

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ

Федеральное государственное автономное
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«Национальный исследовательский университет ИТМО»

Факультет программной инженерии и компьютерной техники

ЛАБОРАТОРНАЯ РАБОТА №1

по дисциплине

“Операционные системы”

Вариант №388677

Студент:

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Группа Р33302

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Задание:

Основная цель лабораторной работы - знакомство с системными инструментами анализа производительности и поведения программ. Для этого предлагается для выданной по варианту программы выяснить следующую информацию:

1. Количество потоков создаваемое программой;
2. Список файлов и сетевых соединений с которыми работает программа
3. Карту памяти процесса;
4. Содержимое передаваемых по сети данных;
5. Построить графики:
 - Потребления программой спу;
 - Нагрузки генерируемой программой на подсистему ввода-вывода;
 - Нагрузки генерируемой программой на сетевую подсистему.
 - Смены состояния исполнения потоков;

Выполнение:

1. Количество потоков создаваемое программой

top -H -p (\$PID)

```
kirill@kirill-VirtualBox: ~/Рабочий стол/OS/Lab1
Файл Правка Вид Поиск Терминал Справка
top - 18:47:11 up 29 min,  1 user,  load average: 2,96, 3,70, 3,18
Threads:  27 total,    2 running,  25 sleeping,    0 stopped,    0 zombie
%Cpu(s):  0,4 us,  4,7 sy,  0,0 ni, 82,3 id, 12,3 wa,  0,0 hi,  0,3 si,  0,0 st
КиБ Мем : 2034808 total,   67248 free, 1757560 used,   210000 buff/cache
КиБ Swap:  483800 total,  211160 free,   272640 used.   111288 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR S  %CPU  %MEM    TIME+  COMMAND
 2002 kirill    20   0 2189456 1,182g  632 R   11,0   60,9   0:57.31 388677
 2004 kirill    20   0 2189456 1,182g  632 D    3,0   60,9   0:59.76 388677
 2006 kirill    20   0 2189456 1,182g  632 R    1,7   60,9   0:58.64 388677
 2008 kirill    20   0 2189456 1,182g  632 S    1,7   60,9   0:57.49 388677
 2010 kirill    20   0 2189456 1,182g  632 D    1,0   60,9   0:59.74 388677
 2024 kirill    20   0 2189456 1,182g  632 S    0,3   60,9   0:00.23 388677
 2001 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:00.00 388677
 2003 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:15.37 388677
 2005 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:16.55 388677
 2007 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:16.47 388677
 2009 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:16.94 388677
 2011 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:16.52 388677
 2012 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:00.02 388677
 2013 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:00.07 388677
 2014 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:00.03 388677
 2015 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:00.08 388677
 2016 kirill    20   0 2189456 1,182g  632 S    0,0   60,9   0:00.03 388677
```

2. Список файлов и сетевых соединений, с которыми работает программа lsof -p (\$PID)

```
kirill@kirill-VirtualBox:~/Рабочий стол/OS/Lab1$ lsof -p 1878
COMMAND  PID  USER  FD   TYPE DEVICE SIZE/OFF  NODE NAME
388677   1878 kirill cwd    DIR   8,1    4096    8221 /home/kirill/Рабочий стол/OS/Lab1
388677   1878 kirill rtd    DIR   8,1    4096     2 /
388677   1878 kirill txt    REG   8,1   240552    5985 /home/kirill/Рабочий стол/OS/Lab1/388677
388677   1878 kirill mem    REG   8,1  2030928  269137 /lib/x86_64-linux-gnu/libc-2.27.so
388677   1878 kirill mem    REG   8,1  144976  269270 /lib/x86_64-linux-gnu/libpthread-2.27.so
388677   1878 kirill mem    REG   8,1   96616  269174 /lib/x86_64-linux-gnu/libgcc_s.so.1
388677   1878 kirill mem    REG   8,1  1700792  269200 /lib/x86_64-linux-gnu/libm-2.27.so
388677   1878 kirill mem    REG   8,1  1594864  145538 /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.25
388677   1878 kirill mem    REG   8,1   179152  269109 /lib/x86_64-linux-gnu/ld-2.27.so
388677   1878 kirill 0u     CHR  136,0    0t0     3 /dev/pts/0
388677   1878 kirill 1u     CHR  136,0    0t0     3 /dev/pts/0
388677   1878 kirill 2u     CHR  136,0    0t0     3 /dev/pts/0
388677   1878 kirill 3u     IPv4  53438    0t0    TCP *:5550 (LISTEN)
388677   1878 kirill 5u     IPv4  53441    0t0    TCP *:5555 (LISTEN)
388677   1878 kirill 8u     IPv4  46212    0t0    TCP *:5552 (LISTEN)
388677   1878 kirill 10u    IPv4  44967    0t0    TCP *:5551 (LISTEN)
388677   1878 kirill 11u    IPv4  46213    0t0    TCP *:5553 (LISTEN)
```

