Laboratorio 4

Integrantes:

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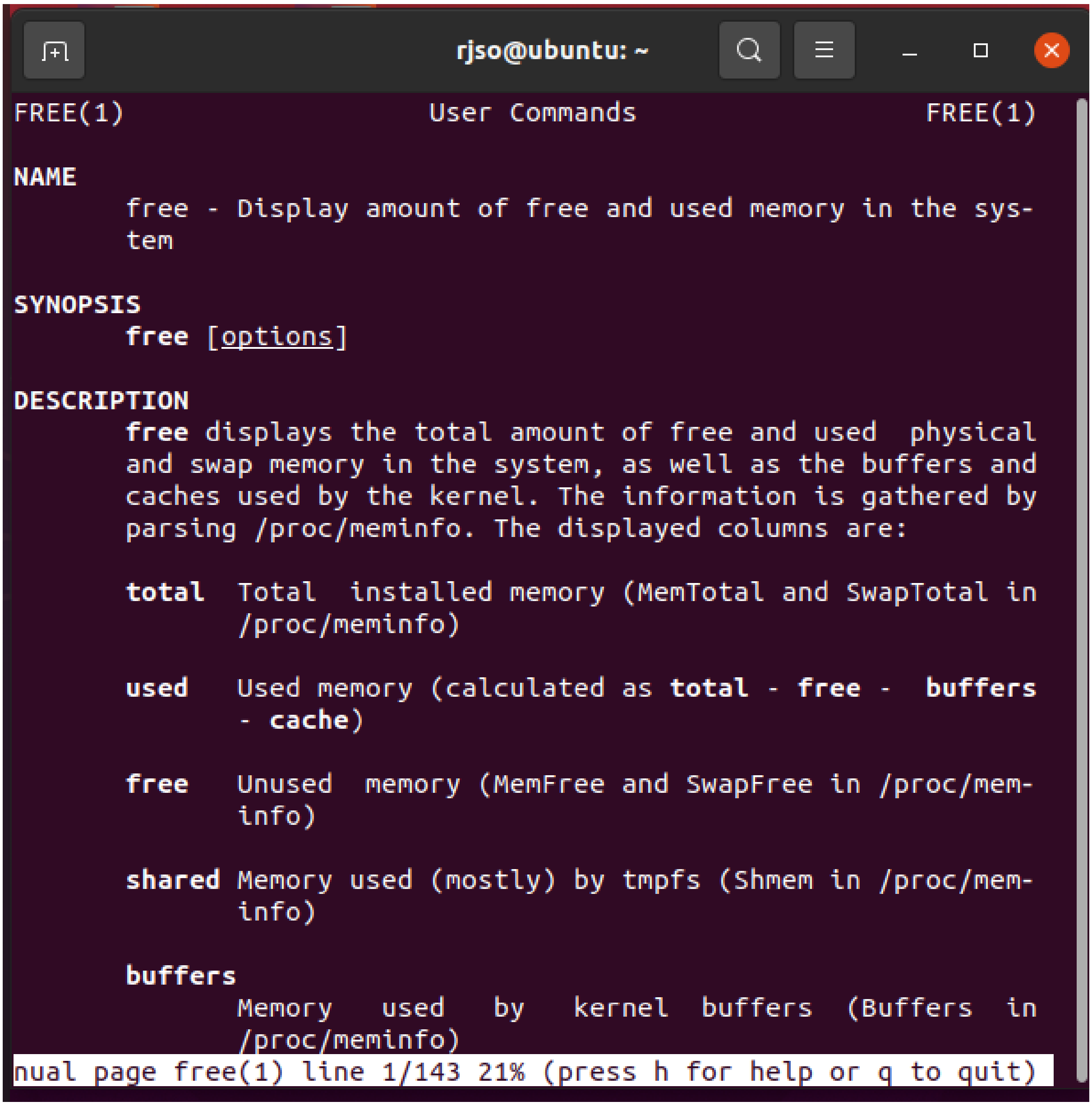
Homework (Code)
In this homework, we'll just learn about a few useful tools to examine virtual memory usage on Linux-based systems. This will only be a brief hint at what is possible; you'll have to dive deeper on your own to truly become an expert (as always!).

Questions

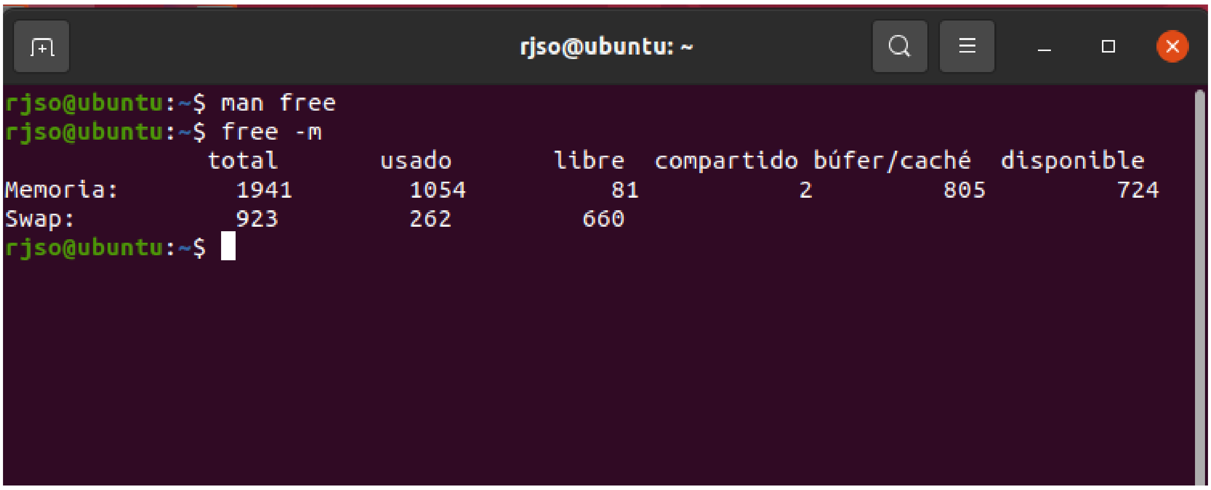
1. The first Linux tool you should check out is the very simple tool free. First, type man free and read its entire manual page; it's short, don't worry!



```
FREE(1)                    User Commands                   FREE(1)

NAME
       free - Display amount of free and used memory in the sys-
       tem

SYNOPSIS
       free [options]

DESCRIPTION
       free displays the total amount of free and used  physical
       and swap memory in the system, as well as the buffers and
       caches used by the kernel. The information is gathered by
       parsing /proc/meminfo. The displayed columns are:

       total  Total  installed memory (MemTotal and SwapTotal in
              /proc/meminfo)

       used   Used memory (calculated as total - free -  buffers
              - cache)

       free   Unused  memory (MemFree and SwapFree in /proc/mem-
              info)

       shared Memory used (mostly) by tmpfs (Shmem in /proc/mem-
              info)

       buffers
              Memory   used   by   kernel  buffers  (Buffers  in
              /proc/meminfo)
nual page free(1) line 1/143 21% (press h for help or q to quit)
```

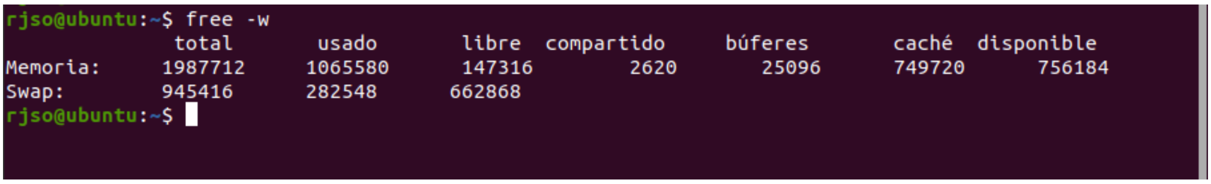
2. Now, run free, perhaps using some of the arguments that might be useful (e.g., -m, to display memory totals in megabytes). How much memory is in your system? How much is free? Do these numbers match your intuition?

free -m: Display the amount of memory in mebibytes.



```
rjso@ubuntu:~$ man free
rjso@ubuntu:~$ free -m
               total        usado        libre   compartido  búfer/caché   disponible
Memoria:        1941         1054           81            2          805          724
Swap:            923          262          660
rjso@ubuntu:~$ 
```

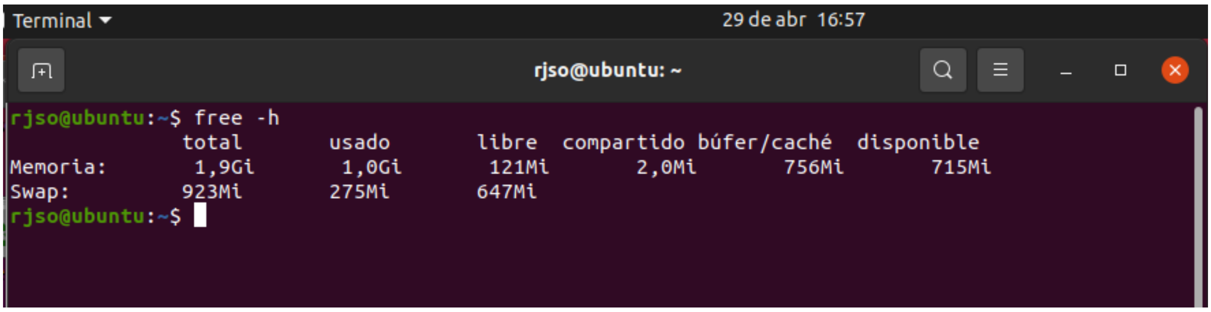
free -w: Switch to the wide mode. The wide mode produces lines longer than 80 characters. In this mode buffers and cache are reported in two separate columns.



```
rjso@ubuntu:~$ free -w
              total        usado        libre  compartido     búferes       caché   disponible
Memoria:    1987712      1065580       147316        2620        25096      749720       756184
Swap:        945416       282548       662868
rjso@ubuntu:~$ 
```

free -h: Show all output fields automatically scaled to the shortest three digit unit and display the units of print out. Following units are used.

