Лабораторная работа №6

Управление процессами

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Цель работы

Цель лабораторной работы

Получить навыки управления процессами операционной системы Linux.

Ход выполнения

Управление заданиями

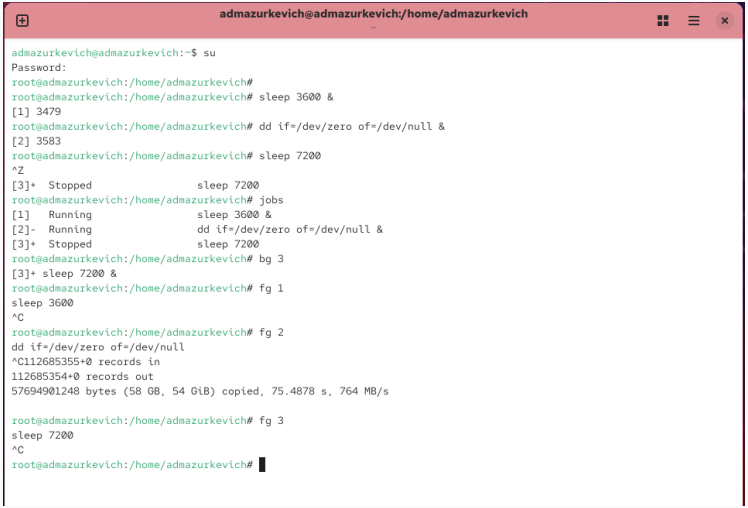
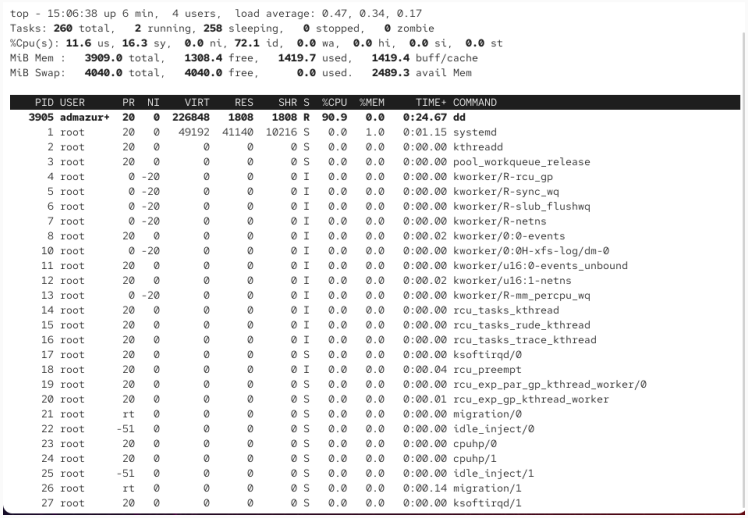