strace -e trace=openat,connect -f -p (\$PID)

```
kirill@kirill-VirtualBox:~/Рабочий стол/OS/Lab1$ sudo strace -e trace=openat,connect -f -p 1875
[sudo] пароль для kirill:
strace: Process 1875 attached with 27 threads
[pid 1893] connect(3, {sa_family=AF_INET, sin_port=htons(5553), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1889] connect(4, {sa_family=AF_INET, sin_port=htons(5551), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1891] connect(6, {sa_family=AF_INET, sin_port=htons(5552), sin_addr=inet_addr("127.0.0.1")}, 16) <unfinished ...>
[pid 1897] connect(5, {sa_family=AF_INET, sin_port=htons(5555), sin_addr=inet_addr("127.0.0.1")}, 16) <unfinished ...>
[pid 1895] connect(8, {sa_family=AF_INET, sin_port=htons(5554), sin_addr=inet_addr("127.0.0.1")}, 16) <unfinished ...>
[pid 1891] <... connect resumed> ) = -1 ECONNREFUSED (Connection refused)
[pid 1897] <... connect resumed> ) = -1 ECONNREFUSED (Connection refused)
[pid 1895] <... connect resumed> ) = -1 ECONNREFUSED (Connection refused)
[pid 1887] connect(7, {sa_family=AF_INET, sin_port=htons(5550), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1898] openat(AT_FDCWD, "/bin", O_RDONLY|O_NONBLOCK|O_CLOEXEC|O_DIRECTORY) = 14
[pid 1885] openat(AT_FDCWD, "14455122978176290807", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 14
[pid 1877] openat(AT_FDCWD, "121162767979915039", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 15
[pid 1893] connect(3, {sa_family=AF_INET, sin_port=htons(5553), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
[pid 1889] connect(4, {sa_family=AF_INET, sin_port=htons(5551), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
[pid 1891] connect(6, {sa_family=AF_INET, sin_port=htons(5552), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
[pid 1897] connect(5, {sa_family=AF_INET, sin_port=htons(5555), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1895] connect(8, {sa_family=AF_INET, sin_port=htons(5554), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
[pid 1887] connect(7, {sa_family=AF_INET, sin_port=htons(5550), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
[pid 1884] openat(AT_FDCWD, "13168735062061067178", O_RDONLY) = 4
[pid 1884] openat(AT_FDCWD, "13168735062061067178", O_RDONLY) = 4
[pid 1876] openat(AT_FDCWD, "9249461349285510783", O_RDONLY) = 6
[pid 1876] openat(AT_FDCWD, "9249461349285510783", O_RDONLY) = 6
[pid 1897] connect(5, {sa_family=AF_INET, sin_port=htons(5555), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
[pid 1879] openat(AT_FDCWD, "6395679106848170992", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 4
[pid 1878] openat(AT_FDCWD, "13509045036272254041", O_RDONLY) = 5
[pid 1878] openat(AT_FDCWD, "13509045036272254041", O_RDONLY) = 4
[pid 1883] openat(AT_FDCWD, "4619056396797967638", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 4
[pid 1881] openat(AT_FDCWD, "1689709904034666967", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 5
[pid 1882] openat(AT_FDCWD, "17181430420627806230", O_RDONLY) = 4
[pid 1882] openat(AT_FDCWD, "17181430420627806230", O_RDONLY) = 4
[pid 1880] openat(AT_FDCWD, "11524521244571039149", O_RDONLY) = 5
[pid 1880] openat(AT_FDCWD, "11524521244571039149", O_RDONLY) = 5
[pid 1876] openat(AT_FDCWD, "9249461349285510783", O_WRONLY|O_CREAT|O_TRUNC, 0666) <unfinished ...>
[pid 1884] openat(AT_FDCWD, "13168735062061067178", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 4
[pid 1876] <... openat resumed> ) = 5
[pid 1898] openat(AT_FDCWD, "/bin", O_RDONLY|O_NONBLOCK|O_CLOEXEC|O_DIRECTORY) = 6
[pid 1878] openat(AT_FDCWD, "13509045036272254041", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 4
[pid 1882] openat(AT_FDCWD, "17181430420627806230", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 4
[pid 1880] openat(AT_FDCWD, "11524521244571039149", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 5
[pid 1893] connect(3, {sa_family=AF_INET, sin_port=htons(5553), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1889] connect(4, {sa_family=AF_INET, sin_port=htons(5551), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1891] connect(5, {sa_family=AF_INET, sin_port=htons(5552), sin_addr=inet_addr("127.0.0.1")}, 16) <unfinished ...>
[pid 1895] connect(6, {sa_family=AF_INET, sin_port=htons(5554), sin_addr=inet_addr("127.0.0.1")}, 16) = -1 ECONNREFUSED (Connection refused)
[pid 1891] <... connect resumed> ) = -1 ECONNREFUSED (Connection refused)
```



```

kirill@kirill-VirtualBox:~/Рабочий стол/OS/Lab1$ rmap -x 2001
2001:      ./388677
Адрес      K6      RSS      Dirty Mode      Mapping
00000000000400000      232      88      0 r-x-- 388677
00000000000400000      0      0      0 r-x-- 388677
00000000000639000      4      4      4 r---- 388677
00000000000639000      0      0      0 r---- 388677
0000000000063a000      4      4      4 rw--- 388677
0000000000063a000      0      0      0 rw--- 388677
00000000001a72000      132     36     36 rw--- [ anon ]
00000000001a72000      0      0      0 rw--- [ anon ]
00007f5e4c700000 123904 123904 123904 rw--- [ anon ]
00007f5e4c700000      0      0      0 rw--- [ anon ]
00007f5e54000000      132     12     12 rw--- [ anon ]
00007f5e54000000      0      0      0 rw--- [ anon ]
00007f5e54021000 65404      0      0 ----- [ anon ]
00007f5e54021000      0      0      0 ----- [ anon ]
00007f5e59c00000 495616 495616 495616 rw--- [ anon ]
00007f5e59c00000      0      0      0 rw--- [ anon ]
00007f5e78000000      132     12     12 rw--- [ anon ]
00007f5e78000000      0      0      0 rw--- [ anon ]
00007f5e78021000 65404      0      0 ----- [ anon ]
00007f5e78021000      0      0      0 ----- [ anon ]
00007f5e7c000000      132     12     12 rw--- [ anon ]
00007f5e7c000000      0      0      0 rw--- [ anon ]
00007f5e7c021000 65404      0      0 ----- [ anon ]
00007f5e7c021000      0      0      0 ----- [ anon ]
00007f5e80000000      132     12     12 rw--- [ anon ]
00007f5e80000000      0      0      0 rw--- [ anon ]
00007f5e80021000 65404      0      0 ----- [ anon ]
00007f5e80021000      0      0      0 ----- [ anon ]
00007f5e88000000      132     12     12 rw--- [ anon ]
00007f5e88000000      0      0      0 rw--- [ anon ]
00007f5e88021000 65404      0      0 ----- [ anon ]
00007f5e88021000      0      0      0 ----- [ anon ]
00007f5e93ff8000      4      0      0 ----- [ anon ]
00007f5e93ff8000      0      0      0 ----- [ anon ]
00007f5e93ff9000 8192      8      8 rw--- [ anon ]
00007f5e93ff9000      0      0      0 rw--- [ anon ]
00007f5e947f9000      4      0      0 ----- [ anon ]
00007f5e947f9000      0      0      0 ----- [ anon ]
00007f5e947fa000 8192      8      8 rw--- [ anon ]
00007f5e947fa000      0      0      0 rw--- [ anon ]
00007f5e94ffa000      4      0      0 ----- [ anon ]
00007f5e94ffa000      0      0      0 ----- [ anon ]
00007f5e94ffb000 8192      8      8 rw--- [ anon ]
00007f5e94ffb000      0      0      0 rw--- [ anon ]
00007f5e957fb000      4      0      0 ----- [ anon ]

