How much memory users uses in GNU / Linux and FreeBSD - Commands and Scripts to find user memory usage on Linux

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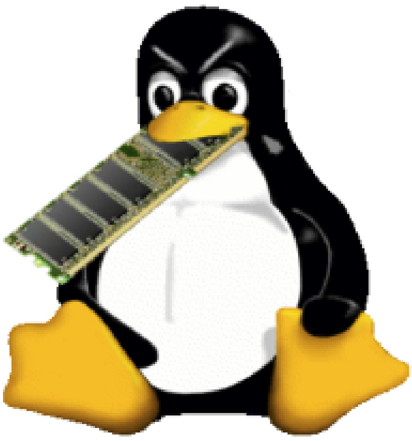


If you have to **administrate a heterogenous network with Linux and FreeBSD or other UNIX like OSes** you should sooner or later need for scripting purposes to have a way to list how much memory separate users take up on your system. Listing memory usage per user is very helpful for admins who manager free-shells or for companies where you have developers, developing software directly on the server via ssh. Being able to check which process eats up most memory is essential for every UNIX / Linux sysadmin, because often we as admins setup (daemons) on servers and we forgot about their existence, just t**o remember they exist 2 years later and see the server is crashing because of memory exhaustion.** Tracking server bottlenecks where RAM memory and Swapping is the bottleneck is among the main swiss amry knives of admins. Checking which user occupies all server memory is among the routine tasks we're forced to do as admins, but because nowdays servers have a lot of memory and we put on servers often much more memory than ever will be used **many admins forget to routinely track users / daemons memory consumption or even many probably doesn't know how.** Probably all are aware of the **easiest wy to get list of all users memory in console non interactively with `free` command, e.g.:**

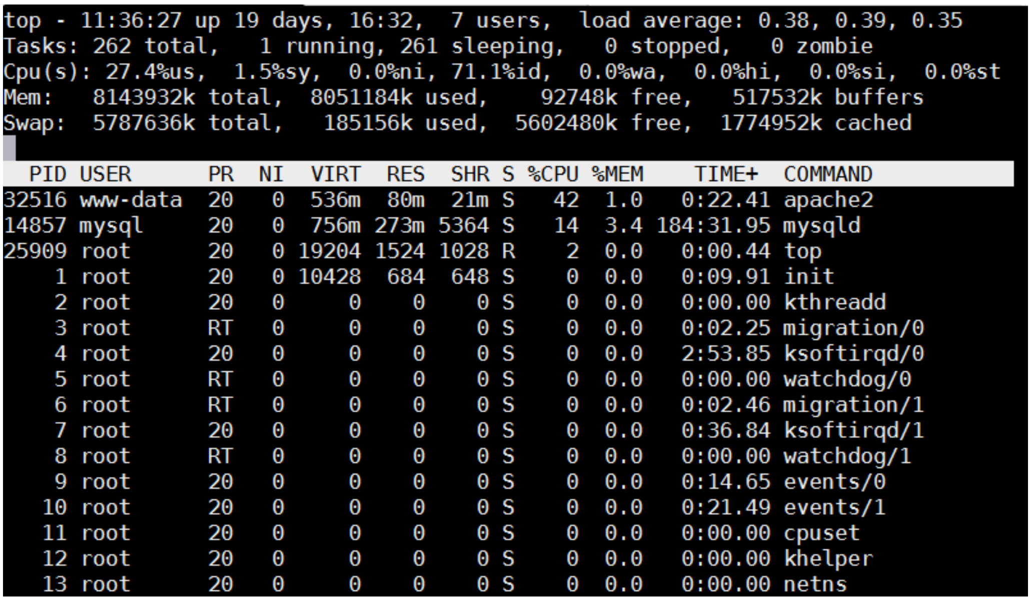
```
free -m
```

```
             total       used       free     shared    buffers     cached
Mem:         32236      26226       6010          0        983       8430
-/+ buffers/cache:      16812      15424
Swap:        62959        234      62725
```

but unfortunately ***free*** command only shows overall situation with memory and doesn't **divide memory usage by user**

