Данные о текущей конфигурации операционной системы

- Общий объем оперативной памяти: 1870900 КБ = 1827,05 МБ = 1,78 ГБ
- Объем раздела подкачки: 839676 КБ = 820 МБ
- Размер страницы виртуальной памяти: 4096 КБ
- Объем свободной физической памяти в ненагруженной системе: 1472108 КБ = 1437,61 МБ
- Объем свободного пространства в разделе подкачки в ненагруженной системе: 839676 КБ

## Эксперимент №1

Подготовительный этап:

Скрипт mem.bash, который выполняет бесконечный цикл. Перед началом выполнения цикла создается пустой массив и счетчик шагов, равный 0. На каждом шаге цикла в конец массива добавляется последовательность из 10 элементов: (1 2 3 4 5 6 7 8 9 10).

```
#!/bin/bash
> report.log
array=()
step=0
while true; do
array+=({1..10})
step=$((step + 1))
if (( step × 100000 == 0 )); then
echo "Step $step: Array size is ${#array[@]}" >> report.log
fi
done
```

Каждый 100000-ый шаг в файл report.log добавляется строка с текущим значением размера массива (перед запуском скрипта файл обнуляется).

## Первый этап:

Вывод последних сообщений системного журнала – параметры, с которыми произошла аварийная остановка процесса