B = bytes
Ki = kibibyte
Mi = mebibyte
Gi = gibibyte
Ti = tebibyte
Pi = pebibyte

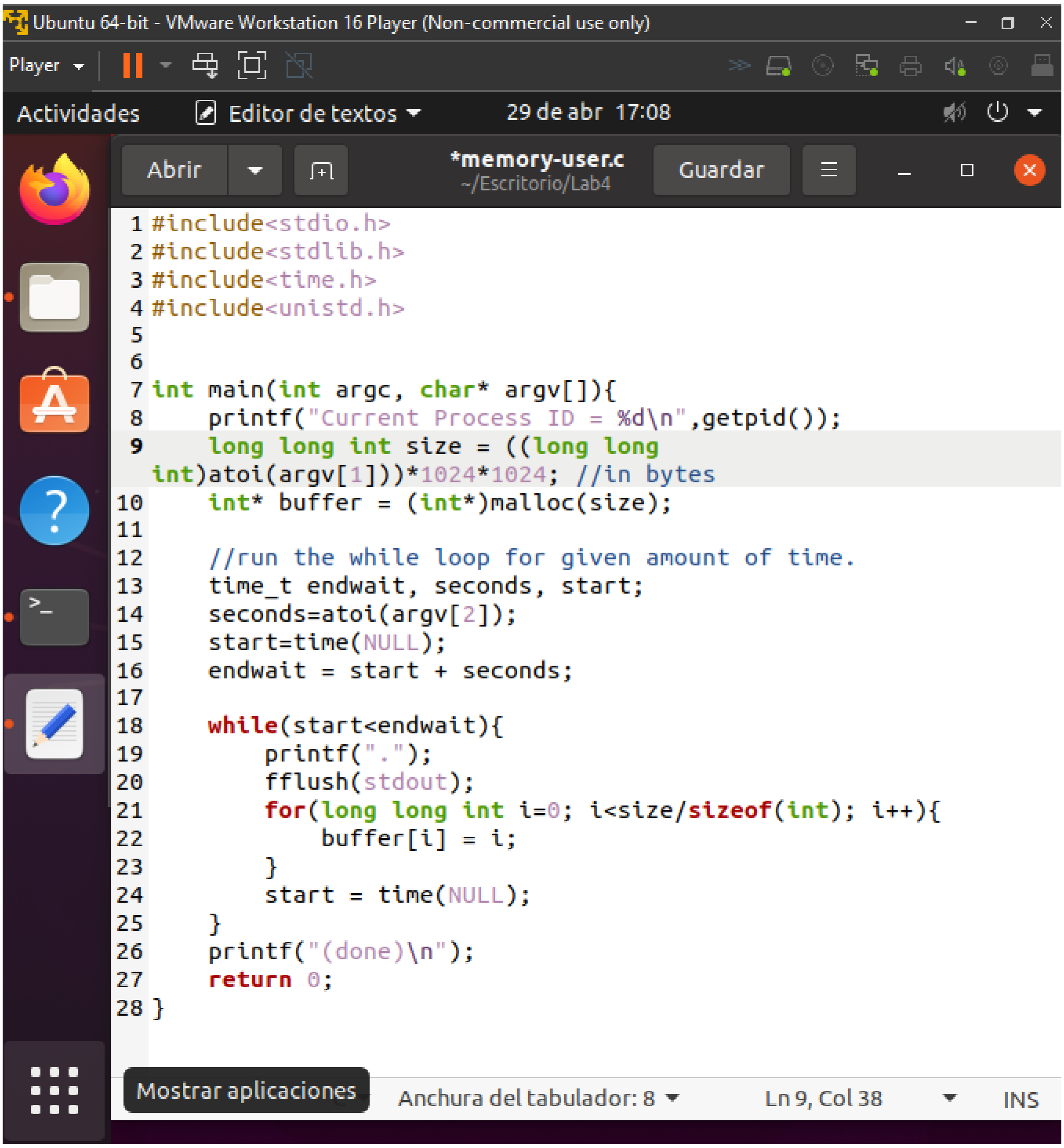


```
rjso@ubuntu:~$ free -h
              total        usado        libre  compartido búfer/caché  disponible
Memoria:       1,9Gi        1,0Gi        121Mi       2,0Mi       756Mi       715Mi
Swap:          923Mi        275Mi        647Mi
rjso@ubuntu:~$ 
```

R: La memoria total del sistema es de 1.9 gibibytes y cuenta con 121 mebibytes libres

3. Next, create a little program that uses a certain amount of memory, called memory-user.c. This program should take one command- line argument: the number of megabytes of memory it will use. When run, it should allocate an array, and constantly stream through the array, touching each entry. The program should do this indefinitely, or, perhaps, for a certain amount of time also specified at the command line.

El primer argumento es la cantidad de MB a reservar y el segundo es la cantidad mínima de segundos para ejecutar el programa.



```c
#include<stdio.h>
#include<stdlib.h>
#include<time.h>
#include<unistd.h>

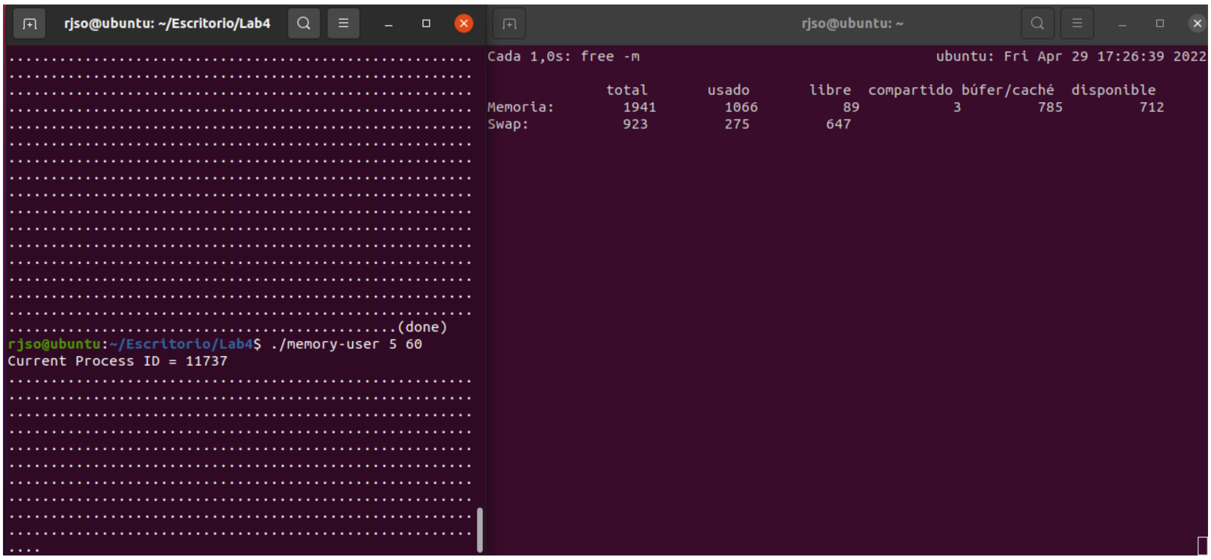

int main(int argc, char* argv[]){
    printf("Current Process ID = %d\n",getpid());
    long long int size = ((long long int)atoi(argv[1]))*1024*1024; //in bytes
    int* buffer = (int*)malloc(size);

    //run the while loop for given amount of time.
    time_t endwait, seconds, start;
    seconds=atoi(argv[2]);
    start=time(NULL);
    endwait = start + seconds;

    while(start<endwait){
        printf(".");
        fflush(stdout);
        for(long long int i=0; i<size/sizeof(int); i++){
            buffer[i] = i;
        }
        start = time(NULL);
    }
    printf("(done)\n");
    return 0;
}
```

4. Now, while running your memory-user program, also (in a different terminal window, but on the same machine) run the free tool. How do the memory usage totals change when your program is running? How about when you kill the memory-user program?
Do the numbers match your expectations? Try this for different amounts of memory usage. What happens when you use really large amounts of memory?

R: Los recursos de memoria van disminuyendo mientras más grande sea el tamaño que se indique al ejecutar el programa, pero cuando está en niveles muy bajos se termina la ejecución y se tiene que el proceso ha sido killed



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..............................................(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 5 60
Current Process ID = 11737
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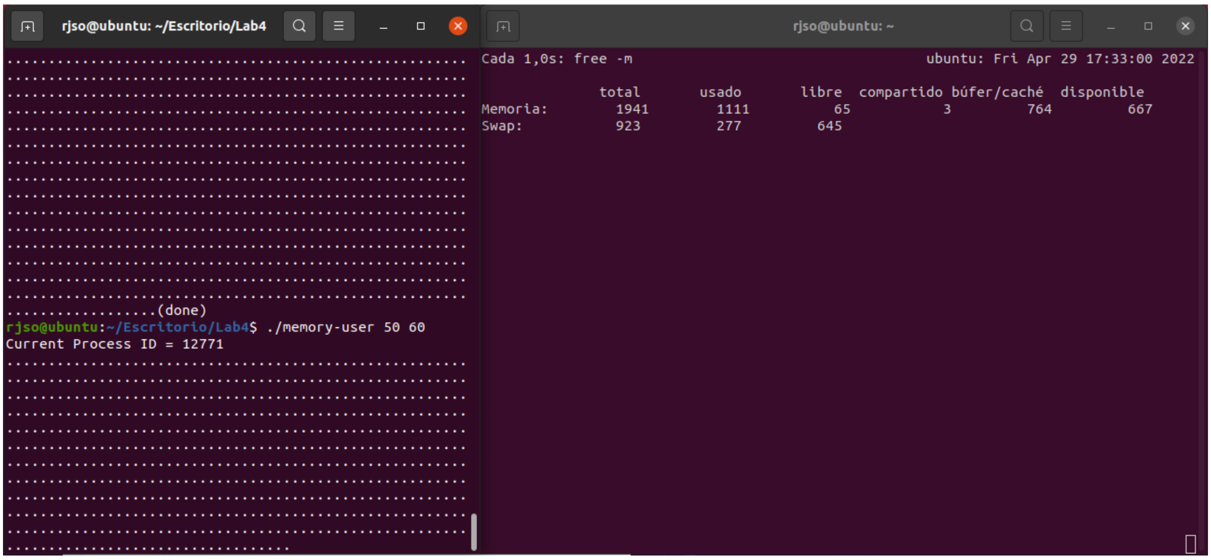
```
Cada 1,0s: free -m                                     ubuntu: Fri Apr 29 17:26:39 2022

               total        usado        libre  compartido  búfer/caché   disponible
Memoria:        1941         1066           89           3          785          712
Swap:            923          275          647
```



