

Университет ИТМО, факультет ПИиКТ

Лабораторная работа №1 по  
“Операционные системы”

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Группа: Р33113

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2020г.

## Задание

Разработать программу на языке C, которая осуществляет следующие действия

- Создает область памяти размером 242 мегабайт, начинающихся с адреса 0xC5FA086B (если возможно) при помощи mmap заполненную случайными числами /dev/urandom в 35 потоков. Используя системные средства мониторинга определите адрес начала в адресном пространстве процесса и характеристики выделенных участков памяти. Замеры виртуальной/физической памяти необходимо снять:
  1. До аллокации
  2. После аллокации
  3. После заполнения участка данными
  4. После деаллокации
- Записывает область памяти в файлы одинакового размера 162 мегабайт с использованием блочного обращения к диску. Размер блока ввода-вывода 129 байт. Преподаватель выдает в качестве задания последовательность записи/чтения блоков (последовательный)
- Генерацию данных и запись осуществлять в бесконечном цикле.
- В отдельных 46 потоках осуществлять чтение данных из файлов и подсчитывать агрегированные характеристики данных - сумму.
- Чтение и запись данных в/из файла должна быть защищена примитивами синхронизации futex
- По заданию преподавателя изменить приоритеты потоков и описать изменения в характеристиках программы.

Для запуска программы возможно использовать операционную систему Windows 10 или Debian/Ubuntu в виртуальном окружении.

Измерить значения затраченного процессорного времени на выполнение программы и на операции ввода-вывода используя системные утилиты.

Отследить трассу системных вызовов.

Используя star построить графики системных характеристик.

## Исходный код

<https://github.com/salvoronis/operationSystemLab1>

## Пример подсчета суммы данных в файлах

```
<--cycle start-->
files data sum -> 41432547109
<--cycle end-->
<--cycle start-->
files data sum -> 41432157846
<--cycle end-->
```

## Замеры виртуальной памяти

1. До аллокации

```
[salvoroni@salvoroni-pc osLab]$ pmap -x 100455
100455:   build/main alloc 15
Address          Kbytes      RSS    Dirty Mode  Mapping
00005555d8764000      4        4        0 r---- main
00005555d8765000      4        4        0 r-x-- main
00005555d8766000      4        4        0 r---- main
00005555d8767000      4        4        4 r---- main
00005555d8768000      4        4        4 rw--- main
00005555d9933000     132        4        4 rw--- [ anon ]
00007ff2a47b2000      12        8        8 rw--- [ anon ]
00007ff2a47b5000     152     152        0 r---- libc-2.32.so
00007ff2a47db000    1332     788        0 r-x-- libc-2.32.so
00007ff2a4928000     304      96        0 r---- libc-2.32.so
00007ff2a4974000      12      12       12 r---- libc-2.32.so
00007ff2a4977000      12      12       12 rw--- libc-2.32.so
00007ff2a497a000      16        8        8 rw--- [ anon ]
00007ff2a497e000      28      28        0 r----
libpthread-2.32.so
00007ff2a4985000      64      64        0 r-x--
libpthread-2.32.so
00007ff2a4995000      20        0        0 r----
libpthread-2.32.so
00007ff2a499a000        4        4        4 r----
libpthread-2.32.so
00007ff2a499b000        4        4        4 rw---
libpthread-2.32.so
00007ff2a499c000      24      12       12 rw--- [ anon ]
00007ff2a49d6000        8        8        0 r---- ld-2.32.so
00007ff2a49d8000     132     132        0 r-x-- ld-2.32.so
00007ff2a49f9000      36      28        0 r---- ld-2.32.so
00007ff2a4a02000        4        4        4 r---- ld-2.32.so
00007ff2a4a03000        8        8        8 rw--- ld-2.32.so
00007ffde3c77000     132      12       12 rw--- [ stack ]
00007ffde3cb6000      16        0        0 r---- [ anon ]
00007ffde3cba000        8        4        0 r-x-- [ anon ]
fffffffffff60000        4        0        0 --x-- [ anon ]
-----
total kB          2484     1408      96
```

## 2. После аллокации

```
[salvoroni@salvoroni-pc osLab]$ pmap -x 100455
100455:   build/main alloc 15
Address          Kbytes      RSS    Dirty Mode  Mapping
00000000c5fa0000   247808        0        0 rw-s- zero (deleted)
00005555d8764000      4        4        0 r---- main
00005555d8765000      4        4        0 r-x-- main
00005555d8766000      4        4        0 r---- main
00005555d8767000      4        4        4 r---- main
00005555d8768000      4        4        4 rw--- main
```

00005555d9933000	132	4	4	rw---	[ anon ]
00007ff2a47b2000	12	8	8	rw---	[ anon ]
00007ff2a47b5000	152	152	0	r----	libc-2.32.so
00007ff2a47db000	1332	788	0	r-x--	libc-2.32.so
00007ff2a4928000	304	96	0	r----	libc-2.32.so
00007ff2a4974000	12	12	12	r----	libc-2.32.so
00007ff2a4977000	12	12	12	rw---	libc-2.32.so
00007ff2a497a000	16	8	8	rw---	[ anon ]
00007ff2a497e000	28	28	0	r----	
libpthread-2.32.so					
00007ff2a4985000	64	64	0	r-x--	
libpthread-2.32.so					
00007ff2a4995000	20	0	0	r----	
libpthread-2.32.so					
00007ff2a499a000	4	4	4	r----	
libpthread-2.32.so					
00007ff2a499b000	4	4	4	rw---	
libpthread-2.32.so					
00007ff2a499c000	24	12	12	rw---	[ anon ]
00007ff2a49d6000	8	8	0	r----	ld-2.32.so
00007ff2a49d8000	132	132	0	r-x--	ld-2.32.so
00007ff2a49f9000	36	28	0	r----	ld-2.32.so
00007ff2a4a02000	4	4	4	r----	ld-2.32.so
00007ff2a4a03000	8	8	8	rw---	ld-2.32.so
00007ffde3c77000	132	12	12	rw---	[ stack ]
00007ffde3cb6000	16	0	0	r----	[ anon ]
00007ffde3cba000	8	4	0	r-x--	[ anon ]
fffffffffff600000	4	0	0	--x--	[ anon ]