Thus probably to track memory users the only known way for most pepole is to (**interactively**) use good old **top** command or if you like modern (colorful) visualization with **htop**:

```
debian:~# top
```

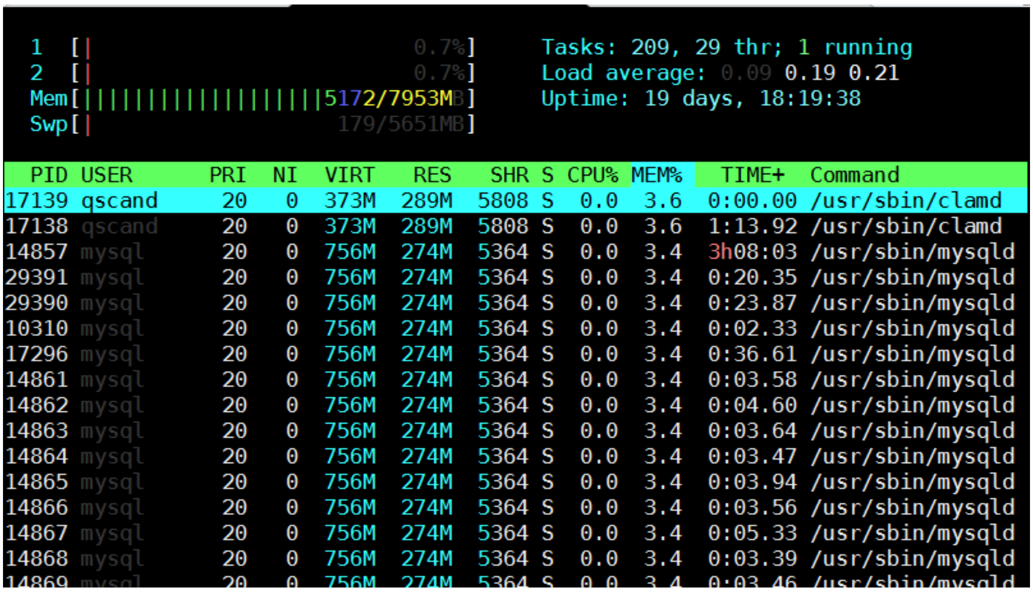


```
top - 11:36:27 up 19 days, 16:32,  7 users,  load average: 0.38, 0.39, 0.35
Tasks: 262 total,   1 running, 261 sleeping,   0 stopped,   0 zombie
Cpu(s): 27.4%us,  1.5%sy,  0.0%ni, 71.1%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:   8143932k total,  8051184k used,    92748k free,   517532k buffers
Swap:  5787636k total,   185156k used,  5602480k free,  1774952k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
32516 www-data  20   0  536m  80m  21m S   42  1.0   0:22.41 apache2
14857 mysql     20   0  756m 273m 5364 S   14  3.4 184:31.95 mysqld
25909 root      20   0 19204 1524 1028 R    2  0.0   0:00.44 top
    1 root      20   0 10428  684  648 S    0  0.0   0:09.91 init
    2 root      20   0     0    0    0 S    0  0.0   0:00.00 kthreadd
    3 root      RT   0     0    0    0 S    0  0.0   0:02.25 migration/0
    4 root      20   0     0    0    0 S    0  0.0   2:53.85 ksoftirqd/0
    5 root      RT   0     0    0    0 S    0  0.0   0:00.00 watchdog/0
    6 root      RT   0     0    0    0 S    0  0.0   0:02.46 migration/1
    7 root      20   0     0    0    0 S    0  0.0   0:36.84 ksoftirqd/1
    8 root      RT   0     0    0    0 S    0  0.0   0:00.00 watchdog/1
    9 root      20   0     0    0    0 S    0  0.0   0:14.65 events/0
   10 root      20   0     0    0    0 S    0  0.0   0:21.49 events/1
   11 root      20   0     0    0    0 S    0  0.0   0:00.00 cpuset
   12 root      20   0     0    0    0 S    0  0.0   0:00.00 khelper
   13 root      20   0     0    0    0 S    0  0.0   0:00.00 netns
```

