

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ
ФЕДЕРАЦИИ

Московский Авиационный Институт
(Национальный Исследовательский Университет)

Институт №8 "Компьютерные науки и прикладная математика"
Кафедра 806 "Вычислительная математика и программирование"

Лабораторная работа №8
По курсу «Операционные системы»

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Цель работы

Приобретение практических навыков диагностики работы программного обеспечения.

Задание

При выполнении лабораторных работ по курсу ОС необходимо продемонстрировать ключевые системные вызовы, которые в них используются и то, что их использование соответствует варианту ЛР

По итогам выполнения всех лабораторных работ отчет по данной ЛР должен содержать краткую сводку по исследованию написанных программ

Общие сведения о программе

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

Основные файлы программы

```
lw_1.log
execve("./main", [ "./main" ], 0x7ffcd051e010 /* 92 vars */) = 0
brk(NULL) = 0x55b9fdbcb6000
arch_prctl(0x3001 /* ARCH_??? */, 0x7fff4b4365d0) = -1 EINVAL (Invalid argument)
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7fdd81206000
access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=75567, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 75567, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fdd811f3000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=2522552, ...}, AT_EMPTY_PATH) =
0
mmap(NULL, 2535872, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fdd80e00000
mmap(0x7fdd80e9c000, 1249280, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x9c000) = 0x7fdd80e9c000
mmap(0x7fdd80fcd000, 577536, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1cd000) = 0x7fdd80fcd000
mmap(0x7fdd8105a000, 57344, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x25a000) = 0x7fdd8105a000
mmap(0x7fdd81068000, 12736, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fdd81068000
close(3) = 0
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\3\0>\0\1\0\0\0\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=141872, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 144232, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fdd811cf000
mmap(0x7fdd811d2000, 110592, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0x7fdd811d2000
mmap(0x7fdd811ed000, 16384, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1e000) = 0x7fdd811ed000
mmap(0x7fdd811f1000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x21000) = 0x7fdd811f1000
close(3) = 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\0P<\2\0\0\0\0"..., 832) =
832
pread64(3, "\6\0\0\0\4\0\0\0@ \0\0\0\0\0\0\0@ \0\0\0\0\0\0\0@ \0\0\0\0\0\0\0"...,
784, 64) = 784
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=2072888, ...}, AT_EMPTY_PATH) =
0
pread64(3, "\6\0\0\0\4\0\0\0@ \0\0\0\0\0\0\0@ \0\0\0\0\0\0\0@ \0\0\0\0\0\0\0"...,
784, 64) = 784
mmap(NULL, 2117488, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fdd80a00000
mmap(0x7fdd80a22000, 1540096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x22000) = 0x7fdd80a22000
mmap(0x7fdd80b9a000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x19a000) = 0x7fdd80b9a000
mmap(0x7fdd80bf2000, 24576, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1f1000) = 0x7fdd80bf2000
mmap(0x7fdd80bf8000, 53104, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fdd80bf8000
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\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=948816, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 950520, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fdd810e6000
mmap(0x7fdd810f4000, 516096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe000) = 0x7fdd810f4000
mmap(0x7fdd81172000, 372736, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x8c000) = 0x7fdd81172000
mmap(0x7fdd811cd000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe6000) = 0x7fdd811cd000
close(3) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7fdd810e4000
arch_prctl(ARCH_SET_FS, 0x7fdd810e5440) = 0
set_tid_address(0x7fdd810e5710) = 63484
set_robust_list(0x7fdd810e5720, 24) = 0
rseq(0x7fdd810e5d60, 0x20, 0, 0x53053053) = 0
mprotect(0x7fdd80bf2000, 16384, PROT_READ) = 0
mprotect(0x7fdd811cd000, 4096, PROT_READ) = 0
mprotect(0x7fdd811f1000, 4096, PROT_READ) = 0

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mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7fdd810e2000
mprotect(0x7fdd8105a000, 45056, PROT_READ) = 0
mprotect(0x55b9fd8ba000, 4096, PROT_READ) = 0
mprotect(0x7fdd8123b000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY})
= 0
munmap(0x7fdd811f3000, 75567) = 0
futex(0x7fdd810687fc, FUTEX_WAKE_PRIVATE, 2147483647) = 0
getrandom("\x53\x3d\x00\x92\x5f\xd1\xd0\x8b", 8, GRND_NONBLOCK) = 8
brk(NULL) = 0x55b9fdbcb6000
brk(0x55b9fdbc7000) = 0x55b9fdbc7000
pipe2([3, 4], 0) = 0
pipe2([5, 6], 0) = 0
newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0
read(0, "test.txt\n", 1024) = 9
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD,
child_tidptr=0x7fdd810e5710) = 63506
close(3) = 0
close(6) = 0
