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**Лабораторная работа №1 по курсу**

**«Операционные системы»**

**Приобретение практических навыков диагностики работы программного обеспечения**

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1. **Постановка задачи**

При выполнении последующих лабораторных работ необходимо продемонстрировать ключевые системные вызовы, которые в них используются.

Используемые утилиты: strace, ltrace.

1. **Описание используемых утилит**

Strace — это утилита Linux, отслеживающая системные вызовы, которые представляют собой механизм трансляции, обеспечивающий интерфейс между процессом и операционной системой. Использование данной утилиты позволяет понять, что процесс пытается сделать в данное время. Strace может быть полезен при отладке программ.

Для удобства работы с протоколом утилиты можно использовать следующие ключи:

* -o file – Перенаправить протокол утилиты в файл file
* -e trace=filters – Указать выражения, по которым будут фильтроваться системные вызовы. Например -e trace=write,%process задаёт фильтрацию по системным вызовам write и по группе системных вызовов, связанных с межпроцессорным взаимодействием.
* -f – Отслеживать системные вызовы в дочерних процессах
* -y – Заменить в протоколе все файловые дескрипторы на имена соответствующих им файлов (где возможно).
* -p file – Отслеживать только обращения к файлу file
* -k – Отображать стек вызовов

Ltrace – это утилита Linux, отслеживающая системные вызовы, связанные с динамическими библиотеками. Использование данной утилиты очень похоже на использование strace.

1. **Примеры использования утилит**

Ниже приведены протоколы strace лабораторных работ. Ключевые строки в протоколе будут выделены жирным шрифтом.

***Лабораторная работа 2 – взаимодействие между процессами***

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab2$** strace -T -i -f -e trace="%process,read,write,dup2,pipe" -o strace\_log.txt ./parent

Enter file's name for child process 1 (gets odd lines): strace\_file1

Enter file's name for child process 2 (gets even lines): strace\_file2

straceodd

straceeven

straceodd

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab2$** cat strace\_log.txt

81 [00007f7ddfcb4e97] execve("./parent", ["./parent"], 0x7fffea6ff0b8 /\* 19 vars \*/) = 0 <0.002969>

81 [00007fb37c41cdd4] read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832 <0.000094>

81 [00007fb37c401024] arch\_prctl(ARCH\_SET\_FS, 0x7fb37c6a14c0) = 0 <0.000010>

81 [00007fb37c110264] write(1, "Enter file's name for child proc"..., 56) = 56 <0.000085>

81 [00007fb37c110191] read(0, "strace\_file1\n", 4096) = 13 <7.269710>

81 [00007fb37c110264] write(1, "Enter file's name for child proc"..., 57) = 57 <0.000273>

81 [00007fb37c110191] read(0, "strace\_file2\n", 4096) = 12 <6.020148>

**81 [00007fb37c110b17] pipe([5, 6]) = 0 <0.000097>**

**81 [00007fb37c110b17] pipe([7, 8]) = 0 <0.000084>**

**81 [00007fb37c0e4b7c] clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7fb37c6a1790) = 82 <0.002854>**

**81 [00007fb37c0e4b7c] clone( <unfinished ...>**

**82 [00007fb37c110ab7] dup2(5, 0) = 0 <0.000069>**

**82 [00007fb37c110ab7] dup2(3, 1) = 1 <0.000057>**

**82 [00007fb37c0e4e97] execve("/mnt/c/Users/\320\230\320\262\320\260\320\275/projects/os\_labs/os\_lab2/child", ["child"], 0x7fffdee9b2e8 /\* 19 vars \*/ <unfinished ...>**

**81 [00007fb37c0e4b7c] <... clone resumed> child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7fb37c6a1790) = 83 <0.003578>**

81 [00007fb37c110191] read(0, <unfinished ...>

**83 [00007fb37c110ab7] dup2(7, 0) = 0 <0.000036>**

**83 [00007fb37c110ab7] dup2(4, 1) = 1 <0.000035>**

**83 [00007fb37c0e4e97] execve("/mnt/c/Users/\320\230\320\262\320\260\320\275/projects/os\_labs/os\_lab2/child", ["child"], 0x7fffdee9b2e8 /\* 19 vars \*/ <unfinished ...>**

**82 [00007f8062201090] <... execve resumed> ) = 0 <0.004487>**

**83 [00007f09d7601090] <... execve resumed> ) = 0 <0.002149>**

82 [00007f806221cdd4] read(6, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832 <0.000079>

82 [00007f8062201024] arch\_prctl(ARCH\_SET\_FS, 0x7f80625e14c0) = 0 <0.000081>

83 [00007f09d761cdd4] read(5, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832 <0.000039>

