Московский Авиационный Институт

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Факультет информационных технологий и прикладной математики

Кафедра вычислительной математики и программирования

**Лабораторная работа №1 по курсу**

**«Операционные системы»**

**Тема работы**

**Приобретение практических навыков диагностики работы программного обеспечения.**

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Дата: \_\_\_\_\_\_\_\_\_\_\_

Подпись: \_\_\_\_\_\_\_\_\_\_\_

Москва, 2021

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**Репозиторий**

<https://github.com/IgShalar/OS/tree/main/os_lab1>

**Постановка задачи**

При выполнении лабораторной работы необходимо продемонстрировать ключевые системные вызовы, которые в ней используются и то, что их использование соответствует варианту ЛР.

**Общие сведения о программе**

Лабораторная работа №4 на работу с memory-mapped files.

**Демонстрация работы dtruss:**

parent.cpp:

9793/0xfd95b: thread\_selfid(0x0, 0x0, 0x0) = 1038683 0

9793/0xfd95b: open(".\0", 0x0, 0x1) = 3 0

9793/0xfd95b: fstat64(0x3, 0x7FFF5DF05700, 0x1) = 0 0

9793/0xfd95b: fcntl(0x3, 0x32, 0x7FFF5DF059C0) = 0 0

9793/0xfd95b: close(0x3) = 0 0

9793/0xfd95b: stat64("/Users/igor/Desktop/NOW/OS/lab3/os\_lab4/src\0", 0x7FFF5DF05670, 0x7FFF5DF059C0) = 0 0

9793/0xfd95b: issetugid(0x7FFF5DF059C0, 0x7FFF5DF05670, 0x7FFF5DF059C0) = 0 0

9793/0xfd95b: csrctl(0x0, 0x7FFF5DF058EC, 0x4) = -1 Err#1

9793/0xfd95b: csops(0x0, 0x0, 0x7FFF5DF059C0) = 0 0

9793/0xfd95b: shared\_region\_check\_np(0x7FFF5DF02FD8, 0x0, 0x7FFF5DF059C0) = 0 0

9793/0xfd95b: getpid(0x7FFF5DF02FD8, 0x0, 0x7FFF5DF059C0) = 9793 0

9793/0xfd95b: proc\_info(0x2, 0x2641, 0x8) = 1272 0

9793/0xfd95b: stat64("/usr/lib/libc++.1.dylib\0", 0x7FFF5DF04C88, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/libSystem.B.dylib\0", 0x7FFF5DF04C88, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/libc++abi.dylib\0", 0x7FFF5DF04B98, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libcache.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libcommonCrypto.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libcompiler\_rt.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libcopyfile.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libcorecrypto.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libdispatch.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libdyld.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libkeymgr.dylib\0", 0x7FFF5DF046C8, 0x8 = 0 0

9793/0xfd95b: stat64("/usr/lib/system/liblaunch.dylib\0", 0x7FFF5DF046C8, 0x8 = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libmacho.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libquarantine.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libremovefile.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_asl.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_blocks.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_c.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_configuration.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_coreservices.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_coretls.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_dnssd.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_info.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_kernel.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_m.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_malloc.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_network.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_networkextension.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_notify.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_platform.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_pthread.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_sandbox.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_secinit.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_symptoms.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libsystem\_trace.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libunwind.dylib\0", 0x7FFF5DF046C8, 0x8 = 0 0

9793/0xfd95b: stat64("/usr/lib/system/libxpc.dylib\0", 0x7FFF5DF046C8, 0x8) = 0 0

9793/0xfd95b: stat64("/usr/lib/libobjc.A.dylib\0", 0x7FFF5DF03988, 0x8) = 0 0

9793/0xfd95b: open("/dev/dtracehelper\0", 0x2, 0x7FFF5DF05870) = 3 0

9793/0xfd95b: ioctl(0x3, 0x80086804, 0x7FFF5DF057F8) = 0 0

9793/0xfd95b: close(0x3) = 0 0

9793/0xfd95b: thread\_selfid(0x3, 0x80086804, 0x7FFF5DF057F8) = 1038683 0

9793/0xfd95b: bsdthread\_register(0x7FFFC2770080, 0x7FFFC2770070, 0x2000) = 1073741919 0