Рис. 1: Список запущенных заданий

Управление заданиями

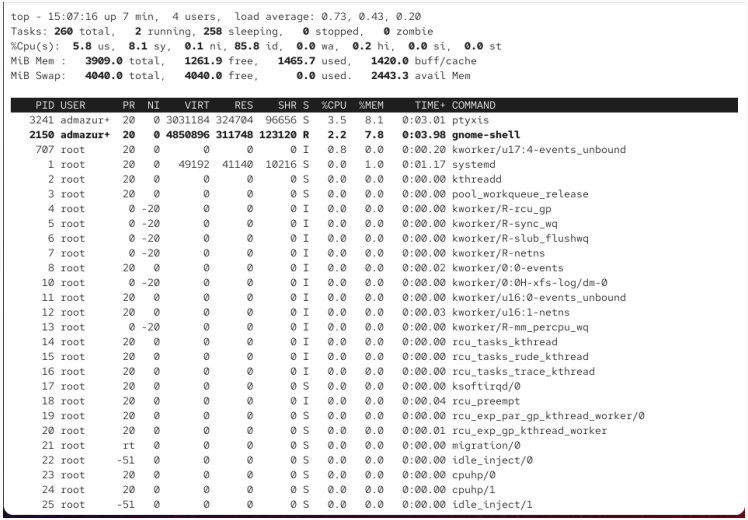


```
top - 15:06:38 up 6 min,  4 users,  load average: 0.47, 0.34, 0.17
Tasks: 260 total,   2 running, 258 sleeping,   0 stopped,   0 zombie
%Cpu(s): 11.6 us, 16.3 sy,  0.0 ni, 72.1 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   3909.0 total,   1308.4 free,   1419.7 used,   1419.4 buff/cache
MiB Swap:   4040.0 total,   4040.0 free,      0.0 used.   2489.3 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   3905 admazur+  20   0  226848   1808   1808 R  90.9   0.0   0:24.67 dd
      1 root      20   0   49192  41140  10216 S   0.0   1.0   0:01.15 systemd
      2 root      20   0       0      0      0 S   0.0   0.0   0:00.00 kthreadd
      3 root      20   0       0      0      0 S   0.0   0.0   0:00.00 pool_workqueue_release
      4 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-rcu_gp
      5 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-sync_wq
      6 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-slub_flushwq
      7 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-netns
      8 root      20   0       0      0      0 I   0.0   0.0   0:00.02 kworker/0:0-events
     10 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/0:0H-xfs-log/dm-0
     11 root      20   0       0      0      0 I   0.0   0.0   0:00.00 kworker/u16:0-events_unbound
     12 root      20   0       0      0      0 I   0.0   0.0   0:00.02 kworker/u16:1-netns
     13 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-mm_percpu_wq
     14 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_kthread
     15 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_rude_kthread
     16 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_trace_kthread
     17 root      20   0       0      0      0 S   0.0   0.0   0:00.00 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.04 rcu_preempt
     19 root      20   0       0      0      0 S   0.0   0.0   0:00.00 rcu_exp_par_gp_kthread_worker/0
     20 root      20   0       0      0      0 S   0.0   0.0   0:00.01 rcu_exp_gp_kthread_worker
     21 root      rt   0       0      0      0 S   0.0   0.0   0:00.00 migration/0
     22 root     -51   0       0      0      0 S   0.0   0.0   0:00.00 idle_inject/0
     23 root      20   0       0      0      0 S   0.0   0.0   0:00.00 cpuhp/0
     24 root      20   0       0      0      0 S   0.0   0.0   0:00.00 cpuhp/1
     25 root     -51   0       0      0      0 S   0.0   0.0   0:00.00 idle_inject/1
     26 root      rt   0       0      0      0 S   0.0   0.0   0:00.14 migration/1
     27 root      20   0       0      0      0 S   0.0   0.0   0:00.00 ksoftirqd/1
```

Рис. 2: Процесс dd в top

Управление заданиями



```
top - 15:07:16 up 7 min,  4 users,  load average: 0.73, 0.43, 0.20
Tasks: 260 total,   2 running, 258 sleeping,   0 stopped,   0 zombie
%Cpu(s):  5.8 us,  8.1 sy,  0.1 ni, 85.8 id,  0.0 wa,  0.2 hi,  0.0 si,  0.0 st
MiB Mem :   3909.0 total,   1261.9 free,   1465.7 used,   1420.0 buff/cache
MiB Swap:   4040.0 total,   4040.0 free,      0.0 used.   2443.3 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   3241 admazur+  20   0 3031184 324704  96656 S   3.5   8.1   0:03.01 ptyxis
   2150 admazur+  20   0 4850896 311748 123120 R   2.2   7.8   0:03.98 gnome-shell
    707 root      20   0       0      0      0 I   0.8   0.0   0:00.20 kworker/u17:4-events_unbound
      1 root      20   0   49192  41140  10216 S   0.0   1.0   0:01.17 systemd
      2 root      20   0       0      0      0 S   0.0   0.0   0:00.00 kthreadd
      3 root      20   0       0      0      0 S   0.0   0.0   0:00.00 pool_workqueue_release
      4 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-rcu_gp
      5 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-sync_wq
      6 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-slub_flushwq
      7 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-netns
      8 root      20   0       0      0      0 I   0.0   0.0   0:00.02 kworker/0:0-events
     10 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/0:0H-xfs-log/dm-0
     11 root      20   0       0      0      0 I   0.0   0.0   0:00.00 kworker/u16:0-events_unbound
     12 root      20   0       0      0      0 I   0.0   0.0   0:00.03 kworker/u16:1-netns
     13 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-mm_percpu_wq
     14 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_kthread
     15 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_rude_kthread
     16 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_trace_kthread
     17 root      20   0       0      0      0 S   0.0   0.0   0:00.00 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.04 rcu_preempt
     19 root      20   0       0      0      0 S   0.0   0.0   0:00.00 rcu_exp_par_gp_kthread_worker/0
     20 root      20   0       0      0      0 S   0.0   0.0   0:00.01 rcu_exp_gp_kthread_worker
     21 root      rt   0       0      0      0 S   0.0   0.0   0:00.00 migration/0
     22 root     -51   0       0      0      0 S   0.0   0.0   0:00.00 idle_inject/0
     23 root      20   0       0      0      0 S   0.0   0.0   0:00.00 cpuhp/0
     24 root      20   0       0      0      0 S   0.0   0.0   0:00.00 cpuhp/1
     25 root     -51   0       0      0      0 S   0.0   0.0   0:00.00 idle_inject/1
```