82 [00007f8061f10191] read(0, <unfinished ...>

83 [00007f09d7601024] arch\_prctl(ARCH\_SET\_FS, 0x7f09d79514c0) = 0 <0.000011>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110191] <... read resumed> "straceodd\n", 4096) = 10 <10.332725>

81 [00007fb37c110264] write(6, "s", 1) = 1 <0.000083>

82 [00007f8061f10191] <... read resumed> "s", 4096) = 1 <10.326293>

81 [00007fb37c110264] write(6, "t", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000143>

82 [00007f8061f10191] <... read resumed> "t", 4096) = 1 <0.000090>

81 [00007fb37c110264] write(6, "r", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000181>

82 [00007f8061f10191] <... read resumed> "r", 4096) = 1 <0.000153>

81 [00007fb37c110264] write(6, "a", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000127>

82 [00007f8061f10191] <... read resumed> "a", 4096) = 1 <0.000092>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] write(6, "c", 1) = 1 <0.000115>

82 [00007f8061f10191] <... read resumed> "c", 4096) = 1 <0.000415>

81 [00007fb37c110264] write(6, "e", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000149>

82 [00007f8061f10191] <... read resumed> "e", 4096) = 1 <0.000149>

81 [00007fb37c110264] write(6, "o", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000135>

82 [00007f8061f10191] <... read resumed> "o", 4096) = 1 <0.000115>

81 [00007fb37c110264] write(6, "d", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000079>

82 [00007f8061f10191] <... read resumed> "d", 4096) = 1 <0.000184>

81 [00007fb37c110264] write(6, "d", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000122>

82 [00007f8061f10191] <... read resumed> "d", 4096) = 1 <0.000088>

81 [00007fb37c110264] write(6, "\0", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000109>

82 [00007f8061f10191] <... read resumed> "\0", 4096) = 1 <0.000061>

81 [00007fb37c110191] read(0, <unfinished ...>

82 [00007f8061f10264] write(1, "ddoecarts\n", 10) = 10 <0.000113>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110191] <... read resumed> "straceeven\n", 4096) = 11 <5.904481>

81 [00007fb37c110264] write(8, "s", 1) = 1 <0.000113>

83 [00007f09d7310191] <... read resumed> "s", 4096) = 1 <16.234433>

81 [00007fb37c110264] write(8, "t", 1 <unfinished ...>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000146>

83 [00007f09d7310191] <... read resumed> "t", 4096) = 1 <0.000119>

81 [00007fb37c110264] write(8, "r", 1 <unfinished ...>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000091>

83 [00007f09d7310191] <... read resumed> "r", 4096) = 1 <0.000126>

81 [00007fb37c110264] write(8, "a", 1 <unfinished ...>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000188>

83 [00007f09d7310191] <... read resumed> "a", 4096) = 1 <0.000071>

81 [00007fb37c110264] write(8, "c", 1 <unfinished ...>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000040>

83 [00007f09d7310191] <... read resumed> "c", 4096) = 1 <0.000072>

81 [00007fb37c110264] write(8, "e", 1 <unfinished ...>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000055>

83 [00007f09d7310191] <... read resumed> "e", 4096) = 1 <0.000036>

81 [00007fb37c110264] write(8, "e", 1 <unfinished ...>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000043>

83 [00007f09d7310191] <... read resumed> "e", 4096) = 1 <0.000043>

81 [00007fb37c110264] write(8, "v", 1) = 1 <0.000014>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] write(8, "e", 1 <unfinished ...>

83 [00007f09d7310191] <... read resumed> "v", 4096) = 1 <0.000147>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000089>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] write(8, "n", 1 <unfinished ...>

83 [00007f09d7310191] <... read resumed> "e", 4096) = 1 <0.000091>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000148>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110264] write(8, "\0", 1 <unfinished ...>

83 [00007f09d7310191] <... read resumed> "n", 4096) = 1 <0.000154>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000073>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110191] read(0, <unfinished ...>

83 [00007f09d7310191] <... read resumed> "\0", 4096) = 1 <0.000097>

83 [00007f09d7310264] write(1, "neveecarts\n", 11) = 11 <0.000428>

83 [00007f09d7310191] read(0, <unfinished ...>

81 [00007fb37c110191] <... read resumed> "straceodd\n", 4096) = 10 <4.846124>

81 [00007fb37c110264] write(6, "s", 1) = 1 <0.000077>

82 [00007f8061f10191] <... read resumed> "s", 4096) = 1 <10.754823>

81 [00007fb37c110264] write(6, "t", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000136>