-----	-----	-----	-----
total kB	250292	1408	96

### 3. После заполнения данными

```
[salvoroni@salvoroni-pc osLab]$ pmap -x 100455
```

```
100455: build/main alloc 15
```

Address	Kbytes	RSS	Dirty	Mode	Mapping
00000000c5fa0000	247808	247808	247808	rw-s-	zero (deleted)
00005555d8764000	4	4	0	r----	main
00005555d8765000	4	4	0	r-x--	main
00005555d8766000	4	4	0	r----	main
00005555d8767000	4	4	4	r----	main
00005555d8768000	4	4	4	rw---	main
00005555d9933000	132	36	36	rw---	[ anon ]
00007ff1f4000000	132	8	8	rw---	[ anon ]
00007ff1f4021000	65404	0	0	-----	[ anon ]
00007ff1fc000000	132	8	8	rw---	[ anon ]
00007ff1fc021000	65404	0	0	-----	[ anon ]
00007ff2037ff000	4	0	0	-----	[ anon ]
00007ff203800000	8192	8	8	rw---	[ anon ]
00007ff204000000	132	8	8	rw---	[ anon ]

00007ff204021000	65404	0	0	-----	[ anon ]
00007ff2087f9000	4	0	0	-----	[ anon ]
00007ff2087fa000	8192	8	8	rw---	[ anon ]
00007ff208ffa000	4	0	0	-----	[ anon ]
00007ff208ffb000	8192	8	8	rw---	[ anon ]
00007ff2097fb000	4	0	0	-----	[ anon ]
00007ff2097fc000	8192	8	8	rw---	[ anon ]
00007ff20c000000	132	8	8	rw---	[ anon ]
00007ff20c021000	65404	0	0	-----	[ anon ]
00007ff214000000	132	8	8	rw---	[ anon ]
00007ff214021000	65404	0	0	-----	[ anon ]
00007ff21c000000	132	8	8	rw---	[ anon ]
00007ff21c021000	65404	0	0	-----	[ anon ]
00007ff224000000	132	16	16	rw---	[ anon ]
00007ff224021000	65404	0	0	-----	[ anon ]
00007ff22c000000	132	8	8	rw---	[ anon ]
00007ff22c021000	65404	0	0	-----	[ anon ]
00007ff230000000	132	8	8	rw---	[ anon ]
00007ff230021000	65404	0	0	-----	[ anon ]
00007ff234000000	132	8	8	rw---	[ anon ]
00007ff234021000	65404	0	0	-----	[ anon ]
00007ff238000000	132	8	8	rw---	[ anon ]
00007ff238021000	65404	0	0	-----	[ anon ]
00007ff23c000000	132	8	8	rw---	[ anon ]
00007ff23c021000	65404	0	0	-----	[ anon ]
00007ff240000000	132	16	16	rw---	[ anon ]
00007ff240021000	65404	0	0	-----	[ anon ]
00007ff244000000	132	8	8	rw---	[ anon ]
00007ff244021000	65404	0	0	-----	[ anon ]
00007ff248000000	132	16	16	rw---	[ anon ]
00007ff248021000	65404	0	0	-----	[ anon ]
00007ff24c000000	132	8	8	rw---	[ anon ]
00007ff24c021000	65404	0	0	-----	[ anon ]
00007ff250000000	132	8	8	rw---	[ anon ]
00007ff250021000	65404	0	0	-----	[ anon ]
00007ff254000000	132	8	8	rw---	[ anon ]
00007ff254021000	65404	0	0	-----	[ anon ]
00007ff258000000	132	8	8	rw---	[ anon ]
00007ff258021000	65404	0	0	-----	[ anon ]
00007ff25c000000	132	8	8	rw---	[ anon ]
00007ff25c021000	65404	0	0	-----	[ anon ]
00007ff260000000	132	8	8	rw---	[ anon ]
00007ff260021000	65404	0	0	-----	[ anon ]
00007ff264000000	132	8	8	rw---	[ anon ]
00007ff264021000	65404	0	0	-----	[ anon ]
00007ff268000000	132	8	8	rw---	[ anon ]
00007ff268021000	65404	0	0	-----	[ anon ]
00007ff26c000000	132	16	16	rw---	[ anon ]