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..................(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 50 60
Current Process ID = 12771
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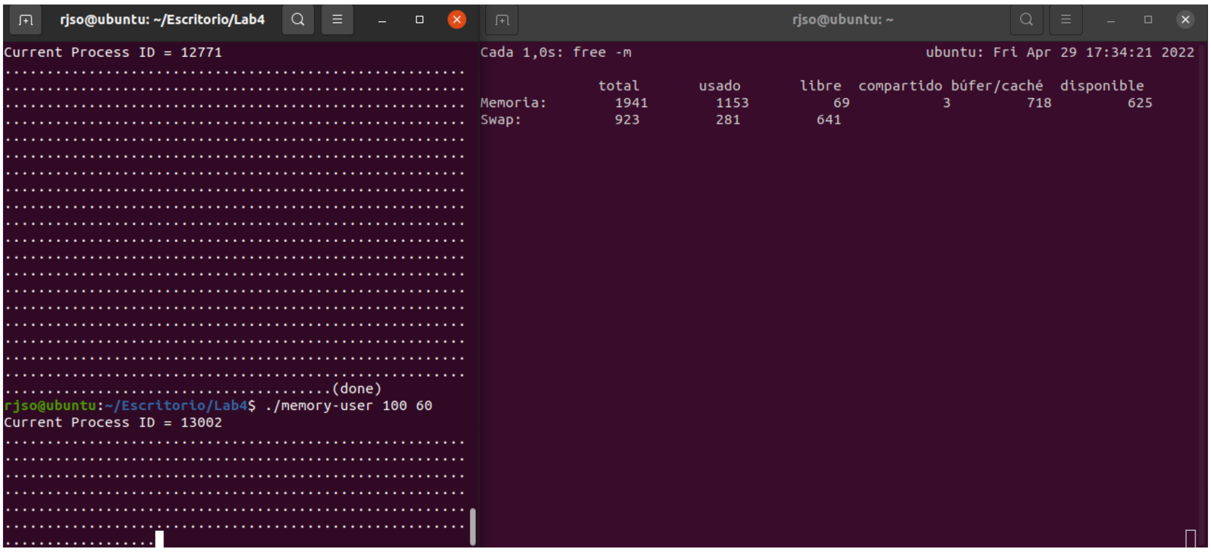
```
Cada 1,0s: free -m                                     ubuntu: Fri Apr 29 17:33:00 2022

               total        usado        libre  compartido  búfer/caché   disponible
Memoria:        1941         1111           65           3          764          667
Swap:            923          277          645
```



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Current Process ID = 12771
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.......................................(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 100 60
Current Process ID = 13002
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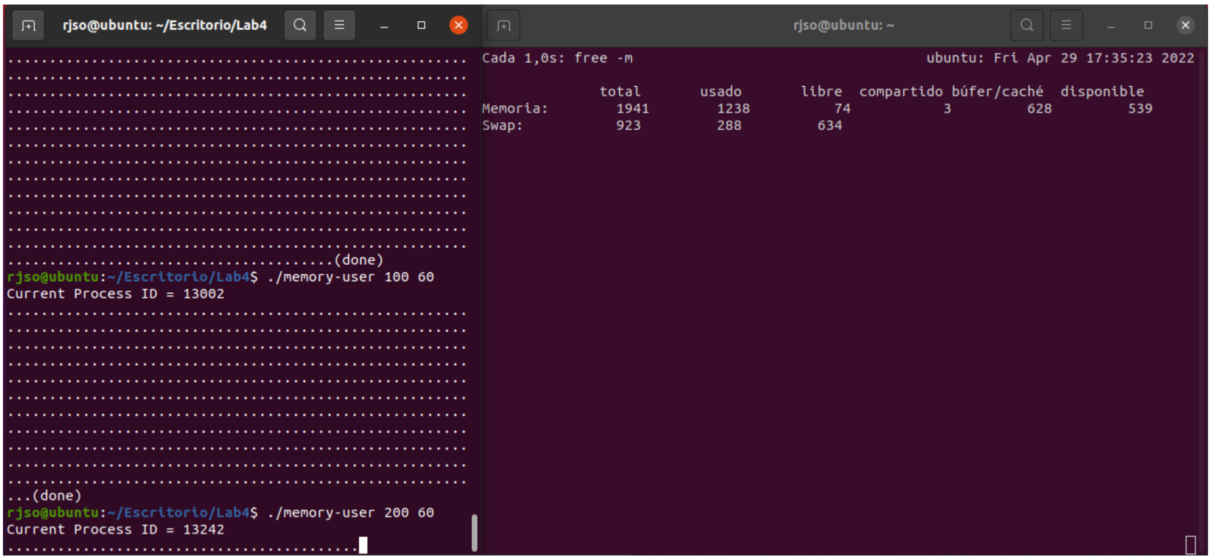
```

```
Cada 1,0s: free -m                               ubuntu: Fri Apr 29 17:34:21 2022

              total        usado        libre  compartido búfer/caché  disponible
Memoria:       1941         1153           69           3         718         625
Swap:           923          281          641
```



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.......................................(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 100 60
Current Process ID = 13002
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...(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 200 60
Current Process ID = 13242
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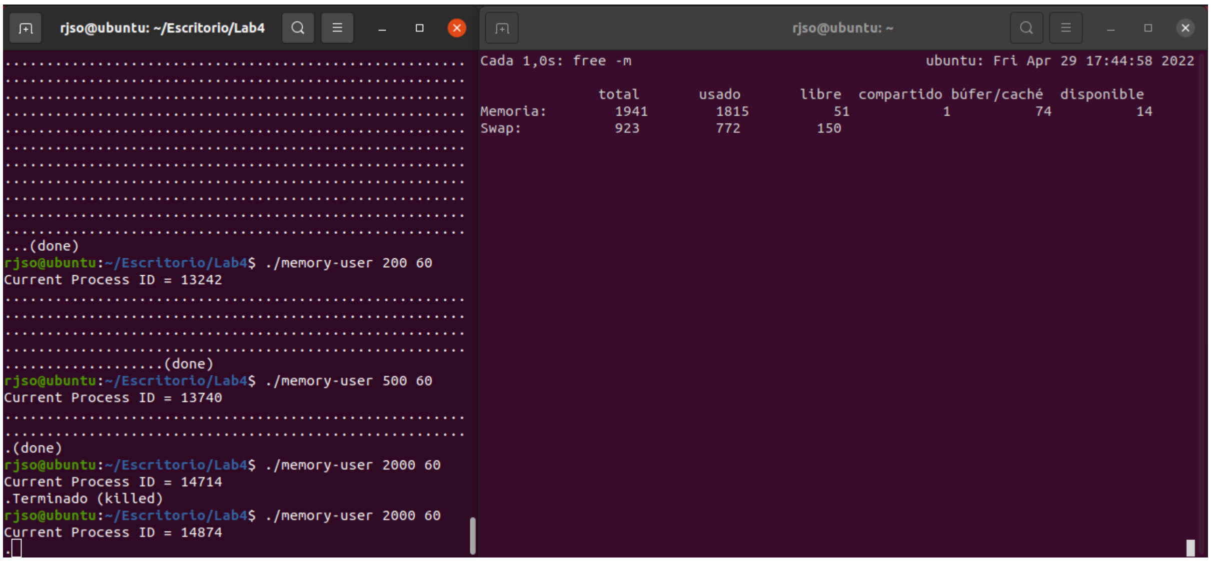
```

```
Cada 1,0s: free -m                               ubuntu: Fri Apr 29 17:35:23 2022

              total        usado        libre  compartido búfer/caché  disponible
Memoria:       1941         1238           74           3         628         539
Swap:           923          288          634
```



