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

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Репозиторий

<https://github.com/Brokiloene/os>

Постановка задачи

Подробно рассказать о каждом системном вызове из утилиты strace на примере лабораторной работы №2.

Описание работы strace

execve — открывает файл на исполнение.

brk — изменяет расположение маркера окончания неинициализированных данных, который определяет конец сегмента данных процесса.

arch_prctl — устанавливает состояние процесса или потока, зависящее от архитектуры.

access - для проверки существования файла

openat — открывает файл в определенной директории.

newfstatat — возвращает информацию о файле в буфер.

close — закрывает файловый дескриптор.

mmap — создает новое отображение памяти в адресном пространстве процесса.

ftruncate — устанавливает файлу необходимый размер.

munmap — удаляет отображение.

mprotect – контролирует доступ к области памяти.

set_robust_list - запрашивает ядро записать начало списка надёжных фьютексов, принадлежащего вызывающей нити

rt_sigaction - получает и изменяет обработчик сигнала.

rt_sigprocmask - используется для проверки или настройки сигнальной маски текущего процесса.

set_tid_address - устанавливает у вызывающей нити

значение clear_child_tid равным tidptr (В ядре для каждой нити хранится два атрибута (адреса): set_child_tid и clear_child_tid. Их значение по умолчанию равно NULL)

futex - предоставляет программам метод для ожидания пока определённое условие не станет истинным


```

, child_tidptr=0x7f698d94ba10) = 17575
[pid 17574] clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD
<unfinished ...>
[pid 17575] set_robust_list(0x7f698d94ba20, 24) = 0
[pid 17575] close(5strace: Process 17576 attached
<unfinished ...>
[pid 17574] <... clone resumed>, child_tidptr=0x7f698d94ba10) = 17576
[pid 17575] <... close resumed> = 0
[pid 17574] close(3 <unfinished ...>
[pid 17576] set_robust_list(0x7f698d94ba20, 24 <unfinished ...>
[pid 17575] close(4 <unfinished ...>
[pid 17574] <... close resumed> = 0
[pid 17576] <... set_robust_list resumed>) = 0
[pid 17575] <... close resumed> = 0
[pid 17574] close(5 <unfinished ...>
[pid 17575] close(7 <unfinished ...>
[pid 17574] <... close resumed> = 0
[pid 17576] close(3 <unfinished ...>
[pid 17575] <... close resumed> = 0
[pid 17574] close(6 <unfinished ...>
[pid 17576] <... close resumed> = 0
[pid 17574] <... close resumed> = 0
[pid 17575] close(8 <unfinished ...>
[pid 17574] close(8 <unfinished ...>
[pid 17576] close(4 <unfinished ...>
[pid 17574] <... close resumed> = 0
[pid 17575] <... close resumed> = 0
[pid 17576] <... close resumed> = 0
[pid 17575] dup2(3, 0 <unfinished ...>
[pid 17574] getrandom( <unfinished ...>
[pid 17576] close(6 <unfinished ...>
[pid 17574] <... getrandom resumed>"\x9e\x9d\xe8\x69\x5f\x93\x42\x37", 8, GRND_NONBLOCK) = 8
[pid 17575] <... dup2 resumed> = 0
[pid 17576] <... close resumed> = 0
[pid 17574] brk(NULL <unfinished ...>
[pid 17575] dup2(6, 1 <unfinished ...>
[pid 17574] <... brk resumed> = 0x558b42454000
[pid 17576] close(7 <unfinished ...>
[pid 17574] brk(0x558b42475000 <unfinished ...>
[pid 17575] <... dup2 resumed> = 1
[pid 17574] <... brk resumed> = 0x558b42475000
[pid 17576] <... close resumed> = 0
[pid 17575] close(3 <unfinished ...>
[pid 17574] newfstatat(0, "", <unfinished ...>
[pid 17576] dup2(5, 0 <unfinished ...>
[pid 17574] <... newfstatat resumed>{st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0
[pid 17575] <... close resumed> = 0
[pid 17574] read(0, <unfinished ...>
[pid 17576] <... dup2 resumed> = 0
[pid 17575] close(6 <unfinished ...>
[pid 17576] dup2(8, 1 <unfinished ...>
[pid 17575] <... close resumed> = 0
[pid 17576] <... dup2 resumed> = 1
[pid 17576] close(5 <unfinished ...>
[pid 17575] execve("./child", ["child"], 0x7ffc9c46fad8 /* 56 vars */ <unfinished ...>
[pid 17576] <... close resumed> = 0
[pid 17576] close(8) = 0
[pid 17576] execve("./child2", ["child2"], 0x7ffc9c46fad8 /* 56 vars */ <unfinished ...>
[pid 17575] <... execve resumed> = 0
[pid 17575] brk(NULL) = 0x5588e29a3000
[pid 17575] arch_prctl(0x3001 /* ARCH_??? */, 0x7fff865f2b0 <unfinished ...>
[pid 17576] <... execve resumed> = 0
[pid 17575] <... arch_prctl resumed> = -1 EINVAL (Invalid argument)
[pid 17576] brk(NULL <unfinished ...>