PID: 1485

Общий объём виртуальной памяти, используемой процессом: 2658416kB = 2,54GB

Объём анонимной резидентной памяти, используемой процессом: 1685984kB = 1,61GB

Последня строка файла report.log

Array size is 31000000

```
1826.8 total,
820.0 total,
                                           1410.2 free,
820.0 free,
                                                                    190.5 used,
0.0 used.
                                                                                          226.1 buff/cache
1484.8 avail Mem
MiB Mem :
MiB Swap:
      PID USER
                                           VIRT
                                                                  SHR S
                            \mathbf{PR}
                                 НΙ
                                                        RES
                                                                              ∠CPU
                                                                                       %MEM
                                                                                                     TIME+ COMMAND
                                                                                        2.0
2.6
0.7
0.0
                                                                                                 0:00.40 mem.bash
0:00.54 mem.bash
0:02.33 systemd
0:00.00 kthreadd
    1454 root
1454 root
                                                    37788
49140
                            20
                                   0
                                        257072
                                                                 2936
                                                                        \mathbf{R}
                                                                              68.4
                                        268556
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                                   И
                                                                 2936
                                                                        \mathbf{R}
                                                                              75.0
0.0
                           20
                                        179188
                                                                 8508 S
        1 root
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         2 root
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         3
           root
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                                                                                                  0:00.00 rcu_gp
                                                                         T
                                                                                                  0:00.00 rcu_par_gp
         4
           root
                             И
                                -20
                                                И
                                                           А
                                                                     И
                                                                               0.0
                                                                                        0.0
Iteration 2
MiB Mem :
MiB Swap:
                  1826.8 total,
820.0 total,
                                           1301.0 free,
820.0 free,
                                                                                          226.3 buff/cache
1375.8 avail Mem
                                                                    299.5 used,
                                                                       0.0 used.
                                                                                      %MEM
7.9
8.5
     PID USER
                           PR
                                           VIRT
                                                                  SHR S
                                                                             ∠CPU
                                                                                                     TIME+ COMMAND
                                 НI
                                                       RES
                                                                                                 0:01.72 mem.bash
0:01.85 mem.bash
    1454 root
1454 root
                           20
                                  Ø
                                                                             81.2
                                        366632
                                                   147348
                                                                 2936
                                                                        \mathbf{R}
                                        378512
                            20
                                   0
                                                   158964
                                                                 2936
                                                                         R
                                                                             80.0
           root
                                                                                        0.7
0.0
                                                                     38 S
0 S
           root
                            20
                                   0
                                        179188
                                                    13456
                                                                 8508
                                                                               0.0
                                                                                                  0:02.33 systemd
         2 root
                                                                                                  0:00.00 kthreadd
                           20
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                                                Я
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         3
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I
                                                                                                 0:00.00 rcu_gp
0:00.00 rcu_par_gp
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           root
         4 root
                             ō
                                -20
                                                ō
                                                           0
                                                                     0
                                                                               0.0
                                                                                        0.0
Iteration 3
MiB Mem :
MiB Swap:
                                                                     404.7 used,
0.0 used.
                                                                                            226.3 buff/cache
1270.6 avail Mem
                  1826.8 total,
                                            1195.8 free,
                    820.0 total,
                                             820.0 free,
                                                                                                   TIME+ COMMAND
0:03.00 mem.bash
     PID USER
                                  NI
Ø
                                            VIRT
                                                                    SHR S
                            PR
                                                         RES
                                                                               >CPII
                                                                                        ×MEM
                                         475796 256380
487544 267996
                                                                               82.4
81.2
0.0
                                                                                         13.7
14.3
0.7
                            20
                                                                  2936 R
    1454 root
                                                                                                   0:03.13 mem.bash
0:02.33 systemd
0:00.00 kthreadd
    1454 root
                                    Ø
                            20
                                                                  2936 R
                            20
                                    0
                                         179188
                                                                  8508
           root
                                                      13456
           root
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                                                0
                                                            0
                                                                       0
                                                                                0.0
                                                                                          0.0
                                -20
-20
                                                                                                   0:00.00 rcu_gp
0:00.00 rcu_par_gp
                             0
                                                 0
                                                            0
                                                                       0
                                                                          I
I
                                                                                0.0
                                                                                          0.0
            root
         4
           root
                             0
                                                 0
                                                            0
                                                                       0
                                                                                0.0
                                                                                          0.0
Iteration 4
MiB Mem :
MiB Swap:
                                           1090.7 free,
820.0 free,
                                                                                           226.3 buff/cache
1165.5 avail Mem
                  1826.8 total,
                                                                     509.8 used,
                    820.0 total,
                                                                        0.0 used.
                                  ΝI
     PID USER
                            \mathbf{PR}
                                           VIRT
                                                                   SHR S
                                                                              >CPU
                                                                                                      TIME+ COMMAND
                                                        RES
                                                                                        MEM
                                                                                                  0:04.25 mem.bash
0:04.40 mem.bash
0:02.33 systemd
                            20
20
20
                                                                                        19.4
                                   0
    1454 root
                                        581660
                                                   362244
                                                                  2936
                                                                         R
                                                                              80.0
                                                                              81.2
0.0
0.0
     1454 root
                                    0
                                        593672
                                                   374388
                                                                  2936
                                                                                        20.0
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0.0
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                                         179188
                                                     13456
                                                                  8508
                                                                         S
            root
         23
                            20
                                                                         SII
           root
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                                                0
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                                                                                                   0:00.00 kthreadd
                                                                                                  0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                                0.0 \\ 0.0
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           root
                             И
                                -20
                                                И
                                                           И
                                                                      И
                                -20
                                                0
         4 root
                                                                      0
                             0
                                                           ø
Iteration 5
                  1826.8 total,
820.0 total,
                                            986.2 free,
820.0 free,
                                                                   614.3 used,
0.0 used.
                                                                                         226.3 buff/cache
1061.1 avail Mem
MiB Mem :
MiB Swap:
                           PR
20
                                       VIRT RES
688712 469428
699272 479724
     PID USER
                                                                                      %MEM
25.1
25.6
                                                                                                 TIME+ COMMAND
0:05.54 mem.bash
0:05.67 mem.bash
                                 ИΙ
                                                                  SHR S
                                                                             次CPU
                                                                             82.4
81.2
                                  Ø
                                                                2936
                                                                        \mathbf{R}
    1454 root
    1454 root
                           20
                                   0