Рис. 3: Завершение процесса dd в top

Управление процессами

```
root@admazurkevich:/home/admazurkevich# dd if=/dev/zero of=/dev/zero &
[1] 4261
root@admazurkevich:/home/admazurkevich# dd if=/dev/zero of=/dev/zero &
[2] 4263
root@admazurkevich:/home/admazurkevich# dd if=/dev/zero of=/dev/zero &
[3] 4265
root@admazurkevich:/home/admazurkevich# ps aux | grep dd
root           2  0.0  0.0      0     0 ?        S    14:59   0:00 [kthreadd]
root          92  0.0  0.0      0     0 ?        I<   14:59   0:00 [kworker/R-ipv6_addrconf]
root        1155  0.0  0.0 578492  3140 ?        Sl   14:59   0:00 /usr/sbin/VBoxService --pidfile /var/run/vboxadd-service.sh
admazur+    2525  0.0  0.6 962676 25636 ?        Ssl  15:01   0:00 /usr/libexec/evolution-addressbook-factory
root        4261 99.5  0.0 226848  1760 pts/0    R    15:08   0:12 dd if=/dev/zero of=/dev/zero
root        4263 98.7  0.0 226848  1752 pts/0    R    15:08   0:10 dd if=/dev/zero of=/dev/zero
root        4265 99.2  0.0 226848  1816 pts/0    R    15:08   0:10 dd if=/dev/zero of=/dev/zero
root        4291  0.0  0.0 227688  2028 pts/0    S+   15:08   0:00 grep --color=auto dd
root@admazurkevich:/home/admazurkevich# renice -n 5 4261
4261 (process ID) old priority 0, new priority 5
root@admazurkevich:/home/admazurkevich# ps fax | grep -B5 dd
    PID TTY      STAT   TIME COMMAND
      2 ?        S      0:00 [kthreadd]
--
     82 ?        I<     0:00  \_ [kworker/R-kthrotld]
     87 ?        I<     0:00  \_ [kworker/R-acpi_thermal_pm]
     88 ?        I<     0:00  \_ [kworker/R-kmpath_rdacd]
     89 ?        I<     0:00  \_ [kworker/R-kaluad]
     91 ?        I<     0:00  \_ [kworker/R-mld]
     92 ?        I<     0:00  \_ [kworker/R-ipv6_addrconf]
--
    928 ?        SNs    0:00 /usr/sbin/alsactl -s -n 19 -c -E ALSA_CONFIG_PATH=/etc/alsa/alsactl.conf --initfile=/lib/alsa/init/00main rdaemon
    953 ?        S      0:00 /usr/sbin/chronyd -F 2
```