```

```

[pid 17575] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
[pid 17576] <... brk resumed>) = 0x55ba7ba8d000
[pid 17575] <... mmap resumed>) = 0x7f8b7e685000
[pid 17576] arch_prctl(0x3001 /* ARCH_??? */ , 0x7ffeb962a300 <unfinished ...>
[pid 17575] access("/etc/ld.so.preload", R_OK <unfinished ...>
[pid 17576] <... arch_prctl resumed>) = -1 EINVAL (Invalid argument)
[pid 17575] <... access resumed>) = -1 ENOENT (No such file or directory)
[pid 17576] mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
[pid 17575] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 17576] <... mmap resumed>) = 0x7f1601239000
[pid 17575] <... openat resumed>) = 3
[pid 17576] access("/etc/ld.so.preload", R_OK <unfinished ...>
[pid 17575] newfstatat(3, "", <unfinished ...>
[pid 17576] <... access resumed>) = -1 ENOENT (No such file or directory)
[pid 17575] <... newfstatat resumed>{st_mode=S_IFREG|0644, st_size=121559, ...},
AT_EMPTY_PATH) = 0
[pid 17576] openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC <unfinished ...>
[pid 17575] mmap(NULL, 121559, PROT_READ, MAP_PRIVATE, 3, 0 <unfinished ...>
[pid 17576] <... openat resumed>) = 3
[pid 17575] <... mmap resumed>) = 0x7f8b7e667000
[pid 17576] newfstatat(3, "", <unfinished ...>
[pid 17575] close(3 <unfinished ...>
[pid 17576] <... newfstatat resumed>{st_mode=S_IFREG|0644, st_size=121559, ...},
AT_EMPTY_PATH) = 0
[pid 17575] <... close resumed>) = 0
[pid 17576] mmap(NULL, 121559, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f160121b000
[pid 17575] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC <unfinished
...>
[pid 17576] close(3 <unfinished ...>
[pid 17575] <... openat resumed>) = 3
[pid 17576] <... close resumed>) = 0
[pid 17575] read(3, <unfinished ...>
[pid 17576] openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC <unfinished
...>
[pid 17575] <... read
resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832
[pid 17576] <... openat resumed>) = 3
[pid 17575] pread64(3, <unfinished ...>
[pid 17576] read(3, <unfinished ...>
[pid 17575] <... pread64
resumed>"\6\0\0\0\4\0\0\0@ \0\0\0\0\0\0@ \0\0\0\0\0\0@ \0\0\0\0\0\0@ \0\0\0\0\0\0"..., 784, 64) = 784
[pid 17576] <... read
resumed>"\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832
[pid 17575] pread64(3, <unfinished ...>
[pid 17576] pread64(3, <unfinished ...>
[pid 17575] <... pread64 resumed>"\4\0\0\0
\0\0\0\5\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
[pid 17576] <... pread64
resumed>"\6\0\0\0\4\0\0\0@ \0\0\0\0\0\0@ \0\0\0\0\0\0@ \0\0\0\0\0\0@ \0\0\0\0\0\0"..., 784, 64) = 784
[pid 17575] pread64(3, <unfinished ...>
[pid 17576] pread64(3, <unfinished ...>
[pid 17575] <... pread64
resumed>"\4\0\0\0\24\0\0\0\3\0\0\0GNU\0i8\235HZ\227\223\333\350s\360\352,\223\340."..., 68,
896) = 68
[pid 17576] <... pread64 resumed>"\4\0\0\0
\0\0\0\5\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0"..., 48, 848) = 48
[pid 17575] newfstatat(3, "", <unfinished ...>
[pid 17576] pread64(3, <unfinished ...>
[pid 17575] <... newfstatat resumed>{st_mode=S_IFREG|0644, st_size=2216304, ...},
AT_EMPTY_PATH) = 0
[pid 17576] <... pread64
resumed>"\4\0\0\0\24\0\0\0\3\0\0\0GNU\0i8\235HZ\227\223\333\350s\360\352,\223\340."..., 68,
896) = 68