9793/0xfd95b: ulock\_wake(0x1, 0x7FFF5DF04F6C, 0x0) = -1 Err#2

9793/0xfd95b: issetugid(0x1, 0x7FFF5DF04F6C, 0x0) = 0 0

9793/0xfd95b: mprotect(0x101CFF000, 0x88, 0x1) = 0 0

9793/0xfd95b: mprotect(0x101D01000, 0x1000, 0x0) = 0 0

9793/0xfd95b: mprotect(0x101D17000, 0x1000, 0x0) = 0 0

9793/0xfd95b: mprotect(0x101D18000, 0x1000, 0x0) = 0 0

9793/0xfd95b: mprotect(0x101D2E000, 0x1000, 0x0) = 0 0

9793/0xfd95b: mprotect(0x101D2F000, 0x1000, 0x1) = 0 0

9793/0xfd95b: mprotect(0x101CFF000, 0x88, 0x3) = 0 0

9793/0xfd95b: mprotect(0x101CFF000, 0x88, 0x1) = 0 0

9793/0xfd95b: getpid(0x101CFF000, 0x88, 0x1) = 9793 0

9793/0xfd95b: stat64("/AppleInternal/XBS/.isChrooted\0", 0x7FFF5DF04E28, 0x1) = -1 Err#2

9793/0xfd95b: stat64("/AppleInternal\0", 0x7FFF5DF04EC0, 0x1) = -1 Err#2

9793/0xfd95b: csops(0x2641, 0x7, 0x7FFF5DF04950) = -1 Err#22

dtrace: error on enabled probe ID 2158 (ID 561: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 40

9793/0xfd95b: ulock\_wake(0x1, 0x7FFF5DF04ED0, 0x0) = -1 Err#2

9793/0xfd95b: csops(0x2641, 0x7, 0x7FFF5DF04230) = -1 Err#22

9793/0xfd95b: getrlimit(0x1008, 0x7FFF5DF06438, 0x7FFF5DF04230) = 0 0

9793/0xfd95b: fstat64(0x0, 0x7FFF5DF06458, 0x7FFF5DF04230) = 0 0

9793/0xfd95b: ioctl(0x0, 0x4004667A, 0x7FFF5DF0649C) = 0 0

dtrace: error on enabled probe ID 2135 (ID 949: syscall::read\_nocancel:return): invalid kernel access in action #13 at DIF offset 92

dtrace: error on enabled probe ID 2135 (ID 949: syscall::read\_nocancel:return): invalid kernel access in action #13 at DIF offset 92

9793/0xfd95b: shm\_open(0x101CFAF2C, 0x202, 0x180) = 3 0

9793/0xfd95b: ftruncate(0x3, 0x8, 0x180) = 0 0

9793/0xfd95b: mmap(0x0, 0x8, 0x3, 0x1, 0x3, 0x0) = 0x101D30000 0

9793/0xfd95b: fork() = 9794 0

9794/0xfd960: thread\_selfid(0x0, 0x0, 0x0) = 1038688 0

9793/0xfd95b: munmap(0x101D30000, 0x8) = 0 0

9794/0xfd960: bsdthread\_register(0x7FFFC2770080, 0x7FFFC2770070, 0x2000) = -1 Err#22

9794/0xfd960: getpid(0x7FFFC2770080, 0x7FFFC2770070, 0x2000) = 9794 0

9794/0xfd960: \_\_mac\_syscall(0x7FFFC277BC46, 0x4, 0x7FFF5DF06408) = -1 Err#45

9794/0xfd960: csops(0x2642, 0xB, 0x7FFF5DF06448) = -1 Err#22

dtrace: error on enabled probe ID 2109 (ID 275: syscall::execve:return): invalid address (0x101cfaf67) in action #12 at DIF offset 24

**child.cpp:**

9794/0xfd961: thread\_selfid(0x0, 0x0, 0x0) = 1038689 0

9794/0xfd961: open(".\0", 0x0, 0x1) = 3 0

9794/0xfd961: fstat64(0x3, 0x7FFF504A1700, 0x1) = 0 0

9794/0xfd961: fcntl(0x3, 0x32, 0x7FFF504A19C0) = 0 0

9794/0xfd961: close(0x3) = 0 0

9794/0xfd961: stat64("/Users/igor/Desktop/NOW/OS/lab3/os\_lab4/src\0", 0x7FFF504A1670, 0x7FFF504A19C0) = 0 0

9794/0xfd961: issetugid(0x7FFF504A19C0, 0x7FFF504A1670, 0x7FFF504A19C0) = 0 0

9794/0xfd961: csrctl(0x0, 0x7FFF504A18EC, 0x4) = -1 Err#1

9794/0xfd961: csops(0x0, 0x0, 0x7FFF504A19C0) = 0 0

9794/0xfd961: shared\_region\_check\_np(0x7FFF5049EFD8, 0x0, 0x7FFF504A19C0) = 0 0

9794/0xfd961: getpid(0x7FFF5049EFD8, 0x0, 0x7FFF504A19C0) = 9794 0

9794/0xfd961: proc\_info(0x2, 0x2642, 0x8) = 1272 0

9794/0xfd961: stat64("/usr/lib/libc++.1.dylib\0", 0x7FFF504A0C88, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/libSystem.B.dylib\0", 0x7FFF504A0C88, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/libc++abi.dylib\0", 0x7FFF504A0B98, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libcache.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libcommonCrypto.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libcompiler\_rt.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libcopyfile.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libcorecrypto.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libdispatch.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libdyld.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libkeymgr.dylib\0", 0x7FFF504A06C8, 0x8 = 0 0