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                                   0
                                        179188
                                                    13456
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                                                                                                 0:02.33
           root
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                                                                       SII
                                                                                                 0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
        2 root
3 root
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         4 root
                             Ø
                               -20
                                               0
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                                                                              0.0
                                                                                        0.0
Iteration 6
MiB Mem :
MiB Swap:
                  1826.8 total,
820.0 total,
                                            896.9 free,
820.0 free,
                                                                                           226.3 buff/cache
971.8 avail Mem
                                                                    703.6 used,
                                                                      0.0 used.
     PID USER
                           \mathbf{PR}
                                 НΙ
                                          VIRT
                                                       RES
                                                                  SHR S
                                                                             ∠CPU
                                                                                                    TIME+ COMMAND
                                                                                      MEM
                           20
20
                                        775700 556284
786656 567372
179188 13456
                                                                             68.4
73.3
0.0
                                                                                      29.7
30.3
                                                                                                 0:06.78 mem.bash
0:06.91 mem.bash
                                  0
                                                                2936
                                                                        R
    1454 root
                                                                2936
     1454
           root
                                   0
                                                                        R
                                                                                       0.7
                                                                                                 0:02.33 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                           20
                                                                8508 S
           root
                                   0
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0.0
                                  ø
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                                                                     0 S
         2 root
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0.0
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           root
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                                -20
           root
                             0 -20
                                               Ø
                                                          0
                                                                     Ø
                                                                              0.0
```

```
Iteration 7
MiB Mem :
MiB Swap:
                                                    813.5 free,
820.0 free,
                     1826.8 total,
820.0 total,
                                                                                787.0 used,
0.0 used.
                                                                                                            226.3 buff/cache 888.4 avail Mem
                                                                                                                   TIME+ COMMAND
0:08.00 mem.bash
       PID USER
                                                  VIRT
                                                                              SHR S
                                                                                            >:CPU
                                                                                                      ×MEM
                                                                             2936 R
2936 R
8508 S
     1454 root
1454 root
                                20
20
                                               864800 645252
876284 656868
                                                                                           68.8
                                                                                                       34.5
                                                                                                       35.1
0.7
0.0
                                                                                                                   0:08.14 mem.bash
0:02.33 systemd
0:00.00 kthreadd
                                                                                            75.0
0.0
                                         0
                                20
                                                179188
                                          ō
                                                              13456
             root
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              root
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                                                                                                                   0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                                                        0.0
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                                                        Ø
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              root
                                      -20
              root
                                  И
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                                                                                                        0.0
Iteration 8
                      1826.8 total,
820.0 total,
                                                                                   869.7 used,
0.0 used.
MiB Mem :
MiB Swap:
                                                      730.8 free,
820.0 free,
                                                                                                                226.3 buff/cache 805.6 avail Mem
       PID USER
                                  PR
                                                    VIRT
                                                                                 SHR S
                                                                                                          >MEM
                                                                                                                            TIME+ COMMAND
                                 20
20
20
20
20
                                                                                                                       0:09.23 mem.bash
0:09.37 mem.bash
      1454 root
                                          0
                                                 947036 727620
                                                                               2936
                                                                                        \mathbf{R}
                                                                                               65.0
                                                                                                           38.9
                                                                                2936
                                                                                               76.5
5.9
                                                                                                           39.5
      1454 root
                                           0
                                                 958652
                                                              739236
                                                                                        \mathbf{R}
                                                                                                                       0:00.01 top
0:02.33 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                                                               3852 R
8508 S
      1531 root
1 root
                                                                                                            0.2
0.7
                                                 274140
179188
                                           0
                                                                 4428
                                                                 13456
                                                                                                 0.0
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                                  20
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                                                                                                            0.0
           2 root
                                                                       И
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                                                          И
           3 root
                                       -20
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                                                                                     0 I
                                                                                                            0.0
                                                                                                 0.0
                                   0
Iteration 9
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                    628.8 free,
820.0 free,
                                                                                971.7 used,
0.0 used.
                                                                                                            226.3 buff/cache 703.7 avail Mem
                                                                                            %CPU
       PID USER
                                 \mathbf{PR}
                                        НΙ
                                                  VIRT
                                                                  RES
                                                                              SHR S
                                                                                                      %MEM
                                                                                                                       TIME+ COMMAND
                                20
20
20
                                                                                                                   0:10.50 mem.bash
0:10.63 mem.bash
     1454 root
                                         0 1052504 833220
                                                                             2936 R
                                                                                            80.0
                                                                                                       44.5
                                                                                            73.3
0.0
0.0
                                                                                                       45.1
0.7
0.0
                                         0 1062536 842988
0 179188 13456
      1454 root
                                                                             2936 R
                                                                                                                   0:02.33 systemd
0:00.00 kthreadd
                                                                             8508 S
             root
                                20
                                                                                  0 S
           2 root
                                         0
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                                                                                  0 I
0 I
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0.0
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0.0
                                                                                                                   0:00.00 rcu_gp
0:00.00 rcu_par_gp
             root
                                  0
                                      -20
                                                        0
                                                                     0
             root
                                  0 -20
                                                        ø
                                                                     ø
Iteration 10
MiB Mem : 1
MiB Swap:
                 1826.8 total,
820.0 total,
                                                                                                   226.3 buff/cache
606.5 avail Mem
                                                                        1068.9 used,
                                                531.6 free,
820.0 free,
                                                                             0.0 used.
                                                                                              %MEM
49.9
50.5
      PID USER
                              \mathbf{PR}
                                              VIRT
                                                                        SHR S
                                                                                    %CPU
                                                                                                              TIME+ COMMAND
                                    НΙ
                                                            RES
                                                                                                          11112+ COMMIND
0:11.76 mem.bash
0:11.91 mem.bash
0:00.27 kworker/0:3-ata_sff
0:02.33 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                         1152296 933012
1164176 944628
                                                                                    75.0
76.5
5.9
0.0
     1454 root
1454 root
