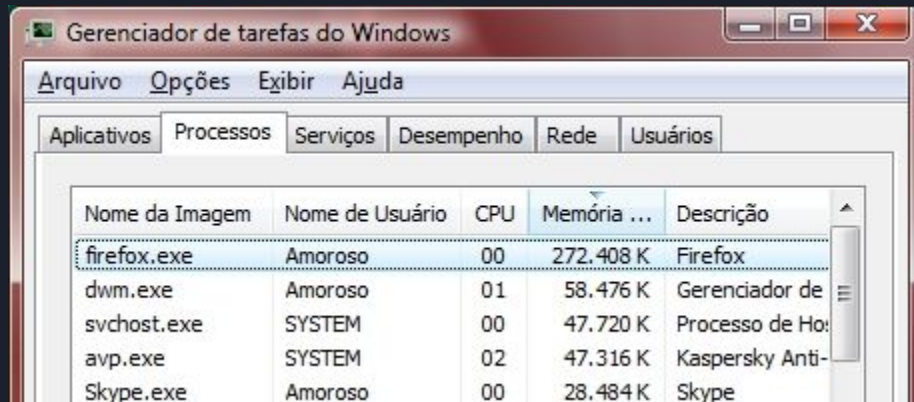# Trabalho 1 Processos

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Processos

- Execve

- Getuid
  - UserID real

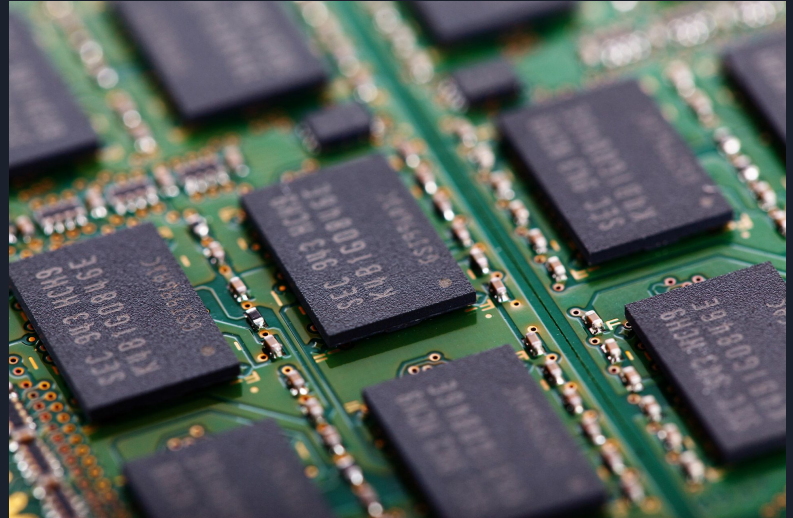- Geteuid
  - UserID efetivo

Resultado do strace


```
gso15@tau05-vm3: ~/SSC0640_SistemasOperacionaisl/programas_compilados

gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisl/programas_compilados$ strace -T ./processos
execve("./processos", ["./processos"], [/* 30 vars */]) = 0 <0.000166>
brk(NULL)                               = 0x1dde000 <0.000008>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000014>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000012>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000015>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000009>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f10f432b000 <0.000012>
close(3)                                = 0 <0.000007>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000011>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000016>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000009>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000008>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f10f432a000 <0.000012>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f10f3d4f000 <0.000012>
mprotect(0x7f10f3f0f000, 2097152, PROT_NONE) = 0 <0.000017>
mmap(0x7f10f410f000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c0000) = 0x7f10f410f000 <0.
000019>
mmap(0x7f10f4115000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f10f4115000 <0.000011
>
close(3)                                = 0 <0.000009>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f10f4329000 <0.000010>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f10f4328000 <0.000009>
arch_prctl(ARCH_SET_FS, 0x7f10f4329700) = 0 <0.000008>
mprotect(0x7f10f410f000, 16384, PROT_READ) = 0 <0.000013>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000011>
mprotect(0x7f10f433e000, 4096, PROT_READ) = 0 <0.000014>
munmap(0x7f10f432b000, 74000)           = 0 <0.000025>
getuid()                                = 1170 <0.000007>
geteuid()                               = 1170 <0.000007>
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 2), ...}) = 0 <0.000010>
brk(NULL)                               = 0x1dde000 <0.000007>
brk(0x1dff000)                          = 0x1dff000 <0.000010>
write(1, "The REAL UID =: 1170\n", 21The REAL UID =: 1170
)   = 21 <0.000042>
write(1, "The EFFECTIVE UID =: 1170\n", 26The EFFECTIVE UID =: 1170
) = 26 <0.000041>
exit_group(0)                           = ?
```

