

1)

```
maykon_hop@DELLG15:/mnt/c/Users/mayko$ ps aux
USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.1  0.1  21708 12264 ?        Ss   20:46   0:00 /sbin/init
root           2  0.0  0.0   3060 1664 ?        Sl   20:46   0:00 /init
root           5  0.0  0.0   3076 1888 ?        Ss   20:46   0:00 plan@ --control-socket 7 --log-level 4 --server-fd 8 --pipe-fd 10 --log-truncate
root          52  0.0  0.2  50432 18900 ?        Ss   20:46   0:00 /usr/lib/systemd/systemd-journald
root         108  0.0  0.0  24872  5888 ?        Ss   20:46   0:00 /usr/lib/systemd/systemd-udev
systemd+     119  0.0  0.1  21456 12544 ?        Ss   20:46   0:00 /usr/lib/systemd/systemd-resolved
systemd+     120  0.0  0.0   91024  7808 ?        Ssl  20:46   0:00 /usr/lib/systemd/systemd-timesyncd
root         190  0.0  0.0   4236  2432 ?        Ss   20:46   0:00 /usr/sbin/cron -f -P
message+    191  0.0  0.0   9764  4992 ?        Ss   20:46   0:00 @dbus-daemon --system --address=systemd: --nofork --nopidfile --systemd-activation --syslog-only
root        198  0.0  0.1  17960  8448 ?        Ss   20:46   0:00 /usr/lib/systemd/systemd-logind
root        201  0.0  0.1 1755840 11904 ?        Ssl  20:46   0:00 /usr/libexec/wsl-pro-service -vv
root        206  0.0  0.0   3160  1920 hvc0     Ss+  20:46   0:00 /sbin/agetty -o -p -- \u --noclear --keep-baud - 115200,38400,9600 vt220
syslog      220  0.0  0.0  222508  4992 ?        Ssl  20:46   0:00 /usr/sbin/rsyslogd -n -iNONE
root        222  0.0  0.0   3116  1792 tty1     Ss+  20:46   0:00 /sbin/agetty -o -p -- \u --noclear - linux
root        228  0.0  0.2 107032 22656 ?        Ssl  20:46   0:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
root        322  0.0  0.0   3068   896 ?        Ss   20:46   0:00 /init
root        323  0.0  0.0   3084  1152 ?        S   20:46   0:00 /init
maykon_+    324  0.0  0.0   6080  4864 pts/0    Ss   20:46   0:00 /bin/bash
root        427  0.0  0.0   6656  4480 pts/1    Ss   20:47   0:00 /bin/login -f
maykon_+    473  0.0  0.1  20300 11136 ?        Ss   20:47   0:00 /usr/lib/systemd/systemd --user
maykon_+    474  0.0  0.0   21152  3516 ?        S   20:47   0:00 (sd-pam)
maykon_+    485  0.0  0.0   6056  5120 pts/1    S+   20:47   0:00 -bash
root        827  0.0  0.2 370084 20352 ?        Ssl  20:47   0:00 /usr/libexec/packagekitd
polkitd     832  0.0  0.0 308164  7680 ?        Ssl  20:47   0:00 /usr/lib/polkit-1/polkitd --no-debug
maykon_+   1185  0.0  0.0   8284  4096 pts/0    R+   20:50   0:00 ps aux
```

2)

```
maykon_hop@DELLG15:/mnt/c/Users/mayko$ strace date
execve("/usr/bin/date", ["date"], 0x7ffed8f4a080 /* 24 vars */) = 0
brk(NULL)                               = 0x650d73e25000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7881e0a32000
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=18059, ...}) = 0
mmap(NULL, 18059, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7881e0a2d000
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\3\0\0\1\0\0\220\243\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" ..., 784, 64) = 784
fstat(3, {st_mode=S_IFREG|0755, st_size=2125328, ...}) = 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" ..., 784, 64) = 784
mmap(NULL, 2170256, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7881e0800000
mmap(0x7881e0828000, 1605632, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x28000) = 0x7881e0828000
mmap(0x7881e09b0000, 323584, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1b0000) = 0x7881e09b0000
mmap(0x7881e09ff000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1fe000) = 0x7881e09ff000
mmap(0x7881e0a50000, 52624, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7881e0a50000
close(3)                                = 0
mmap(NULL, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7881e0a2a000
arch_prctl(ARCH_SET_FS, 0x7881e0a2a740) = 0
set_tid_address(0x7881e0a2aa10)         = 1183
set_robust_list(0x7881e0a2aa20, 24)     = 0
rseq(0x7881e0a2b060, 0x20, 0, 0x53053053) = 0
mprotect(0x7881e09ff000, 16384, PROT_READ) = 0
mprotect(0x650d40ed5000, 8192, PROT_READ) = 0
mprotect(0x7881e0a6a000, 8192, PROT_READ) = 0
prlimit64(0, RLIMIT_STACK, NULL, {rlim_cur=8192*1024, rlim_max=RLIM64_INFINITY}) = 0
munmap(0x7881e0a2d000, 18059)           = 0
getrandom("\x29\x83\x47\xe4\x3f\x4b\x9d\xd3", 8, GRND_NONBLOCK) = 8
brk(NULL)                               = 0x650d73e25000
brk(0x650d73e46000)                     = 0x650d73e46000
openat(AT_FDCWD, "/usr/lib/locale/locale-archive", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/usr/share/locale/locale.alias", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=2996, ...}) = 0
read(3, "# Locale name alias data base.\n# ... , 4096) = 2996
read(3, "", 4096)                       = 0
close(3)                                = 0
```