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.......................................................
...(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 200 60
Current Process ID = 13242
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...................(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 500 60
Current Process ID = 13740
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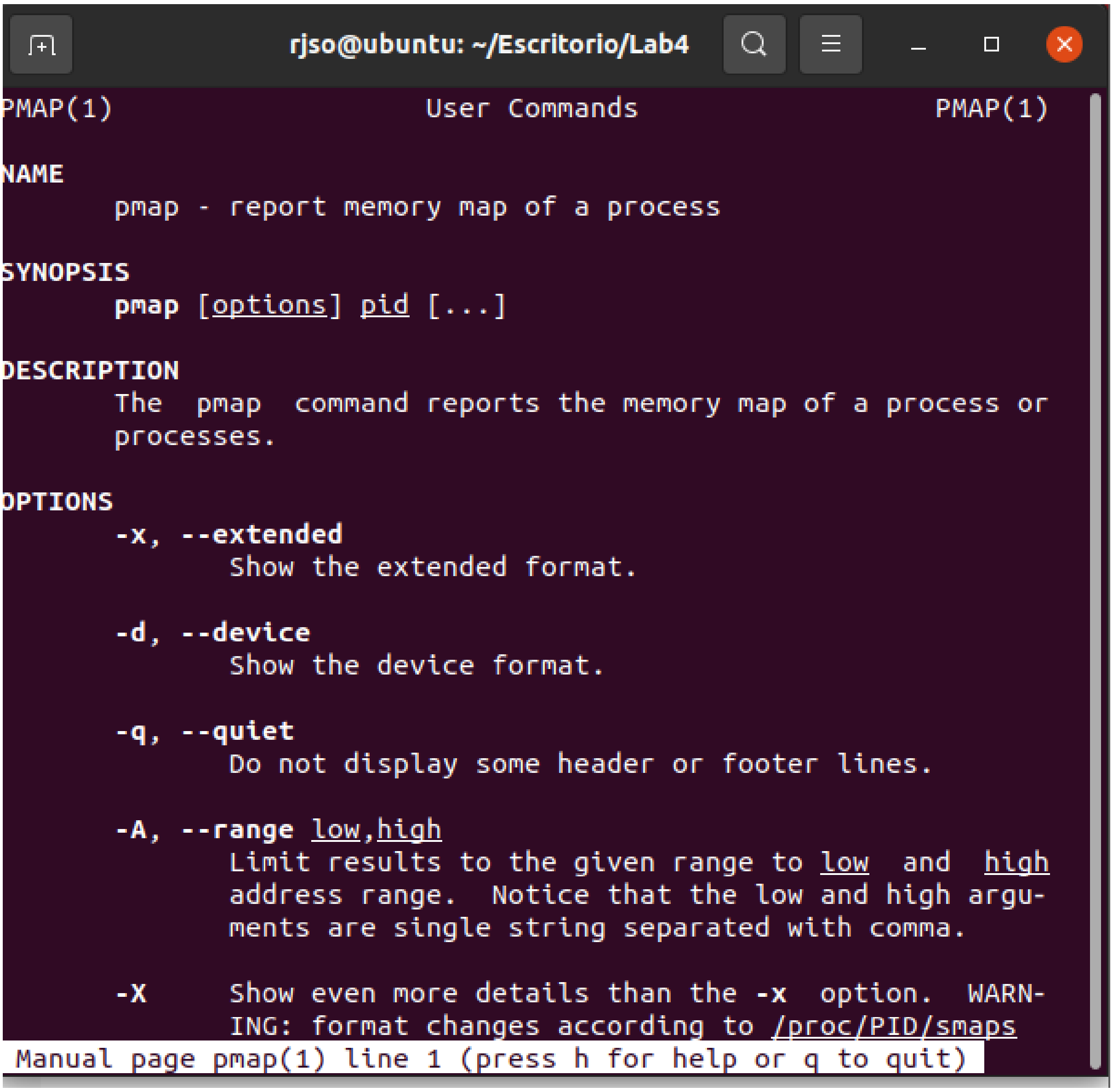
.......................................................
.(done)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 2000 60
Current Process ID = 14714
.Terminado (killed)
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 2000 60
Current Process ID = 14874
.
```

```
Cada 1,0s: free -m                               ubuntu: Fri Apr 29 17:44:58 2022

              total        usado        libre  compartido búfer/caché  disponible
Memoria:       1941         1815           51           1          74          14
Swap:           923          772          150
```

5. Let’s try one more tool, known as pmap. Spend some time, and read the pmap manual page in detail.



```
PMAP(1)                   User Commands                   PMAP(1)

NAME
       pmap - report memory map of a process

SYNOPSIS
       pmap [options] pid [...]

DESCRIPTION
       The  pmap  command reports the memory map of a process or
       processes.

OPTIONS
       -x, --extended
              Show the extended format.

       -d, --device
              Show the device format.

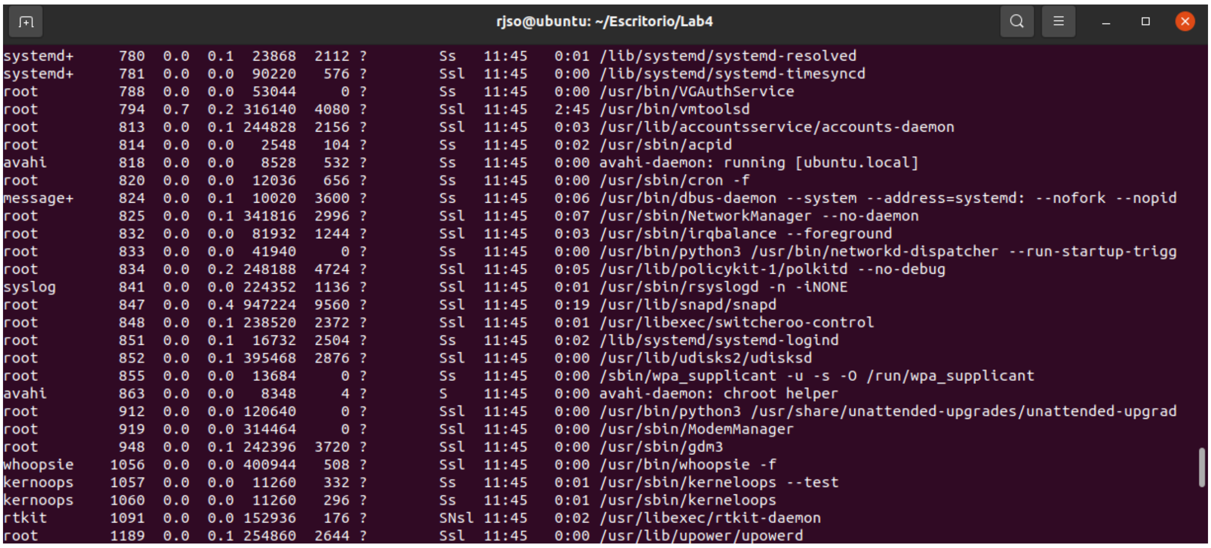
       -q, --quiet
              Do not display some header or footer lines.

       -A, --range low,high
              Limit results to the given range to low  and  high
              address range.  Notice that the low and high argu-
              ments are single string separated with comma.

       -X     Show even more details than the -x  option.  WARN-
              ING: format changes according to /proc/PID/smaps
 Manual page pmap(1) line 1 (press h for help or q to quit)
```

6. To use pmap, you have to know the process ID of the process you’re interested in. Thus, first run ps auxw to see a list of all processes; then, pick an interesting one, such as a browser. You can also use your memory-user program in this case (indeed, you can even have that program call getpid() and print out its PID for your convenience).

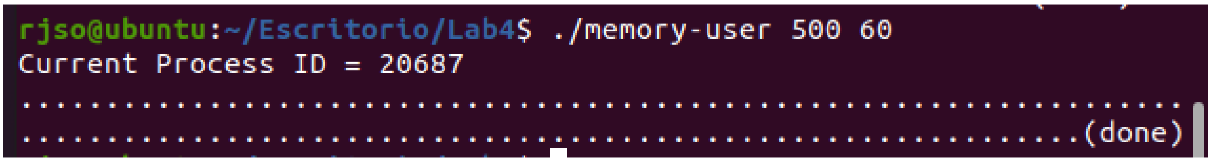
ps auxw



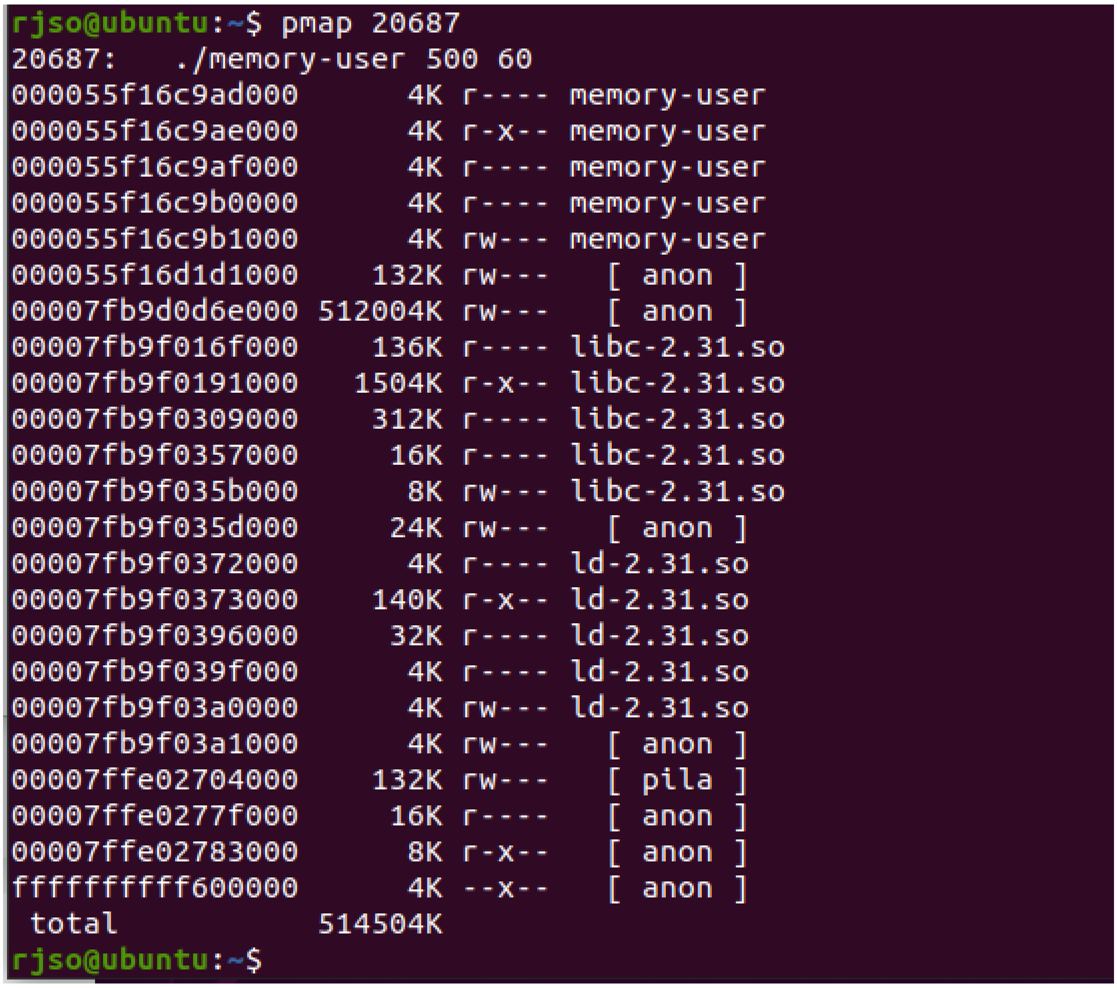
rjso@ubuntu: ~/Escritorio/Lab4