82 [00007f8061f10191] <... read resumed> "t", 4096) = 1 <0.000093>

81 [00007fb37c110264] write(6, "r", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000076>

82 [00007f8061f10191] <... read resumed> "r", 4096) = 1 <0.000148>

81 [00007fb37c110264] write(6, "a", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000031>

82 [00007f8061f10191] <... read resumed> "a", 4096) = 1 <0.000041>

81 [00007fb37c110264] write(6, "c", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000039>

82 [00007f8061f10191] <... read resumed> "c", 4096) = 1 <0.000042>

81 [00007fb37c110264] write(6, "e", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000039>

82 [00007f8061f10191] <... read resumed> "e", 4096) = 1 <0.000037>

81 [00007fb37c110264] write(6, "o", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000037>

82 [00007f8061f10191] <... read resumed> "o", 4096) = 1 <0.000036>

81 [00007fb37c110264] write(6, "d", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000048>

82 [00007f8061f10191] <... read resumed> "d", 4096) = 1 <0.000149>

81 [00007fb37c110264] write(6, "d", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000153>

82 [00007f8061f10191] <... read resumed> "d", 4096) = 1 <0.000061>

81 [00007fb37c110264] write(6, "\0", 1 <unfinished ...>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000040>

82 [00007f8061f10191] <... read resumed> "\0", 4096) = 1 <0.000042>

81 [00007fb37c110191] read(0, <unfinished ...>

82 [00007f8061f10264] write(1, "ddoecarts\n", 10) = 10 <0.000086>

82 [00007f8061f10191] read(0, <unfinished ...>

81 [00007fb37c110191] <... read resumed> "", 4096) = 0 <1.271390>

81 [00007fb37c110264] write(8, "\377", 1) = 1 <0.000117>

83 [00007f09d7310191] <... read resumed> "\377", 4096) = 1 <6.119869>

81 [00007fb37c110264] write(8, "\0", 1) = 1 <0.000054>

81 [00007fb37c110264] write(8, "\377", 1 <unfinished ...>

83 [00007f09d72e4e66] exit\_group(0 <unfinished ...>

81 [00007fb37c110264] <... write resumed> ) = 1 <0.000126>

83 [00007f09d72e4e66] <... exit\_group resumed>) = ?

81 [00007fb37c110264] write(8, "\0", 1 <unfinished ...>

83 [????????????????] +++ exited with 0 +++

81 [00007fb37c110264] <... write resumed> ) = -1 EPIPE (Broken pipe) <0.000066>

81 [00007fb37c110264] --- SIGPIPE {si\_signo=SIGPIPE, si\_code=SI\_USER, si\_pid=81, si\_uid=1000} ---

82 [00007f8061f10191] <... read resumed> "", 4096) = 0 <1.273573>

81 [????????????????] +++ killed by SIGPIPE +++

82 [00007f8061ee4e66] exit\_group(0) = ?

82 [????????????????] +++ exited with 0 +++

***Лабораторная работа 3 – взаимодействие между потоками***

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab3$** strace -f -e trace="%process,write" -o strace\_log.txt ./main 3

Thread number: 3

Enter string length: 10

Enter pattern length: 2

Enter string: adagosodos

Enter pattern: os

Minimal index of the pattern occurence in the text: 4

Time: 0.0075 seconds

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab3$** cat strace\_log.txt

13025 execve("./main", ["./main", "3"], 0x7fffef7c9390 /\* 19 vars \*/) = 0

13025 arch\_prctl(ARCH\_SET\_FS, 0x7fc602c50740) = 0

13025 write(1, "Thread number: 3\n", 17) = 17

13025 write(1, "Enter string length: ", 21) = 21

13025 write(1, "Enter pattern length: ", 22) = 22

13025 write(1, "Enter string: ", 14) = 14

13025 write(1, "Enter pattern: ", 15) = 15

**13025 clone(child\_stack=0x7fc6023cffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7fc6023d09d0, tls=0x7fc6023d0700, child\_tidptr=0x7fc6023d09d0) = 13026**

**13025 clone(child\_stack=0x7fc601bbffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7fc601bc09d0, tls=0x7fc601bc0700, child\_tidptr=0x7fc601bc09d0) = 13027**

**13025 clone(child\_stack=0x7fc6013affb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7fc6013b09d0, tls=0x7fc6013b0700, child\_tidptr=0x7fc6013b09d0) = 13028**

13026 exit(0) = ?

13027 exit(0 <unfinished ...>

13026 +++ exited with 0 +++

13027 <... exit resumed>) = ?

13027 +++ exited with 0 +++

13028 exit(0) = ?