Once top runs interactive press 'm' to **get ordered list of processes which occupy most system memory on Linux server**.Top process use status statistics will refresh by default every '3.0' seconds to change that behavior to '1' second press s and type '1.0'. To get Sort by Memory Use in **htop** also press 'm'

```
[root@mail-server ~]# htop
```



```
  1  [|                          0.7%]     Tasks: 209, 29 thr; 1 running
  2  [|                          0.7%]     Load average: 0.09 0.19 0.21
  Mem[|||||||||||||||||||5172/7953MB]     Uptime: 19 days, 18:19:38
  Swp[|                     179/5651MB]

  PID USER       PRI  NI  VIRT   RES   SHR S  CPU% MEM%   TIME+  Command
17139 qscand      20   0  373M  289M  5808 S   0.0  3.6  0:00.00 /usr/sbin/clamd
17138 qscand      20   0  373M  289M  5808 S   0.0  3.6  1:13.92 /usr/sbin/clamd
14857 mysql       20   0  756M  274M  5364 S   0.0  3.4  3h08:03 /usr/sbin/mysqld
29391 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:20.35 /usr/sbin/mysqld
29390 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:23.87 /usr/sbin/mysqld
10310 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:02.33 /usr/sbin/mysqld
17296 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:36.61 /usr/sbin/mysqld
14861 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.58 /usr/sbin/mysqld
14862 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:04.60 /usr/sbin/mysqld
14863 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.64 /usr/sbin/mysqld
14864 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.47 /usr/sbin/mysqld
14865 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.94 /usr/sbin/mysqld
14866 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.56 /usr/sbin/mysqld
14867 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:05.33 /usr/sbin/mysqld
14868 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.39 /usr/sbin/mysqld
14869 mysql       20   0  756M  274M  5364 S   0.0  3.4  0:03.46 /usr/sbin/mysqld
```

However if you need to be involved in scripting and setting as a cron job tasks to be performed in case if high memroy consumption by a service you will need to use few lines of code. **Below are few examples on how Linux user memory usage can be shown with `ps` cmd.**

Probably the **most universal way to see memory usage by users on Debian / Ubuntu / CentOS / RHEL and BSDs (FreeBSD / NetBSD)** is with below one liner:

```
server:~# ps hax -o rss,user | awk '{a[$2]+=$1;}END{for(i in a)print i" "int(a[i]/1024+0.5);}' | sort -rnk2
```

```
daemon 0
debian-tor 63
dnscache 1
dnslog 0
hipo 21
messagebus 1
mysql 268
ntp 2
privoxy 1
proftpd 1
qmaill 0
qmailq 0
qmailr 0
qmails 0
qscand 291
root 94
shellinabox 1
snmp 1
statd 1
vpopmail 80
www-data 6765
```

Output is in MBs

Below is output from machine where this **blog is running, the system runs (Apache + PHP + MySQL Webserver + Qmail Mail server and Tor) on Debian GNU / Linux.**

To get **more human readable** (but obscure to type - useful for scripting) **output list of which user takes how much memory use on deb / rpm etc. based Linux :**

```
server:~# echo "USER                 RSS      PROCS" ; echo "-------------------- -------- -----" ; \
ps hax -o rss,user | awk '{rss[$2]+=$1;procs[$2]+=1;}END{for(user in rss) printf "%-20s %8.0f %5.0f\n", user, rss[user]/1024, procs[user];}' | sort -rnk2
```

```
USER                 RSS      PROCS
-------------------- -------- -----
```

```
www-data           6918   100
qscand            291     2
mysql            273     1
root            95   120
vpopmail           81     4
debian-tor           63     1
hipo            21    15
ntp            2     1
statd            1     1
snmp             1     1
shellinabox            1     2
proftpd             1     1
privoxy             1     1
messagebus             1     1
dnscache             1     1
qmails             0     2
qmailr             0     1
qmailq              0     2
qmaill             0     4
dnslog             0     1
daemon               0     2
```