```

00007f5e957fb000	0	0	0	-----	[anon]
00007f5e957fc000	8192	8	8	rw---	[anon]
00007f5e957fc000	0	0	0	rw---	[anon]
00007f5e95ffc000	4	0	0	-----	[anon]
00007f5e95ffc000	0	0	0	-----	[anon]
00007f5e95ffd000	8192	8	8	rw---	[anon]
00007f5e95ffd000	0	0	0	rw---	[anon]
00007f5e967fd000	4	0	0	-----	[anon]
00007f5e967fd000	0	0	0	-----	[anon]
00007f5e967fe000	8192	8	8	rw---	[anon]
00007f5e967fe000	0	0	0	rw---	[anon]
00007f5e96ffe000	4	0	0	-----	[anon]
00007f5e96ffe000	0	0	0	-----	[anon]
00007f5e96fff000	8192	8	8	rw---	[anon]
00007f5e96fff000	0	0	0	rw---	[anon]
00007f5e977ff000	4	0	0	-----	[anon]
00007f5e977ff000	0	0	0	-----	[anon]
00007f5e97800000	8192	8	8	rw---	[anon]
00007f5e97800000	0	0	0	rw---	[anon]
00007f5e98000000	132	8	8	rw---	[anon]
00007f5e98000000	0	0	0	rw---	[anon]
00007f5e98021000	65404	0	0	-----	[anon]
00007f5e98021000	0	0	0	-----	[anon]
00007f5e9c000000	132	16	16	rw---	[anon]
00007f5e9c000000	0	0	0	rw---	[anon]
00007f5e9c021000	65404	0	0	-----	[anon]
00007f5e9c021000	0	0	0	-----	[anon]
00007f5ea0000000	132	8	8	rw---	[anon]
00007f5ea0000000	0	0	0	rw---	[anon]
00007f5ea0021000	65404	0	0	-----	[anon]
00007f5ea0021000	0	0	0	-----	[anon]
00007f5ea47f9000	4	0	0	-----	[anon]
00007f5ea47f9000	0	0	0	-----	[anon]
00007f5ea47fa000	8192	8	8	rw---	[anon]
00007f5ea47fa000	0	0	0	rw---	[anon]
00007f5ea4ffa000	4	0	0	-----	[anon]
00007f5ea4ffa000	0	0	0	-----	[anon]
00007f5ea4ffb000	8192	8	8	rw---	[anon]
00007f5ea4ffb000	0	0	0	rw---	[anon]
00007f5ea57fb000	4	0	0	-----	[anon]
00007f5ea57fb000	0	0	0	-----	[anon]
00007f5ea57fc000	8192	8	8	rw---	[anon]
00007f5ea57fc000	0	0	0	rw---	[anon]
00007f5ea5ffc000	4	0	0	-----	[anon]
00007f5ea5ffc000	0	0	0	-----	[anon]
00007f5ea5ffd000	8192	8	8	rw---	[anon]
00007f5ea5ffd000	0	0	0	rw---	[anon]
00007f5ea67fd000	4	0	0	-----	[anon]

