Лабораторная работа №6

Управление процессами

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Цель работы

Основная цель

Получение навыков управления заданиями и процессами в операционной системе Linux.

Ход выполнения работы

Управление заданиями

```
haoladar@haoladar:~$ su
Password:
root@haoladar:/home/haoladar# sleeo 3600 &
[1] 3401
root@haoladar:/home/haoladar# bash: sleeo: command not found...

[1]+  Exit 127                sleeo 3600
root@haoladar:/home/haoladar# sleep 3600 &
[1] 3429
root@haoladar:/home/haoladar# dd if=/dev/zero of=/dev/null &
[2] 3470
root@haoladar:/home/haoladar# sleep 7200
^Z
[3]+  Stopped                 sleep 7200
root@haoladar:/home/haoladar# jobs
[1]   Running                 sleep 3600 &
[2]-  Running                 dd if=/dev/zero of=/dev/null &
[3]+  Stopped                 sleep 7200
root@haoladar:/home/haoladar# bg 3
[3]+ sleep 7200 &
root@haoladar:/home/haoladar# jobs
[1]   Running                 sleep 3600 &
[2]-  Running                 dd if=/dev/zero of=/dev/null &
[3]+  Running                 sleep 7200 &
root@haoladar:/home/haoladar#
```


Рис. 1: Продолжение выполнения job в фоне

Управление заданиями

```
root@haoladar:/home/haoladar#
root@haoladar:/home/haoladar# fg 1
sleep 3600
^C
root@haoladar:/home/haoladar# fg 2
dd if=/dev/zero of=/dev/null
^C108624478+0 records in
108624478+0 records out
55615732736 bytes (56 GB, 52 GiB) copied, 73.6234 s, 755 MB/s

root@haoladar:/home/haoladar# fg 3
sleep 7200
^C
root@haoladar:/home/haoladar# jobs
root@haoladar:/home/haoladar#
```

Рис. 2: Перевод процессов на передний план и завершение

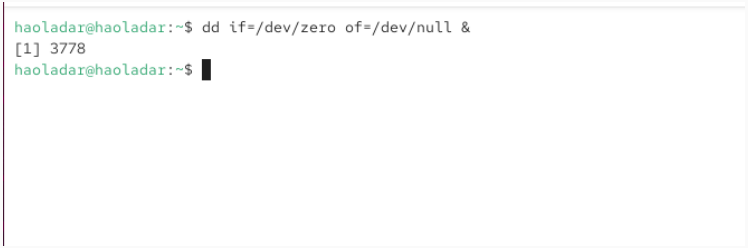


Рис. 3: Фоновый процесс в другом терминале

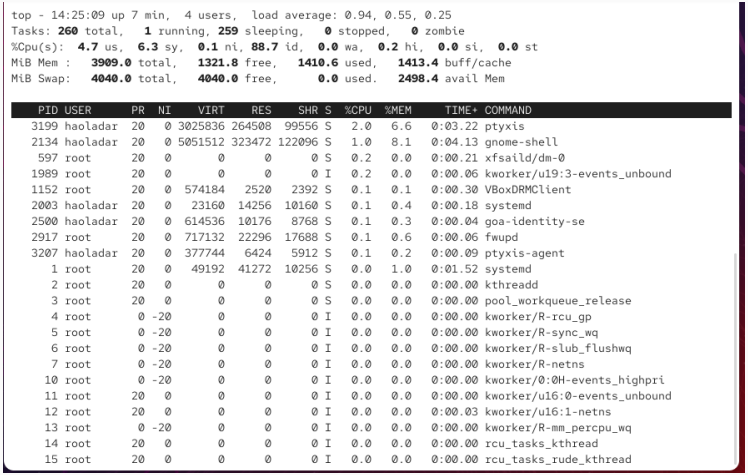
Управление заданиями

```
top - 14:23:41 up 5 min,  4 users,  load average: 0.72, 0.39, 0.17
Tasks: 263 total,   2 running, 261 sleeping,   0 stopped,   0 zombie
%Cpu(s):  5.7 us,  5.7 sy,  0.0 ni, 85.7 id,  0.0 wa,  2.9 hi,  0.0 si,  0.0 st
MiB Mem :   3909.0 total,   1368.5 free,   1365.0 used,   1412.2 buff/cache
MiB Swap:   4040.0 total,   4040.0 free,      0.0 used.   2543.9 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   3778 haoladar  20   0  226848   1896   1896 R 100.0   0.0   0:23.42 dd
      1 root      20   0   49192  41272  10256 S   0.0   1.0   0:01.46 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
     10 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/0:0H-events_highpri
     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   0:00.01 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.09 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   0:00.11 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
```