Memória

Chamadas de sistema analisadas sobre gerenciamento de memória.

- MMAP
- MUMAP
- MPROTECT

Vamos ao código!

```
gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ strace -T ./memory0
execve("./memory0", ["./memory0"], [/* 30 vars */]) = 0 <0.000278>
brk(NULL)                               = 0x1743000 <0.000019>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000028>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000027>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000029>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000019>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f196659b000 <0.000024>
close(3)                                = 0 <0.000019>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000023>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000029>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000021>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000019>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f196659a000 <0.000023>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f1965fbf000 <0.000023>
mprotect(0x7f196617f000, 2097152, PROT_NONE) = 0 <0.000031>
mmap(0x7f196637f000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c000) = 0x7f196637f000 <0.000031>
mmap(0x7f1966385000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f1966385000 <0.000025>
close(3)                                = 0 <0.000019>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f1966599000 <0.000023>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f1966598000 <0.000019>
arch_prctl(ARCH_SET_FS, 0x7f1966599700) = 0 <0.000018>
mprotect(0x7f196637f000, 16384, PROT_READ) = 0 <0.000080>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000009>
mprotect(0x7f19665ae000, 4096, PROT_READ) = 0 <0.000009>
munmap(0x7f196659b000, 74000)           = 0 <0.000013>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f19665ad000 <0.000009>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f19665ac000 <0.000008>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f19665ab000 <0.000007>
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 0), ...}) = 0 <0.000007>
brk(NULL)                               = 0x1743000 <0.000007>
brk(0x1764000)                          = 0x1764000 <0.000008>
write(1, "Vamos multiplicar 5 * 7\n", 24Vamos multiplicar 5 * 7
) = 24 <0.000037>
write(1, "Resultado: 35\n", 14Resultado: 35
)        = 14 <0.000036>
munmap(0x7f19665ad000, 4)               = 0 <0.000049>
munmap(0x7f19665ac000, 4)               = 0 <0.000009>
munmap(0x7f19665ab000, 4)               = 0 <0.000009>
exit_group(0)                           = ?
+++ exited with 0 +++
```

```
gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ strace -T ./memory1
execve("./memory1", ["./memory1"], [/* 30 vars */]) = 0 <0.000293>
brk(NULL)                               = 0x22cf000 <0.000020>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000028>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000026>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000030>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000020>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fc57cb6a000 <0.000024>
close(3)                                = 0 <0.000018>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000023>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000029>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000021>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000019>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fc57cb69000 <0.000022>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fc57c58e000 <0.000023>
mprotect(0x7fc57c74e000, 2097152, PROT_NONE) = 0 <0.000030>
mmap(0x7fc57c94e000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c0000) = 0x7fc57c94e000 <0.000030>
mmap(0x7fc57c954000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fc57c954000 <0.000025>
close(3)                                = 0 <0.000018>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fc57cb68000 <0.000023>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fc57cb67000 <0.000020>
arch_prctl(ARCH_SET_FS, 0x7fc57cb68700) = 0 <0.000018>
mprotect(0x7fc57c94e000, 16384, PROT_READ) = 0 <0.000009>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000007>
mprotect(0x7fc57cb7d000, 4096, PROT_READ) = 0 <0.000008>
munmap(0x7fc57cb6a000, 74000)           = 0 <0.000012>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fc57cb7c000 <0.000008>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fc57cb7b000 <0.000007>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fc57cb7a000 <0.000006>
mprotect(0x7fc57cb7b000, 4, PROT_NONE)  = 0 <0.000009>
--- SIGSEGV {si_signo=SIGSEGV, si_code=SEGV_ACCERR, si_addr=0x7fc57cb7b000} ---
+++ killed by SIGSEGV (core dumped) +++
Segmentation fault (core dumped)
```