00007ff26c021000	65404	0	0	-----	[ anon ]
00007ff270000000	132	8	8	rw---	[ anon ]
00007ff270021000	65404	0	0	-----	[ anon ]
00007ff277ff8000	4	0	0	-----	[ anon ]
00007ff277ff9000	8192	8	8	rw---	[ anon ]
00007ff2787f9000	4	0	0	-----	[ anon ]
00007ff2787fa000	8192	8	8	rw---	[ anon ]
00007ff278ffa000	4	0	0	-----	[ anon ]
00007ff278ffb000	8192	8	8	rw---	[ anon ]
00007ff2797fb000	4	0	0	-----	[ anon ]
00007ff2797fc000	8192	8	8	rw---	[ anon ]
00007ff279ffc000	4	0	0	-----	[ anon ]
00007ff279ffd000	8192	8	8	rw---	[ anon ]
00007ff27a7fd000	4	0	0	-----	[ anon ]
00007ff27a7fe000	8192	8	8	rw---	[ anon ]
00007ff27a7ffe000	4	0	0	-----	[ anon ]
00007ff27a7fff000	8192	8	8	rw---	[ anon ]
00007ff27b7ff000	4	0	0	-----	[ anon ]
00007ff27b800000	8192	8	8	rw---	[ anon ]
00007ff27c000000	132	8	8	rw---	[ anon ]
00007ff27c021000	65404	0	0	-----	[ anon ]
00007ff280000000	132	8	8	rw---	[ anon ]
00007ff280021000	65404	0	0	-----	[ anon ]
00007ff284000000	132	8	8	rw---	[ anon ]
00007ff284021000	65404	0	0	-----	[ anon ]
00007ff289ffc000	4	0	0	-----	[ anon ]
00007ff289ffd000	8192	8	8	rw---	[ anon ]
00007ff28a7fd000	4	0	0	-----	[ anon ]
00007ff28a7fe000	8192	8	8	rw---	[ anon ]
00007ff28a7ffe000	4	0	0	-----	[ anon ]
00007ff28a7fff000	8192	8	8	rw---	[ anon ]
00007ff28b7ff000	4	0	0	-----	[ anon ]
00007ff28b800000	8192	8	8	rw---	[ anon ]
00007ff28c000000	132	8	8	rw---	[ anon ]
00007ff28c021000	65404	0	0	-----	[ anon ]
00007ff2907f9000	4	0	0	-----	[ anon ]
00007ff2907fa000	8192	8	8	rw---	[ anon ]
00007ff290ffa000	4	0	0	-----	[ anon ]
00007ff290ffb000	8192	8	8	rw---	[ anon ]
00007ff2917fb000	4	0	0	-----	[ anon ]
00007ff2917fc000	8192	8	8	rw---	[ anon ]
00007ff291ffc000	4	0	0	-----	[ anon ]
00007ff291ffd000	8192	8	8	rw---	[ anon ]
00007ff2927fd000	4	0	0	-----	[ anon ]
00007ff2927fe000	8192	8	8	rw---	[ anon ]
00007ff292ffe000	4	0	0	-----	[ anon ]
00007ff292fff000	8192	8	8	rw---	[ anon ]
00007ff2937ff000	4	0	0	-----	[ anon ]

00007ff293800000	8192	8	8 rw---	[ anon ]
00007ff294000000	132	8	8 rw---	[ anon ]
00007ff294021000	65404	0	0 -----	[ anon ]
00007ff2987f9000	4	0	0 -----	[ anon ]
00007ff2987fa000	8192	8	8 rw---	[ anon ]
00007ff298ffa000	4	0	0 -----	[ anon ]
00007ff298ffb000	8192	8	8 rw---	[ anon ]
00007ff2997fb000	4	0	0 -----	[ anon ]
00007ff2997fc000	8192	8	8 rw---	[ anon ]
00007ff299ffc000	4	0	0 -----	[ anon ]
00007ff299ffd000	8192	8	8 rw---	[ anon ]
00007ff29a7fd000	4	0	0 -----	[ anon ]
00007ff29a7fe000	8192	8	8 rw---	[ anon ]
00007ff29affe000	4	0	0 -----	[ anon ]
00007ff29afff000	8192	8	8 rw---	[ anon ]
00007ff29b7ff000	4	0	0 -----	[ anon ]
00007ff29b800000	8192	8	8 rw---	[ anon ]
00007ff29c000000	132	8	8 rw---	[ anon ]
00007ff29c021000	65404	0	0 -----	[ anon ]
00007ff2a07aa000	4	0	0 -----	[ anon ]
00007ff2a07ab000	8192	8	8 rw---	[ anon ]
00007ff2a0fab000	4	0	0 -----	[ anon ]
00007ff2a0fac000	8192	8	8 rw---	[ anon ]
00007ff2a17ac000	4	0	0 -----	[ anon ]
00007ff2a17ad000	8192	8	8 rw---	[ anon ]
00007ff2a1fad000	4	0	0 -----	[ anon ]
00007ff2a1fae000	8192	8	8 rw---	[ anon ]
00007ff2a27ae000	4	0	0 -----	[ anon ]
00007ff2a27af000	8192	8	8 rw---	[ anon ]
00007ff2a2faf000	4	0	0 -----	[ anon ]
00007ff2a2fb0000	8192	8	8 rw---	[ anon ]
00007ff2a37b0000	4	0	0 -----	[ anon ]
00007ff2a37b1000	8192	12	12 rw---	[ anon ]
00007ff2a3fb1000	4	0	0 -----	[ anon ]
00007ff2a3fb2000	8204	16	16 rw---	[ anon ]
00007ff2a47b5000	152	152	0 r----	libc-2.32.so
00007ff2a47db000	1332	980	0 r-x--	libc-2.32.so
00007ff2a4928000	304	160	0 r----	libc-2.32.so
00007ff2a4974000	12	12	12 r----	libc-2.32.so
00007ff2a4977000	12	12	12 rw---	libc-2.32.so
00007ff2a497a000	16	8	8 rw---	[ anon ]
00007ff2a497e000	28	28	0 r----	
libpthread-2.32.so				
00007ff2a4985000	64	64	0 r-x--	
libpthread-2.32.so				
00007ff2a4995000	20	20	0 r----	
libpthread-2.32.so				

