Презентация по лабораторной работе №6

Управление процессами

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Цели и задачи работы

Цель работы

Получить навыки управления процессами операционной системы.

Ход выполнения работы

Управление заданиями

```
eragdzhabekova@eragdzhabekova:~$ su
Password:
root@eragdzhabekova:/home/eragdzhabekova# sleep 3600 &
[1] 3335
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[2] 3382
root@eragdzhabekova:/home/eragdzhabekova# sleep 7200
^Z
[3]+  Stopped                 sleep 7200
root@eragdzhabekova:/home/eragdzhabekova# jobs
[1]   Running                 sleep 3600 &
[2]-  Running                 dd if=/dev/zero of=/dev/null &
[3]+  Stopped                 sleep 7200
root@eragdzhabekova:/home/eragdzhabekova# bg 3
[3]+ sleep 7200 &
root@eragdzhabekova:/home/eragdzhabekova# jobs
[1]   Running                 sleep 3600 &
[2]-  Running                 dd if=/dev/zero of=/dev/null &
[3]+  Running                 sleep 7200 &
root@eragdzhabekova:/home/eragdzhabekova# fg 1
sleep 3600
^C
root@eragdzhabekova:/home/eragdzhabekova# fg 2
dd if=/dev/zero of=/dev/null
^C158272023+0 records in
158272023+0 records out
81035275776 bytes (81 GB, 75 GiB) copied, 105.137 s, 771 MB/s

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

Работа с заданиями в фоне и переднем плане

eragdzhabekova@eragdzhabekova:/home/eragdzhabekova

eragdzhabekova@eragdzhabekova:~ — top

```
top - 15:22:30 up 7 min,  4 users,  load average: 0.56, 0.38, 0.17
Tasks: 232 total,   1 running, 231 sleeping,   0 stopped,   0 zombie
%Cpu(s):  1.8 us,  2.0 sy,  0.0 ni, 95.8 id,  0.0 wa,  0.3 hi,  0.0 si,  0.0 st
MiB Mem :   1961.3 total,    154.6 free,   1199.6 used,    776.1 buff/cache
MiB Swap:   2092.0 total,   2091.7 free,      0.3 used.    761.6 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   3138 eragdzh+  20   0 1914472 301840  98844 S   3.0  15.0   0:01.92 ptyxis
   2039 eragdzh+  20   0 4089512 300676 119780 S   2.3  15.0   0:03.03 gnome-shell
     33 root      20   0       0      0      0 I   0.3   0.0   0:00.09 kworker/u10:1-events_unbound
     36 root      20   0       0      0      0 I   0.3   0.0   0:00.08 kworker/u9:1-events_unbound
   1105 root      20   0  574184   2376   2120 S   0.3   0.1   0:00.16 VBoxDRMClient
   3948 eragdzh+  20   0  231612   5544   3368 R   0.3   0.3   0:00.01 top
      1 root      20   0   49192  40216   9324 S   0.0   2.0   0:01.50 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   0:00.04 kworker/0:0-ata_sff
     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/u8:0-events_unbound
     12 root      20   0       0      0      0 I   0.0   0.0   0:00.03 kworker/u8:1-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   0:00.03 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.07 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   0:00.03 ksoftirqd/1
```

Мониторинг процессов в top

```
top - 15:23:39 up 0 min,  3 users,  load average: 0.39, 0.08, 0.03
Tasks: 247 total,   1 running, 246 sleeping,   0 stopped,   0 zombie
%Cpu(s):  4.8 us,  4.8 sy,  0.0 ni, 90.5 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   1961.3 total,    430.4 free,   1124.0 used,    566.0 buff/cache
MiB Swap:   2092.0 total,   2092.0 free,      0.0 used.    837.2 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   2939 eragdzh+  20   0  231616   4900   2852 R   8.3   0.2   0:00.01 top
      1 root      20   0   49192  41136  10160 S   0.0   2.0   0:00.75 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-xfs-inodegc/dm-0
      9 root      20   0       0      0      0 I   0.0   0.0   0:00.00 kworker/0:1-ata_sff
     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/u8:0-events_unbound
     12 root      20   0       0      0      0 I   0.0   0.0   0:00.00 kworker/u8:1-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   0:00.00 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   0:00.00 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   0:00.13 migration/1
     27 root      20   0       0      0      0 S   0.0   0.0   0:00.01 ksoftirqd/1
     28 root      20   0       0      0      0 I   0.0   0.0   0:00.00 kworker/1:0-cgroup_destroy
     29 root       0 -20       0      0      0 I   0.0   0.0   0:00.00 kworker/1:0H-events_highpri
```


Рис. 3: Мониторинг процессов в top

Управление процессами