Memória - Resultados do comando 'strace'

```
gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ strace -T ./memory2
execve("./memory2", ["./memory2"], [/* 30 vars */]) = 0 <0.000179>
brk(NULL)                               = 0x85a000 <0.000011>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000017>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000014>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000017>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000011>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fd0f1e2a000 <0.000013>
close(3)                                = 0 <0.000010>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000013>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000016>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000012>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000010>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1e29000 <0.000012>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fd0f184e000 <0.000014>
mprotect(0x7fd0f1a0e000, 2097152, PROT_NONE) = 0 <0.000016>
mmap(0x7fd0f1c0e000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c0000) = 0x7fd0f1c0e000 <0.000017>
mmap(0x7fd0f1c14000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1c14000 <0.000013>
close(3)                                = 0 <0.000010>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1e28000 <0.000013>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1e27000 <0.000011>
arch_prctl(ARCH_SET_FS, 0x7fd0f1e28700) = 0 <0.000010>
mprotect(0x7fd0f1c0e000, 16384, PROT_READ) = 0 <0.000014>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000013>
mprotect(0x7fd0f1e3d000, 4096, PROT_READ) = 0 <0.000013>
munmap(0x7fd0f1e2a000, 74000)           = 0 <0.000020>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1e3c000 <0.000012>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1e3b000 <0.000012>
mmap(NULL, 4, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fd0f1e3a000 <0.000011>
mprotect(0x7fd0f1e3c000, 4, PROT_NONE)  = 0 <0.000012>
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 0), ...}) = 0 <0.000011>
brk(NULL)                               = 0x85a000 <0.000010>
brk(0x87b000)                           = 0x87b000 <0.000011>
write(1, "Vamos multiplicar 5 * 7\n", 24Vamos multiplicar 5 * 7
) = 24 <0.000056>
--- SIGSEGV {si_signo=SIGSEGV, si_code=SEGV_ACCERR, si_addr=0x7fd0f1e3c000} ---
+++ killed by SIGSEGV (core dumped) +++
Segmentation fault (core dumped)
```

E/S e Arquivos

- Access
  - F_OK, R_OK, W_OK

- Fstat

- Open

Resultado do strace

```
gso15@tau05-vm3: ~/SSC0640_SistemasOperacionaisI/programas_compilados
gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ strace -T ./IOArquivosAccess pasta
execve("./IOArquivosAccess", ["./IOArquivosAccess", "pasta"], [/* 30 vars */]) = 0 <0.000158>
brk(NULL)                               = 0xe2e000 <0.000009>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000014>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000011>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000015>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000009>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f60919d0000 <0.000011>
close(3)                                = 0 <0.000008>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000011>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000015>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000010>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000009>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f60919cf000 <0.000010>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f60913f4000 <0.000013>
mprotect(0x7f60915b4000, 2097152, PROT_NONE) = 0 <0.000018>
mmap(0x7f60917b4000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c0000) = 0x7f60917b4000 <0.
000019>
mmap(0x7f60917ba000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f60917ba000 <0.000010
>
close(3)                                = 0 <0.000008>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f60919ce000 <0.000010>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f60919cd000 <0.000008>
arch_prctl(ARCH_SET_FS, 0x7f60919ce700) = 0 <0.000008>
mprotect(0x7f60917b4000, 16384, PROT_READ) = 0 <0.000012>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000088>
mprotect(0x7f60919e3000, 4096, PROT_READ) = 0 <0.000013>
munmap(0x7f60919d0000, 74000)           = 0 <0.000025>
access("pasta", F_OK)                   = -1 ENOENT (No such file or directory) <0.000014>
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 1), ...}) = 0 <0.000009>
brk(NULL)                               = 0xe2e000 <0.000008>
brk(0xe4f000)                           = 0xe4f000 <0.000010>
write(1, "pasta nao existe!\n", 18pasta nao existe!
)       = 18 <0.000042>
exit_group(0)                           = ?
```