00007ff2a499a000	4	4	4	r----	
libpthread-2.32.so					
00007ff2a499b000	4	4	4	rw---	
libpthread-2.32.so					
00007ff2a499c000	24	12	12	rw---	[ anon ]
00007ff2a49d6000	8	8	0	r----	ld-2.32.so
00007ff2a49d8000	132	132	0	r-x--	ld-2.32.so
00007ff2a49f9000	36	28	0	r----	ld-2.32.so
00007ff2a4a02000	4	4	4	r----	ld-2.32.so
00007ff2a4a03000	8	8	8	rw---	ld-2.32.so
00007ffde3c77000	132	12	12	rw---	[ stack ]
00007ffde3cb6000	16	0	0	r----	[ anon ]
00007ffde3cba000	8	4	0	r-x--	[ anon ]
fffffffffff600000	4	0	0	--x--	[ anon ]
-----					
total kB	2593356	250112	248524		

#### 4. После деаллокации

```
[salvoroni@salvoroni-pc osLab]$ pmap -x 100455
100455: build/main alloc 15
```

Address	Kbytes	RSS	Dirty	Mode	Mapping
00005555d8764000	4	4	0	r----	main
00005555d8765000	4	4	0	r-x--	main
00005555d8766000	4	4	0	r----	main
00005555d8767000	4	4	4	r----	main
00005555d8768000	4	4	4	rw---	main
00005555d9933000	132	40	40	rw---	[ anon ]
00007ff1f4000000	132	12	12	rw---	[ anon ]
00007ff1f4021000	65404	0	0	-----	[ anon ]
00007ff1fc000000	132	12	12	rw---	[ anon ]
00007ff1fc021000	65404	0	0	-----	[ anon ]
00007ff2037ff000	4	0	0	-----	[ anon ]
00007ff203800000	8192	8	8	rw---	[ anon ]
00007ff204000000	132	12	12	rw---	[ anon ]
00007ff204021000	65404	0	0	-----	[ anon ]
00007ff2087f9000	4	0	0	-----	[ anon ]
00007ff2087fa000	8192	8	8	rw---	[ anon ]
00007ff208ffa000	4	0	0	-----	[ anon ]
00007ff208ffb000	8192	8	8	rw---	[ anon ]
00007ff2097fb000	4	0	0	-----	[ anon ]
00007ff2097fc000	8192	8	8	rw---	[ anon ]
00007ff20c000000	132	12	12	rw---	[ anon ]
00007ff20c021000	65404	0	0	-----	[ anon ]
00007ff214000000	132	12	12	rw---	[ anon ]
00007ff214021000	65404	0	0	-----	[ anon ]
00007ff2187f9000	4	0	0	-----	[ anon ]
00007ff2187fa000	8192	8	8	rw---	[ anon ]
00007ff218ffa000	4	0	0	-----	[ anon ]
00007ff218ffb000	8192	8	8	rw---	[ anon ]



00007ff2197fb000	4	0	0	-----	[ anon ]
00007ff2197fc000	8192	8	8	rw---	[ anon ]
00007ff219ffc000	4	0	0	-----	[ anon ]
00007ff219ffd000	8192	8	8	rw---	[ anon ]
00007ff21a7fd000	4	0	0	-----	[ anon ]
00007ff21a7fe000	8192	8	8	rw---	[ anon ]
00007ff21affe000	4	0	0	-----	[ anon ]
00007ff21afff000	8192	8	8	rw---	[ anon ]
00007ff21b7ff000	4	0	0	-----	[ anon ]
00007ff21b800000	8192	8	8	rw---	[ anon ]
00007ff21c000000	132	12	12	rw---	[ anon ]
00007ff21c021000	65404	0	0	-----	[ anon ]
00007ff2207f9000	4	0	0	-----	[ anon ]
00007ff2207fa000	8192	8	8	rw---	[ anon ]
00007ff220ffa000	4	0	0	-----	[ anon ]
00007ff220ffb000	8192	8	8	rw---	[ anon ]
00007ff2217fb000	4	0	0	-----	[ anon ]
00007ff2217fc000	8192	8	8	rw---	[ anon ]
00007ff221ffc000	4	0	0	-----	[ anon ]
00007ff221ffd000	8192	8	8	rw---	[ anon ]
00007ff2227fd000	4	0	0	-----	[ anon ]
00007ff2227fe000	8192	8	8	rw---	[ anon ]
00007ff222ffe000	4	0	0	-----	[ anon ]
00007ff222fff000	8192	8	8	rw---	[ anon ]
00007ff2237ff000	4	0	0	-----	[ anon ]
00007ff223800000	8192	8	8	rw---	[ anon ]
00007ff224000000	132	20	20	rw---	[ anon ]
00007ff224021000	65404	0	0	-----	[ anon ]
00007ff2287f9000	4	0	0	-----	[ anon ]
00007ff2287fa000	8192	8	8	rw---	[ anon ]
00007ff228ffa000	4	0	0	-----	[ anon ]
00007ff228ffb000	8192	8	8	rw---	[ anon ]
00007ff2297fb000	4	0	0	-----	[ anon ]
00007ff2297fc000	8192	8	8	rw---	[ anon ]
00007ff229ffc000	4	0	0	-----	[ anon ]
00007ff229ffd000	8192	8	8	rw---	[ anon ]
00007ff22a7fd000	4	0	0	-----	[ anon ]
00007ff22a7fe000	8192	8	8	rw---	[ anon ]
00007ff22affe000	4	0	0	-----	[ anon ]
00007ff22afff000	8192	8	8	rw---	[ anon ]
00007ff22b7ff000	4	0	0	-----	[ anon ]
00007ff22b800000	8192	8	8	rw---	[ anon ]
00007ff22c000000	132	12	12	rw---	[ anon ]
00007ff22c021000	65404	0	0	-----	[ anon ]
00007ff230000000	132	12	12	rw---	[ anon ]
00007ff230021000	65404	0	0	-----	[ anon ]
00007ff234000000	132	12	12	rw---	[ anon ]
00007ff234021000	65404	0	0	-----	[ anon ]