It is possible to **get the list of memory usage listed in percentage proportion, with a tiny for bash loop and some awk + process list command**

```
  TOTAL=$(free | awk '/Mem:/ { print $2 }')
for USER in $(ps haux | awk '{print $1}' | sort -u)
do
   ps hux -U $USER | awk -v user=$USER -v total=$TOTAL '{ sum += $6 } END { printf
"%s %.2f\n", user, sum / total * 100; }'
done
```

```
  107 1.34
115 2.10
119 1.34
daemon 1.32
dnscache 1.34
dnslog 1.32
```

```
hipo 1.59
mysql 4.79
ntp 1.34
privoxy 1.33
proftpd 1.32
qmaill 1.33
qmailq 1.33
qmailr 1.32
qmails 1.33
qscand 4.98
root 1.33
snmp 1.33
statd 1.33
vpopmail 2.35
www-data 86.48
```

Also a raw script which can be easily extended to give you some custom information on memory use by user list_memory_use_by_user.sh is here.

You can also want to debug further how much memory a certain users (lets say user **mysql** and my username **hipo**) is allocating, this can easily be achieved **ps** like so:

```
 root@pcfreak:~# ps -o size,pid,user,command -u mysql --sort -size
 SIZE   PID USER     COMMAND
796924 14857 mysql   /usr/sbin/mysqld --basedir=/usr --datadir=/var/lib/mysql --plugin-dir=/usr/lib/mysql/plugin --user=mysql --pid-file=/var/run/mysqld/mysqld.pid
--socket=/var/run/mysqld/mysqld.sock --port=3306
```

```
 root@pcfreak~# ps -o size,pid,user,command -u hipo --sort -size|less
 SIZE   PID USER     COMMAND
13408 19063 hipo     irssi
 3168 19020 hipo     SCREEN
 2940  2490 hipo     -bash
 1844 19021 hipo     /bin/bash
 1844 19028 hipo     /bin/bash
 1844 19035 hipo     /bin/bash
 1844 19042 hipo     /bin/bash
 1844 19491 hipo     /bin/bash
 1844 22952 hipo     /bin/bash
  744  2487 hipo     sshd: hipo@pts/0
```

```
744  2516 hipo     sshd: hipo@notty
524  2519 hipo     screen -r
412  2518 hipo     /usr/lib/openssh/sftp-server
```

You see from below output user running with **www-data** (this is **Apache Webserver** user in Debian) is eating **86.48%** of overall system memory and **MySQL server user is using only 4.79% of available memory**

Output is shown in Megabytes per username memory usage, and user memory usage is ordered (stepping-down / descentive) from top to bottom

Getting more thoroughful and easier to read reporting without beeing a 31337 bash coder you can install and use on Linux **smem** - memory reporting tool .

SMEM can provide you with following memory info:

- **system overview listing**
- **listings by process, mapping, user**
- **filtering by process, mapping, or user**
- **configurable columns from multiple data sources**
- **configurable output units and percentages**
- **configurable headers and totals**
- **reading live data from /proc**
- **reading data snapshots from directory mirrors or compressed tarballs**
- **lightweight capture tool for embedded systems**
- **built-in chart generation**

Installing smem on **Debian 6 / 7 / Ubuntu 14.04 / Turnkey Linux** etc. servers is done with standard:

```
   debian:~# apt-get install --yes smem
....
```

To install smem on CentOS 6 / 7:

```
  [root@centos ~ ]# yum -y install smem
....
```

On Slackware and other Linux-es where smem is not available as a package you can install it easily from binary archive with:

```
  cd /tmp/
wget http://www.selenic.com/smem/download/smem-1.3.tar.gz
tar xvf smem-1.3.tar.gz
sudo cp /tmp/smem-1.3/smem /usr/local/bin/
sudo chmod +x /usr/local/bin/smem
```