                              20
20
                                      0
0
                                                                      2936 R
2936 R
                                                                           96 R
Ø I
98 S
Ø S
Ø I
      363 root
1 root
                              20
20
                                                                       0.0
0.7
                                      0
0
                                                   0
                                                               И
                                                         13456
                                            179188
                                                                                                0.0
0.0
         2 root
3 root
                              20
                                   0
                                                               0
0
                                                                                     0.0
                                ø
                                                    ø
Iteration 11
MiB Mem : 1826.8 total,
Suan: 820.0 total,
                                                427.9 free, 820.0 free,
                                                                        1172.6 used,
0.0 used.
                                                                                                   226.3 buff/cache 502.7 avail Mem
      PID USER
                              \mathbf{PR}
                                    ΝI
                                               VIRT
                                                            RES
                                                                        SHR S
                                                                                    ∠CPU
                                                                                              %MEM
                                                                                                             TIME+ COMMAND
                                                                                                          11ME+ CUMMHND
0:13.05 mem.bash
0:13.18 mem.bash
0:02.33 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                           76 R
36 R
38 S
0 S
0 I
0 I
                                                         1.0g
1.0g
13456
                                                                                              55.6
56.2
0.7
0.0
     1454 root
1454 root
                              20
20
                                     0
                                         1259612
1271360
                                                                      2936
2936
                                                                                    76.5
80.0
                                                                                     0.0
0.0
0.0
         1 root
2 root
                              20
                                            179188
                                                                       8508
                              20
                                      ø
                                                   ø
          3 root
4 root
                                  -20
-20
                                                                                                0.0
0.0
                               0
                                                    ø
                                                                0
0
                                                                                      0.0
                               О
                                                   О
Iteration 12
                  1826.8 total,
820.0 total,
                                                                            1276.5 used,
0.0 used.
                                                   324.0 free,
820.0 free,
                                                                                                         226.3 buff/cache 398.9 avail Mem
MiB Mem :
MiB Swap:
      PID HSER
                                                                            SHR S
                                PR
                                      NI
                                                 UIRT
                                                               RES
                                                                                         2CPH
                                                                                                   >MEM
                                                                                                                   TIME+ COMMAND
                                                                                        81.2
81.2
0.0
                                                                                                                0:14.31 mem.bash
0:14.45 mem.bash
                                                            1.1g
1.1g
13456
                                                                                                   61.2
61.9
0.7
                                        0 1364816
                                20
                                                                          2936 R
     1454 root
                               20
20
                                            1376960
179188
     1454 root
                                                                          2936 R
                                                                          8508 S
                                                                                                                0:02.33 systemd
0:00.00 kthreadd
              root
                                        и
                                20
                                        0
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                                                                               0 S
                                                                                                     0.0
             root
                                                                                                                0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                                          0.0
0.0
                                                                                                     0.0
0.0
                                                                               0 I
0 I
                                    -20
                                                       0
                                                                   Ø
             root
          4 root
                                 A -2A
                                                       И
                                                                   0
Iteration 13
                                                                              1381.1 used,
0.0 used.
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                                                                           226.3 buff/cache
294.3 avail Mem
                                                    219.4 free,
820.0 free,
       PID USER
                                \mathbf{PR}
                                       НΙ
                                                  VIRT
                                                                 RES
                                                                              SHR S
                                                                                           >:CPU
                                                                                                      >MEM
                                                                                                                       TIME+ COMMAND
                                                                                                                  TIME+ CUMMAND
0:15.59 mem.bash
0:15.72 mem.bash
0:02.33 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                                                     67.0
67.6
0.7
     1454 root
1454 root
                                            1472132
1483748
                                                             1.2g
1.2g
13456
                                                                            2936
2936
8508
                                                                                           81.2
80.0
                                20
                                         0
                                                                                     \mathbf{R}
                                20
20
                                         Ю
                                                                                     \mathbf{R}
                                                                                            0.0
                                               179188
                                         Ø
                                                                                     S
             root
                                                                                     SII
             root
                                         ø
                                                                    0
                                                                                 0
                                                                                             0.0
                                20
              root
                                                                                                       0.0
0.0
                                  0
                                     -20
                                                        0
                                                                     0
                                                                                 0
                                                                                             0.0
                                     -20
           4
             root
                                  И
                                                        И
                                                                     И
                                                                                 И
                                                                                             0.0
```

```
Iteration 14
MiB Mem :
MiB Swap:
                         1826.8 total,
820.0 total,
                                                              116.2 free,
820.0 free,
                                                                                            1484.2 used,
0.0 used.
                                                                                                                              226.3 buff/cache
191.1 avail Mem
        PID USER
                                      PR
                                                           VIRT
                                                                             RES
                                                                                           SHR
                                                                                                                                           TIME+ COMMAND
                                                                                               36 R
36 R
38 S
0 S
0 I
                                                                                                                                      8:16:86 mem.bash
8:17:00 mem.bash
8:02:33 systemd
8:00:00 kthreadd
8:00:00 rcu_gp
8:00:00 rcu_par_gp
                                      20
20
                                                                                                          73.7
82.4
0.0
                                                                                                                        72.7
73.3
0.7
0.0
               root
root
                                                    1578392
1590668
                                                                           1.3g
1.3g
                                                                                         2936
2936
                                                0
                root
                                      20
20
                                                0
                                                       179188
                                                                         13456
                                                                                         8508
                                                                 0
                root
root
                                             -20
-20
                                                                                                             0.0
                                                                  0
                                                                                0
```

```
1826.8 total,
820.0 total,
MiB Mem :
MiB Swap:
                                              1681.3 free,
820.0 free,
                                                                         90.6 used,
0.0 used.
                                                                                                  54.9 buff/cache
                                                                                               1635.8 avail Mem
      PID USER
                                             VIRT
                                                                                                           TIME+ COMMAND
                                                                    2264 S
0 S
0 I
0 I
                                                                                   0.0
0.0
0.0
                                                                                             0.1
0.0
0.0
                                                                                                       0:02.55 systemd
0:00.00 kthreadd
         1 root
2 root
                                  0
                                          179192
                             20
                                                         2489
                             20
                              0 -20
0 -20
         3 root
                                                  A
                                                                                                       0:00.00 rcu_gp
0:00.00 rcu_par_gp
0:00.00 kworker/0:0H-kblockd
                                                              0
            root
            root
                              0
                                                  Ø
                                                              0
                                                                         0
                                                                                   0.0
                                                                                             0.0
```