00007ff238000000	132	12	12 rw---	[ anon ]
00007ff238021000	65404	0	0 -----	[ anon ]
00007ff23c000000	132	12	12 rw---	[ anon ]
00007ff23c021000	65404	0	0 -----	[ anon ]
00007ff240000000	132	20	20 rw---	[ anon ]
00007ff240021000	65404	0	0 -----	[ anon ]
00007ff244000000	132	12	12 rw---	[ anon ]
00007ff244021000	65404	0	0 -----	[ anon ]
00007ff248000000	132	20	20 rw---	[ anon ]
00007ff248021000	65404	0	0 -----	[ anon ]
00007ff24c000000	132	20	20 rw---	[ anon ]
00007ff24c021000	65404	0	0 -----	[ anon ]
00007ff250000000	132	20	20 rw---	[ anon ]
00007ff250021000	65404	0	0 -----	[ anon ]
00007ff254000000	132	12	12 rw---	[ anon ]
00007ff254021000	65404	0	0 -----	[ anon ]
00007ff258000000	132	20	20 rw---	[ anon ]
00007ff258021000	65404	0	0 -----	[ anon ]
00007ff25c000000	132	20	20 rw---	[ anon ]
00007ff25c021000	65404	0	0 -----	[ anon ]
00007ff260000000	132	12	12 rw---	[ anon ]
00007ff260021000	65404	0	0 -----	[ anon ]
00007ff264000000	132	12	12 rw---	[ anon ]
00007ff264021000	65404	0	0 -----	[ anon ]
00007ff268000000	132	12	12 rw---	[ anon ]
00007ff268021000	65404	0	0 -----	[ anon ]
00007ff26c000000	132	20	20 rw---	[ anon ]
00007ff26c021000	65404	0	0 -----	[ anon ]
00007ff270000000	132	12	12 rw---	[ anon ]
00007ff270021000	65404	0	0 -----	[ anon ]
00007ff2747f1000	4	0	0 -----	[ anon ]
00007ff2747f2000	8192	8	8 rw---	[ anon ]
00007ff2747ff2000	4	0	0 -----	[ anon ]
00007ff2747ff3000	8192	8	8 rw---	[ anon ]
00007ff2757f3000	4	0	0 -----	[ anon ]
00007ff2757f4000	8192	8	8 rw---	[ anon ]
00007ff2757ff4000	4	0	0 -----	[ anon ]
00007ff2757ff5000	8192	8	8 rw---	[ anon ]
00007ff2767f5000	4	0	0 -----	[ anon ]
00007ff2767f6000	8192	8	8 rw---	[ anon ]
00007ff2767ff6000	4	0	0 -----	[ anon ]
00007ff2767ff7000	8192	8	8 rw---	[ anon ]
00007ff2777f7000	4	0	0 -----	[ anon ]
00007ff2777f8000	8192	8	8 rw---	[ anon ]
00007ff2777ff8000	4	0	0 -----	[ anon ]
00007ff2777ff9000	8192	8	8 rw---	[ anon ]
00007ff2787f9000	4	0	0 -----	[ anon ]
00007ff2787fa000	8192	8	8 rw---	[ anon ]

