
write(4, "\1\0\0\0\0\0\0\0", 8) = 8
write(4, "\1\0\0\0\0\0\0\0", 8) = 8
poll([{fd=3, events=POLLIN}], 1, -1) = 1 ([{fd=3, revents=POLLIN}])
read(3, "\1\0\0\0\0\0\0\0", 8) = 8
write(6, "\1\0\0\0\0\0\0\0", 8) = 8
close(7) = 0
close(6) = 0
close(5) = 0
close(4) = 0
close(3) = 0
lseek(0, -1, SEEK_CUR) = -1 ESPIPE (Illegal seek)
exit_group(0) = ?
+++ exited with 0 +++

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## Вывод

По мере выполнения данной лабораторной работы я освоил диагностику работы ПО с помощью утилиты strace — простого и надёжного инструмента. Strace позволяет отслеживать выполнение системных вызовов и сигналов к ядру системы. Ее функционал прост, но широк; работать с ней комфортно и, главное, полезно.

Я научился просматривать как все вызовы сразу, так и несколько отдельных; получилось отследить работу и дочерних процессов. Научился отображать названия, пути к файлам, с которыми работает программа, вместо дескрипторов. Получилось взглянуть на удобную статистику системных вызовов и наблюдать время выполнения (обычное и относительное) тех или иных вызовов. Смог подключиться к уже запущенному процессу.

Все это — лишь малая часть функционала утилиты strace. С ее помощью можно делать еще много интересных вещей: намеренно ломать программу (инъекция ошибок) для выявления уязвимостей, наблюдать стек процесса в момент системного вызова и другое.

Но больше всего мне понравилась возможность отследить время тех или иных вызовов, т.к. это в будущем позволит определить, в каком участке кода программа могла заикнуться; или понять, в каком месте стоит произвести оптимизацию. Также интересной и полезной я нахожу возможность отобразить статистику системных вызовов в удобной форме, в виде таблицы.