## Последние записи о скрипте mem.bash в системном журнале

Последняя строка файла report.log

```
Array size is 30000000
```

#### Второй этап

Второй скрипт mem2.bash – копия скрипта mem.bash, записывает в файл report2.log

```
#!/bin/bash
> report2.log
array=()
step=0
while true; do
array+=({1..10})
step=$((step + 1))
if (( step × 100000 == 0 )); then
echo "Step $step: Array size is ${#array[@]}" >> report2.log
fi
done
```

Скрипт, который запускает mem.bash и mem2.bash в фоновом режиме

```
#!/bin/bash
./mem.bash &
./memZ.bash &
```

```
1826.8 total,
820.0 total,
                                                               1582.4 free,
735.3 free,
                                                                                                   111.6 used,
84.7 used.
                                                                                                                                   132.7 buff/cache
1575.5 avail Mem
MiB Mem :
MiB Swap:
        PID USER
                                        \mathbf{PR}
                                                 НΙ
                                                              VIRT
                                                                                 RES
                                                                                                SHR S
                                                                                                                %CPU
                                                                                                                              %MEM
                                                                                                                                                   TIME+ COMMAND
                                                   0
0
                                                         236348
236216
                                                                            16916
16912
                                                                                              2916
2920
                                                                                                                31.6
31.6
0.0
                                                                                                                                0.9
0.9
                                                                                                                                             0:00.16 mem.bash
0:00.17 mem2.bash
      1702 root
1703 root
                                                                                                         \mathbf{R}
                                        20
                                        20
                                                                                              3492 S
0 S
0 I
                                                                                                                                0.3
0.0
                                                                                                                                             0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                       20
20
                                                   0
0
                root
                                                          179188
                                                                              4840
                                                                                     0
                                                                                                                   0.0
                root
                                                                     0
                                                                     ø
                                                                                     ø
                 root
Iteration 2
                          1826.8 total,
820.0 total,
                                                                                                                                  132.7 buff/cache
1479.5 avail Mem
                                                                                                  207.6 used,
84.7 used.
MiB Mem :
MiB Swap:
                                                              1486.5 free, 735.3 free,
                                                                                                                                             TIME+ COMMAND
0:00.78 mem2.bash
0:00.77 mem.bash
0:02.46 systemd
0:08.00 kthreadd
                                        \mathbf{PR}
                                                 НΙ
        PID USER
                                                              VIRT
                                                                                 RES
                                                                                                SHR
                                                                                                                >CPU
                                                                                                                              >MEM
                                                                                                                               3.5
3.5
0.3
0.0
                                       20
20
20
                                                   0
                                                          284000
                                                                            64696
                                                                                              2920
       1703 root
                                                                                                                43.8
                                                   0
0
                                                                                              2916 R
3492 S
                                                          285188
                                                                            65756
4840
                                                                                                                31.2
0.0
       1702 root
            1 root
                                                          179188
                                        20
                                                   ø
                                                                     0
                                                                                     0
                                                                                                     0
                                                                                                         S
                                                                                                                   0.0
                 root
             3 root
                                          0
                                              -20
                                                                     0
                                                                                     0
                                                                                                     0
                                                                                                                  0.0
                                                                                                                                0.0
                                                                                                                                              0:00.00 rcu_gp
Iteration 3
MiB Mem :
MiB Swap:
                        1826.8 total,
820.0 total,
                                                           1392.5 free,
735.3 free,
                                                                                            301.6 used,
84.7 used.
                                                                                                                          132.7 buff/cache
1385.5 avail Mem
                                                                                        SHR S
2916 R
2920 R
0 I
3492 S
0 S
                                     PR
20
20
20
                                                      VIRT RES
335480 116180
330464 110896
0 0
                                                                                                         жСРU
31.6
31.6
5.3
                                                                                                                                     TIME+ COMMAND
0:01.37 mem.bash
0:01.36 mem2.bash
0:00.22 kworker/0:2-events
                                             NI
Ø
        PID USER
      1702 root
1703 root
1695 root
1 root
2 root
                                                                                                                        6.2
5.9
0.0
                                                0
                                     20
20
                                                                                                           0.0
                                                                                                                        0.3
0.0
                                                                                                                                     0:02.46 systemd
0:00.00 kthreadd
                                                0
                                                      179188
                                                                          4840
                                                                 0
                                                                                Ø
Iteration 4
MiB Mem :
MiB Swap:
                         1826.8 total,
820.0 total,
                                                                                                                          132.7 buff/cache
1290.4 avail Mem
                                                           1297.3 free,
735.3 free,
                                                                                            396.8 used,
84.7 used.
                                             NI
00
00
        PID USER
                                     PR
                                                          UIRT
                                                                           RES
                                                                                           SHR S
                                                                                                         >CPU
                                                                                                                                         TIME+ COMMAND
                                                                                                                      >MEM
                                                                                                                                    TIME+ CUPINHID

8:81.95 mem.bash

8:81.95 mem2.bash

8:82.46 systemd

8:80.80 kthreadd

8:80.80 rcu_gp
                                                                                        SHR S
2916 R
2920 R
3492 S
0 S
0 I
                                                                                                         35.3
29.4
0.0
0.0
      1702 root
1703 root
1 root
2 root
3 root
                                                                                                                        8.8
8.5
0.3
0.0
                                     20
20
20
                                                      384056 164756
379172 159736
                                                       179188
                                     20
                                                0
                                                                 0
                                                                                Ø
Iteration
MiB Mem :
MiB Swap:
                       1826.8 total,
820.0 total,
                                                        1200.3 free,
735.3 free,
                                                                                        493.7 used,
84.7 used.
                                                                                                                     132.7 buff/cache
1193.4 avail Mem
                                                                                                                              TIME+ COMMAND
0:02.57 mem.bash
0:02.56 mem2.bash
0:00.23 kworker/0:2-events_power_ef+
0:02.46 systemd
0:00.00 kthreadd
       PID USER
                                    \mathbf{PR}
                                                                                      SHR S
                                            НΙ
                                                        VIRT
                                                                        RES
                                                                                                    %CPU
                                                                                                                ×MEM
                                   20
20
20
20
20
20
                                                                                    2916 R
2920 R
0 I
3492 S
0 S
                                                                                                    35.0
30.0
5.0
0.0
                                                                                                                11.6
11.3
0.0
0.3
                                                   436460 217028
430124 210688
0 0
      1702 root
1703 root
                                             0
0
      1695 root
1 root
2 root
                                             0
0
0
                                                    179188
Ø
                                                                      4840
0
Iteration 6
MiB Mem :
MiB Swap:
                         1826.8 total,
820.0 total,
                                                           1100.1 free,
735.3 free,
                                                                                            593.9 used,
84.7 used.
                                                                                                                          132.7 buff/cache
1093.2 avail Mem
                                                                                                                      %MEM
14.3
13.9
0.3
                                                                                                                                     TIME+ COMMAND
0:03.16 mem.bash
0:03.15 mem2.bash
0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                     PR
20
20
20
                                             NI
0
0
                                                      VIRT RES
486488 266924
                                                                                        SHR S
2916 R
        PID USER
                                                                                                         ∠CPU
                                                                                                         43.8
31.2
0.0
      1702 root
1703 root
1 root
                                                      479228 259792
179188 4840
                                                                                         2920 R
3492 S
            2 root
3 root
                                     20
                                           -20
                                                                 0
                                                                                8
                                                                                               0
                                                                                                  S
                                                                                                           0.0
                                                                                                                        0.0
                                       Ø
Iteration 7
MiB Mem :
MiB Swap:
                        1826.8 total,
820.0 total,
                                                                                                                            132.7 buff/cache
994.2 avail Mem
                                                           1001.2 free,
735.3 free,
                                                                                            692.9 used,
84.7 used.
                                                                                                                                    TIME+ COMMAND
0:03.74 mem.bash
0:03.75 mem2.bash
0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                             NI
0
0
                                                                                        SHR S
2916 R
2920 R
3492 S
        PID USER
                                                          UIRT
                                     \mathbf{PR}
                                                                                                          ∠CPU
                                                                                                                      ×MEM
                                                      535856 316292
529784 310480
179188 4840
                                                                                                                      16.9
16.6
0.3
                                                                                                         40.0
40.0
0.0
                                     20
20
20
      1702 root
1703 root
           1 root
2 root
3 root
                                                                                              0
                                                                                                           0.0
                                                                                                                        0.0
                                                                                                  S
                                                                0
                                                                                0
                                           -20