00007f5ea67fd000	0	0	0	-----	[anon]
00007f5ea67fe000	8192	8	8	rw---	[anon]
00007f5ea67fe000	0	0	0	rw---	[anon]
00007f5ea6ffe000	4	0	0	-----	[anon]
00007f5ea6ffe000	0	0	0	-----	[anon]
00007f5ea6fff000	8192	8	8	rw---	[anon]
00007f5ea6fff000	0	0	0	rw---	[anon]
00007f5ea77ff000	4	0	0	-----	[anon]
00007f5ea77ff000	0	0	0	-----	[anon]
00007f5ea7800000	8192	8	8	rw---	[anon]
00007f5ea7800000	0	0	0	rw---	[anon]
00007f5ea8000000	132	8	8	rw---	[anon]
00007f5ea8000000	0	0	0	rw---	[anon]
00007f5ea8021000	65404	0	0	-----	[anon]
00007f5ea8021000	0	0	0	-----	[anon]
00007f5eac000000	132	8	8	rw---	[anon]
00007f5eac000000	0	0	0	rw---	[anon]
00007f5eac021000	65404	0	0	-----	[anon]
00007f5eac021000	0	0	0	-----	[anon]
00007f5eb0000000	132	8	8	rw---	[anon]
00007f5eb0000000	0	0	0	rw---	[anon]
00007f5eb0021000	65404	0	0	-----	[anon]
00007f5eb0021000	0	0	0	-----	[anon]
00007f5eb471d000	4	0	0	-----	[anon]
00007f5eb471d000	0	0	0	-----	[anon]
00007f5eb471e000	8192	8	8	rw---	[anon]
00007f5eb471e000	0	0	0	rw---	[anon]
00007f5eb4f1e000	4	0	0	-----	[anon]
00007f5eb4f1e000	0	0	0	-----	[anon]
00007f5eb4f1f000	8192	12	12	rw---	[anon]
00007f5eb4f1f000	0	0	0	rw---	[anon]
00007f5eb571f000	4	0	0	-----	[anon]
00007f5eb571f000	0	0	0	-----	[anon]
00007f5eb5720000	8192	8	8	rw---	[anon]
00007f5eb5720000	0	0	0	rw---	[anon]
00007f5eb5f20000	4	0	0	-----	[anon]
00007f5eb5f20000	0	0	0	-----	[anon]
00007f5eb5f21000	8192	8	8	rw---	[anon]
00007f5eb5f21000	0	0	0	rw---	[anon]
00007f5eb6721000	4	0	0	-----	[anon]
00007f5eb6721000	0	0	0	-----	[anon]
00007f5eb6722000	8192	8	8	rw---	[anon]
00007f5eb6722000	0	0	0	rw---	[anon]
00007f5eb6f22000	4	0	0	-----	[anon]
00007f5eb6f22000	0	0	0	-----	[anon]
00007f5eb6f23000	8192	8	8	rw---	[anon]
00007f5eb6f23000	0	0	0	rw---	[anon]
00007f5eb7723000	4	0	0	-----	[anon]