00007ff278ffa000	4	0	0	-----	[ anon ]
00007ff278ffb000	8192	8	8	rw---	[ anon ]
00007ff2797fb000	4	0	0	-----	[ anon ]
00007ff2797fc000	8192	8	8	rw---	[ anon ]
00007ff279ffc000	4	0	0	-----	[ anon ]
00007ff279ffd000	8192	8	8	rw---	[ anon ]
00007ff27a7fd000	4	0	0	-----	[ anon ]
00007ff27a7fe000	8192	8	8	rw---	[ anon ]
00007ff27a7ffe000	4	0	0	-----	[ anon ]
00007ff27afff000	8192	8	8	rw---	[ anon ]
00007ff27b7ff000	4	0	0	-----	[ anon ]
00007ff27b800000	8192	8	8	rw---	[ anon ]
00007ff27c000000	132	12	12	rw---	[ anon ]
00007ff27c021000	65404	0	0	-----	[ anon ]
00007ff280000000	132	12	12	rw---	[ anon ]
00007ff280021000	65404	0	0	-----	[ anon ]
00007ff284000000	132	12	12	rw---	[ anon ]
00007ff284021000	65404	0	0	-----	[ anon ]
00007ff2887f9000	4	0	0	-----	[ anon ]
00007ff2887fa000	8192	8	8	rw---	[ anon ]
00007ff288ffa000	4	0	0	-----	[ anon ]
00007ff288ffb000	8192	8	8	rw---	[ anon ]
00007ff2897fb000	4	0	0	-----	[ anon ]
00007ff2897fc000	8192	8	8	rw---	[ anon ]
00007ff289ffc000	4	0	0	-----	[ anon ]
00007ff289ffd000	8192	8	8	rw---	[ anon ]
00007ff28a7fd000	4	0	0	-----	[ anon ]
00007ff28a7fe000	8192	8	8	rw---	[ anon ]
00007ff28a7ffe000	4	0	0	-----	[ anon ]
00007ff28afff000	8192	8	8	rw---	[ anon ]
00007ff28b7ff000	4	0	0	-----	[ anon ]
00007ff28b800000	8192	8	8	rw---	[ anon ]
00007ff28c000000	132	12	12	rw---	[ anon ]
00007ff28c021000	65404	0	0	-----	[ anon ]
00007ff2907f9000	4	0	0	-----	[ anon ]
00007ff2907fa000	8192	8	8	rw---	[ anon ]
00007ff290ffa000	4	0	0	-----	[ anon ]
00007ff290ffb000	8192	8	8	rw---	[ anon ]
00007ff2917fb000	4	0	0	-----	[ anon ]
00007ff2917fc000	8192	8	8	rw---	[ anon ]
00007ff291ffc000	4	0	0	-----	[ anon ]
00007ff291ffd000	8192	8	8	rw---	[ anon ]
00007ff2927fd000	4	0	0	-----	[ anon ]
00007ff2927fe000	8192	8	8	rw---	[ anon ]
00007ff292ffe000	4	0	0	-----	[ anon ]
00007ff292fff000	8192	8	8	rw---	[ anon ]
00007ff2937ff000	4	0	0	-----	[ anon ]
00007ff293800000	8192	8	8	rw---	[ anon ]

00007ff294000000	132	12	12	rw---	[ anon ]
00007ff294021000	65404	0	0	-----	[ anon ]
00007ff2987f9000	4	0	0	-----	[ anon ]
00007ff2987fa000	8192	8	8	rw---	[ anon ]
00007ff298ffa000	4	0	0	-----	[ anon ]
00007ff298ffb000	8192	8	8	rw---	[ anon ]
00007ff2997fb000	4	0	0	-----	[ anon ]
00007ff2997fc000	8192	8	8	rw---	[ anon ]
00007ff299ffc000	4	0	0	-----	[ anon ]
00007ff299ffd000	8192	8	8	rw---	[ anon ]
00007ff29a7fd000	4	0	0	-----	[ anon ]
00007ff29a7fe000	8192	8	8	rw---	[ anon ]
00007ff29affe000	4	0	0	-----	[ anon ]
00007ff29afff000	8192	8	8	rw---	[ anon ]
00007ff29b7ff000	4	0	0	-----	[ anon ]
00007ff29b800000	8192	8	8	rw---	[ anon ]
00007ff29c000000	132	12	12	rw---	[ anon ]
00007ff29c021000	65404	0	0	-----	[ anon ]
00007ff2a07aa000	4	0	0	-----	[ anon ]
00007ff2a07ab000	8192	8	8	rw---	[ anon ]
00007ff2a0fab000	4	0	0	-----	[ anon ]
00007ff2a0fac000	8192	8	8	rw---	[ anon ]
00007ff2a17ac000	4	0	0	-----	[ anon ]
00007ff2a17ad000	8192	8	8	rw---	[ anon ]
00007ff2a1fad000	4	0	0	-----	[ anon ]
00007ff2a1fae000	8192	8	8	rw---	[ anon ]
00007ff2a27ae000	4	0	0	-----	[ anon ]
00007ff2a27af000	8192	8	8	rw---	[ anon ]
00007ff2a2faf000	4	0	0	-----	[ anon ]
00007ff2a2fb0000	8192	8	8	rw---	[ anon ]
00007ff2a37b0000	4	0	0	-----	[ anon ]
00007ff2a37b1000	8192	12	12	rw---	[ anon ]
00007ff2a3fb1000	4	0	0	-----	[ anon ]
00007ff2a3fb2000	8204	16	16	rw---	[ anon ]
00007ff2a47b5000	152	152	0	r----	libc-2.32.so
00007ff2a47db000	1332	980	0	r-x--	libc-2.32.so
00007ff2a4928000	304	160	0	r----	libc-2.32.so
00007ff2a4974000	12	12	12	r----	libc-2.32.so
00007ff2a4977000	12	12	12	rw---	libc-2.32.so
00007ff2a497a000	16	8	8	rw---	[ anon ]
00007ff2a497e000	28	28	0	r----	
libpthread-2.32.so					
00007ff2a4985000	64	64	0	r-x--	
libpthread-2.32.so					
00007ff2a4995000	20	20	0	r----	
libpthread-2.32.so					
00007ff2a499a000	4	4	4	r----	
libpthread-2.32.so					

```

00007ff2a499b000          4          4          4 rw---
libpthread-2.32.so
00007ff2a499c000         24         12         12 rw--- [ anon ]
00007ff2a49d6000          8          8          0 r---- ld-2.32.so
00007ff2a49d8000        132        132          0 r-x-- ld-2.32.so
00007ff2a49f9000         36         28          0 r---- ld-2.32.so
00007ff2a4a02000          4          4          4 r---- ld-2.32.so
00007ff2a4a03000          8          8          8 rw--- ld-2.32.so
00007ffde3c77000        132         12         12 rw--- [ stack ]
00007ffde3cb6000         16          0          0 r---- [ anon ]
00007ffde3cba000          8          4          0 r-x-- [ anon ]
fffffffffff600000         4          0          0 --x-- [ anon ]
-----
total kB          2599624      2712      1124