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[pid 17575] pread64(3, <unfinished ...>
[pid 17576] newfstatat(3, "", <unfinished ...>
[pid 17575] <... pread64
resumed>"\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784
[pid 17576] <... newfstatat resumed>{st_mode=S_IFREG|0644, st_size=2216304, ...},
AT_EMPTY_PATH) = 0
[pid 17575] mmap(NULL, 2260560, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0 <unfinished ...>
[pid 17576] pread64(3, <unfinished ...>
[pid 17575] <... mmap resumed>) = 0x7f8b7e43f000
[pid 17576] <... pread64
resumed>"\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784
[pid 17575] mmap(0x7f8b7e467000, 1658880, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000 <unfinished ...>
[pid 17576] mmap(NULL, 2260560, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0 <unfinished ...>
[pid 17575] <... mmap resumed>) = 0x7f8b7e467000
[pid 17576] <... mmap resumed>) = 0x7f1600ff3000
[pid 17575] mmap(0x7f8b7e5fc000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1bd000 <unfinished ...>
[pid 17576] mmap(0x7f160101b000, 1658880, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000 <unfinished ...>
[pid 17575] <... mmap resumed>) = 0x7f8b7e5fc000
[pid 17576] <... mmap resumed>) = 0x7f160101b000
[pid 17575] mmap(0x7f8b7e654000, 24576, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x214000 <unfinished ...>
[pid 17576] mmap(0x7f16011b0000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1bd000 <unfinished ...>
[pid 17575] <... mmap resumed>) = 0x7f8b7e654000
[pid 17576] <... mmap resumed>) = 0x7f16011b0000
[pid 17575] mmap(0x7f8b7e65a000, 52816, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 17576] mmap(0x7f1601208000, 24576, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x214000 <unfinished ...>
[pid 17575] <... mmap resumed>) = 0x7f8b7e65a000
[pid 17576] <... mmap resumed>) = 0x7f1601208000
[pid 17576] mmap(0x7f160120e000, 52816, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0 <unfinished ...>
[pid 17575] close(3 <unfinished ...>
[pid 17576] <... mmap resumed>) = 0x7f160120e000
[pid 17575] <... close resumed>) = 0
[pid 17576] close(3 <unfinished ...>
[pid 17575] mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
[pid 17576] <... close resumed>) = 0
[pid 17575] <... mmap resumed>) = 0x7f8b7e43c000
[pid 17576] mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0
<unfinished ...>
[pid 17575] arch_prctl(ARCH_SET_FS, 0x7f8b7e43c740 <unfinished ...>
[pid 17576] <... mmap resumed>) = 0x7f1600ff0000
[pid 17575] <... arch_prctl resumed>) = 0
[pid 17576] arch_prctl(ARCH_SET_FS, 0x7f1600ff0740 <unfinished ...>
[pid 17575] set_tid_address(0x7f8b7e43ca10 <unfinished ...>
[pid 17576] <... arch_prctl resumed>) = 0
[pid 17575] <... set_tid_address resumed>) = 17575
[pid 17576] set_tid_address(0x7f1600ff0a10 <unfinished ...>
[pid 17575] set_robust_list(0x7f8b7e43ca20, 24 <unfinished ...>
[pid 17576] <... set_tid_address resumed>) = 17576
[pid 17575] <... set_robust_list resumed>) = 0
[pid 17576] set_robust_list(0x7f1600ff0a20, 24 <unfinished ...>
[pid 17575] rseq(0x7f8b7e43d0e0, 0x20, 0, 0x53053053 <unfinished ...>
[pid 17576] <... set_robust_list resumed>) = 0
[pid 17575] <... rseq resumed>) = 0
[pid 17576] rseq(0x7f1600ff10e0, 0x20, 0, 0x53053053) = 0