Рис. 4: Просмотр процессов через top

Управление заданиями



```
top - 14:25:09 up 7 min,  4 users,  load average: 0.94, 0.55, 0.25
Tasks: 260 total,   1 running, 259 sleeping,   0 stopped,   0 zombie
%Cpu(s):  4.7 us,  6.3 sy,  0.1 ni, 88.7 id,  0.0 wa,  0.2 hi,  0.0 si,  0.0 st
MiB Mem :   3909.0 total,   1321.8 free,   1410.6 used,   1413.4 buff/cache
MiB Swap:   4040.0 total,   4040.0 free,      0.0 used.   2498.4 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   3199 haoladar  20   0 3025836 264508  99556 S   2.0   6.6   0:03.22 ptyxis
   2134 haoladar  20   0 5051512 323472 122096 S   1.0   8.1   0:04.13 gnome-shell
    597 root      20   0       0      0      0 S   0.2   0.0   0:00.21 xfsaild/dm-0
   1989 root      20   0       0      0      0 I   0.2   0.0   0:00.06 kworker/u19:3-events_unbound
   1152 root      20   0  574184   2520   2392 S   0.1   0.1   0:00.30 VBoxDRMClient
   2003 haoladar  20   0   23160  14256  10160 S   0.1   0.4   0:00.18 systemd
   2500 haoladar  20   0  614536  10176   8768 S   0.1   0.3   0:00.04 goa-identity-se
   2917 root      20   0  717132  22296  17688 S   0.1   0.6   0:00.06 fwupd
   3207 haoladar  20   0  377744   6424   5912 S   0.1   0.2   0:00.09 ptyxis-agent
      1 root      20   0   49192  41272  10256 S   0.0   1.0   0:01.52 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
     10 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/0:0H-events_highpri
     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
```

