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Q2-
B) ID do processo

```
louis-ian@louisian-VirtualBox:~/Área de Trabalho/SO/TP01$ ./fibonacci_b
PID do pai: 13619
Este programa imprime parte da sequencia de fibonacci:
 do i-esimo ate o n-esimo numero
i: 1
n: 10
^C
```

```
louis-ian@louisian-VirtualBox:~/Área de Trabalho/SO/TP01$ top -E k -b | grep fibonacci
  13620 louis-i+  20   0    5884    196      0 R 100,0   0,0   0:04.42 fibonacci_b
  13619 louis-i+  20   0    5884   1468   1312 S   0,0   0,0   0:00.00 fibonacci_b
```

C) Subprocessos

```
louis-ian@louisian-VirtualBox:~/Área de Trabalho/SO/TP01$ top -E k -b | grep fibonacci
  13620 louis-i+  20   0    5884    196      0 R 100,0   0,0   0:04.42 fibonacci_b
  13619 louis-i+  20   0    5884   1468   1312 S   0,0   0,0   0:00.00 fibonacci_b
```

D)
IO

```
louis-ian@louisian-VirtualBox:/proc/13619$ sudo cat io
rchar: 6793
wchar: 112
syscr: 18
syscw: 4
read_bytes: 0
write_bytes: 0
cancelled_write_bytes: 0
```

Memória

```
louis-ian@louisian-VirtualBox:~$ pmap 17440
17440:   ./fibonacci_b
000055e33c782000      8K r---- fibonacci_b
000055e33c784000      8K r-x-- fibonacci_b
000055e33c786000      4K r---- fibonacci_b
000055e33c787000      4K r---- fibonacci_b
000055e33c788000      4K rw--- fibonacci_b
000055e33d8e2000    132K rw---   [ anon ]
00007f779faf7000     16K rw---   [ anon ]
00007f779fafb000    148K r---- libc-2.31.so
00007f779fb20000   1504K r-x-- libc-2.31.so
00007f779fc98000    296K r---- libc-2.31.so
00007f779fce2000      4K ----- libc-2.31.so
00007f779fce3000     12K r---- libc-2.31.so
00007f779fce6000     12K rw--- libc-2.31.so
00007f779fce9000     16K rw---   [ anon ]
00007f779fced000     12K r---- libgcc_s.so.1
00007f779fcf0000     72K r-x-- libgcc_s.so.1
00007f779fd02000     16K r---- libgcc_s.so.1
00007f779fd06000      4K r---- libgcc_s.so.1
00007f779fd07000      4K rw--- libgcc_s.so.1
00007f779fd08000     60K r---- libm-2.31.so
00007f779fd17000    668K r-x-- libm-2.31.so
00007f779fdbe000    604K r---- libm-2.31.so
00007f779fe55000      4K r---- libm-2.31.so
00007f779fe56000      4K rw--- libm-2.31.so
00007f779fe57000    600K r---- libstdc++.so.6.0.28
00007f779feed000    960K r-x-- libstdc++.so.6.0.28
00007f779ffdd000    292K r---- libstdc++.so.6.0.28
00007f77a0026000      4K ----- libstdc++.so.6.0.28
00007f77a0027000     44K r---- libstdc++.so.6.0.28
00007f77a0032000     12K rw--- libstdc++.so.6.0.28
00007f77a0035000     20K rw---   [ anon ]
00007f77a004c000      4K r---- ld-2.31.so
00007f77a004d000    140K r-x-- ld-2.31.so
00007f77a0070000     32K r---- ld-2.31.so
00007f77a0079000      4K r---- ld-2.31.so
00007f77a007a000      4K rw--- ld-2.31.so
00007f77a007b000      4K rw---   [ anon ]
00007fff5ae83000    132K rw---   [ pilha ]
00007fff5aedf000     12K r----   [ anon ]
00007fff5aee2000      4K r-x--   [ anon ]
ffffffffff600000      4K --x--   [ anon ]
 total             5888K
```