00007f5eb7723000	0	0	0	----	[anon]
00007f5eb7724000	8192	8	8	rw---	[anon]
00007f5eb7724000	0	0	0	rw---	[anon]
00007f5eb7f24000	4	0	0	----	[anon]
00007f5eb7f24000	0	0	0	----	[anon]
00007f5eb7f25000	8192	8	8	rw---	[anon]
00007f5eb7f25000	0	0	0	rw---	[anon]
00007f5eb8725000	4	0	0	----	[anon]
00007f5eb8725000	0	0	0	----	[anon]
00007f5eb8726000	8192	8	8	rw---	[anon]
00007f5eb8726000	0	0	0	rw---	[anon]
00007f5eb8f26000	4	0	0	----	[anon]
00007f5eb8f26000	0	0	0	----	[anon]
00007f5eb8f27000	8192	8	8	rw---	[anon]
00007f5eb8f27000	0	0	0	rw---	[anon]
00007f5eb9727000	4	0	0	----	[anon]
00007f5eb9727000	0	0	0	----	[anon]
00007f5eb9728000	627712	619528	619528	rw---	[anon]
00007f5eb9728000	0	0	0	rw---	[anon]
00007f5edfc28000	1948	400	0	r-x--	libc-2.27.so
00007f5edfc28000	0	0	0	r-x--	libc-2.27.so
00007f5edfe0f000	2048	0	0	----	libc-2.27.so
00007f5edfe0f000	0	0	0	----	libc-2.27.so
00007f5ee000f000	16	16	16	r----	libc-2.27.so
00007f5ee000f000	0	0	0	r----	libc-2.27.so
00007f5ee0013000	8	8	8	rw---	libc-2.27.so
00007f5ee0013000	0	0	0	rw---	libc-2.27.so
00007f5ee0015000	16	12	12	rw---	[anon]
00007f5ee0015000	0	0	0	rw---	[anon]
00007f5ee0019000	104	48	0	r-x--	libpthread-2.27.so
00007f5ee0019000	0	0	0	r-x--	libpthread-2.27.so
00007f5ee0033000	2044	0	0	----	libpthread-2.27.so
00007f5ee0033000	0	0	0	----	libpthread-2.27.so
00007f5ee0232000	4	4	4	r----	libpthread-2.27.so
00007f5ee0232000	0	0	0	r----	libpthread-2.27.so
00007f5ee0233000	4	4	4	rw---	libpthread-2.27.so
00007f5ee0233000	0	0	0	rw---	libpthread-2.27.so
00007f5ee0234000	16	4	4	rw---	[anon]
00007f5ee0234000	0	0	0	rw---	[anon]
00007f5ee0238000	92	4	0	r-x--	libgcc_s.so.1
00007f5ee0238000	0	0	0	r-x--	libgcc_s.so.1
00007f5ee024f000	2044	0	0	----	libgcc_s.so.1
00007f5ee024f000	0	0	0	----	libgcc_s.so.1
00007f5ee044e000	4	4	4	r----	libgcc_s.so.1
00007f5ee044e000	0	0	0	r----	libgcc_s.so.1
00007f5ee044f000	4	4	4	rw---	libgcc_s.so.1
00007f5ee044f000	0	0	0	rw---	libgcc_s.so.1
00007f5ee0450000	1652	16	0	r-x--	libm-2.27.so


```

00007f5ee0450000      0      0      0 r-x-- libm-2.27.so
00007f5ee05ed000    2044      0      0 ---- libm-2.27.so
00007f5ee05ed000      0      0      0 ---- libm-2.27.so
00007f5ee07ec000      4      4      4 r---- libm-2.27.so
00007f5ee07ec000      0      0      0 r---- libm-2.27.so
00007f5ee07ed000      4      4      4 rw--- libm-2.27.so
00007f5ee07ed000      0      0      0 rw--- libm-2.27.so
00007f5ee07ee000    1508    120      0 r-x-- libstdc++.so.6.0.25
00007f5ee07ee000      0      0      0 r-x-- libstdc++.so.6.0.25
00007f5ee0967000    2048      0      0 ---- libstdc++.so.6.0.25
00007f5ee0967000      0      0      0 ---- libstdc++.so.6.0.25
00007f5ee0b67000     40     40     40 r---- libstdc++.so.6.0.25
00007f5ee0b67000      0      0      0 r---- libstdc++.so.6.0.25
00007f5ee0b71000      8      8      8 rw--- libstdc++.so.6.0.25
00007f5ee0b71000      0      0      0 rw--- libstdc++.so.6.0.25
00007f5ee0b73000     16     16     16 rw--- [ anon ]
00007f5ee0b73000      0      0      0 rw--- [ anon ]
00007f5ee0b77000    164     32      0 r-x-- ld-2.27.so
00007f5ee0b77000      0      0      0 r-x-- ld-2.27.so
00007f5ee0d86000     28     24     24 rw--- [ anon ]
00007f5ee0d86000      0      0      0 rw--- [ anon ]
00007f5ee0d9a000     24     24     24 rw--- [ anon ]
00007f5ee0d9a000      0      0      0 rw--- [ anon ]
00007f5ee0da0000      4      4      4 r---- ld-2.27.so
00007f5ee0da0000      0      0      0 r---- ld-2.27.so
00007f5ee0da1000      4      4      4 rw--- ld-2.27.so
00007f5ee0da1000      0      0      0 rw--- ld-2.27.so
00007f5ee0da2000      4      4      4 rw--- [ anon ]
00007f5ee0da2000      0      0      0 rw--- [ anon ]
00007fff0dc1f000    132     12     12 rw--- [ stack ]
00007fff0dc1f000      0      0      0 rw--- [ stack ]
00007fff0dcb1000     12      0      0 r---- [ anon ]
00007fff0dcb1000      0      0      0 r---- [ anon ]
00007fff0dcb4000      4      4      0 r-x-- [ anon ]
00007fff0dcb4000      0      0      0 r-x-- [ anon ]
fffffffffff600000     4      0      0 --x-- [ anon ]
fffffffffff600000      0      0      0 --x-- [ anon ]
-----
всего Кб  2189460 1240324 1239612