13028 +++ exited with 0 +++

13025 write(1, "Minimal index of the pattern occ"..., 54) = 54

13025 write(1, "Time: 0.0075 seconds\n", 21) = 21

13025 exit\_group(0) = ?

13025 +++ exited with 0 +++

***Лабораторная работа 4 – отображаемые файлы***

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab4$** strace -o strace\_log.txt ./parent

Enter file's name for child process 1 (gets odd lines): file1

Enter file's name for child process 2 (gets even lines): file2

odd1

even1

odd2

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab4$** cat strace\_log.txt

execve("./parent", ["./parent"], 0x7fffcfa517e0 /\* 19 vars \*/) = 0

brk(NULL) = 0x7fffb8721000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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=60037, ...}) = 0

mmap(NULL, 60037, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7fb2cf175000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\260\34\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030544, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7fb2cf170000

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7fb2cea00000

mprotect(0x7fb2cebe7000, 2097152, PROT\_NONE) = 0

mmap(0x7fb2cede7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7fb2cede7000

mmap(0x7fb2ceded000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7fb2ceded000

close(3) = 0

arch\_prctl(ARCH\_SET\_FS, 0x7fb2cf1714c0) = 0

mprotect(0x7fb2cede7000, 16384, PROT\_READ) = 0

mprotect(0x7fb2cf401000, 4096, PROT\_READ) = 0

mprotect(0x7fb2cf027000, 4096, PROT\_READ) = 0

munmap(0x7fb2cf175000, 60037) = 0

fstat(1, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 8), ...}) = 0

ioctl(1, TCGETS, {B38400 opost isig icanon echo ...}) = 0

brk(NULL) = 0x7fffb8721000

brk(0x7fffb8742000) = 0x7fffb8742000

fstat(0, {st\_mode=S\_IFCHR|0660, st\_rdev=makedev(4, 8), ...}) = 0

ioctl(0, TCGETS, {B38400 opost isig icanon echo ...}) = 0

write(1, "Enter file's name for child proc"..., 56) = 56

read(0, "file1\n", 4096) = 6

write(1, "Enter file's name for child proc"..., 57) = 57

read(0, "file2\n", 4096) = 6

openat(AT\_FDCWD, "file1", O\_WRONLY|O\_CREAT, 0600) = 3

openat(AT\_FDCWD, "file2", O\_WRONLY|O\_CREAT, 0600) = 4

openat(AT\_FDCWD, "file1\_mapped", O\_RDWR|O\_CREAT, 0600) = 5

openat(AT\_FDCWD, "file2\_mapped", O\_RDWR|O\_CREAT, 0600) = 6

write(5, "\1\0\0\0\0\0\0\0", 8) = 8

write(6, "\1\0\0\0\0\0\0\0", 8) = 8

**mmap(NULL, 4096, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 5, 0) = 0x7fb2cf180000**

**mmap(NULL, 4096, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 6, 0) = 0x7fb2cf160000**

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7fb2cf171790) = 402

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7fb2cf171790) = 403

read(0, "odd1\n", 4096) = 5

read(0, "even1\n", 4096) = 6

read(0, "odd2\n", 4096) = 5

read(0, "", 4096) = 0

munmap(0x7fb2cf180000, 4096) = 0

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=403, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

munmap(0x7fb2cf160000, 4096) = 0

close(5) = 0

close(6) = 0

unlink("file1\_mapped") = 0

unlink("file2\_mapped") = 0

exit\_group(0) = ?

+++ exited with 0 +++

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab4$** strace -e mmap -o strace\_log1.txt ./parent

Enter file's name for child process 1 (gets odd lines): s\_file1

Enter file's name for child process 2 (gets even lines): s\_file2

odd

even

odd

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab4$** cat strace\_log1.txt

mmap(NULL, 60037, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f9789523000

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f9789520000

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f9788e00000

mmap(0x7f97891e7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7f97891e7000

mmap(0x7f97891ed000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f97891ed000

mmap(NULL, 4096, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 5, 0) = 0x7f9789530000

mmap(NULL, 4096, PROT\_READ|PROT\_WRITE, MAP\_SHARED, 6, 0) = 0x7f9789510000

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=411, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

+++ exited with 0 +++

***Лабораторная работа 5 – динамические библиотеки***

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab5/task-2$** ltrace -o ltrace.log ./programm-2

+-------------+-------------------------------------------+

| command | description |

|=============+===========================================|

| 0 | switch implementation |

|=========================================================|

| FISRT IMPLEMENTATION(default) |

|=========================================================|

| 1 x | count 'e' number |

| | using second remarkable limit |

|-------------+-------------------------------------------|

| 2 num | translate number to binary number system |

| | from decimal number system |

|=========================================================|

| SECOND IMPLEMENTATION |

|=========================================================|

| 1 x | count 'e' number |

| | using Taylor series |

|-------------+-------------------------------------------|

| 2 num | translate number to ternary number system |

| | from decimal number system |

+-------------+-------------------------------------------+

1 10

Counting 'e' number using second remarkable limit

2.593742

2 8

Translate number 8 to binary number system

1000

0

Changing context...