```
systemd+     780  0.0  0.1  23868  2112 ?        Ss   11:45   0:01 /lib/systemd/systemd-resolved
systemd+     781  0.0  0.0  90220   576 ?        Ssl  11:45   0:00 /lib/systemd/systemd-timesyncd
root         788  0.0  0.0  53044     0 ?        Ss   11:45   0:00 /usr/bin/VGAuthService
root         794  0.7  0.2 316140  4080 ?        Ssl  11:45   2:45 /usr/bin/vmtoolsd
root         813  0.0  0.1 244828  2156 ?        Ssl  11:45   0:03 /usr/lib/accountsservice/accounts-daemon
root         814  0.0  0.0   2548   104 ?        Ss   11:45   0:02 /usr/sbin/acpid
avahi        818  0.0  0.0   8528   532 ?        Ss   11:45   0:00 avahi-daemon: running [ubuntu.local]
root         820  0.0  0.0  12036   656 ?        Ss   11:45   0:00 /usr/sbin/cron -f
message+     824  0.0  0.1  10020  3600 ?        Ss   11:45   0:06 /usr/bin/dbus-daemon --system --address=systemd: --nofork --nopid
root         825  0.0  0.1 341816  2996 ?        Ssl  11:45   0:07 /usr/sbin/NetworkManager --no-daemon
root         832  0.0  0.0  81932  1244 ?        Ssl  11:45   0:03 /usr/sbin/irqbalance --foreground
root         833  0.0  0.0  41940     0 ?        Ss   11:45   0:00 /usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-trigg
root         834  0.0  0.2 248188  4724 ?        Ssl  11:45   0:05 /usr/lib/policykit-1/polkitd --no-debug
syslog       841  0.0  0.0 224352  1136 ?        Ssl  11:45   0:01 /usr/sbin/rsyslogd -n -iNONE
root         847  0.0  0.4 947224  9560 ?        Ssl  11:45   0:19 /usr/lib/snapd/snapd
root         848  0.0  0.1 238520  2372 ?        Ssl  11:45   0:01 /usr/libexec/switcheroo-control
root         851  0.0  0.1  16732  2504 ?        Ss   11:45   0:02 /lib/systemd/systemd-logind
root         852  0.0  0.1 395468  2876 ?        Ssl  11:45   0:00 /usr/lib/udisks2/udisksd
root         855  0.0  0.0  13684     0 ?        Ss   11:45   0:00 /sbin/wpa_supplicant -u -s -O /run/wpa_supplicant
avahi        863  0.0  0.0   8348     4 ?        S    11:45   0:00 avahi-daemon: chroot helper
root         912  0.0  0.0 120640     0 ?        Ssl  11:45   0:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrad
root         919  0.0  0.0 314464     0 ?        Ssl  11:45   0:00 /usr/sbin/ModemManager
root         948  0.0  0.1 242396  3720 ?        Ssl  11:45   0:00 /usr/sbin/gdm3
whoopsie    1056  0.0  0.0 400944   508 ?        Ssl  11:45   0:00 /usr/bin/whoopsie -f
kernoops    1057  0.0  0.0  11260   332 ?        Ss   11:45   0:01 /usr/sbin/kerneloops --test
kernoops    1060  0.0  0.0  11260   296 ?        Ss   11:45   0:01 /usr/sbin/kerneloops
rtkit       1091  0.0  0.0 152936   176 ?        SNsl 11:45   0:02 /usr/libexec/rtkit-daemon
root        1189  0.0  0.1 254860  2644 ?        Ssl  11:45   0:00 /usr/lib/upower/upowerd
```

pmap con memory-user



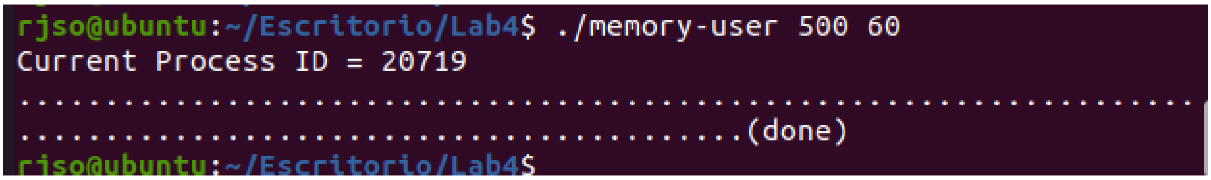
```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 500 60
Current Process ID = 20687
..................................................................
..................................................................(done)
```



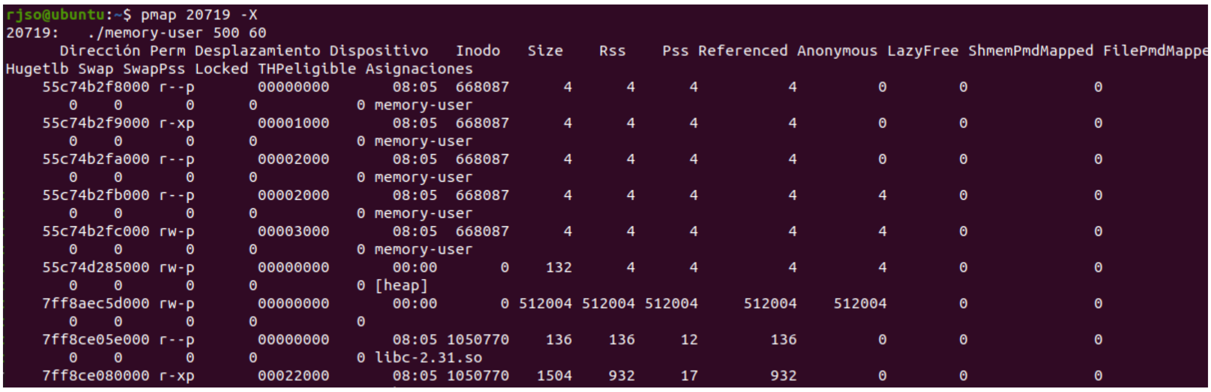
```
rjso@ubuntu:~$ pmap 20687
20687:   ./memory-user 500 60
000055f16c9ad000      4K r---- memory-user
000055f16c9ae000      4K r-x-- memory-user
000055f16c9af000      4K r---- memory-user
000055f16c9b0000      4K r---- memory-user
000055f16c9b1000      4K rw--- memory-user
000055f16d1d1000    132K rw---   [ anon ]
00007fb9d0d6e000 512004K rw---   [ anon ]
00007fb9f016f000    136K r---- libc-2.31.so
00007fb9f0191000   1504K r-x-- libc-2.31.so
00007fb9f0309000    312K r---- libc-2.31.so
00007fb9f0357000     16K r---- libc-2.31.so
00007fb9f035b000      8K rw--- libc-2.31.so
00007fb9f035d000     24K rw---   [ anon ]
00007fb9f0372000      4K r---- ld-2.31.so
00007fb9f0373000    140K r-x-- ld-2.31.so
00007fb9f0396000     32K r---- ld-2.31.so
00007fb9f039f000      4K r---- ld-2.31.so
00007fb9f03a0000      4K rw--- ld-2.31.so
00007fb9f03a1000      4K rw---   [ anon ]
00007ffe02704000    132K rw---   [ pila ]
00007ffe0277f000     16K r----   [ anon ]
00007ffe02783000      8K r-x--   [ anon ]
ffffffffff600000      4K --x--   [ anon ]
 total           514504K
rjso@ubuntu:~$
```

7. Now run pmap on some of these processes, using various flags (like-X) to reveal many details about the process. What do you see? How many different entities make up a modern address space, as opposed to our simple conception of code/stack/heap?

Flag – X, show even more details than the -x option

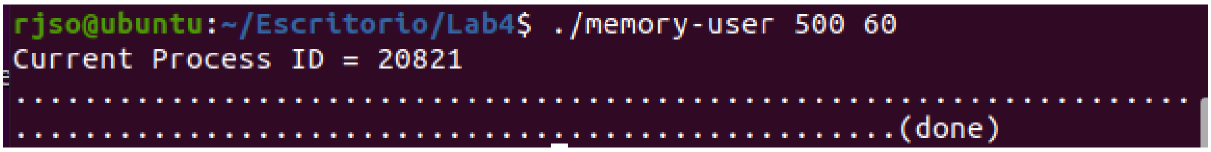