9794/0xfd961: stat64("/usr/lib/system/liblaunch.dylib\0", 0x7FFF504A06C8, 0x8 = 0 0

9794/0xfd961: stat64("/usr/lib/system/libmacho.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libquarantine.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libremovefile.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_asl.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_blocks.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_c.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_configuration.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_coreservices.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_coretls.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_dnssd.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_info.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_kernel.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_m.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_malloc.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_network.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_networkextension.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_notify.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_platform.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_pthread.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_sandbox.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_secinit.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_symptoms.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libsystem\_trace.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/system/libunwind.dylib\0", 0x7FFF504A06C8, 0x8 = 0 0

9794/0xfd961: stat64("/usr/lib/system/libxpc.dylib\0", 0x7FFF504A06C8, 0x8) = 0 0

9794/0xfd961: stat64("/usr/lib/libobjc.A.dylib\0", 0x7FFF5049F988, 0x8) = 0 0

9794/0xfd961: open("/dev/dtracehelper\0", 0x2, 0x7FFF504A1870) = 3 0

9794/0xfd961: ioctl(0x3, 0x80086804, 0x7FFF504A17F8) = 0 0

9794/0xfd961: close(0x3) = 0 0

9794/0xfd961: thread\_selfid(0x3, 0x80086804, 0x7FFF504A17F8) = 1038689 0

9794/0xfd961: bsdthread\_register(0x7FFFC2770080, 0x7FFFC2770070, 0x2000) = 1073741919 0

9794/0xfd961: ulock\_wake(0x1, 0x7FFF504A0F6C, 0x0) = -1 Err#2

9794/0xfd961: issetugid(0x1, 0x7FFF504A0F6C, 0x0) = 0 0

9794/0xfd961: mprotect(0x10F768000, 0x88, 0x1) = 0 0

9794/0xfd961: mprotect(0x10F76A000, 0x1000, 0x0) = 0 0

9794/0xfd961: mprotect(0x10F780000, 0x1000, 0x0) = 0 0

9794/0xfd961: mprotect(0x10F781000, 0x1000, 0x0) = 0 0

9794/0xfd961: mprotect(0x10F797000, 0x1000, 0x0) = 0 0

9794/0xfd961: mprotect(0x10F798000, 0x1000, 0x1) = 0 0

9794/0xfd961: mprotect(0x10F768000, 0x88, 0x3) = 0 0

9794/0xfd961: mprotect(0x10F768000, 0x88, 0x1) = 0 0

9794/0xfd961: getpid(0x10F768000, 0x88, 0x1) = 9794 0

9794/0xfd961: stat64("/AppleInternal/XBS/.isChrooted\0", 0x7FFF504A0E28, 0x1) = -1 Err#2

9794/0xfd961: stat64("/AppleInternal\0", 0x7FFF504A0EC0, 0x1) = -1 Err#2

9794/0xfd961: csops(0x2642, 0x7, 0x7FFF504A0950) = -1 Err#22

dtrace: error on enabled probe ID 2158 (ID 561: syscall::sysctl:return): invalid kernel access in action #11 at DIF offset 40

9794/0xfd961: ulock\_wake(0x1, 0x7FFF504A0ED0, 0x0) = -1 Err#2

9794/0xfd961: csops(0x2642, 0x7, 0x7FFF504A0230) = -1 Err#22

9794/0xfd961: shm\_open(0x10F761E84, 0x0, 0x100) = 3 0

9794/0xfd961: mmap(0x0, 0x8, 0x1, 0x1, 0x3, 0x0) = 0x10F799000 0

9794/0xfd961: getrlimit(0x1008, 0x7FFF504A2548, 0x1) = 0 0

9794/0xfd961: open\_nocancel("qwerty\0", 0x601, 0x1B6) = 4 0

9794/0xfd961: fstat64(0x4, 0x7FFF504A21D8, 0x1B6) = 0 0

dtrace: error on enabled probe ID 2133 (ID 951: syscall::write\_nocancel:return): invalid kernel access in action #13 at DIF offset 92

9794/0xfd961: close\_nocancel(0x4) = 0 0

9794/0xfd961: munmap(0x10F799000, 0x8) = 0 0

9794/0xfd961: shm\_unlink(0x10F761E84, 0x8, 0x2) = 0 0

dtrace: error on enabled probe ID 2315 (ID 901: syscall::thread\_selfid:return): invalid user access in action #5 at DIF offset 0

Вывод: с помощью dtruss можно проследить за системными вызовами.