Рис. 5: Завершение процесса dd через top

Управление процессами

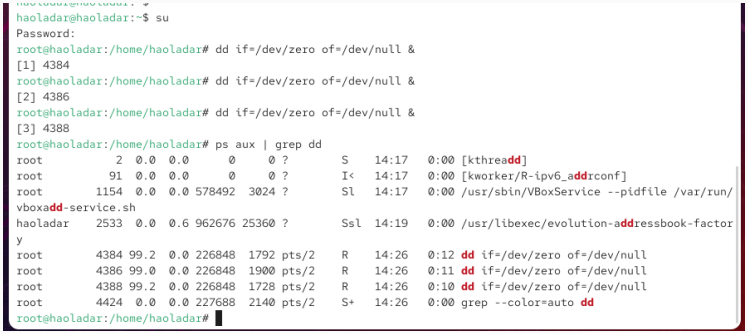


Рис. 6: Запуск фоновых процессов dd

Управление процессами

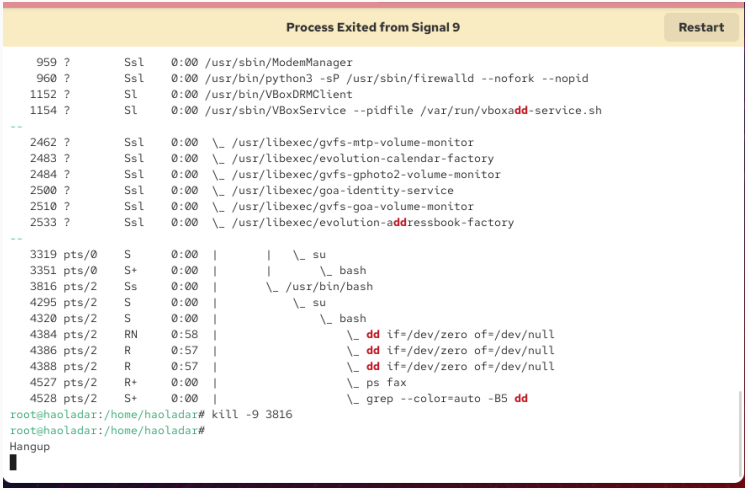


Рис. 7: Завершение процессов через kill

```
haoladar@haoladar:~$
haoladar@haoladar:~$ dd if=/dev/zero of=/dev/null &
[1] 5006
haoladar@haoladar:~$ dd if=/dev/zero of=/dev/null &
[2] 5008
haoladar@haoladar:~$ dd if=/dev/zero of=/dev/null &
[3] 5010
haoladar@haoladar:~$ renice -n 5 5006
5006 (process ID) old priority 0, new priority 5
haoladar@haoladar:~$ renice -n 15 5006
5006 (process ID) old priority 5, new priority 15
haoladar@haoladar:~$ killall dd
[1]   Terminated              dd if=/dev/zero of=/dev/null
[2]-  Terminated              dd if=/dev/zero of=/dev/null
[3]+  Terminated              dd if=/dev/zero of=/dev/null
haoladar@haoladar:~$
```

Рис. 8: Изменение приоритета процесса

```
haoladar@haoladar:~$ su
Password:
root@haoladar:/home/haoladar# yes > /dev/null &
[1] 5312
root@haoladar:/home/haoladar# yes > /dev/null
^Z
[2]+  Stopped                 yes > /dev/null
root@haoladar:/home/haoladar# yes > /dev/null
^C
root@haoladar:/home/haoladar# jobs
[1]-  Running                 yes > /dev/null &
[2]+  Stopped                 yes > /dev/null
root@haoladar:/home/haoladar#
```

Рис. 9: Работа yes на переднем плане и завершение

Задание 2

```
root@haoladar:/home/haoladar#
root@haoladar:/home/haoladar# jobs
[1]-  Running                 yes > /dev/null &
[2]+  Stopped                 yes > /dev/null
root@haoladar:/home/haoladar# fg 1
yes > /dev/null
^C
root@haoladar:/home/haoladar# jobs
[2]+  Stopped                 yes > /dev/null
root@haoladar:/home/haoladar# bg 2
[2]+ yes > /dev/null &
root@haoladar:/home/haoladar# jobs
[2]+  Running                 yes > /dev/null &
root@haoladar:/home/haoladar# nohup yes > /dev/null &
[3] 5508
root@haoladar:/home/haoladar# nohup: ignoring input and redirecting stderr to stdout

root@haoladar:/home/haoladar# jobs
[2]-  Running                 yes > /dev/null &
[3]+  Running                 nohup yes > /dev/null &
root@haoladar:/home/haoladar#
```

Рис. 10: Перевод процесса на передний план

Задание 2

```
top - 14:35:08 up 17 min,  5 users,  load average: 1.14, 0.85, 0.59
Tasks: 260 total,   3 running, 257 sleeping,   0 stopped,   0 zombie
%Cpu(s): 18.9 us, 29.7 sy,  0.0 ni, 51.4 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   3909.0 total,   1356.6 free,   1364.2 used,   1428.4 buff/cache
MiB Swap:   4040.0 total,   4040.0 free,      0.0 used.   2544.8 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   5324 root      20   0  226820   1676   1676 R 100.0   0.0   0:49.73 yes
   5508 root      20   0  226820   1716   1716 R  90.9   0.0   0:26.82 yes
    134 root      20   0       0      0      0 I   9.1   0.0   0:00.28 kworker/u17:3-events_unbound
      1 root      20   0   49192  41144  10256 S   0.0   1.0   0:02.09 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
     10 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/0:0H-events_highpri
     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   0:00.06 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   0:00.01 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.16 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   0:00.12 rcu_exp_gp_kthread_worker
     21 root      rt   0       0      0      0 S   0.0   0.0   0:00.11 migration/0
```