[pid 17575] mprotect(0x7f8b7e654000, 16384, PROT_READ) = 0
[pid 17576] mprotect(0x7f1601208000, 16384, PROT_READ <unfinished ...>
[pid 17575] mprotect(0x5588e156d000, 4096, PROT_READ <unfinished ...>

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[pid 17576] <... mprotect resumed>      = 0
[pid 17575] <... mprotect resumed>      = 0
[pid 17576] mprotect(0x55ba7a81a000, 4096, PROT_READ <unfinished ...>
[pid 17575] mprotect(0x7f8b7e6bf000, 8192, PROT_READ <unfinished ...>
[pid 17576] <... mprotect resumed>      = 0
[pid 17575] <... mprotect resumed>      = 0
[pid 17576] mprotect(0x7f1601273000, 8192, PROT_READ) = 0
[pid 17575] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) =
0
[pid 17576] prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) =
0
[pid 17575] munmap(0x7f8b7e667000, 121559 <unfinished ...>
[pid 17576] munmap(0x7f160121b000, 121559 <unfinished ...>
[pid 17575] <... munmap resumed>         = 0
[pid 17576] <... munmap resumed>         = 0
[pid 17575] read(0, <unfinished ...>
[pid 17576] read(0, HELLO      HELLO      HELLO
<unfinished ...>
[pid 17574] <... read resumed>"HELLO      HELLO      HELLO\n", 1024) = 24
[pid 17574] write(4, "\30\0\0\0", 4)    = 4
[pid 17575] <... read resumed>"\30\0\0\0", 4) = 4
[pid 17574] write(4, "HELLO      HELLO      HELLO\0", 24) = 24
[pid 17575] getRandom( <unfinished ...>
[pid 17574] read(7, <unfinished ...>
[pid 17575] <... getRandom resumed>"\x51\x3f\xd0\x9a\x1e\x8f\x41\xe4", 8, GRND_NONBLOCK) = 8
[pid 17575] brk(NULL)                   = 0x5588e29a3000
[pid 17575] brk(0x5588e29c4000)         = 0x5588e29c4000
[pid 17575] read(0, "HELLO      HELLO      HELLO\0", 24) = 24
[pid 17575] write(1, "\30\0\0\0", 4)    = 4
[pid 17576] <... read resumed>"\30\0\0\0", 4) = 4
[pid 17575] write(1, "hello      hello      hello\0", 24 <unfinished ...>
[pid 17576] getRandom( <unfinished ...>
[pid 17575] <... write resumed>         = 24
[pid 17576] <... getRandom resumed>"\x3d\xa0\x4f\x19\x44\xc3\x9c\x79", 8, GRND_NONBLOCK) = 8
[pid 17575] read(0, <unfinished ...>
[pid 17576] brk(NULL)                   = 0x55ba7ba8d000
[pid 17576] brk(0x55ba7baae000)         = 0x55ba7baae000
[pid 17576] read(0, "hello      hello      hello\0", 24) = 24
[pid 17576] write(1, "\30\0\0\0", 4)    = 4
[pid 17574] <... read resumed>"\30\0\0\0", 4) = 4
[pid 17576] write(1, "hello hello hello\0\0\0\0\0\0\0", 24 <unfinished ...>
[pid 17574] read(7, <unfinished ...>
[pid 17576] <... write resumed>         = 24
[pid 17574] <... read resumed>"hello hello hello\0\0\0\0\0\0\0", 24) = 24
[pid 17576] read(0, <unfinished ...>
[pid 17574] newfstatat(1, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0
[pid 17574] write(1, "hello hello hello\n", 18hello hello hello
) = 18
[pid 17574] read(0, "", 1024)            = 0
[pid 17574] exit_group(6)                = ?
[pid 17574] +++ exited with 6 +++
[pid 17575] <... read resumed>"", 4)     = 0
[pid 17575] exit_group(0)                = ?
[pid 17576] <... read resumed>"", 4)     = 0
[pid 17575] +++ exited with 0 +++
exit_group(0)                            = ?
+++ exited with 0 +++

```

Вывод

Проделав лабораторную работу, я приобрёл навыки, необходимые для работы с strace, а также изучил системные вызовы.