Now context is second

1 10

Counting 'e' number using Taylor series

2.718282

2 8

Translate number 8 to ternary number system

22

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab5/task-2$** cat ltrace.log

puts("+-------------+-----------------"...) = 60

puts("| command | de"...) = 60

puts("|=============+================="...) = 60

puts("| 0 | switch"...) = 60

puts("|==============================="...) = 60

puts("| FISRT IMPLEMENTAT"...) = 60

puts("|==============================="...) = 60

puts("| 1 x | co"...) = 60

puts("| | using sec"...) = 60

puts("|-------------+-----------------"...) = 60

puts("| 2 num | translate number"...) = 60

puts("| | from deci"...) = 60

puts("|==============================="...) = 60

puts("| SECOND IMPLEM"...) = 60

puts("|==============================="...) = 60

puts("| 1 x | cou"...) = 60

puts("| | using "...) = 60

puts("|-------------+-----------------"...) = 60

puts("| 2 num | translate number"...) = 60

puts("| | from deci"...) = 60

puts("+-------------+-----------------"...) = 61

**dlopen("libimp.so", 1) = 0x7fffe4583690**

**dlsym(0x7fffe4583690, "e") = 0x7fbdf51e07ba**

**dlsym(0x7fffe4583690, "translation") = 0x7fbdf51e0810**

**dlerror() = nil**

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b4, 1, 0) = 1

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b8, 0x7fbdf57dd8d0, 16) = 1

printf("%f\n", 2.593742) = 9

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b4, 0, 0) = 1

\_\_isoc99\_scanf(0x7fbdf6001373, 0x7fffecb7b6b8, 0x7fbdf57dd8d0, 16) = 1

printf("Translate number %ld to ", 8) = 22

printf("binary ") = 7

puts("number system") = 14

puts("1000") = 5

free(0x7fffe45847f0) = <void>

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b4, 0x7fffe4583010, 5) = 1

**dlclose(0x7fffe4583690) = 0**

**dlopen("libimp\_2.so", 1) = 0x7fffe4583690**

**dlsym(0x7fffe4583690, "e") = 0x7fbdf51e074a**

**dlsym(0x7fffe4583690, "translation") = 0x7fbdf51e07c9**

**dlerror() = nil**

puts("Changing context...") = 20

sleep(1) = 0

puts("Now context is second") = 22

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b4, 0x7fbdf57dd8c0, 3) = 1

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b8, 0x7fbdf57dd8d0, 16) = 1

printf("%f\n", 2.718282) = 9

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b4, 0, 0) = 1

\_\_isoc99\_scanf(0x7fbdf6001373, 0x7fffecb7b6b8, 0x7fbdf57dd8d0, 16) = 1

printf("Translate number %ld to ", 8) = 22

printf("ternary ") = 8

puts("number system") = 14

puts("22") = 3

free(0x7fffe4583ca0) = <void>

\_\_isoc99\_scanf(0x7fbdf600136c, 0x7fffecb7b6b4, 0, 0) = 0xffffffff

**dlclose(0x7fffe4583690) = 0**

+++ exited (status 0) +++

***Лабораторная работа 6 – очереди сообщений***

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab6-8$** strace -o strace\_log.txt ./client

create 1 -1

OK: 28484

exit

**ivan@Laptop-IM:/mnt/c/Users/Иван/projects/os\_labs/os\_lab6-8$** cat strace\_log.txt

execve("./client", ["./client"], 0x7ffff166da70 /\* 28 vars \*/) = 0

brk(NULL) = 0x7ffff3fda000

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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=61725, ...}) = 0

mmap(NULL, 61725, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f9627e7a000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/local/lib/libzmq.so.5", 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\260\276\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=6400680, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f9627e70000

mmap(NULL, 2483240, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f96279a1000

mprotect(0x7f96279fb000, 2097152, PROT\_NONE) = 0

mmap(0x7f9627bfb000, 20480, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x5a000) = 0x7f9627bfb000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/libstdc++.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\304\10\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=1594864, ...}) = 0

mmap(NULL, 3702848, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f9627610000