Two most common smem uses are:

```
  root@mail:~# smem -u
User     Count     Swap      USS      PSS      RSS
dnslog       1       44       48       54      148
qmaill       4      232      124      145      464
hipo        11    13552     8596     9171    13160
qscand       2     4500   295336   295602   297508
root       188   217312  4521080  4568699  7712776
```

Below command shows (**-u** - Report memory usage by user, **-t** - show totals, **-k** - show unix suffixes)

```
  root@mail:~# smem -u -t -k
User     Count     Swap      USS      PSS      RSS
dnslog       1    44.0K    48.0K    54.0K   148.0K
qmaill       4   232.0K   124.0K   145.0K   464.0K
hipo        11    13.2M     8.4M     9.0M    12.9M
qscand       2     4.4M   288.4M   288.7M   290.5M
root       188   212.2M     4.3G     4.4G     7.4G
---------------------------------------------------
           206   230.1M     4.6G     4.6G     7.7G
```

To **get users memory use by percentage with smem**:

```
  root@mail:~# smem -u -p
User     Count     Swap      USS      PSS      RSS
dnslog       1    0.00%    0.00%    0.00%    0.00%
qmaill       4    0.00%    0.00%    0.00%    0.01%
hipo        11    0.17%    0.11%    0.11%    0.16%
qscand       2    0.05%    3.63%    3.63%    3.66%
root       194    2.64%   56.18%   56.77%   95.56%
```

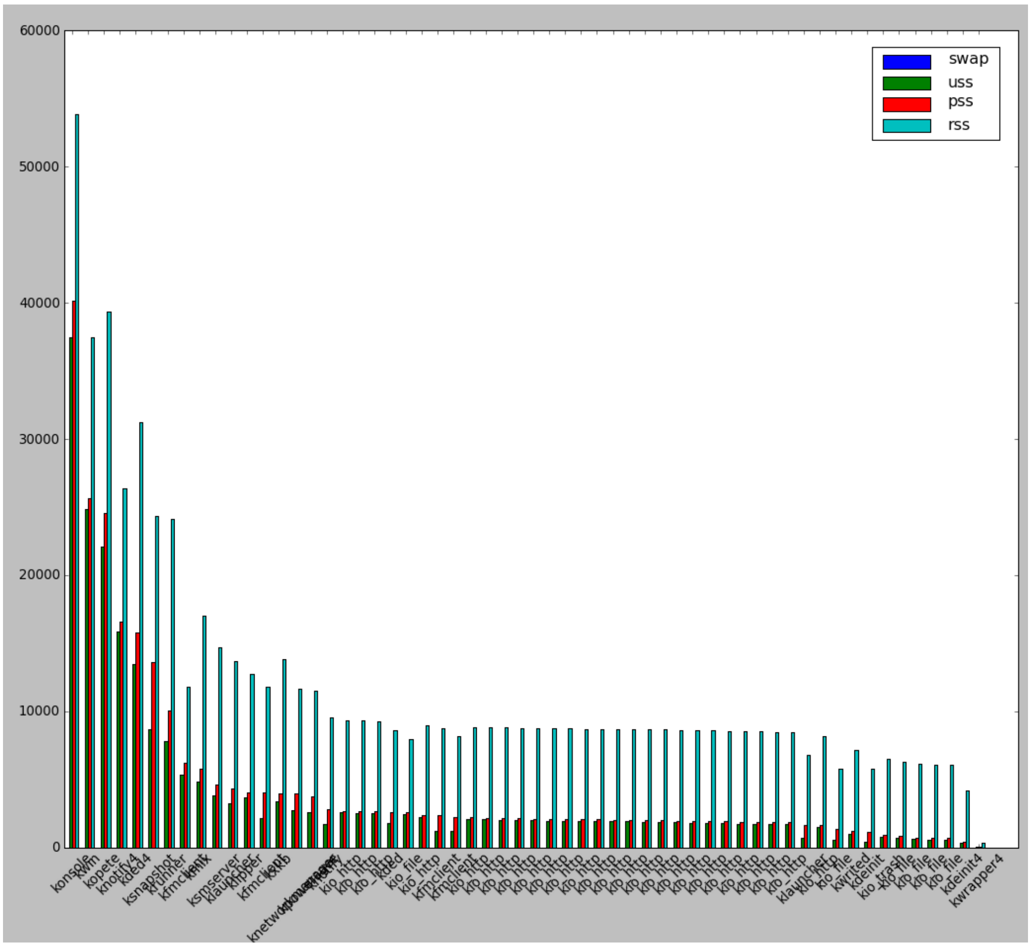
It is also useful sometimes when you want to **debug system overloads caused by external hardware drivers loaded into kernel causing issues to get list of system wide memory use sorted by user**

```
   root@mail:~# smem -w -p
Area                           Used      Cache   Noncache
firmware/hardware             0.00%      0.00%      0.00%
```

```
kernel image              0.00%      0.00%      0.00%
kernel dynamic memory       38.30%     36.01%      2.28%
userspace memory            60.50%      0.98%     59.53%
free memory                1.20%      1.20%      0.00%
```