Iteration 8
MiB Mem :
MiB Swap:
                         1826.8 total,
820.0 total,
                                                              921.4 free, 735.3 free,
                                                                                                                               132.7 buff/cache
914.4 avail Mem
                                                                                              772.7 used,
84.7 used.
                                                                                                                        %MEM
19.0
18.5
                                                                                                                                            TIME+ COMMAND
        PID USER
                                              НΙ
                                                           VIRT
                                                                                            SHR S
                                                                                                           >:CPU
                                                                                                           38.9
27.8
0.0
0.0
                                                                                                                                       0:04.34 mem.bash
0:04.33 mem2.bash
      1702 root
1703 root
                                     20
20
                                              0
                                                       574136 354572
565160 345856
                                                                                          2916 R
2920 R
            1 root
2 root
3 root
                                                                                                    S
                                                                                                                          0.3
0.0
0.0
                                      20
20
                                                0
                                                                                          3492
Ø
                                                                                                                                       0:02.46 systemd
0:00.00 kthreadd
                                                       179188
                                                                          4840
                                                                  0
                                                                                 Ø
                                        Й
                                            -20
                                                                  И
                                                                                 Ø
                                                                                                 О
                                                                                                                                       0:00.00 rcu_gp
```

```
Iteration 9
MiB Mem :
MiB Swap:
                     1826.8 total,
820.0 total,
                                                       856.7 free,
735.3 free,
                                                                                    837.4 used,
84.7 used.
                                                                                                                 132.7 buff/cache
849.8 avail Mem
                                                 VIRT RES
612020 392588
602912 383344
0 0
                                                                                                                        TIME+ COMMAND
0:04.91 mem.bash
0:04.91 mem2.bash
0:05.02 kworker/0:0-events
       PID USER
                                          НΙ
                                                                                  SHR S
                                                                                                ≥CPII
                                  \mathbf{PR}
                                                                                                           >MEM
      PID USER
1702 root
1703 root
1676 root
1 root
2 root
                                  20
20
20
20
                                           0
0
0
                                                                                                41.2
35.3
5.9
                                                                                                           21.0
20.5
0.0
                                                                                 2916 R
                                                                                2920 R
0 I
3492 S
0 S
                                  20
20
                                                  179188
                                                                   4840
                                                                                                             0.3
0.0
                                                                                                                        0:02.46 systemd
0:00.00 kthreadd
                                            0
0
                                                                                                  0.0
Iteration 10
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                         760.4 free,
735.3 free,
                                                                                       933.7 used,
84.7 used.
                                                                                                                     132.7 buff/cache
753.4 avail Mem
        PID USER
                                   \mathbf{PR}
                                           ИI
                                                                                     SHR S
                                                                                                    ∠CPU
                                                       VIRT
                                                                                                                ×MEM
                                                                                                                                  TIME+ COMMAND
                                                                                                                             0:05.51 mem.bash
0:05.51 mem.bash
0:05.49 mem2.bash
0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                                                                                   46.7
33.3
0.0
                                                                                                               23.7
23.0
      1702 root
1703 root
                                   20
20
                                             Ø
Ø
                                                   661916 442484
650036 430600
                                                                                   2916 R
2920 R
                                                                                    3492 S
Ø S
Ø I
                                                                                                                 0.3
0.0
0.0
            1 root
                                   20
                                                    179188
                                                                     4840
           2 root
3 root
                                         0
-20
                                                             0
0
                                                                                                     0.0
                                   20
                                                                           0
                                                                           ō
                                     0
Iteration 11
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                        665.6 free,
735.3 free,
                                                                                     1028.4 used,
84.7 used.
                                                                                                                     132.7 buff/cache
658.7 avail Mem
        PID USER
                                   \mathbf{PR}
                                           ΝI
                                                       VIRT
                                                                                     SHR S
                                                                                                                ×MEM
                                                                                                                                  TIME+ COMMAND
                                                                                                   40.0
35.0
0.0
0.0
                                                                                                               25.7
26.3
0.3
0.0
                                                                                                                             0:06.09 mem2.bash
0:06.10 mem.bash
0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                                   699536 479968
712208 492644
179188 4840
                                                                                   2920 R
2916 R
3492 S
      1703 root
1702 root
                                   20
20
                                            0
                                                                                         0 S
0 S
                                   20
                                             ø
            1 root
           2 root
3 root
                                   20
                                             0
                                                             0
                                                                           0
                                     0 -20
                                                             ŏ
                                                                           ŏ
Iteration 12
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                           569.1 free, 735.3 free,
                                                                                         1125.0 used,
84.7 used.
                                                                                                                          132.7 buff/cache
562.1 avail Mem
                                                         VIRT
                                                                                                                    %MEM
29.0
                                                                                                                                       TIME+ COMMAND
        PID USER
                                     \mathbf{PR}
                                             ИΙ
                                                                                         SHR S
                                                                                                       >CPU
                                                                                                                                  0:06.68 mem.bash
0:06.69 mem2.bash
                                                                                                        36.8
36.8
                                     20
                                               0
                                                      761312 541748
                                                                                       2916
      1702 root
                                                                                                \mathbf{R}
                                                                                                                    28.3
0.3
      1703 root
                                     20
                                               0
                                                      748508 529072
                                                                                       2920
                                                                                                                                  0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
            1 root
                                     20
                                               0
0
                                                      179188
                                                                        4840
                                                                                       3492 S
Ø S
                                                                                                         0.0
                                                                                                         0.0
0.0
            2 root
                                     20
                                                                                                                      0.0
                                                               О
                                                                              О
                                                                                             ō
                                      0
                                             -20
                                                                                                                      0.0
               root
Iteration 13
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                         467.5 free,
735.3 free,
                                                                                      1226.6 used,
84.7 used.
                                                                                                                      132.7 buff/cache
460.5 avail Mem
        PID USER
                                                       VIRT
                                                                                      SHR
                                    PR
                                            ΝI
                                                                        RES
                                                                                                    >CPU
                                                                                                                >MEM
                                                                                                                                   TIME+ COMMAND
                                                                                                                              11HL+ CUMPHAND

0:07.29 mem2.bash

0:07.29 mem.bash

0:02.46 systemd

0:00.00 kthreadd
      1703 root
1702 root
                                   20
20
20
                                             0
                                                   799196 579760
813848 594284
                                                                                                                31.0
31.8
0.3
                                                                                                    36.8
                                                                                    2920
                                                                                    2916 R
3492 S
                                                                                                    31.6
0.0
                                             ø
            1 root
                                                                      4840
                                                    179188
                                    20
                                              0
                                                              0
                                                                                          0 S
                                                                                                      0.0
                                                                                                                  0.0
               root
            3 root
                                     И
                                         -20
                                                             И
                                                                            И
                                                                                          И
                                                                                                      0.0
                                                                                                                  0.0
                                                                                                                              0:00.00 rcu_gp
Iteration 14
MiB Mem : 1826.8 total,
MiB Swap: 820.0 total,
                                                         370.6 free, 735.3 free,
                                                                                      1323.5 used,
84.7 used.
                                                                                                                      132.8 buff/cache 363.7 avail Mem
                                                                                                                              TIME+ COMMAND
0:07.87 mem2.bash
0:07.86 mem.bash
0:02.46 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
                                                   VIRT RES
848036 628600
862292 642860
                                           NI
Ø
        PID USER
                                    \mathbf{PR}
                                                                                      SHR S
                                                                                                    2CPU
                                                                                                                ×MEM
                                                                                                    37.5
31.2
0.0
                                                                                                                33.6
34.4
0.3
0.0
      1703 root
1702 root
                                                                                    2920 R
                                   20