STRACE

```
louis-ian@louisian-VirtualBox:~/Área de Trabalho/GitHub/Sistemas-Operacionais/TP
01$ strace ./fibonacci_b 3 7
execve("./fibonacci_b", ["./fibonacci_b", "3", "7"], 0x7ffee2fbb990 /* 49 vars */) = 0
brk(NULL)                               = 0x556e7319a000
arch_prctl(0x3001 /* ARCH_??? */, 0x7fff9f371770) = -1 EINVAL (Argumento inválido)
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (Arquivo ou diretório não encontrado)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=73149, ...}) = 0
mmap(NULL, 73149, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fd4a323b000
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\240\341\t\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=1952928, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd4a3239000
mmap(NULL, 1968128, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd4a3058000
mprotect(0x7fd4a30ee000, 1286144, PROT_NONE) = 0
mmap(0x7fd4a30ee000, 983040, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x96000) = 0x7fd4a30ee000
mmap(0x7fd4a31de000, 299008, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x186000) = 0x7fd4a31de000
mmap(0x7fd4a3228000, 57344, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1cf000) = 0x7fd4a3228000
mmap(0x7fd4a3236000, 10240, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fd4a3236000
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\300\363\0\0\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=1369352, ...}) = 0
mmap(NULL, 1368336, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd4a2f09000
mmap(0x7fd4a2f18000, 684032, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xf000) = 0x7fd4a2f18000
mmap(0x7fd4a2fbf000, 618496, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0xb6000) = 0x7fd4a2fbf000
mmap(0x7fd4a3056000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x14c000) = 0x7fd4a3056000
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\3405\0\0\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0644, st_size=104984, ...}) = 0
mmap(NULL, 107592, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd4a2eee000
mmap(0x7fd4a2ef1000, 73728, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x3000) = 0x7fd4a2ef1000
mmap(0x7fd4a2f03000, 16384, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x15000) = 0x7fd4a2f03000
mmap(0x7fd4a2f07000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x18000) = 0x7fd4a2f07000
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\0\360q\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
pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0", 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\363\377?\332\200\270\27\304d\245n\355Y\377\t\334"..., 68, 880) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=2029224, ...}) = 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
pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0", 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\363\377?\332\200\270\27\304d\245n\355Y\377\t\334"..., 68, 880) = 68
mmap(NULL, 2036952, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd4a2cfc000
mprotect(0x7fd4a2d21000, 1847296, PROT_NONE) = 0
mmap(0x7fd4a2d21000, 1540096, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x25000) = 0x7fd4a2d21000
mmap(0x7fd4a2e99000, 303104, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x19d000) = 0x7fd4a2e99000
```

Temos diversas chamadas de bibliotecas que são utilizadas dentro do programa na imagem acima.

```
mmap(0x7fd4a2ee4000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1e7000) = 0x7fd4a2ee4000
mmap(0x7fd4a2eea000, 13528, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fd4a2eea000
close(3)                                = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd4a2cfa000
arch_prctl(ARCH_SET_FS, 0x7fd4a2cfaf40) = 0
mprotect(0x7fd4a2ee4000, 12288, PROT_READ) = 0
mprotect(0x7fd4a2f07000, 4096, PROT_READ) = 0
mprotect(0x7fd4a3056000, 4096, PROT_READ) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd4a2cf8000
mprotect(0x7fd4a3228000, 45056, PROT_READ) = 0
mprotect(0x556e723d9000, 4096, PROT_READ) = 0
mprotect(0x7fd4a327a000, 4096, PROT_READ) = 0
munmap(0x7fd4a323b000, 73149)           = 0
brk(NULL)                               = 0x556e7319a000
brk(0x556e731bb000)                     = 0x556e731bb000
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0), ...}) = 0
write(1, "Este programa imprime parte da s"..., 55Este programa imprime parte da sequencia de fibonacci:
) = 55
write(1, " do i-esimo ate o n-esimo numero"..., 33 do i-esimo ate o n-esimo numero
) = 33
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD, child_tidptr=0x7fd4a2cfb210) = 17980
wait4(-1, fibonaccis de 3 ate 7:
1 2 [{WIFEXITED(s) && WEXITSTATUS(s) == 0}], 0, NULL) = 17980
--- SIGCHLD {si_signo=SIGCHLD, si_code=CLD_EXITED, si_pid=17980, si_uid=1000, si_status=0, si_utime=0, si_stime=0} ---
write(1, "3 5 \n", 53 5
)                 = 5
exit_group(0)                           = ?
+++ exited with 0 +++
```

E nesta imagem temos, ao final, chamadas de sistema para escrita em tela, clone(), wait() e por fim, exit().