Рис. 11: Вывод top с процессами yes

Задание 2

```
root@haoladar:/home/haoladar# yes > /dev/null &
[1] 5839
root@haoladar:/home/haoladar# yes > /dev/null &
[2] 5841
root@haoladar:/home/haoladar# yes > /dev/null &
[3] 5843
root@haoladar:/home/haoladar# kill 5839
root@haoladar:/home/haoladar#
[1]   Terminated              yes > /dev/null
root@haoladar:/home/haoladar# fg 2
yes > /dev/null
^C
root@haoladar:/home/haoladar#
root@haoladar:/home/haoladar# kill -1 5324
root@haoladar:/home/haoladar# kill -1 5843
[3]+  Hangup                  yes > /dev/null
root@haoladar:/home/haoladar#
root@haoladar:/home/haoladar# jobs
root@haoladar:/home/haoladar# yes > /dev/null &
[1] 6015
root@haoladar:/home/haoladar# yes > /dev/null &
[2] 6017
root@haoladar:/home/haoladar# yes > /dev/null &
[3] 6019
root@haoladar:/home/haoladar# killall yes
[1]   Terminated              yes > /dev/null
[2]-  Terminated              yes > /dev/null
[3]+  Terminated              yes > /dev/null
root@haoladar:/home/haoladar#
```

Задание 2

```
root@haoladar:/home/haoladar# yes > /dev/null &
[1] 6200
root@haoladar:/home/haoladar# nice -n 5 yes > /dev/null &
[2] 6223
root@haoladar:/home/haoladar# ps -l
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0    3319    3275  0  80   0 - 58153 do_wai pts/0    00:00:00 su
4 S     0    3351    3319  0  80   0 - 57575 do_wai pts/0    00:00:00 bash
4 R     0    6200    3351 99  80   0 - 56705 -      pts/0    00:00:11 yes
4 R     0    6223    3351 99  85   5 - 56705 -      pts/0    00:00:04 yes
4 R     0    6235    3351  0  80   0 - 57682 -      pts/0    00:00:00 ps
root@haoladar:/home/haoladar# renice -n 5 6200
6200 (process ID) old priority 0, new priority 5
root@haoladar:/home/haoladar# ps -l
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0    3319    3275  0  80   0 - 58153 do_wai pts/0    00:00:00 su
4 S     0    3351    3319  0  80   0 - 57575 do_wai pts/0    00:00:00 bash
4 R     0    6200    3351 99  85   5 - 56705 -      pts/0    00:00:25 yes
4 R     0    6223    3351 99  85   5 - 56705 -      pts/0    00:00:18 yes
4 R     0    6260    3351  0  80   0 - 57682 -      pts/0    00:00:00 ps
root@haoladar:/home/haoladar# killall yes
[1]-  Terminated              yes > /dev/null
[2]+  Terminated              nice -n 5 yes > /dev/null
root@haoladar:/home/haoladar#
```

Рис. 13: Сравнение приоритетов процессов

Итоги работы

Вывод

- Получены навыки управления заданиями в Linux (**jobs, fg, bg**)
- Освоены приёмы завершения процессов (**kill, killall, top**)
- Изучены механизмы изменения приоритета процессов (**nice, renice**)
- На практике проверены особенности сигналов и работы с nohup
- Сформированы базовые умения администрирования процессов в Linux