```

## Затраченное процессорное время

85932 salvoro+ 20 0 3126092 250748 249324 S 94.4 2.1 0:23.99 main,  
Где 23.99 - время

## Показатели ввода-вывода

```

[salvoroni@salvoroni-pc osLab]$ iostat 2 5
Linux 5.9.1-arch1-1 (salvoroni-pc)      10/29/2020      _x86_64_      (4 CPU)

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           6.41    0.12   3.87   0.30    0.00   89.30

Device            tps    kB_read/s    kB_wrtn/s    kB_dscd/s    kB_read    kB_wrtn    kB_dscd
sda                5.28      55.81      599.61        0.00    1205679    12953721      0
sdb                0.02       0.33       0.00        0.00      7036      29      0

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           28.81    0.00   1.51   0.25    0.00   69.43

Device            tps    kB_read/s    kB_wrtn/s    kB_dscd/s    kB_read    kB_wrtn    kB_dscd
sda                3.50       0.00      60.00        0.00      0      120      0
sdb                0.00       0.00       0.00        0.00      0      0      0

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           3.00    0.12  94.75   0.00    0.00   2.12

Device            tps    kB_read/s    kB_wrtn/s    kB_dscd/s    kB_read    kB_wrtn    kB_dscd
sda                0.50       0.00     218.00        0.00      0      436      0
sdb                0.00       0.00       0.00        0.00      0      0      0

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           12.24    3.70  15.82   6.25    0.00   61.99

Device            tps    kB_read/s    kB_wrtn/s    kB_dscd/s    kB_read    kB_wrtn    kB_dscd
sda               262.50       0.00    166292.00        0.00      0    332584      0
sdb                0.00       0.00       0.00        0.00      0      0      0

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           27.63    0.00   2.15   1.77    0.00   68.44

Device            tps    kB_read/s    kB_wrtn/s    kB_dscd/s    kB_read    kB_wrtn    kB_dscd
sda                4.00       0.00     92.00        0.00      0     184      0
sdb                0.00       0.00       0.00        0.00      0      0      0

```

## Трасса системных вызовов

```

...
clone(child_stack=0x7f501ffd6ef0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLO
NE_SYSVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID,
parent_tid=[98434], tls=0x7f501ffd7640,
child_tidptr=0x7f501ffd7910) =

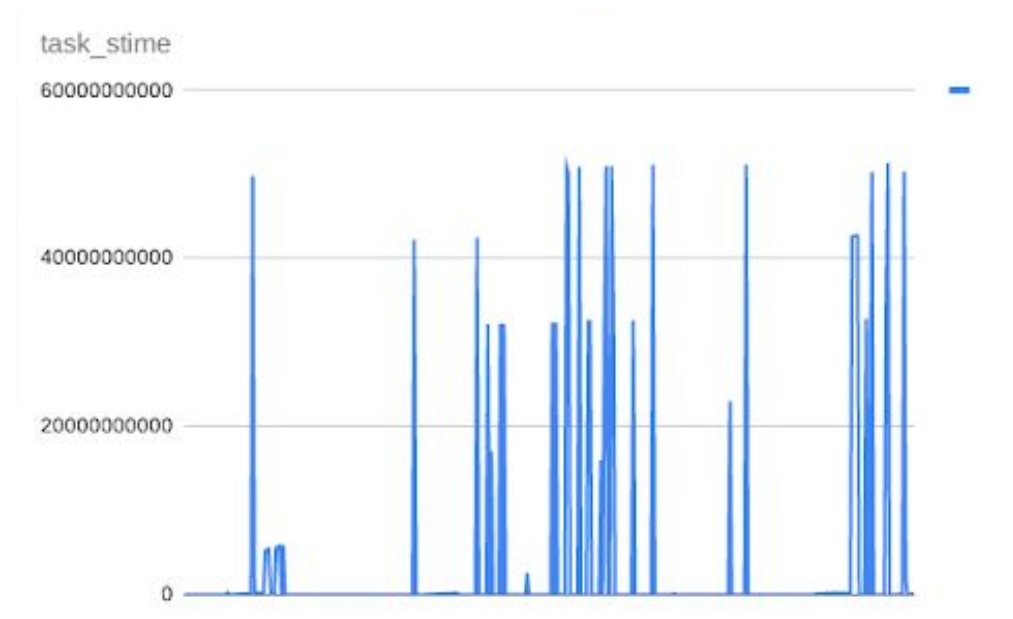
```