Рис. 4: Поиск процессов dd

Управление процессами

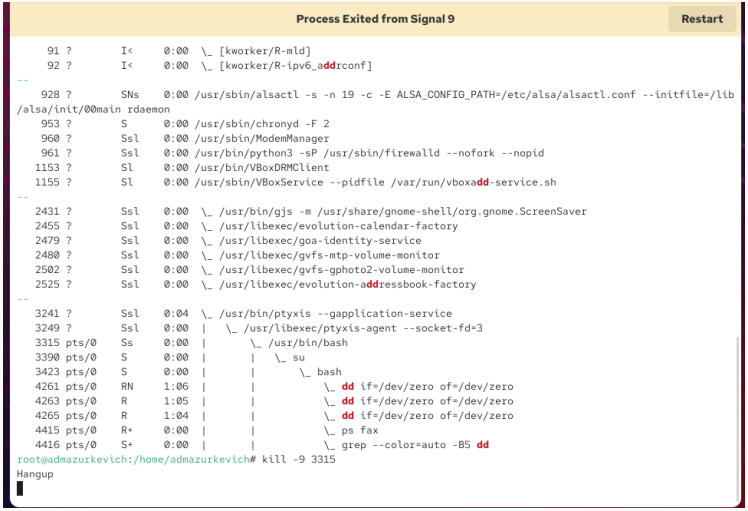


Рис. 5: Завершение родительского процесса и дочерних dd

Задание 1

```
admazurkevich@admazurkevich:~$
admazurkevich@admazurkevich:~$ su
Password:
root@admazurkevich:/home/admazurkevich# dd if=/dev/zero of=/dev/null &
[1] 4885
root@admazurkevich:/home/admazurkevich# dd if=/dev/zero of=/dev/null &
[2] 4887
root@admazurkevich:/home/admazurkevich# dd if=/dev/zero of=/dev/null &
[3] 4889
root@admazurkevich:/home/admazurkevich# renice -n 5 4885
4885 (process ID) old priority 0, new priority 5
root@admazurkevich:/home/admazurkevich# renice -n 15 4885
4885 (process ID) old priority 5, new priority 15
root@admazurkevich:/home/admazurkevich# killall dd
[2]-  Terminated              dd if=/dev/zero of=/dev/null
[1]-  Terminated              dd if=/dev/zero of=/dev/null
[3]+  Terminated              dd if=/dev/zero of=/dev/null
root@admazurkevich:/home/admazurkevich#
```

Рис. 6: Запуск, изменение приоритета и завершение процессов dd

```
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[1] 5097
root@admazurkevich:/home/admazurkevich# yes > /dev/null
^Z
[2]+  Stopped                 yes > /dev/null
root@admazurkevich:/home/admazurkevich# yes > /dev/null
^C
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# jobs
[1]-  Running                 yes > /dev/null &
[2]+  Stopped                 yes > /dev/null
root@admazurkevich:/home/admazurkevich#
```

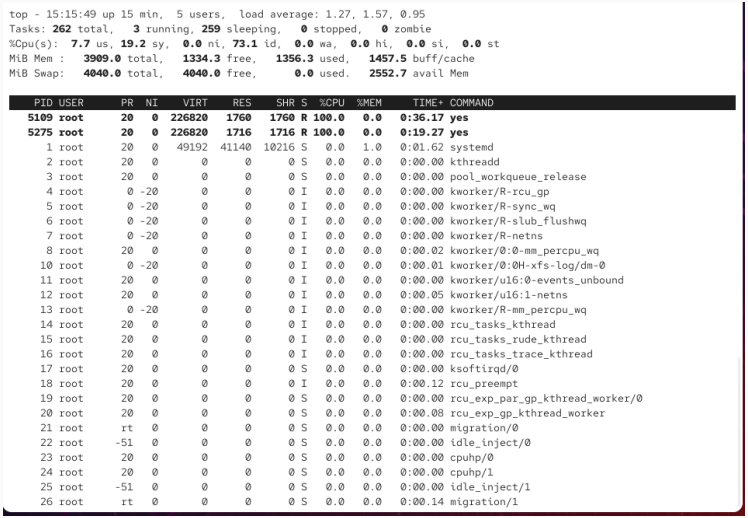
Рис. 7: Фоновые и приостановленные процессы yes

Задание 2

```
^C
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# jobs
[1]-  Running                 yes > /dev/null &
[2]+  Stopped                 yes > /dev/null
root@admazurkevich:/home/admazurkevich# fg 1
yes > /dev/null
^C
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# jobs
[2]+  Stopped                 yes > /dev/null
root@admazurkevich:/home/admazurkevich# bg 2
[2]+ yes > /dev/null &
root@admazurkevich:/home/admazurkevich# jobs
[2]+  Running                 yes > /dev/null &
root@admazurkevich:/home/admazurkevich# nohup yes > /dev/null &
[3] 5275
nohup: ignoring input and redirecting stderr to stdout
root@admazurkevich:/home/admazurkevich# jobs
[2]-  Running                 yes > /dev/null &
[3]+  Running                 nohup yes > /dev/null &
root@admazurkevich:/home/admazurkevich#
```