```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 500 60
Current Process ID = 20719
...................................................................
.........................................(done)
rjso@ubuntu:~/Escritorio/Lab4$
```

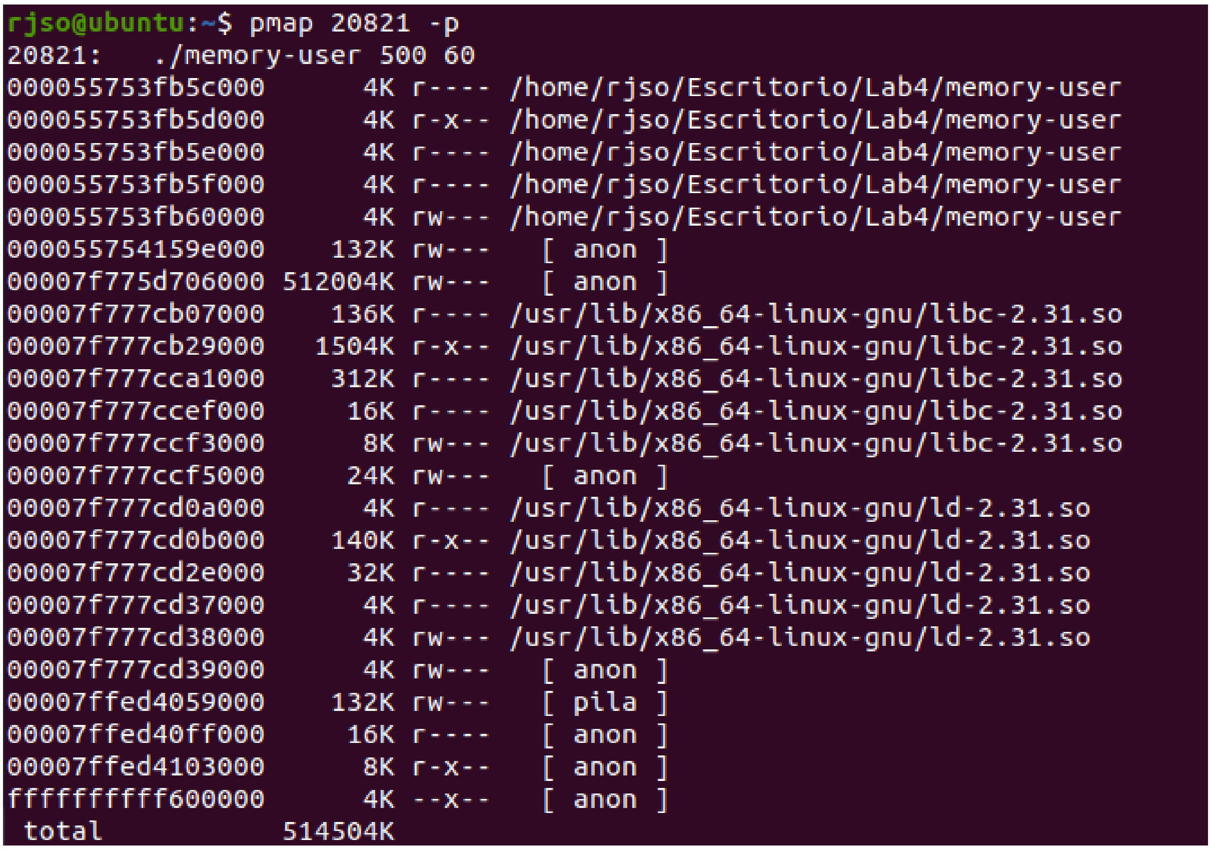