read(0, "1 2 3 4 5 6\n", 1024) = 12
write(4, "1 2 3 4 5 6\n", 12) = 12
read(0, "", 1024) = 0
close(4) = 0
close(5) = 0
wait4(-1, NULL, 0, NULL) = 63506
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=63506, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
exit_group(0) = ?
+++ exited with 0 +++
```

```

mmap(0x7f2a4c3cd000, 577536, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1cd000) = 0x7f2a4c3cd000
mmap(0x7f2a4c45a000, 57344, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x25a000) = 0x7f2a4c45a000
mmap(0x7f2a4c468000, 12736, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f2a4c468000
close(3) = 0
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\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=141872, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 144232, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f2a4c61d000
mmap(0x7f2a4c620000, 110592, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0x7f2a4c620000
mmap(0x7f2a4c63b000, 16384, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1e000) = 0x7f2a4c63b000
mmap(0x7f2a4c63f000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x21000) = 0x7f2a4c63f000
close(3) = 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\0\3\0>\0\1\0\0\0P<\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
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=2072888, ...}, AT_EMPTY_PATH) =
0
pread64(3, "\6\0\0\0\4\0\0\0@ \0\0\0\0\0\0\0@ \0\0\0\0\0\0\0@ \0\0\0\0\0\0\0"...,
784, 64) = 784
mmap(NULL, 2117488, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f2a4be00000
mmap(0x7f2a4be22000, 1540096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x22000) = 0x7f2a4be22000
mmap(0x7f2a4bf9a000, 360448, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x19a000) = 0x7f2a4bf9a000
mmap(0x7f2a4bff2000, 24576, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1f1000) = 0x7f2a4bff2000
mmap(0x7f2a4bff8000, 53104, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f2a4bff8000
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\0\0\0\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=948816, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 950520, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f2a4c534000
mmap(0x7f2a4c542000, 516096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe000) = 0x7f2a4c542000
mmap(0x7f2a4c5c0000, 372736, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x8c000) = 0x7f2a4c5c0000
mmap(0x7f2a4c61b000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe6000) = 0x7f2a4c61b000
close(3) = 0

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mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f2a4c532000
arch_prctl(ARCH_SET_FS, 0x7f2a4c533440) = 0
set_tid_address(0x7f2a4c533710) = 60911
set_robust_list(0x7f2a4c533720, 24) = 0
rseq(0x7f2a4c533d60, 0x20, 0, 0x53053053) = 0
mprotect(0x7f2a4bfff2000, 16384, PROT_READ) = 0
mprotect(0x7f2a4c61b000, 4096, PROT_READ) = 0
mprotect(0x7f2a4c63f000, 4096, PROT_READ) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f2a4c530000
mprotect(0x7f2a4c45a000, 45056, PROT_READ) = 0
mprotect(0x55ed1e1b1000, 4096, PROT_READ) = 0
mprotect(0x7f2a4c689000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY})
= 0
munmap(0x7f2a4c641000, 76571) = 0
futex(0x7f2a4c4687fc, FUTEX_WAKE_PRIVATE, 2147483647) = 0
getrandom("\xcc\x78\xab\x13\x0d\x58\x01\x1c", 8, GRND_NONBLOCK) = 8
brk(NULL) = 0x55ed1ea73000
brk(0x55ed1ea94000) = 0x55ed1ea94000
openat(AT_FDCWD, "../InOutFiles/output.txt", O_WRONLY|O_CREAT|O_TRUNC, 0700) = 3
openat(AT_FDCWD, "../InOutFiles/10.txt", O_RDONLY) = 4
dup2(4, 0) = 0
newfstatat(0, "", {st_mode=S_IFREG|0664, st_size=344, ...}, AT_EMPTY_PATH) = 0
read(0, "10\r\n13 12 14 10 13 14 13 10 12 1"... , 4096) = 344
rt_sigaction(SIGRT_1, {sa_handler=0x7f2a4be8c450, sa_mask=[],
sa_flags=SA_RESTORER|SA_ONSTACK|SA_RESTART|SA_SIGINFO,
sa_restorer=0x7f2a4be3c460}, NULL, 8) = 0
rt_sigprocmask(SIG_UNBLOCK, [RTMIN RT_1], NULL, 8) = 0
mmap(NULL, 8392704, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0x7f2a4b5ff000
mprotect(0x7f2a4b600000, 8388608, PROT_READ|PROT_WRITE) = 0
rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0
clone3({flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSV
SEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID,
child_tid=0x7f2a4bdf990, parent_tid=0x7f2a4bdf990, exit_signal=0,
stack=0x7f2a4b5ff000, stack_size=0x7fff80, tls=0x7f2a4bdf990} =>
{parent_tid=[60912]}, 88) = 60912
rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0
mmap(NULL, 8392704, PROT_NONE, MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) =
0x7f2a4adfe000
mprotect(0x7f2a4adff000, 8388608, PROT_READ|PROT_WRITE) = 0
rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0
clone3({flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLONE_SYSV
SEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID,
child_tid=0x7f2a4b5fe990, parent_tid=0x7f2a4b5fe990, exit_signal=0,
stack=0x7f2a4adfe000, stack_size=0x7fff80, tls=0x7f2a4b5fe990} =>
{parent_tid=[60913]}, 88) = 60913
rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0