Resultado do strace

```
gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ strace -T ./IOArquivosAccess pasta
execve("./IOArquivosAccess", ["./IOArquivosAccess", "pasta"], [/* 30 vars */]) = 0 <0.000211>
brk(NULL)                               = 0x63d000 <0.000009>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000015>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000011>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000015>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000009>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fbe4d2df000 <0.000011>
close(3)                                = 0 <0.000008>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000010>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000016>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000009>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000008>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fbe4d2de000 <0.000011>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fbe4cd03000 <0.000012>
mprotect(0x7fbe4cec3000, 2097152, PROT_NONE) = 0 <0.000016>
mmap(0x7fbe4d0c3000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c0000) = 0x7fbe4d0c3000 <0.
000020>
mmap(0x7fbe4d0c9000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fbe4d0c9000 <0.000010
>
close(3)                                = 0 <0.000007>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fbe4d2dd000 <0.000012>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fbe4d2dc000 <0.000009>
arch_prctl(ARCH_SET_FS, 0x7fbe4d2dd700) = 0 <0.000008>
mprotect(0x7fbe4d0c3000, 16384, PROT_READ) = 0 <0.000013>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000010>
mprotect(0x7fbe4d2f2000, 4096, PROT_READ) = 0 <0.000013>
munmap(0x7fbe4d2df000, 74000)           = 0 <0.000024>
access("pasta", F_OK)                   = 0 <0.000016>
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 1), ...}) = 0 <0.000010>
brk(NULL)                               = 0x63d000 <0.000008>
brk(0x65e000)                           = 0x65e000 <0.000011>
write(1, "pasta existe!\n", 14pasta existe!
)          = 14 <0.000041>
exit_group(0)                           = ?
```
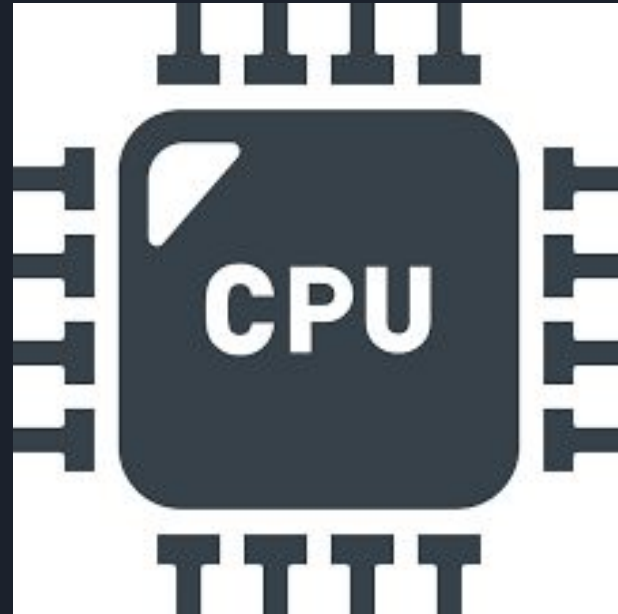
Resultado do strace


```
gso15@tau05-vm3: ~/SSC0640_SistemasOperacionaisI/programas_compilados

gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ strace -T ./IOArquivosFstat pasta
execve("./IOArquivosFstat", ["./IOArquivosFstat", "pasta"], [/* 30 vars */]) = 0 <0.000283>
brk(NULL)                               = 0x19d6000 <0.000024>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000034>
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory) <0.000032>
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3 <0.000030>
fstat(3, {st_mode=S_IFREG|0644, st_size=74000, ...}) = 0 <0.000021>
mmap(NULL, 74000, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f2e6923f000 <0.000024>
close(3)                                = 0 <0.000018>
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or directory) <0.000024>
open("/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3 <0.000030>
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\t\2\0\0\0\0\0"..., 832) = 832 <0.000021>
fstat(3, {st_mode=S_IFREG|0755, st_size=1868984, ...}) = 0 <0.000019>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f2e6923e000 <0.000022>
mmap(NULL, 3971488, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7f2e68c63000 <0.000024>
mprotect(0x7f2e68e23000, 2097152, PROT_NONE) = 0 <0.000035>
mmap(0x7f2e69023000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c0000) = 0x7f2e69023000 <0.
000034>
mmap(0x7f2e69029000, 14752, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7f2e69029000 <0.000025
>
close(3)                                = 0 <0.000017>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f2e6923d000 <0.000023>
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7f2e6923c000 <0.000020>
arch_prctl(ARCH_SET_FS, 0x7f2e6923d700) = 0 <0.000019>
mprotect(0x7f2e69023000, 16384, PROT_READ) = 0 <0.000026>
mprotect(0x600000, 4096, PROT_READ)     = 0 <0.000024>
mprotect(0x7f2e69252000, 4096, PROT_READ) = 0 <0.000024>
munmap(0x7f2e6923f000, 74000)           = 0 <0.000036>
open("pasta", O_RDONLY)                 = 3 <0.000028>
fstat(3, {st_mode=S_IFDIR|0755, st_size=4096, ...}) = 0 <0.000020>
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 1), ...}) = 0 <0.000019>
brk(NULL)                               = 0x19d6000 <0.000019>
brk(0x19f7000)                          = 0x19f7000 <0.000022>
write(1, "File type: 16877\n", 17File type: 16877
)       = 17 <0.000101>
write(1, "File size: 4096\n", 16File size: 4096
)      = 16 <0.000100>
write(1, "File UID: 1170\n", 15File UID: 1170
)       = 15 <0.000105>
write(1, "File GID: 63000\n", 16File GID: 63000
)       = 16 <0.000103>
```