Рис. 8: Запуск yes с nohup

Задание 2



```
top - 15:15:49 up 15 min,  5 users,  load average: 1.27, 1.57, 0.95
Tasks: 262 total,   3 running, 259 sleeping,   0 stopped,   0 zombie
%Cpu(s):  7.7 us, 19.2 sy,  0.0 ni, 73.1 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   3909.0 total,   1334.3 free,   1356.3 used,   1457.5 buff/cache
MiB Swap:   4040.0 total,   4040.0 free,      0.0 used.   2552.7 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   5109 root      20   0  226820   1760   1760 R 100.0   0.0   0:36.17 yes
   5275 root      20   0  226820   1716   1716 R 100.0   0.0   0:19.27 yes
      1 root      20   0   49192  41140  10216 S   0.0   1.0   0:01.62 systemd
      2 root      20   0       0      0      0 S   0.0   0.0   0:00.00 kthreadd
      3 root      20   0       0      0      0 S   0.0   0.0   0:00.00 pool_workqueue_release
      4 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-rcu_gp
      5 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-sync_wq
      6 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-slub_flushwq
      7 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-netns
      8 root      20   0       0      0      0 I   0.0   0.0   0:00.02 kworker/0:0-mm_percpu_wq
     10 root       0 -20       0      0      0 I   0.0   0.0   0:00.01 kworker/0:0H-xfs-log/dm-0
     11 root      20   0       0      0      0 I   0.0   0.0   0:00.00 kworker/u16:0-events_unbound
     12 root      20   0       0      0      0 I   0.0   0.0   0:00.05 kworker/u16:1-netns
     13 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/R-mm_percpu_wq
     14 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_kthread
     15 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_rude_kthread
     16 root      20   0       0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_trace_kthread
     17 root      20   0       0      0      0 S   0.0   0.0   0:00.00 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.12 rcu_preempt
     19 root      20   0       0      0      0 S   0.0   0.0   0:00.00 rcu_exp_par_gp_kthread_worker/0
     20 root      20   0       0      0      0 S   0.0   0.0   0:00.08 rcu_exp_gp_kthread_worker
     21 root      rt   0       0      0      0 S   0.0   0.0   0:00.00 migration/0
     22 root     -51   0       0      0      0 S   0.0   0.0   0:00.00 idle_inject/0
     23 root      20   0       0      0      0 S   0.0   0.0   0:00.00 cpuhp/0
     24 root      20   0       0      0      0 S   0.0   0.0   0:00.00 cpuhp/1
     25 root     -51   0       0      0      0 S   0.0   0.0   0:00.00 idle_inject/1
     26 root      rt   0       0      0      0 S   0.0   0.0   0:00.14 migration/1
```

Рис. 9: Процессы yes в top

Задание 2

```
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[1] 5566
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[2] 5571
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[3] 5583
root@admazurkevich:/home/admazurkevich# kill 5583
[3]+  Terminated              yes > /dev/null
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# fg 2
yes > /dev/null
^C
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# kill -1 5566
[1]+  Hangup                  yes > /dev/null
root@admazurkevich:/home/admazurkevich# kill -1 5109
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# kill -1 5275
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[1] 5844
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[2] 5846
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[3] 5848
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[4] 5850
root@admazurkevich:/home/admazurkevich# killall yes
[4]+  Terminated              yes > /dev/null
[1]   Terminated              yes > /dev/null
[2]-  Terminated              yes > /dev/null
[3]+  Terminated              yes > /dev/null
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich#
```

Задание 2

```
root@admazurkevich:/home/admazurkevich# yes > /dev/null &
[1] 5980
root@admazurkevich:/home/admazurkevich# nice -n 5 yes > /dev/null &
[2] 6004
root@admazurkevich:/home/admazurkevich# ps -l
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0    5317    3954  0  80   0 - 58153 do_wai pts/2    00:00:00 su
4 S     0    5343    5317  0  80   0 - 57575 do_wai pts/2    00:00:00 bash
4 R     0    5980    5343 99  80   0 - 56705 -      pts/2    00:00:09 yes
4 R     0    6004    5343 98  85   5 - 56705 -      pts/2    00:00:02 yes
4 R     0    6006    5343  0  80   0 - 57682 -      pts/2    00:00:00 ps
root@admazurkevich:/home/admazurkevich# renice -n 5 5980
5980 (process ID) old priority 0, new priority 5
root@admazurkevich:/home/admazurkevich# ps -l
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0    5317    3954  0  80   0 - 58153 do_wai pts/2    00:00:00 su
4 S     0    5343    5317  0  80   0 - 57575 do_wai pts/2    00:00:00 bash
4 R     0    5980    5343 99  85   5 - 56705 -      pts/2    00:00:54 yes
4 R     0    6004    5343 99  85   5 - 56705 -      pts/2    00:00:47 yes
4 R     0    6103    5343  0  80   0 - 57682 -      pts/2    00:00:00 ps
root@admazurkevich:/home/admazurkevich# killall yes
[1]-  Terminated              yes > /dev/null
[2]+  Terminated              nice -n 5 yes > /dev/null
root@admazurkevich:/home/admazurkevich#
```

Рис. 11: Изменение приоритета процессов yes

Выводы по проделанной работе

Вывод

В ходе лабораторной работы были освоены:

- управление заданиями и процессами в Linux;
- использование `jobs`, `fg`, `bg`, `kill`, `killall`, `ps`, `top`;
- изменение приоритетов процессов с помощью `nice` и `renice`;
- применение `nohup` для независимого запуска процессов.

Полученные навыки формируют основу администрирования процессов и позволяют эффективно управлять ресурсами системы.