                                   20
20
20
20
                                              ō
                                                                                    2916 R
           1 root
2 root
                                             0
                                                    179188
                                                                     4840
                                                                                    3492 S
Ø S
                                             ō
                                                              0
                                                                            0
                                         -20
                                                              ō
                                                                                          Ō
Iteration 15
                    1826.8 total,
820.0 total,
                                                         275.3 free, 735.3 free,
                                                                                     1418.7 used,
84.7 used.
                                                                                                                     132.8 buff/cache
268.4 avail Mem
MiB Mem :
MiB Swap:
                                                                                 SHR
2920 R
2916 R
3492 S
0 S
0 I
                                                                                                                             TIME+ COMMAND
8:88.46 mem2.bash
8:88.45 mem.bash
8:82.46 systemd
8:80.88 kthreadd
8:80.88 rcu_gp
                                   PR
20
20
        PID USER
                                                                                                    >:CPU
                                                       VIRT
                                                                                                                ×MEM
                                                   896216 676648
911132 691700
                                                                                                   46.7
33.3
0.0
                                                                                                               36.2
37.0
      1703 root
1702 root
                                            0
           1 root
2 root
3 root
                                                                                                                 0.3
0.0
0.0
                                   20
                                             0
                                                    179188
                                                                     4840
                                                                                                     0.0
0.0
                                                             0
0
                                   20
                                             0
                                                                           ø
                                          -20
```

```
Iteration 16
                     1826.8 total,
820.0 total,
MiB Mem :
MiB Swap:
                                                  179.2 free,
735.3 free,
                                                                           1514.8 used,
84.7 used.
                                                                                                       132.8 buff/cache
172.3 avail Mem
      PID USER
                                                                                        >:CPU
                                                VIRT
                                                                           SHR S
                                                                                                  ×MEM
                                                                                                                  TIME+ COMMAND
                                             961160 741860
945716 726280
                                                                                                  39.7
38.8
                                                                                                              0:09.05 mem.bash
0:09.05 mem2.bash
                                                                         2916 R
2920 R
3492 S
                                                                                       38.9
38.9
0.0
     1702 root
1703 root
                               20
20
                                       0
0
                                                                                                              0:02.46 systemd
0:00.00 kthreadd
                               20
                                        ō
                                              179188
                                                                                                    0.3
          1 root
                                                             4840
             root
                               20
                                        И
                                                     0
0
                                                                  Ю
                                                                              0 S
0 I
                                                                                         0.0
                                                                                                    0.0
          3 root
                                И
                                                                  И
                                                                                         0.0
                                                                                                    0.0
                                                                                                              0:00.00 rcu gp
                                    -20
Iteration 17
                    1826.8 total,
820.0 total,
                                                  80.2 free,
735.3 free,
                                                                           1613.8 used,
84.7 used.
                                                                                                       132.8 buff/cache 73.3 avail Mem
MiB Mem :
MiB Swap:
                                                                                                 %MEM
41.5
42.4
0.3
0.0
                               PR
20
                                        II VIRT RES
0 996008 776440
0 1011848 792284
                                                                                                              TIME+ COMMAND
0:09.65 mem2.bash
0:09.65 mem.bash
      PID USER
                                                                           SHR S
                                      ИΙ
                                                                                       >CPU
                                                                                       41.2
35.3
0.0
0.0
                                                                         2920 R
     1703 root
     1702 root
                                                                         2916 R
3492 S
Ø S
                               20
                                                                                                              0:02.46 systemd
0:00.00 kthreadd
          1 root
2 root
                               20
20
                                        0
                                             179188
                                                             4840
                                        ō
                                                     0
                                                                  0
                                                                                                              0:00.00 rcu_gp
              root
                                                      0
Iteration 18
MiB Mem :
MiB Swap:
                  1826.8 total,
820.0 total,
                                                  689.6 free,
374.9 free,
                                                                           1087.6 used,
445.1 used.
                                                                                                       49.7 buff/cache
641.4 avail Mem
                                                                                                             TIME+ COMMAND
0:19.15 mem2.bash
0:02.47 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                                       %CPU
      PID USER
                                      НΙ
                                                VIRT
                                                                           SHR S
                               \mathbf{PR}
                                                               RES
                                                                                                  ×MEM
                                       0 1759232
0 179188
                                                                                       72.2
                                                                                                  62.8
0.1
0.0
                               20
20
                                                             1.1g
2668
     1703 root
                                                                          1668 R
                                                                         2404 S
          1 root
2 root
                               20
                                        0
                                                                  0
                                                                              0 S
                                                                                         0.0
                                                      0
                                                     0
0
                                                                              0 I
0 I
                                                                                         0.0
0.0
                                                                                                   0.0
          3 root
                                0
                                    -20
                                                                  И
                                0 -20
          4 root
                                                                  0
Iteration 19
                 1826.8 total,
820.0 total,
                                                                           1342.8 used,
444.5 used.
                                                                                                       52.8 buff/cache
384.4 avail Mem
                                                  431.2 free, 375.5 free,
MiB Mem :
MiB Swap:
                                                                                                             TIME+ COMMAND
0:20.33 mem2.bash
0:02.47 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                               \mathbf{PR}
      PID USER
                                      НΙ
                                                VIRT
                                                               RES
                                                                           SHR S
                                                                                       ∠CPU
                                                                                                  >MEM
                                                                                       82.4
0.0
0.0
                                                                                                  68.1
                               20
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     1703 root
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                                                                          1668 R
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                                                                              Ō
                                    -20
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          4 root
                                0
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                                                                                         0.0
                    ,
1826.8 total,
820.0 total,
MiB Mem :
MiB Swap:
                                                  339.2 free, 375.5 free,
                                                                          1434.7 used,
444.5 used.
                                                                                                      52.8 buff/cache 292.4 avail Mem
                                                                                                             TIME+ COMMAND
0:21.46 mem2.bash
0:02.47 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                                                                                 %MEM
73.1
0.1
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20
                                     NI VIRT
Ø 1951556
      PID USER
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                                                                                      ∠CPU
                                                            1.3g
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     1703 root
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          3 root
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            root
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                                                                                        0.0
Iteration 21
                  1826.8 total,
820.0 total,
                                                                          1529.1 used,
444.5 used.
                                                                                                      52.8 buff/cache
198.0 avail Mem
MiB Mem :
MiB Swap:
                                                  244.8 free, 375.5 free,
                               \mathbf{PR}
                                     НΙ
      PID USER
                                                UIRT
                                                              RES
                                                                          SHR
                                                                                 S
                                                                                       2CPU
                                                                                                 ×MEM
                                                                                                                 TIME+ COMMAND
                                                                                       73.7
0.0
0.0
                                                                                                             0:22.62 mem2.bash
0:02.47 systemd
0:00.00 kthreadd
                              20
20
20
                                                            1.4g
2668
                                       0 2047652
                                                                                                 78.2
     1703 root
                                                                         1668
          1 root
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                                                                         2404 S
Ø S
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0.0
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                                                                                                             0:00.00 rcu_gp
0:00.00 rcu_par_gp
          3 root
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          4 root
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Iteration 22
MiB Mem : 1826.8 total,
Swan: 820.8 total,
                                                                           1620.1 used,
444.3 used.
                                                  152.8 free,
                                                                                                        53.8 buff/cache
                                                  375.7 free,
                                                                                                       106.5 avail Mem
       PID USER
                               \mathbf{PR}
                                      НΙ
                                                VIRT
                                                              RES
                                                                           SHR S
                                                                                       ∠CPU
                                                                                                 ×MEM
                                                                                                                 TIME+ COMMAND
                                                                                       75.0
0.0
0.0
                                                                                                 83.1
0.1
0.0
                                                                                                             0:23.70 mem2.bash
0:02.47 systemd
0:00.00 kthreadd
     1703 root
                              20
20
                                      0 2138864
0 179188
                                                             1.5g
                                                                         1668 R
                                                             266<u>8</u>
                                                                         2404 S
          1 root
          2 root
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                                                                                                             0:00.00 rcu_gp
0:00.00 rcu_par_gp
             root
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0 -20
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                                                                                                   0.0
```