```

4. Содержимое передаваемых по сети данных
tcpdump -X -i any -c15 -vv

```

krl@kali:~$ sudo tcpdump -i any -s 262144 -v -c 15
tcpdump: listening on any, link-type LINUX_SLL (Linux cooked), capture size 262144 bytes
21:23:17.889726 IP (tos 0x0, ttl 64, id 23821, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.50672 > localhost.5555: Flags [S], cksum 0xfe30 (incorrect -> 0x6c25), seq 992684660, win 65495, options [mss 65495,sackOK,TS val 1511803005 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c 5d0d 4000 4006 dfac 7f00 0001  E...@.@.....
    0x0010: 7f00 0001 c5f0 15b3 3b2b 2a7f 0000 0000  ....;+*t....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 487d 0000 0000 0103 0307  ....Z.H.....
21:23:17.889791 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5555 > localhost.50672: Flags [R.], cksum 0x708a (correct), seq 0, ack 992684661, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15b3 c5f0 0000 0000 3b2b 2a75  ....;+*u....
    0x0020: 5014 0000 7080 0000  ....P.....
21:23:18.890466 IP (tos 0x0, ttl 64, id 45952, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.50674 > localhost.5555: Flags [S], cksum 0xfe30 (incorrect -> 0x6837), seq 992684663, win 65495, options [mss 65495,sackOK,TS val 1511804006 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c b380 4000 4006 8939 7f00 0001  E...@.@.9....
    0x0010: 7f00 0001 c5f2 15b3 3b2b 2a7f 0000 0000  ....;+*w....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 4c66 0000 0000 0103 0307  ....Z.Lf.....
21:23:18.890488 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5555 > localhost.50674: Flags [R.], cksum 0x7085 (correct), seq 0, ack 992684664, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15b3 c5f2 0000 0000 3b2b 2a78  ....;+*x....
    0x0020: 5014 0000 7085 0000  ....P.....
21:23:19.891006 IP (tos 0x0, ttl 64, id 17880, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.50676 > localhost.5555: Flags [S], cksum 0xfe30 (incorrect -> 0x6449), seq 992684666, win 65495, options [mss 65495,sackOK,TS val 1511805007 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c 45d8 4000 4006 f6e1 7f00 0001  E...E.@.@.....
    0x0010: 7f00 0001 c5f4 15b3 3b2b 2a7a 0000 0000  ....;+*z....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 504f 0000 0000 0103 0307  ....Z.PD.....
21:23:19.891032 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5555 > localhost.50676: Flags [R.], cksum 0x7080 (correct), seq 0, ack 992684667, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15b3 c5f4 0000 0000 3b2b 2a7b  ....;+*{....
    0x0020: 5014 0000 7080 0000  ....P.....
21:23:20.876847 IP (tos 0x0, ttl 64, id 48127, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.46306 > localhost.5550: Flags [S], cksum 0xfe30 (incorrect -> 0x4ac8), seq 2129333624, win 65495, options [mss 65495,sackOK,TS val 1511805993 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c bbff 4000 4006 80ba 7f00 0001  E...@.@.....
    0x0010: 7f00 0001 b4e2 15ae 7eeb 0d78 0000 0000  ....;+*X....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 5429 0000 0000 0103 0307  ....Z.T.....
21:23:20.876912 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5550 > localhost.46306: Flags [R.], cksum 0xad90 (correct), seq 0, ack 2129333625, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15ae b4e2 0000 0000 7eeb 0d79  ....;+*Y....
    0x0020: 5014 0000 5ad9 0000  ....P...Z....
21:23:20.891263 IP (tos 0x0, ttl 64, id 25246, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.50680 > localhost.5550: Flags [S], cksum 0xfe30 (incorrect -> 0x0d5a), seq 992684669, win 65495, options [mss 65495,sackOK,TS val 1511806007 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c 629e 4000 4006 db1b 7f00 0001  E...@.@.....
    0x0010: 7f00 0001 c5f8 15b3 3b2b 2a7d 0000 0000  ....;+*}....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 5437 0000 0000 0103 0307  ....Z.T.....
21:23:20.891275 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5550 > localhost.50680: Flags [R.], cksum 0x7079 (correct), seq 0, ack 992684670, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15b3 c5f8 0000 0000 3b2b 2a7e  ....;+*~....
    0x0020: 5014 0000 7079 0000  ....P...py..
21:23:21.877349 IP (tos 0x0, ttl 64, id 24988, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.46310 > localhost.5550: Flags [S], cksum 0xfe30 (incorrect -> 0x46d9), seq 2129333627, win 65495, options [mss 65495,sackOK,TS val 1511806993 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c 019c 4000 4006 db1d 7f00 0001  E...@.@.....
    0x0010: 7f00 0001 b4e6 15ae 7eeb 0d7b 0000 0000  ....;+*{....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 5811 0000 0000 0103 0307  ....Z.X.....
21:23:21.877383 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5550 > localhost.46310: Flags [R.], cksum 0x5ad2 (correct), seq 0, ack 2129333628, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15ae b4e6 0000 0000 7eeb 0d7c  ....;+*|....
    0x0020: 5014 0000 5ad2 0000  ....P...Z.....
21:23:21.888916 IP (tos 0x0, ttl 64, id 33429, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.38408 > localhost.5551: Flags [S], cksum 0xfe30 (incorrect -> 0xa20d), seq 3300821828, win 65495, options [mss 65495,sackOK,TS val 1511807005 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c 8295 4000 4006 ba24 7f00 0001  E...@.@.$....
    0x0010: 7f00 0001 9600 15af c4be 0b44 0000 0000  ....;+*D....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 581d 0000 0000 0103 0307  ....Z.X.....
21:23:21.888953 IP (tos 0x0, ttl 64, id 0, offset 0, flags [DF], proto TCP (6), length 40)
    localhost.5551 > localhost.38408: Flags [R.], cksum 0xb612 (correct), seq 0, ack 3300821829, win 0, length 0
    0x0000: 4500 0028 0000 4000 4006 3cce 7f00 0001  E...@.@<....
    0x0010: 7f00 0001 15af 9600 0000 0000 c4be 0b45  ....;+*E....
    0x0020: 5014 0000 b612 0000  ....P.....
21:23:21.891607 IP (tos 0x0, ttl 64, id 64584, offset 0, flags [DF], proto TCP (6), length 60)
    localhost.50686 > localhost.5555: Flags [S], cksum 0xfe30 (incorrect -> 0x5c69), seq 992684672, win 65495, options [mss 65495,sackOK,TS val 1511807007 ecr 0,nop,wscale 7], length 0
    0x0000: 4500 003c fc48 4000 4006 4071 7f00 0001  E...H.@.@q....
    0x0010: 7f00 0001 c5fe 15b3 3b2b 2a80 0000 0000  ....;+*.....
    0x0020: a002 ffd7 fe30 0000 0204 ffd7 0402 080a  ....0.....
    0x0030: 5a1c 581f 0000 0000 0103 0307  ....Z.X.....
15 packets captured
32 packets received by filter
0 packets dropped by kernel