mprotect(0x7f9627789000, 2097152, PROT\_NONE) = 0

mmap(0x7f9627989000, 49152, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x179000) = 0x7f9627989000

mmap(0x7f9627995000, 12352, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f9627995000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libgcc\_s.so.1", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\300\*\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=96616, ...}) = 0

mmap(NULL, 2192432, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f96273f0000

mprotect(0x7f9627407000, 2093056, PROT\_NONE) = 0

mmap(0x7f9627606000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x16000) = 0x7f9627606000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\20\35\2\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2030928, ...}) = 0

mmap(NULL, 4131552, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f9626ff0000

mprotect(0x7f96271d7000, 2097152, PROT\_NONE) = 0

mmap(0x7f96273d7000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1e7000) = 0x7f96273d7000

mmap(0x7f96273dd000, 15072, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f96273dd000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/librt.so.1", O\_RDONLY|O\_CLOEXEC) = 3

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

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=31680, ...}) = 0

mmap(NULL, 2128864, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f9626de0000

mprotect(0x7f9626de7000, 2093056, PROT\_NONE) = 0

mmap(0x7f9626fe6000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x6000) = 0x7f9626fe6000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

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\0000b\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0755, st\_size=144976, ...}) = 0

mmap(NULL, 2221184, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f9626bc0000

mprotect(0x7f9626bda000, 2093056, PROT\_NONE) = 0

mmap(0x7f9626dd9000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x19000) = 0x7f9626dd9000

mmap(0x7f9626ddb000, 13440, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f9626ddb000

close(3) = 0

access("/etc/ld.so.nohwcap", F\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libm.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\200\272\0\0\0\0\0\0"..., 832) = 832

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=1700792, ...}) = 0

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f9627e60000

mmap(NULL, 3789144, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f9626820000

mprotect(0x7f96269bd000, 2093056, PROT\_NONE) = 0

mmap(0x7f9626bbc000, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x19c000) = 0x7f9626bbc000

close(3) = 0

mmap(NULL, 12288, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f9627e50000

arch\_prctl(ARCH\_SET\_FS, 0x7f9627e50740) = 0

mprotect(0x7f96273d7000, 16384, PROT\_READ) = 0

mprotect(0x7f9626bbc000, 4096, PROT\_READ) = 0

mprotect(0x7f9626dd9000, 4096, PROT\_READ) = 0

mprotect(0x7f9626fe6000, 4096, PROT\_READ) = 0

mprotect(0x7f9627606000, 4096, PROT\_READ) = 0

mprotect(0x7f9627989000, 40960, PROT\_READ) = 0

mprotect(0x7f9627bfb000, 16384, PROT\_READ) = 0

mprotect(0x7f962820d000, 4096, PROT\_READ) = 0

mprotect(0x7f9627e29000, 4096, PROT\_READ) = 0

munmap(0x7f9627e7a000, 61725) = 0

set\_tid\_address(0x7f9627e50a10) = 28483

set\_robust\_list(0x7f9627e50a20, 24) = 0

rt\_sigaction(SIGRTMIN, {sa\_handler=0x7f9626bc5cb0, sa\_mask=[], sa\_flags=SA\_RESTORER|SA\_SIGINFO, sa\_restorer=0x7f9626bd2980}, NULL, 8) = 0

rt\_sigaction(SIGRT\_1, {sa\_handler=0x7f9626bc5d50, sa\_mask=[], sa\_flags=SA\_RESTORER|SA\_RESTART|SA\_SIGINFO, sa\_restorer=0x7f9626bd2980}, NULL, 8) = 0

rt\_sigprocmask(SIG\_UNBLOCK, [RTMIN RT\_1], NULL, 8) = 0

prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=8192\*1024}) = 0

brk(NULL) = 0x7ffff3fda000

brk(0x7ffff3ffb000) = 0x7ffff3ffb000

futex(0x7f962799609c, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0

futex(0x7f96279960a8, FUTEX\_WAKE\_PRIVATE, 2147483647) = 0

eventfd2(0, 0) = 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

fstat(0, {st\_mode=S\_IFCHR|0620, st\_rdev=makedev(136, 1), ...}) = 0

read(0, "create 1 -1\n", 1024) = 12

clone(child\_stack=NULL, flags=CLONE\_CHILD\_CLEARTID|CLONE\_CHILD\_SETTID|SIGCHLD, child\_tidptr=0x7f9627e50a10) = 28484

eventfd2(0, 0) = 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

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=104208, tv\_nsec=341386100}) = 0

epoll\_create(1) = 5

epoll\_ctl(5, EPOLL\_CTL\_ADD, 4, {0, {u32=4093569408, u64=140737286957440}}) = 0