```



```

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"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=141872, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 144232, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f930b178000
mmap(0x7f930b17b000, 110592, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0x7f930b17b000
mmap(0x7f930b196000, 16384, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1e000) = 0x7f930b196000
mmap(0x7f930b19a000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x21000) = 0x7f930b19a000
close(3) = 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\220\202\2\0\0\0\0"...,
832) = 832
pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...,
784, 64) = 784
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2105184, ...}, AT_EMPTY_PATH) =
0
pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...,
784, 64) = 784
mmap(NULL, 2150256, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f930aa00000
mmap(0x7f930aa26000, 1568768, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x26000) = 0x7f930aa26000
mmap(0x7f930aba5000, 348160, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1a5000) = 0x7f930aba5000
mmap(0x7f930abfa000, 24576, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1f9000) = 0x7f930abfa000
mmap(0x7f930ac00000, 53104, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f930ac00000
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\3\0>\0\1\0\0\0\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=957008, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 958712, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f930b08d000
mmap(0x7f930b09d000, 524288, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x10000) = 0x7f930b09d000
mmap(0x7f930b11d000, 364544, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x90000) = 0x7f930b11d000
mmap(0x7f930b176000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe8000) = 0x7f930b176000
close(3) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f930b08b000
arch_prctl(ARCH_SET_FS, 0x7f930b08c480) = 0
set_tid_address(0x7f930b08c750) = 31308
set_robust_list(0x7f930b08c760, 24) = 0
rseq(0x7f930b08cda0, 0x20, 0, 0x53053053) = 0
mprotect(0x7f930abfa000, 16384, PROT_READ) = 0
mprotect(0x7f930b176000, 4096, PROT_READ) = 0
mprotect(0x7f930b19a000, 4096, PROT_READ) = 0

```



```

mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f930b089000
mprotect(0x7f930b05a000, 45056, PROT_READ) = 0
mprotect(0x55b262dea000, 4096, PROT_READ) = 0
mprotect(0x7f930b1e7000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY})
= 0
munmap(0x7f930b19c000, 78325) = 0
futex(0x7f930b06877c, FUTEX_WAKE_PRIVATE, 2147483647) = 0
getrandom("\xa7\xe9\xed\x9b\xa9\xb8\x78\x48", 8, GRND_NONBLOCK) = 8
brk(NULL) = 0x55b263696000
brk(0x55b2636b7000) = 0x55b2636b7000
newfstatat(1, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0
write(1, "Enter filename: ", 16) = 16
newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0
read(0, "q.txt\n", 1024) = 6
write(1, "Enter commands:\n", 16) = 16
openat(AT_FDCWD, "/dev/shm/shared_memory", O_RDWR|O_CREAT|O_NOFOLLOW|O_CLOEXEC,
0600) = 3
ftruncate(3, 88) = 0
mmap(NULL, 88, PROT_WRITE, MAP_SHARED, 3, 0) = 0x7f930b1af000
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD,
child_tidptr=0x7f930b08c750) = 31358
read(0, "4.5 5.5\n", 1024) = 8
read(0, "2.1 3.9 1.5 2.5\n", 1024) = 16
read(0, "110.001 119.999\n", 1024) = 16
read(0, "", 1024) = 0
futex(0x7f930b1af018, FUTEX_WAKE, 1) = 1
futex(0x7f930b1af018, FUTEX_WAKE, 1) = 1
futex(0x7f930b1af018, FUTEX_WAKE, 1) = 1
futex(0x7f930b1af018, FUTEX_WAKE, 1) = 1
wait4(-1, NULL, 0, NULL) = 31358
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=31358, si_uid=1000,
si_status=0, si_utime=0, si_stime=0} ---
munmap(0x7f930b1af000, 88) = 0
unlink("/dev/shm/shared_memory") = -1 ENOENT (No such file or directory)
exit_group(0) = ?
+++ exited with 0 +++