```
rjso@ubuntu:~$ pmap 20719 -X
20719:   ./memory-user 500 60
      Dirección Perm Desplazamiento Dispositivo   Inodo   Size    Rss    Pss Referenced Anonymous LazyFree ShmemPmdMapped FilePmdMappe
Hugetlb Swap SwapPss Locked THPeligible Asignaciones
    55c74b2f8000 r--p       00000000       08:05  668087      4      4      4          4         0        0              0
       0    0       0      0             0 memory-user
    55c74b2f9000 r-xp       00001000       08:05  668087      4      4      4          4         0        0              0
       0    0       0      0             0 memory-user
    55c74b2fa000 r--p       00002000       08:05  668087      4      4      4          4         0        0              0
       0    0       0      0             0 memory-user
    55c74b2fb000 r--p       00002000       08:05  668087      4      4      4          4         4        0              0
       0    0       0      0             0 memory-user
    55c74b2fc000 rw-p       00003000       08:05  668087      4      4      4          4         4        0              0
       0    0       0      0             0 memory-user
    55c74d285000 rw-p       00000000       00:00       0    132      4      4          4         4        0              0
       0    0       0      0             0 [heap]
    7ff8aec5d000 rw-p       00000000       00:00       0 512004 512004 512004     512004    512004        0              0
       0    0       0      0             0
    7ff8ce05e000 r--p       00000000       08:05 1050770    136    136     12        136         0        0              0
       0    0       0      0             0 libc-2.31.so
    7ff8ce080000 r-xp       00022000       08:05 1050770   1504    932     17        932         0        0              0
```

Flag -p, show full path to files in the mapping column



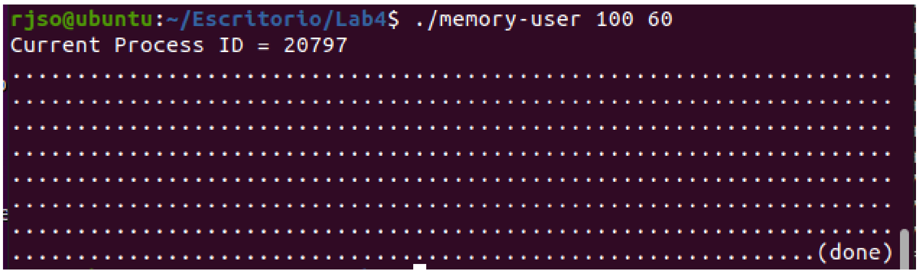
```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 500 60
Current Process ID = 20821
 ..............................................................
 ..............................................(done)
```



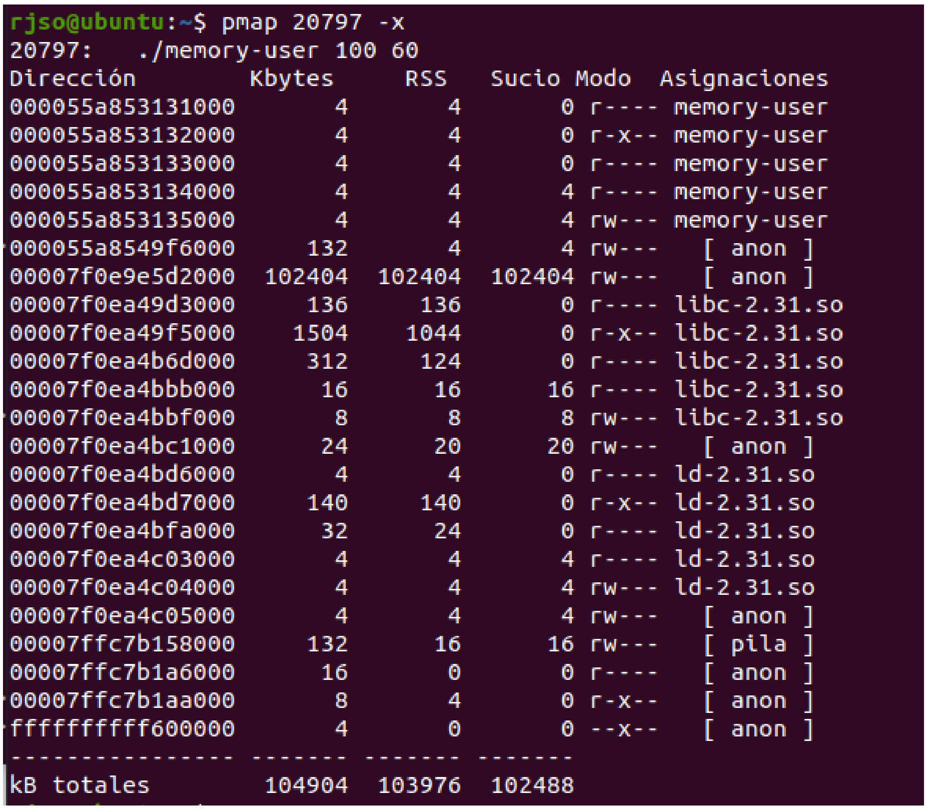
```
rjso@ubuntu:~$ pmap 20821 -p
20821:   ./memory-user 500 60
000055753fb5c000      4K r---- /home/rjso/Escritorio/Lab4/memory-user
000055753fb5d000      4K r-x-- /home/rjso/Escritorio/Lab4/memory-user
000055753fb5e000      4K r---- /home/rjso/Escritorio/Lab4/memory-user
000055753fb5f000      4K r---- /home/rjso/Escritorio/Lab4/memory-user
000055753fb60000      4K rw--- /home/rjso/Escritorio/Lab4/memory-user
000055754159e000    132K rw---   [ anon ]
00007f775d706000 512004K rw---   [ anon ]
00007f777cb07000    136K r---- /usr/lib/x86_64-linux-gnu/libc-2.31.so
00007f777cb29000   1504K r-x-- /usr/lib/x86_64-linux-gnu/libc-2.31.so
00007f777cca1000    312K r---- /usr/lib/x86_64-linux-gnu/libc-2.31.so
00007f777ccef000     16K r---- /usr/lib/x86_64-linux-gnu/libc-2.31.so
00007f777ccf3000      8K rw--- /usr/lib/x86_64-linux-gnu/libc-2.31.so
00007f777ccf5000     24K rw---   [ anon ]
00007f777cd0a000      4K r---- /usr/lib/x86_64-linux-gnu/ld-2.31.so
00007f777cd0b000    140K r-x-- /usr/lib/x86_64-linux-gnu/ld-2.31.so
00007f777cd2e000     32K r---- /usr/lib/x86_64-linux-gnu/ld-2.31.so
00007f777cd37000      4K r---- /usr/lib/x86_64-linux-gnu/ld-2.31.so
00007f777cd38000      4K rw--- /usr/lib/x86_64-linux-gnu/ld-2.31.so
00007f777cd39000      4K rw---   [ anon ]
00007ffed4059000    132K rw---   [ pila ]
00007ffed40ff000     16K r----   [ anon ]
00007ffed4103000      8K r-x--   [ anon ]
ffffffffff600000      4K --x--   [ anon ]
 total          514504K
```

8. Finally, let’s run pmap on your memory-user program, with different amounts of used memory. What do you see here? Does the output from pmap match your expectations?

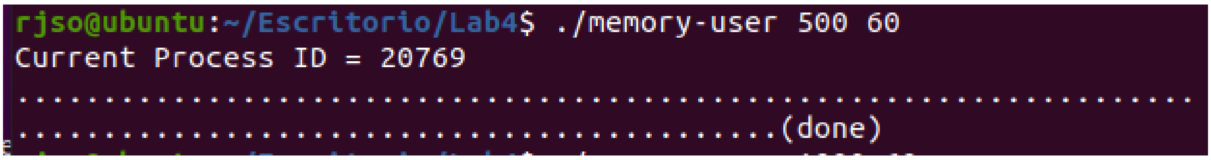
R: De igual manera se va aumentando la cantidad de mb en memory-user, pmap desglosa valores más grandes.



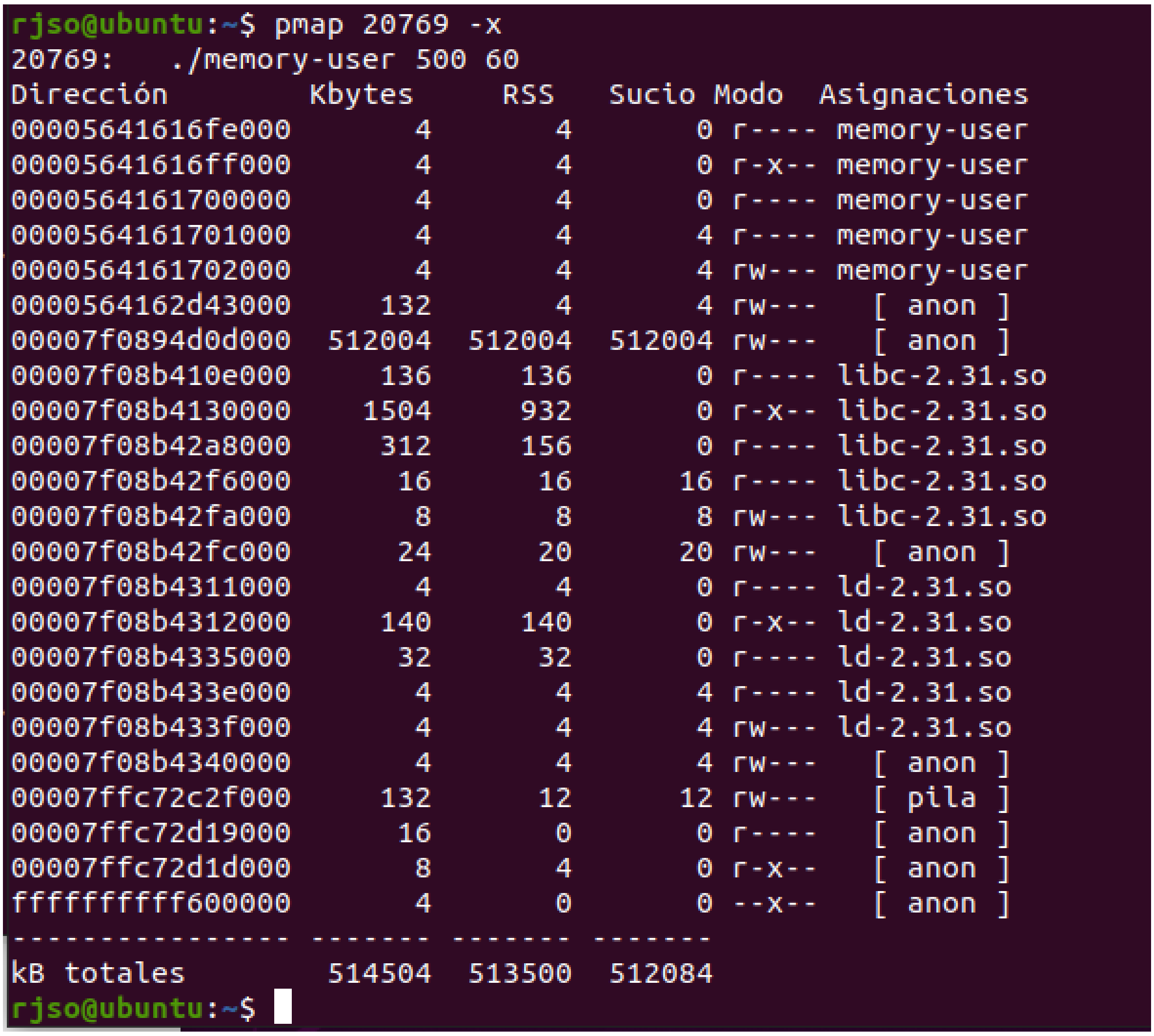
```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 100 60
Current Process ID = 20797
....................................................................
....................................................................
....................................................................
....................................................................
....................................................................
....................................................................
....................................................................
..............................................................(done)
```



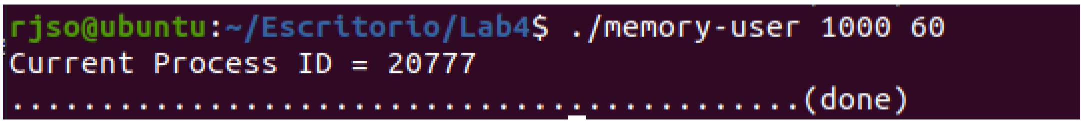
```
rjso@ubuntu:~$ pmap 20797 -x
20797:   ./memory-user 100 60
Dirección         Kbytes     RSS   Sucio Modo  Asignaciones
000055a853131000       4       4       0 r---- memory-user
000055a853132000       4       4       0 r-x-- memory-user
000055a853133000       4       4       0 r---- memory-user
000055a853134000       4       4       4 r---- memory-user
000055a853135000       4       4       4 rw--- memory-user
000055a8549f6000     132       4       4 rw---   [ anon ]
00007f0e9e5d2000  102404  102404  102404 rw---   [ anon ]
00007f0ea49d3000     136     136       0 r---- libc-2.31.so
00007f0ea49f5000    1504    1044       0 r-x-- libc-2.31.so
00007f0ea4b6d000     312     124       0 r---- libc-2.31.so
00007f0ea4bbb000      16      16      16 r---- libc-2.31.so
00007f0ea4bbf000       8       8       8 rw--- libc-2.31.so
00007f0ea4bc1000      24      20      20 rw---   [ anon ]
00007f0ea4bd6000       4       4       0 r---- ld-2.31.so
00007f0ea4bd7000     140     140       0 r-x-- ld-2.31.so
00007f0ea4bfa000      32      24       0 r---- ld-2.31.so
00007f0ea4c03000       4       4       4 r---- ld-2.31.so
00007f0ea4c04000       4       4       4 rw--- ld-2.31.so
00007f0ea4c05000       4       4       4 rw---   [ anon ]
00007ffc7b158000     132      16      16 rw---   [ pila ]
00007ffc7b1a6000      16       0       0 r----   [ anon ]
00007ffc7b1aa000       8       4       0 r-x--   [ anon ]
ffffffffff600000       4       0       0 --x--   [ anon ]
---------------- ------- ------- -------
kB totales        104904  103976  102488
```



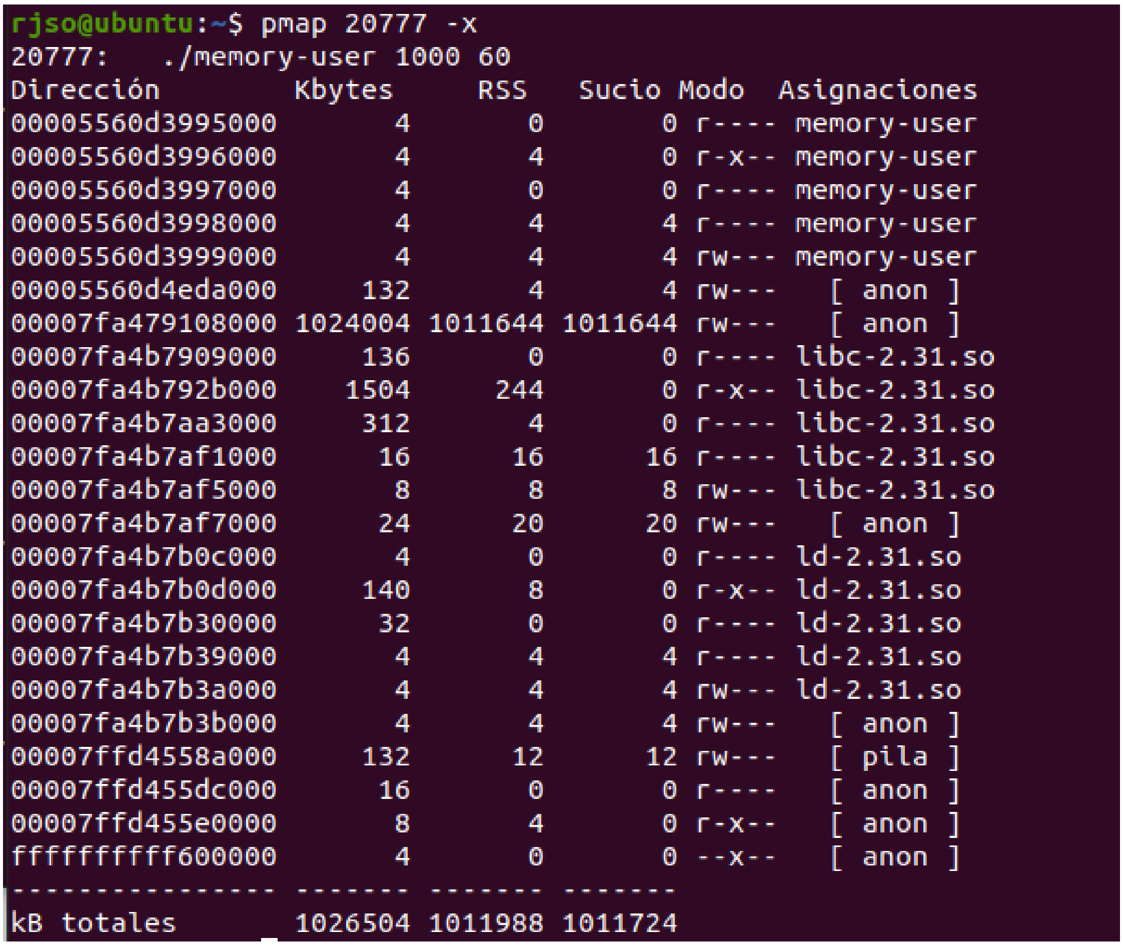
```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 500 60
Current Process ID = 20769
....................................................................
............................................(done)
```



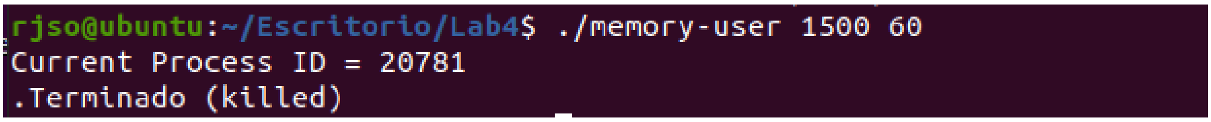
```
rjso@ubuntu:~$ pmap 20769 -x
20769:   ./memory-user 500 60
Dirección         Kbytes     RSS   Sucio Modo  Asignaciones
00005641616fe000       4       4       0 r---- memory-user
00005641616ff000       4       4       0 r-x-- memory-user
0000564161700000       4       4       0 r---- memory-user
0000564161701000       4       4       4 r---- memory-user
0000564161702000       4       4       4 rw--- memory-user
0000564162d43000     132       4       4 rw---   [ anon ]
00007f0894d0d000  512004  512004  512004 rw---   [ anon ]
00007f08b410e000     136     136       0 r---- libc-2.31.so
00007f08b4130000    1504     932       0 r-x-- libc-2.31.so
00007f08b42a8000     312     156       0 r---- libc-2.31.so
00007f08b42f6000      16      16      16 r---- libc-2.31.so
00007f08b42fa000       8       8       8 rw--- libc-2.31.so
00007f08b42fc000      24      20      20 rw---   [ anon ]
00007f08b4311000       4       4       0 r---- ld-2.31.so
00007f08b4312000     140     140       0 r-x-- ld-2.31.so
00007f08b4335000      32      32       0 r---- ld-2.31.so
00007f08b433e000       4       4       4 r---- ld-2.31.so
00007f08b433f000       4       4       4 rw--- ld-2.31.so
00007f08b4340000       4       4       4 rw---   [ anon ]
00007ffc72c2f000     132      12      12 rw---   [ pila ]
00007ffc72d19000      16       0       0 r----   [ anon ]
00007ffc72d1d000       8       4       0 r-x--   [ anon ]
ffffffffff600000       4       0       0 --x--   [ anon ]
---------------- ------- ------- -------
kB totales        514504  513500  512084
rjso@ubuntu:~$
```



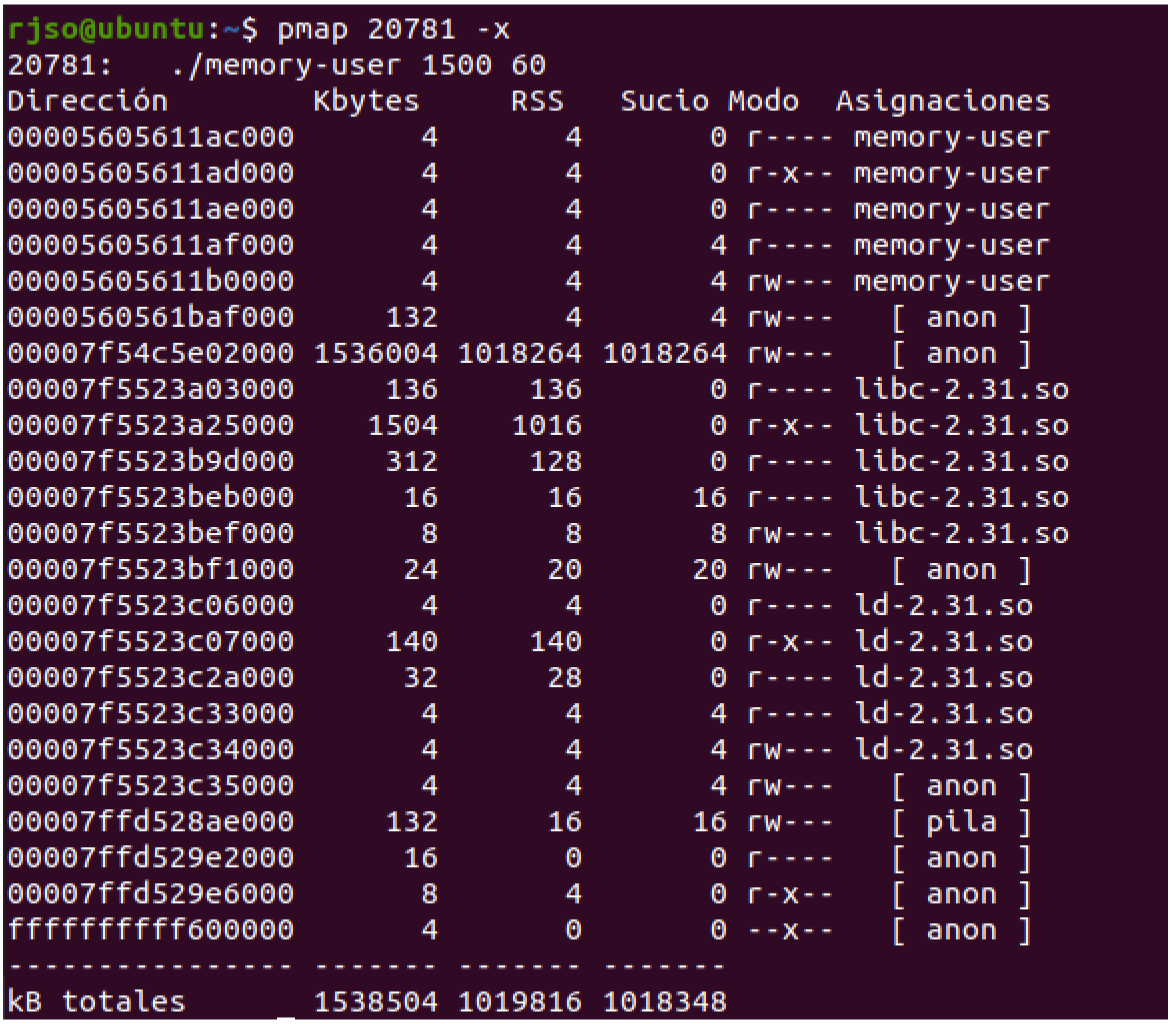
```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 1000 60
Current Process ID = 20777
.............................................(done)
```