O comando precisa obter a data e a hora do sistema. Isso requer chamadas de sistema para acessar o relógio do sistema e retornar a data atual.

Como também outras partes do sistema representado pelos comandos:

open(), close() abrir arquivos.

mmap que faz mapeamentos de memória para carregar as bibliotecas e os dados necessários para a execução.

3)

```
maykon_hop@DELLG15:/mnt/c/Users/mayko$ ltrace date
strchr("date", '/') = nil
setlocale(LC_ALL, "") = "C.UTF-8"
bindtextdomain("coreutils", "/usr/share/locale") = "/usr/share/locale"
textdomain("coreutils") = "coreutils"
__cxa_atexit(0x610657a5d550, 0, 0x610657a6d008, 0) = 0
getopt_long(1, 0x7ffcfe9c8b18, "d:f:I::r:Rs:u", 0x610657a6c900, nil) = -1
nl_langinfo(0x2006c, 0x610657a687e0, 5, 0) = 0x71510fb50a01
getenv("TZ") = nil
malloc(128) = 0x6106818a50b0
clock_gettime(0, 0x7ffcfe9c88d0, 0, 0x6106818a5130) = 0
getenv("TZ") = nil
localtime_r(0x7ffcfe9c87d0, 0x7ffcfe9c87e0, 2, 69) = 0x7ffcfe9c87e0
strcmp("", "-03") = -45
strlen("-03") = 3
memcpy(0x6106818a50b9, "-03\0", 4) = 0x6106818a50b9
__errno_location() = 0x71510fb5c6c8
strftime(" Wed", 1024, " %a", 0x7ffcfe9c87e0) = 4
fwrite("Wed", 3, 1, 0x71510fa045c0) = 1
fputc(' ', 0x71510fa045c0) = 32
strftime(" Aug", 1024, " %b", 0x7ffcfe9c87e0) = 4
fwrite("Aug", 3, 1, 0x71510fa045c0) = 1
fputc(' ', 0x71510fa045c0) = 32
fwrite("20", 2, 1, 0x71510fa045c0) = 1
fputc(' ', 0x71510fa045c0) = 32
fwrite("20", 2, 1, 0x71510fa045c0) = 1
fputc(':', 0x71510fa045c0) = 58
fwrite("49", 2, 1, 0x71510fa045c0) = 1
fputc(':', 0x71510fa045c0) = 58
fputc('0', 0x71510fa045c0) = 48
fwrite("9", 1, 1, 0x71510fa045c0) = 1
fputc(' ', 0x71510fa045c0) = 32
strlen("-03") = 3
fwrite("-03", 3, 1, 0x71510fa045c0) = 1
fputc(' ', 0x71510fa045c0) = 32
fwrite("2025", 4, 1, 0x71510fa045c0) = 1
__overflow(0x71510fa045c0, 10, 0x6f1f8da, 0Wed Aug 20 20:49:09 -03 2025) = 10
) = 0
__fpending(0x71510fa045c0, 0, 1, 1) = 0
```

As funções de biblioteca como `fwrite()`, `fputc()` e `strftime()` em `ltrace` estão intimamente relacionadas com as chamadas de sistema no `strace`, como a leitura de arquivos de localidade e o acesso ao relógio do sistema. Ou seja, as funções da biblioteca realizam chamadas de sistema para obter/fazer as ações necessárias.

4)

----MEM----

```
1      7000
2      3940
3      8001
...
940    0002
```

----CPU----

--Passo 1-- Início

PC 1

AC -

IR -

--Passo 2-- Busca em 1 e incrementa 1 ao Program Counter

PC 2

AC -

IR 7000

--Passo 3-- Executa 7000 (Leitura do Teclado(3) para AC)

PC 2

AC 0003

IR 7000

--Passo 4-- Busca em 2 e incrementa 1 ao PC

PC 3

AC 0003

IR 3940

--Passo 5-- Executa 3940 (Incrementar o valor na memória 940 a AC)

PC 3

AC 0003

IR 3940

--Passo 6-- Busca em 3 e incrementa 1 ao PC

PC 4

AC 0005

IR 8001

--Passo 7-- Executa 8001 (Exibir AC no Dispositivo de Saída)

PC 4

AC 0005

IR 8001