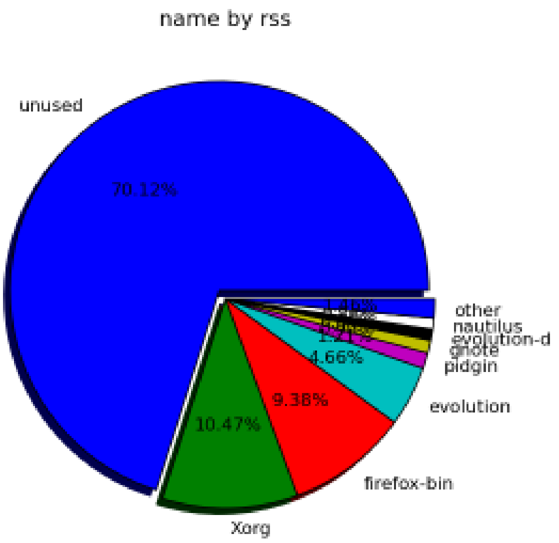
smem is very nice as if you're running it on a Desktop Linux system with Xserver installed you can see also graphical output of memory use by application:

```
root@desktop-pc:~# smem --bar pid -c "pss uss"
```



smem can even **generate graphical pie charts to visualize better memory use**

```
root@desktop-pc:~# smem -P '^k' --pie=name
```



If there is a high percentage shown in **firmware/hardware** this means some buggy module is loaded in kernel eating up memory, to fix it debug further and remove the problematic module.
userspace memory actually shows the percantage of memory out of all server available RAM that is being consumed by applications (non kernel and other system processes which make the system move). You see in above example the kernel itself is consuming about 40% of system overall available memory.

We all know the **SWAP** field stands for hard disk drive used as a memory when system is out, but there are 3 fields which **smem** will report which will be probably unclear for most here is also explanation on **what USS / PSS / RSS means?**

RSS is the *Resident Set Size* and is used to show how much memory is allocated to that process and is in RAM. It does not include memory that is swapped out. It does include memory from shared libraries as long as the pages from those libraries are actually in memory. It does include all stack and heap memory too.

There is also **PSS** (*proportional set size*). This is a newer measure which tracks the shared memory as a proportion used by the current process. So if there were two processes using the same shared library from before.

USS stands for *Unique set size*, USS is just the unshared page count, i.e. memory returned when process is killed

PSS = *Proportional set size,* (*PSS*), is a more meaningful representation of the amount of memory used by libraries and applications in a virtual memory system.
Because large portions of physical memory are typically shared among multiple applications, the standard measure of memory usage known as resident set size (RSS) will significantly overestimate memory usage. The parameter PSS instead measures each application’s “fair share” of each shared area to give a realistic measure. For most admins checking out the output from **RSS** (output) should be enough, **it will indicate which user and therefore which daemon is eating up all your memory** and will help you to **catch problematic services which are cause your server to run out of RAM** and **start swapping to disk.**