```
rjso@ubuntu:~$ pmap 20777 -x
20777:   ./memory-user 1000 60
Dirección        Kbytes     RSS   Sucio Modo  Asignaciones
00005560d3995000       4       0       0 r---- memory-user
00005560d3996000       4       4       0 r-x-- memory-user
00005560d3997000       4       0       0 r---- memory-user
00005560d3998000       4       4       4 r---- memory-user
00005560d3999000       4       4       4 rw--- memory-user
00005560d4eda000     132       4       4 rw---   [ anon ]
00007fa479108000 1024004 1011644 1011644 rw---   [ anon ]
00007fa4b7909000     136       0       0 r---- libc-2.31.so
00007fa4b792b000    1504     244       0 r-x-- libc-2.31.so
00007fa4b7aa3000     312       4       0 r---- libc-2.31.so
00007fa4b7af1000      16      16      16 r---- libc-2.31.so
00007fa4b7af5000       8       8       8 rw--- libc-2.31.so
00007fa4b7af7000      24      20      20 rw---   [ anon ]
00007fa4b7b0c000       4       0       0 r---- ld-2.31.so
00007fa4b7b0d000     140       8       0 r-x-- ld-2.31.so
00007fa4b7b30000      32       0       0 r---- ld-2.31.so
00007fa4b7b39000       4       4       4 r---- ld-2.31.so
00007fa4b7b3a000       4       4       4 rw--- ld-2.31.so
00007fa4b7b3b000       4       4       4 rw---   [ anon ]
00007ffd4558a000     132      12      12 rw---   [ pila ]
00007ffd455dc000      16       0       0 r----   [ anon ]
00007ffd455e0000       8       4       0 r-x--   [ anon ]
ffffffffff600000       4       0       0 --x--   [ anon ]
---------------- ------- ------- -------
kB totales       1026504 1011988 1011724
```



```
rjso@ubuntu:~/Escritorio/Lab4$ ./memory-user 1500 60
Current Process ID = 20781
.Terminado (killed)
```



```
rjso@ubuntu:~$ pmap 20781 -x
20781:   ./memory-user 1500 60
Dirección        Kbytes     RSS   Sucio Modo  Asignaciones
00005605611ac000       4       4       0 r---- memory-user
00005605611ad000       4       4       0 r-x-- memory-user
00005605611ae000       4       4       0 r---- memory-user
00005605611af000       4       4       4 r---- memory-user
00005605611b0000       4       4       4 rw--- memory-user
0000560561baf000     132       4       4 rw---   [ anon ]
00007f54c5e02000 1536004 1018264 1018264 rw---   [ anon ]
00007f5523a03000     136     136       0 r---- libc-2.31.so
00007f5523a25000    1504    1016       0 r-x-- libc-2.31.so
00007f5523b9d000     312     128       0 r---- libc-2.31.so
00007f5523beb000      16      16      16 r---- libc-2.31.so
00007f5523bef000       8       8       8 rw--- libc-2.31.so
00007f5523bf1000      24      20      20 rw---   [ anon ]
00007f5523c06000       4       4       0 r---- ld-2.31.so
00007f5523c07000     140     140       0 r-x-- ld-2.31.so
00007f5523c2a000      32      28       0 r---- ld-2.31.so
00007f5523c33000       4       4       4 r---- ld-2.31.so
00007f5523c34000       4       4       4 rw--- ld-2.31.so
00007f5523c35000       4       4       4 rw---   [ anon ]
00007ffd528ae000     132      16      16 rw---   [ pila ]
00007ffd529e2000      16       0       0 r----   [ anon ]
00007ffd529e6000       8       4       0 r-x--   [ anon ]
ffffffffff600000       4       0       0 --x--   [ anon ]
---------------- ------- ------- -------
kB totales       1538504 1019816 1018348
```