```

lw_4.log

```

execve("./dynamic", ["/dynamic"], 0x7ffd85e70360 /* 92 vars */) = 0
brk(NULL) = 0x559125350000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffd3a9aa870) = -1 EINVAL (Invalid argument)
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f1f6ddac000
access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/home/sky/os/lw4/build/glibc-hwcaps/x86-64-v4/libstdc++.so.6",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)

```

```

newfstatat(AT_FDCWD, "/home/sky/os/lw4/build/glibc-hwcaps/x86-64-v4/",
0x7ffd3a9a9aa0, 0) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/home/sky/os/lw4/build/glibc-hwcaps/x86-64-v3/libstdc++.so.6",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
newfstatat(AT_FDCWD, "/home/sky/os/lw4/build/glibc-hwcaps/x86-64-v3/",
0x7ffd3a9a9aa0, 0) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/home/sky/os/lw4/build/glibc-hwcaps/x86-64-v2/libstdc++.so.6",
O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
newfstatat(AT_FDCWD, "/home/sky/os/lw4/build/glibc-hwcaps/x86-64-v2/",
0x7ffd3a9a9aa0, 0) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/home/sky/os/lw4/build/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = -
1 ENOENT (No such file or directory)
newfstatat(AT_FDCWD, "/home/sky/os/lw4/build/", {st_mode=S_IFDIR|0775,
st_size=4096, ...}, 0) = 0
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=79781, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 79781, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f1f6dd98000
close(3) = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libstdc++.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0\0"... , 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=2522480, ...}, AT_EMPTY_PATH) =
0
mmap(NULL, 2535744, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6da00000
mmap(0x7f1f6da9c000, 1249280, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x9c000) = 0x7f1f6da9c000
mmap(0x7f1f6dbcd000, 577536, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1cd000) = 0x7f1f6dbcd000
mmap(0x7f1f6dc5a000, 57344, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x25a000) = 0x7f1f6dc5a000
mmap(0x7f1f6dc68000, 12608, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f1f6dc68000
close(3) = 0
openat(AT_FDCWD, "/home/sky/os/lw4/build/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libgcc_s.so.1", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0\0"... , 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=141872, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 144232, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dd74000
mmap(0x7f1f6dd77000, 110592, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0x7f1f6dd77000
mmap(0x7f1f6dd92000, 16384, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1e000) = 0x7f1f6dd92000
mmap(0x7f1f6dd96000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x21000) = 0x7f1f6dd96000
close(3) = 0
openat(AT_FDCWD, "/home/sky/os/lw4/build/libc.so.6", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3

```

```

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\220\202\2\0\0\0\0"...,
832) = 832
pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...,
784, 64) = 784
newfstatat(3, "", {st_mode=S_IFREG|0755, st_size=2105184, ...}, AT_EMPTY_PATH) =
0
pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"...,
784, 64) = 784
mmap(NULL, 2150256, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6d600000
mmap(0x7f1f6d626000, 1568768, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x26000) = 0x7f1f6d626000
mmap(0x7f1f6d7a5000, 348160, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x1a5000) = 0x7f1f6d7a5000
mmap(0x7f1f6d7fa000, 24576, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1f9000) = 0x7f1f6d7fa000
mmap(0x7f1f6d800000, 53104, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f1f6d800000
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\3\0>\0\1\0\0\0\0\0\0\0\0\0\0\0"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0644, st_size=957008, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 958712, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dc89000
mmap(0x7f1f6dc99000, 524288, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x10000) = 0x7f1f6dc99000
mmap(0x7f1f6dd19000, 364544, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x90000) = 0x7f1f6dd19000
mmap(0x7f1f6dd72000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xe8000) = 0x7f1f6dd72000
close(3) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f1f6dc87000
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
0x7f1f6dc84000
arch_prctl(ARCH_SET_FS, 0x7f1f6dc84740) = 0
set_tid_address(0x7f1f6dc84a10) = 10162
set_robust_list(0x7f1f6dc84a20, 24) = 0
rseq(0x7f1f6dc85060, 0x20, 0, 0x53053053) = 0
mprotect(0x7f1f6d7fa000, 16384, PROT_READ) = 0
mprotect(0x7f1f6dd72000, 4096, PROT_READ) = 0
mprotect(0x7f1f6dd96000, 4096, PROT_READ) = 0
mprotect(0x7f1f6dc5a000, 45056, PROT_READ) = 0
mprotect(0x559124d9f000, 4096, PROT_READ) = 0
mprotect(0x7f1f6dde3000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY})
= 0
munmap(0x7f1f6dd98000, 79781) = 0
futex(0x7f1f6dc6877c, FUTEX_WAKE_PRIVATE, 2147483647) = 0
getrandom("\xbc\xde\x1a\x68\x56\xfc\xe3\xa1", 8, GRND_NONBLOCK) = 8
brk(NULL) = 0x559125350000
brk(0x559125371000) = 0x559125371000