epoll\_ctl(5, EPOLL\_CTL\_MOD, 4, {EPOLLIN, {u32=4093569408, u64=140737286957440}}) = 0

mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|MAP\_STACK, -1, 0) = 0x7f9626010000

mprotect(0x7f9626011000, 8388608, PROT\_READ|PROT\_WRITE) = 0

clone(child\_stack=0x7f962680ffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7f96268109d0, tls=0x7f9626810700, child\_tidptr=0x7f96268109d0) = 28485

sched\_getparam(28485, [0]) = 0

sched\_getscheduler(28485) = 0 (SCHED\_OTHER)

sched\_setscheduler(28485, SCHED\_OTHER, [0]) = 0

eventfd2(0, 0) = 6

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

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=104208, tv\_nsec=343305400}) = 0

epoll\_create(1) = 7

epoll\_ctl(7, EPOLL\_CTL\_ADD, 6, {0, {u32=4093570528, u64=140737286958560}}) = 0

epoll\_ctl(7, EPOLL\_CTL\_MOD, 6, {EPOLLIN, {u32=4093570528, u64=140737286958560}}) = 0

mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|MAP\_STACK, -1, 0) = 0x7f9625800000

mprotect(0x7f9625801000, 8388608, PROT\_READ|PROT\_WRITE) = 0

clone(child\_stack=0x7f9625ffffb0, flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID, parent\_tidptr=0x7f96260009d0, tls=0x7f9626000700, child\_tidptr=0x7f96260009d0) = 28486

sched\_getparam(28486, [0]) = 0

sched\_getscheduler(28486) = 0 (SCHED\_OTHER)

sched\_setscheduler(28486, SCHED\_OTHER, [0]) = 0

eventfd2(0, 0) = 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

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=104208, tv\_nsec=345453300}) = 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=28483, nl\_groups=00000000}, [12]) = 0**

**time(NULL) = 1618761332 (2021-04-18T18:55:32+0300)**

**sendto(9, "\24\0\0\0\22\0\1\3tV|`\0\0\0\0\0\0\0\0", 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=80, type=0x10 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761332, pid=28483}, "\x00\x00\x01\x00\x08\x00\x00\x00\x40\x00\x00\x00\x00\x00\x00\x00\x0a\x00\x01\x00\x04\xea\x56\x54\x04\xec\x00\x00\x08\x00\x1b\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 80**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=76, type=0x10 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761332, pid=28483}, "\x00\x00\x04\x03\x01\x00\x00\x00\x49\x00\x00\x00\x00\x00\x00\x00\x0a\x00\x01\x00\x00\x00\x00\x00\x00\x00\x00\x00\x08\x00\x1b\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 76**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=80, type=0x10 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761332, pid=28483}, "\x00\x00\x21\x03\x14\x00\x00\x00\x43\x10\x00\x00\x00\x00\x00\x00\x0a\x00\x01\x00\x04\xea\x56\x54\x04\xe8\x00\x00\x08\x00\x1b\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 80**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=80, type=0x10 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761332, pid=28483}, "\x00\x00\x21\x03\x0e\x00\x00\x00\x40\x00\x00\x00\x00\x00\x00\x00\x0a\x00\x01\x00\x04\xea\x56\x54\x04\xe9\x00\x00\x08\x00\x1b\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 80**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=80, type=0x10 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761332, pid=28483}, "\x00\x00\x21\x03\x12\x00\x00\x00\x40\x00\x00\x00\x00\x00\x00\x00\x0a\x00\x01\x00\x06\xea\x56\x54\x04\xe8\x00\x00\x08\x00\x1b\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 80**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=20, type=NLMSG\_DONE, flags=NLM\_F\_MULTI, seq=1618761332, pid=28483}, 0}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 20**