```

Графики

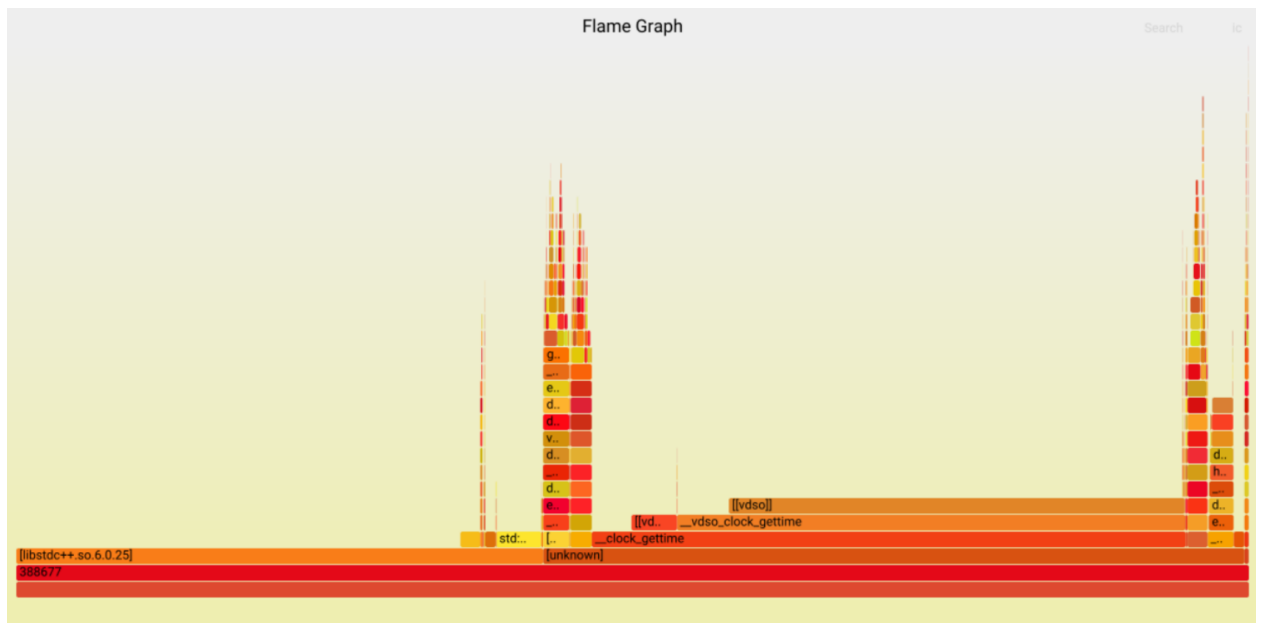
1. Потребление программой CPU

sudo perf record -F 99 -g -p (\$PID) -- sleep 600

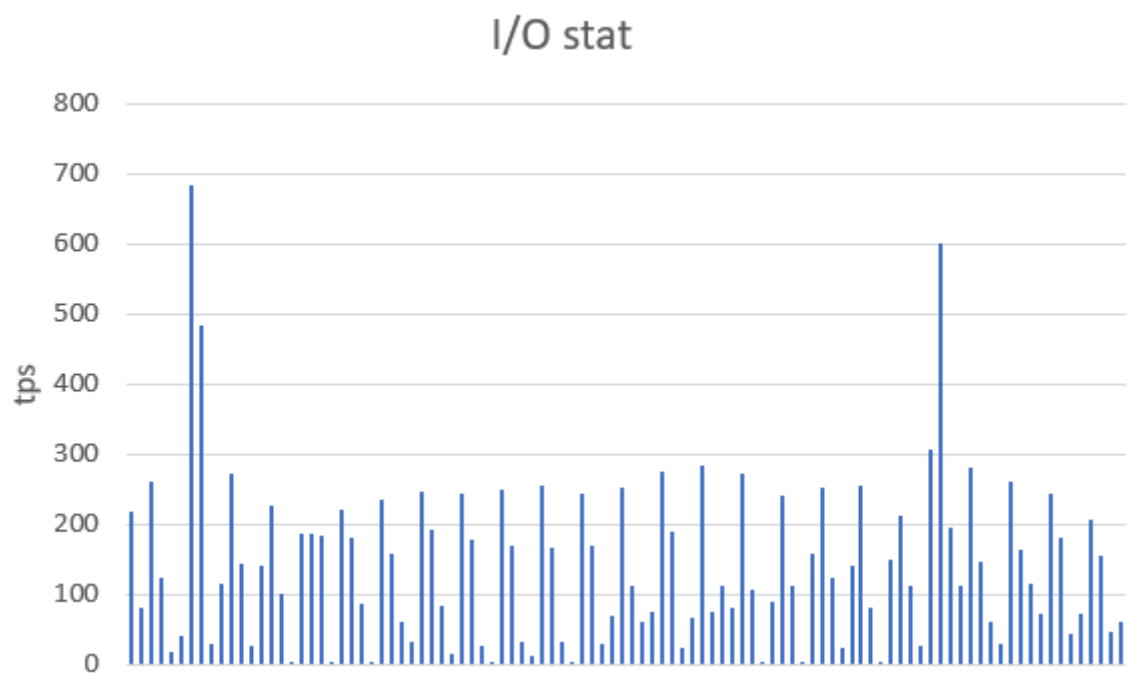
sudo perf script > ./data

FlameGraph/stackcollapse-perf.pl ./data | FlameGraph/flamegraph.pl >

./data.svg



2. Нагрузка генерируемой программой на подсистему ввода-вывода
 iostat -m -d -p sda 6 100

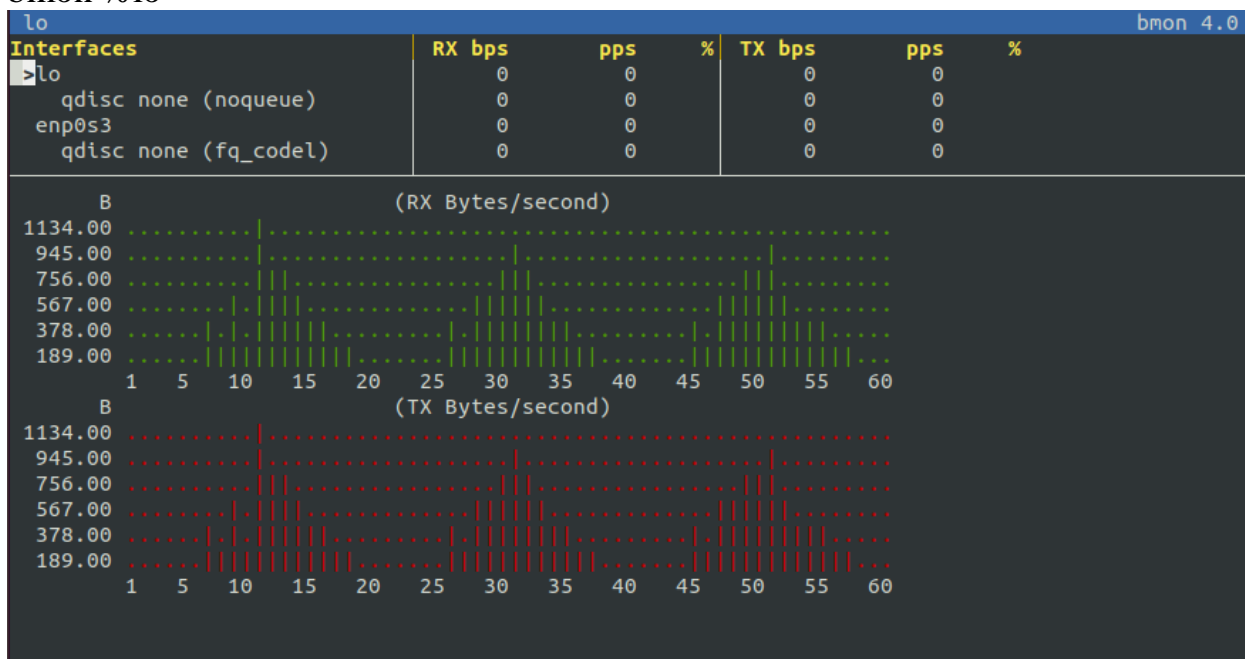


3. Нагрузка генерируемой программой на сетевую подсистему

`netstat -sp ($PID) | head -n 9 | grep -E 'received|sent'`



`bmon %io`



4. Смена состояния исполнения потоков

`top -H -n 30 -d 10 -p ${PID}`



Вывод:

В ходе выполнения данной лабораторной работы я познакомился с основными средствами мониторинга Linux, сетевым вводом-выводом, картой распределения памяти процесса, а также построил графики статистики процесса.