Resultado do strace

CPU_BOUND

Processos CPU-bound são processos cujo tempo de execução depende principalmente da CPU, um dos sinais de que um processo é CPU-bound é quando ele utiliza a CPU durante a maior parte de sua execução.

Vamos ao código!

CPU_BOUND

```
gso15@tau05-vm3:~/SSC0640_SistemasOperacionaisI/programas_compilados$ time ./CPU_bound
Gastei 1952968753 passsos para encontrar 11734 numeros primos!

real    0m7.753s
user    0m7.741s
sys     0m0.008s
```

Tempo total de execução = 7.753s

Tempo de CPU em modo usuário = 7.741s

Tempo de CPU em modo kernel = 0.008s

Porcentagem de uso da CPU = (7.741+0.008)/(7.753) = 99%

IO_BOUND

Processos IO-bound são processos cujo tempo de execução depende principalmente das operações de E/S, um dos sinais de que um processo é IO-bound é quando ele utiliza a CPU durante somente uma fração de sua execução, visto que a maior parte da execução é ocupada por operações de E/S.

Vamos ao código!

IO_BOUND - Com entrada pequena


```
real     0m1.249s
user     0m0.000s
sys      0m0.010s
```

Tempo total de execução = 1.249s

Tempo de CPU em modo usuário = 0.000s

Tempo de CPU em modo kernel = 0.010s

Porcentagem de uso da CPU = (0.010)/(1.249) = 0.8%

IO_BOUND - Com entrada grande

```
real        0m8.667s
user        0m0.095s
sys         0m0.360s
```

Tempo total de execução = 8.667s

Tempo de CPU em modo usuário = 0.095s

Tempo de CPU em modo kernel = 0.360s

Porcentagem de uso da CPU = (0.095 + 0.360)/(8.667) = 5.24%

FIM

Links

GitHub:
https://github.com/andrecoco/SSC0640_SistemasOperacionaisI

Vídeo:

https://youtu.be/d7i_EBLqcIQ