**sendto(9, "\24\0\0\0\26\0\1\3uV|`\0\0\0\0\0\0\0\0", 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=60, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x02\x10\x00\x00\x08\x00\x00\x00\x08\x00\x01\x00\xa9\xfe\x97\x1c\x08\x00\x04\x00\xa9\xfe\xff\xff\x14\x00\x06\x00\xff\xff\xff\xff"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 60**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=64, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x0a\x40\x00\xfd\x08\x00\x00\x00\x14\x00\x01\x00\xfe\x80\x00\x00\x00\x00\x00\x00\xe9\x3c\x94\x41\x9e\x24\x97\x1c\x14\x00\x06\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 64**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=60, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x02\x08\x00\x00\x01\x00\x00\x00\x08\x00\x01\x00\x7f\x00\x00\x01\x08\x00\x04\x00\x7f\xff\xff\xff\x14\x00\x06\x00\xff\xff\xff\xff"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 60**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=64, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x0a\x80\x00\xfe\x01\x00\x00\x00\x14\x00\x01\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x01\x14\x00\x06\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 64**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=60, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x02\x18\x00\x00\x14\x00\x00\x00\x08\x00\x01\x00\xc0\xa8\x64\x07\x08\x00\x04\x00\xc0\xa8\x64\xff\x14\x00\x06\x00\x51\xca\x03\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 60**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=64, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x0a\x40\x00\xfd\x14\x00\x00\x00\x14\x00\x01\x00\xfe\x80\x00\x00\x00\x00\x00\x00\x25\x20\xf5\x7e\xe3\x5d\x64\x5b\x14\x00\x06\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 64**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=60, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x02\x10\x00\x00\x0e\x00\x00\x00\x08\x00\x01\x00\xa9\xfe\xee\x85\x08\x00\x04\x00\xa9\xfe\xff\xff\x14\x00\x06\x00\xff\xff\xff\xff"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 60**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=64, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x0a\x40\x00\xfd\x0e\x00\x00\x00\x14\x00\x01\x00\xfe\x80\x00\x00\x00\x00\x00\x00\x99\x07\xe3\x03\xc8\xb1\xee\x85\x14\x00\x06\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 64**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=60, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x02\x10\x00\x00\x12\x00\x00\x00\x08\x00\x01\x00\xa9\xfe\xc3\x47\x08\x00\x04\x00\xa9\xfe\xff\xff\x14\x00\x06\x00\xff\xff\xff\xff"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 60**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=64, type=0x14 /\* NLMSG\_??? \*/, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, "\x0a\x40\x00\xfd\x12\x00\x00\x00\x14\x00\x01\x00\xfe\x80\x00\x00\x00\x00\x00\x00\x61\x44\xae\x0e\x49\x63\xc3\x47\x14\x00\x06\x00"...}, iov\_len=4096}], msg\_iovlen=1, msg\_controllen=0, msg\_flags=0}, 0) = 64**

**recvmsg(9, {msg\_name={sa\_family=AF\_NETLINK, nl\_pid=0, nl\_groups=00000000}, msg\_namelen=12, msg\_iov=[{iov\_base={{len=20, type=NLMSG\_DONE, flags=NLM\_F\_MULTI, seq=1618761333, pid=28483}, 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(4041), sin\_addr=inet\_addr("127.0.0.1")}, 16) = 0**

**listen(9, 100) = 0**

**getsockname(9, {sa\_family=AF\_INET, sin\_port=htons(4041), 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

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)

clock\_gettime(CLOCK\_MONOTONIC, {tv\_sec=104208, tv\_nsec=354235100}) = 0

poll([{fd=8, events=POLLIN}], 1, 5000) = 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

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

fstat(1, {st\_mode=S\_IFCHR|0620, st\_rdev=makedev(136, 1), ...}) = 0

write(1, "OK: 28484\n", 10) = 10

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

poll([{fd=8, events=POLLIN}], 1, 0) = 0 (Timeout)

write(6, "\1\0\0\0\0\0\0\0", 8) = 8

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, 0) = ? ERESTART\_RESTARTBLOCK (Interrupted by signal)

--- SIGCHLD {si\_signo=SIGCHLD, si\_code=CLD\_EXITED, si\_pid=28484, si\_uid=1000, si\_status=0, si\_utime=0, si\_stime=0} ---

restart\_syscall(<... resuming interrupted poll ...>) = 0

write(6, "\1\0\0\0\0\0\0\0", 8) = 8

lseek(0, -1, SEEK\_CUR) = -1 ESPIPE (Illegal seek)

exit\_group(0) = ?

+++ exited with 0 +++

1. **Выводы**

Утилита strace – простой и надежый инструмент для отслеживания системных вызовов. Он оказлся довльно полезным при отладке и тестировании программ в этом курсе. Неподготволенному юзеру довольно легко запутаться в протоколах этой утилиты, они кажутся чересчур объёмными и непонятными. Но это лишь сперва. Благодаря болльшому разнообразию эта утилита позволяет выодить полученные данные в отфильтрованном и удобном виде.

У утилиты strace есть множество вариаций для специализированных задач, так, например, ltrace (отслеживает вызовы динамических библиотек), ftrace (отслеживает работу операционной системы), perf, SystemTap и многие другие.

Данные утилиты пригодились мне для изучения принципов работы системных вызовов и поиска ошибок в моих лабораторных работах, так как другие привычные методы отладки оказываются в этой области довольно бесполезными.