```

```

openat(AT_FDCWD, "/home/sky/os/lw4/build/libfunction1.so", 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
newfstatat(3, "", {st_mode=S_IFREG|0775, st_size=15848, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16424, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dda7000
mmap(0x7f1f6dda8000, 4096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1000) = 0x7f1f6dda8000
mmap(0x7f1f6dda9000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x2000) = 0x7f1f6dda9000
mmap(0x7f1f6ddaa000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7f1f6ddaa000
close(3) = 0
mprotect(0x7f1f6ddaa000, 4096, PROT_READ) = 0
newfstatat(0, "", {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...},
AT_EMPTY_PATH) = 0
read(0, "\n", 1024) = 2
munmap(0x7f1f6dda7000, 16424) = 0
openat(AT_FDCWD, "/home/sky/os/lw4/build/libfunction2.so", 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
newfstatat(3, "", {st_mode=S_IFREG|0775, st_size=16256, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16464, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dda7000
mmap(0x7f1f6dda8000, 4096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1000) = 0x7f1f6dda8000
mmap(0x7f1f6dda9000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x2000) = 0x7f1f6dda9000
mmap(0x7f1f6ddaa000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7f1f6ddaa000
close(3) = 0
mprotect(0x7f1f6ddaa000, 4096, PROT_READ) = 0
read(0, "\n", 1024) = 2
munmap(0x7f1f6dda7000, 16464) = 0
openat(AT_FDCWD, "/home/sky/os/lw4/build/libfunction1.so", 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
newfstatat(3, "", {st_mode=S_IFREG|0775, st_size=15848, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16424, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dda7000
mmap(0x7f1f6dda8000, 4096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1000) = 0x7f1f6dda8000
mmap(0x7f1f6dda9000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x2000) = 0x7f1f6dda9000
mmap(0x7f1f6ddaa000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7f1f6ddaa000
close(3) = 0
mprotect(0x7f1f6ddaa000, 4096, PROT_READ) = 0
read(0, "\n", 1024) = 2
munmap(0x7f1f6dda7000, 16424) = 0

```

```

openat(AT_FDCWD, "/home/sky/os/lw4/build/libfunction2.so", 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"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0775, st_size=16256, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16464, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dda7000
mmap(0x7f1f6dda8000, 4096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1000) = 0x7f1f6dda8000
mmap(0x7f1f6dda9000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x2000) = 0x7f1f6dda9000
mmap(0x7f1f6ddaa000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7f1f6ddaa000
close(3) = 0
mprotect(0x7f1f6ddaa000, 4096, PROT_READ) = 0
read(0, "\0\n", 1024) = 2
munmap(0x7f1f6dda7000, 16464) = 0
openat(AT_FDCWD, "/home/sky/os/lw4/build/libfunction1.so", 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"..., 832)
= 832
newfstatat(3, "", {st_mode=S_IFREG|0775, st_size=15848, ...}, AT_EMPTY_PATH) = 0
mmap(NULL, 16424, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1f6dda7000
mmap(0x7f1f6dda8000, 4096, PROT_READ|PROT_EXEC,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1000) = 0x7f1f6dda8000
mmap(0x7f1f6dda9000, 4096, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3,
0x2000) = 0x7f1f6dda9000
mmap(0x7f1f6ddaa000, 8192, PROT_READ|PROT_WRITE,
MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7f1f6ddaa000
close(3) = 0
mprotect(0x7f1f6ddaa000, 4096, PROT_READ) = 0
read(0, "", 1024) = 0
exit_group(0) = ?
+++ exited with 0 +++

```

Вывод

В ходе выполнения лабораторной работы я познакомился с таким средством отладки, как strace. Оно помогает выявить, какие системные вызовы совершает программа, что может помочь в поиске ошибок. По strace'у можно определить, какие действия в целом совершает программа, какие файлы открывает, когда и как выделяет память, что способствует более лучшему пониманию программы.