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root

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```
teration 23
MiB Mem :
MiB Swap:
                       1826.8 total,
820.0 total,
                                                        129.5 free,
375.8 free,
                                                                                    1643.2 used,
444.2 used.
                                                                                                                      54.1 buff/cache 17.1 avail Mem
                                                                                    SHR S
1924 R
2480 S
0 S
0 I
0 I
                                          N I
0
0
                                                                                                                            TIME+ COMMAND
0:23.17 mem2.bash
0:03.25 systemd
                                               VIRT
2264812
       PID USER
                                                                      RES
                                                                                                  >:CPU
                                                                                                              ×MEM
                                                                                                              84.5
0.1
                                                                    1.6g
2792
                                                                                   1924
     3786 root
                                   20
                                                                                                  65.0
0.0
                                                                                                                           0:23.17 mem2.bash
0:03.25 systemd
0:00.00 kthreadd
0:00.00 rcu_gp
0:00.00 rcu_par_gp
                                   20
                                                  179188
                                                                                  2480
           1 root
                                   20
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                                                                          0
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                                                                                                                0.0
              root
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0 -20
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                                                            Ø
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           4 root
                                                                                                                0.0
```

```
Iteration 24
                          1826.8 total,
820.0 total,
MiB Mem :
MiB Swap:
                                                                  1680.8 free,
516.9 free,
                                                                                                        94.5 used, 303.1 used.
                                                                                                                                          51.5 buff/cache
1633.3 avail Mem
         PID USER
                                                                  VIRT
                                                                                                                                                           TIME+ COMMAND
                                                                                                                                                     110.4 CUNIHAD
6:83.32 systemd
6:80.80 kthreadd
6:80.80 rcu_gp
6:80.80 rcu_par_gp
6:80.80 rcu_par_gp
6:80.80 kworker/8:8H-kblockd
                                                 -20
-20
-20
             1 root
2 root
3 root
4 root
                                                                                                          30 S
0 S
0 I
0 I
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20
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                                                                                    1872
                                                                         0000
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                                            0 0
                                                                                          000
                  root
```

### Последние записи о скриптах в системном журнале

Последняя строка файла report.log

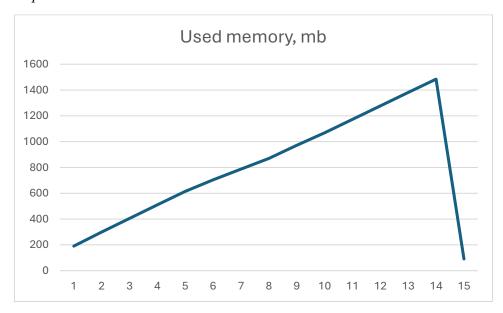
### Array size is 15000000

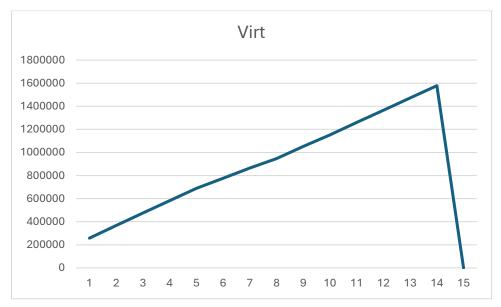
Последняя строка файла report2.log

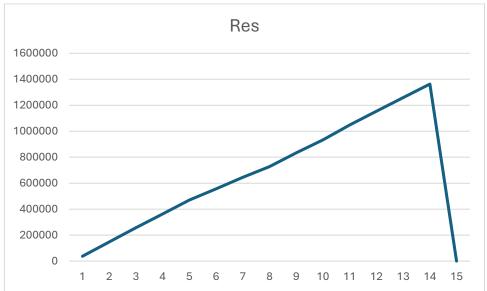
```
Array size is 30000000
```

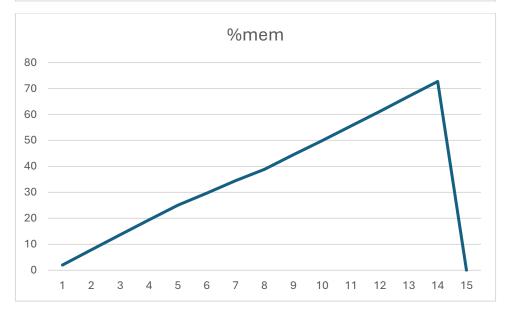
#### Обработка результатов

#### Первый этап

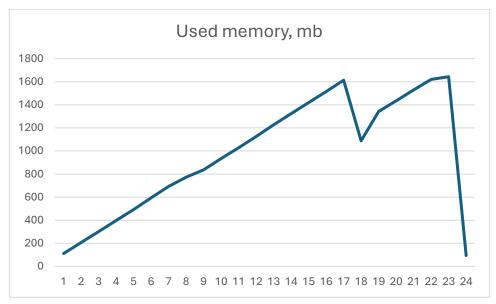


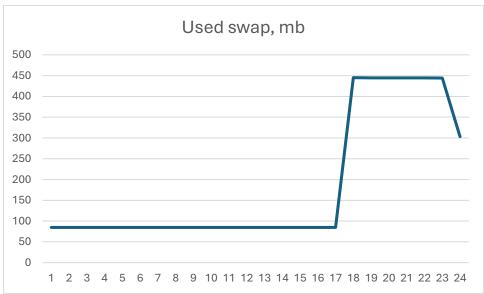


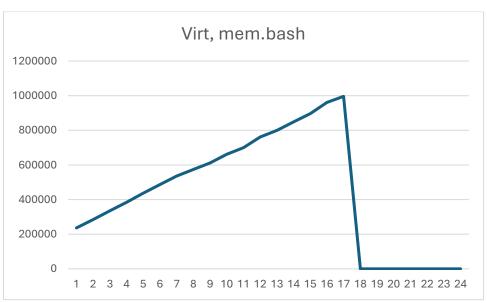


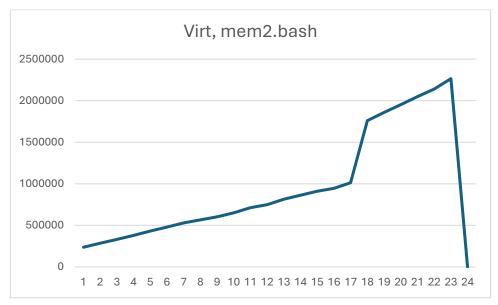


# Второй этап

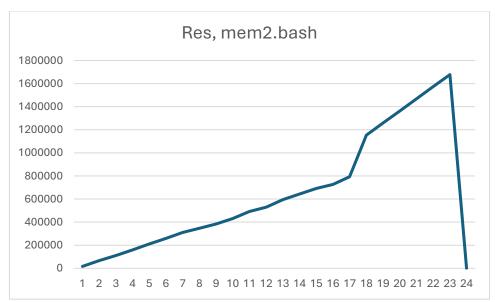




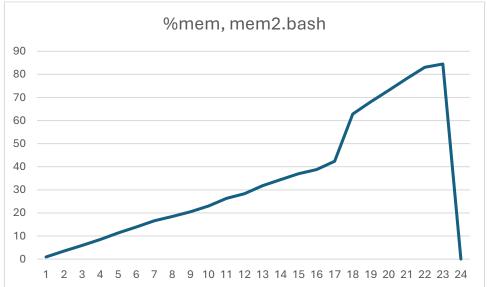












# Эксперимент 2

Подготовительный этап:

Копия скрипта mem.bash newmem.bash, завершает работу, как только размер создаваемого массива превышает значение N, передаваемое в качестве параметра скрипту

```
#!/bin/bash
N=$1
> report.log
array=()
step=8
while true: do
array+=({1..18})
step=$((step + 1))
if [ $(#array[@]) -gt $N ]: then
echo "Array size exceeded $N elements"
exit 8
fi
done
```

#### Основной этап:

Скрипт, который запускает newmem.bash каждую секунду, всего К запусков

```
#!/bin/bash
N=$1
R=$2
for ((i = 1; i <= K; i++)); do
./newmem.bash $N &
sleep 1
done
```

```
Iroot@localhost lab5]# ./task2.bash 3000000 10
Array size exceeded 3000000 elements
Iroot@localhost lab5]#
```

```
[root@localhost lab5]# dmesg | grep "newmem.bash"
[root@localhost lab5]#
```

Максимальное значение N: 1829658