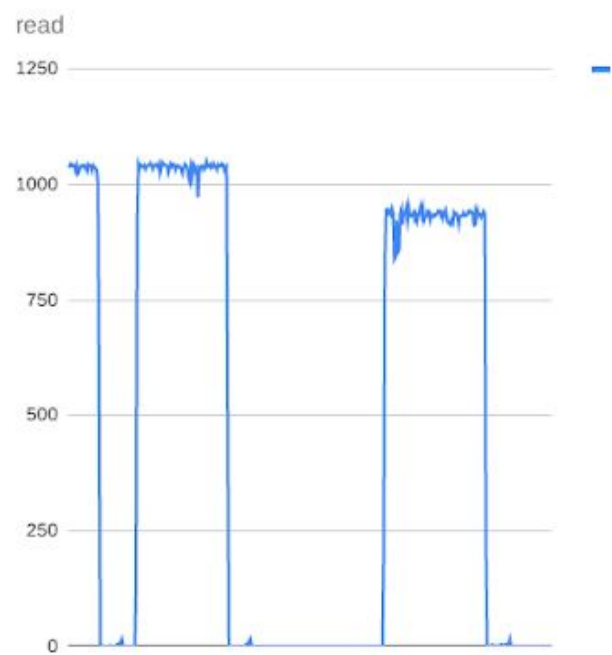
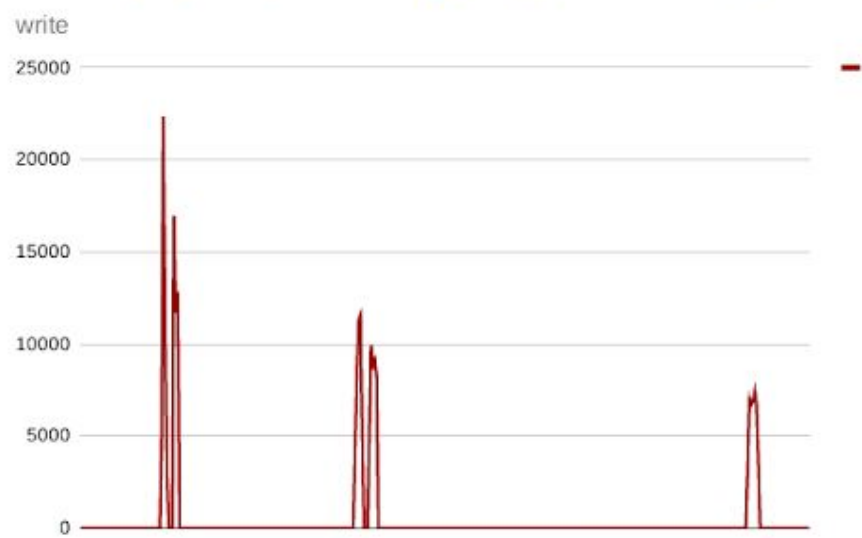
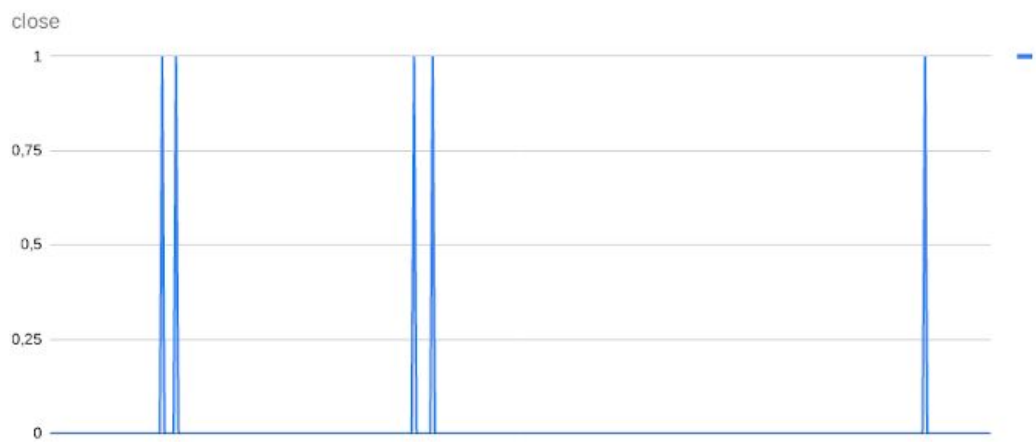
```

98434
rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0
mmap(NULL, 8392704, PROT_NONE,
MAP_PRIVATE|MAP_ANONYMOUS|MAP_STACK, -1, 0) = 0x7f501efd6000
mprotect(0x7f501efd7000, 8388608, PROT_READ|PROT_WRITE) = 0
rt_sigprocmask(SIG_BLOCK, ~[], [], 8) = 0
clone(child_stack=0x7f501f7d5ef0,
flags=CLONE_VM|CLONE_FS|CLONE_FILES|CLONE_SIGHAND|CLONE_THREAD|CLO
NE_SYSVSEM|CLONE_SETTLS|CLONE_PARENT_SETTID|CLONE_CHILD_CLEARTID,
parent_tid=[98435], tls=0x7f501f7d6640,
child_tidptr=0x7f501f7d6910) =
98435
...
futex(0x7f50217da910, FUTEX_WAIT, 98431, NULL) = 0
munmap(0x7f5022fde000, 8392704) = 0
futex(0x7f5020fd9910, FUTEX_WAIT, 98432, NULL) = 0
munmap(0x7f50227dd000, 8392704) = 0
futex(0x7f50207d8910, FUTEX_WAIT, 98433, NULL) = 0
munmap(0x7f5021fdc000, 8392704) = 0
munmap(0x7f50217db000, 8392704) = 0
munmap(0x7f5020fda000, 8392704) = 0
write(1, "files data sum -> 41435050584\n", 30files data sum ->
41435050584
) = 30
write(1, "it's time to check memory(after"..., 43it's time to
check memory(after writting)
) = 43
...

```

## **Графики системных характеристик**





open

1,0

0,5

0,0

-0,5

-1,0

## **Вывод**

Было весело работать с памятью, особенно с mmap когда у меня адрес не выровнен а я пытался до последнего выделить с указанного адреса память, думал даже offset задавать, но потом сдался и убрал MAP\_FIXED.