```
root@eragdzhabekova:/home/eragdzhabekova#
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[1] 3058
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[2] 3060
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[3] 3062
root@eragdzhabekova:/home/eragdzhabekova# ps aux | grep dd
root           2  0.0  0.0      0     0 ?        S    15:23   0:00 [kthreadd]
root          73  0.0  0.0      0     0 ?        I<   15:23   0:00 [kworker/R-ipv6_addrconf]
root        1098  0.0  0.1 512956  3388 ?        Sl   15:23   0:00 /usr/sbin/VBoxService --pidfile /var/run/vboxadd-service.sh
eragdzh+    2407  0.0  1.2 1036400 25528 ?       Ssl  15:23   0:00 /usr/libexec/evolution-addressbook-factory
root        3058 64.1  0.0 226848  1824 pts/0    R    15:24   0:05 dd if=/dev/zero of=/dev/null
root        3060 59.7  0.0 226848  1900 pts/0    R    15:24   0:04 dd if=/dev/zero of=/dev/null
root        3062 56.3  0.0 226848  1784 pts/0    R    15:24   0:04 dd if=/dev/zero of=/dev/null
root        3087  0.0  0.1 227688  2040 pts/0    S+   15:24   0:00 grep --color=auto dd
root@eragdzhabekova:/home/eragdzhabekova# renice -n 5 3058
3058 (process ID) old priority 0, new priority 5
root@eragdzhabekova:/home/eragdzhabekova#
root@eragdzhabekova:/home/eragdzhabekova# ps fax | grep dd
      2 ?        S      0:00 [kthreadd]
     73 ?        I<     0:00  \_ [kworker/R-ipv6_addrconf]
   1098 ?        Sl     0:00 /usr/sbin/VBoxService --pidfile /var/run/vboxadd-service.sh
   2407 ?        Ssl    0:00  \_ /usr/libexec/evolution-addressbook-factory
   3058 pts/0    RN     0:19  |                    \_ dd if=/dev/zero of=/dev/null
   3060 pts/0    R      0:29  |                    \_ dd if=/dev/zero of=/dev/null
   3062 pts/0    R      0:27  |                    \_ dd if=/dev/zero of=/dev/null
   3178 pts/0    S+     0:00  |                    \_ grep --color=auto dd
root@eragdzhabekova:/home/eragdzhabekova#
```

Рис. 4: Просмотр процессов с помощью ps aux

Иерархия процессов и завершение оболочки

```
   1098 ?        Sl     0:00 /usr/sbin/VBoxService --pidfile /var/run/vboxadd-service.sh
--
   2343 ?        Ssl    0:00  \_ /usr/libexec/gvfs-udisks2-volume-monitor
   2353 ?        Ssl    0:00  \_ /usr/libexec/goa-identity-service
   2357 ?        Ssl    0:00  \_ /usr/bin/gjs -m /usr/share/gnome-shell/org.gnome.ScreenSaver
   2378 ?        Ssl    0:00  \_ /usr/libexec/gvfs-mtp-volume-monitor
   2404 ?        Ssl    0:00  \_ /usr/libexec/gvfs-gphoto2-volume-monitor
   2407 ?        Ssl    0:00  \_ /usr/libexec/evolution-addressbook-factory
--
   2846 ?        Ssl    0:01  \_ /usr/bin/ptyxis --gapplication-service
   2853 ?        Ssl    0:00  |   \_ /usr/libexec/ptyxis-agent --socket-fd=3
   2910 pts/0    Ss     0:00  |       \_ /usr/bin/bash
   2988 pts/0    S      0:00  |           \_ su
   3021 pts/0    S      0:00  |               \_ bash
   3058 pts/0    RN     0:31  |                   \_ dd if=/dev/zero of=/dev/null
   3060 pts/0    R      1:03  |                   \_ dd if=/dev/zero of=/dev/null
   3062 pts/0    R      1:02  |                   \_ dd if=/dev/zero of=/dev/null
   3264 pts/0    R+     0:00  |                   \_ ps fax
   3265 pts/0    S+     0:00  |                   \_ grep --color=auto -B5 dd
root@eragdzhabekova:/home/eragdzhabekova# kill -9 2910
```

Рис. 5: Отображение иерархии процессов

Изменение приоритета процессов

```
root@eragdzhabekova:/home/eragdzhabekova#
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[1] 3505
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[2] 3517
root@eragdzhabekova:/home/eragdzhabekova# dd if=/dev/zero of=/dev/null &
[3] 3519
root@eragdzhabekova:/home/eragdzhabekova# renice -n 5 3517
3517 (process ID) old priority 0, new priority 5
root@eragdzhabekova:/home/eragdzhabekova# renice -n 15 3517
3517 (process ID) old priority 5, new priority 15
root@eragdzhabekova:/home/eragdzhabekova# 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
root@eragdzhabekova:/home/eragdzhabekova#
```

Рис. 6: Изменение приоритета и завершение процессов

Работа с процессами yes

```
root@eragdzhabekova:/home/eragdzhabekova#
root@eragdzhabekova:/home/eragdzhabekova# yes > /dev/null &
[1] 4105
root@eragdzhabekova:/home/eragdzhabekova# yes > /dev/null
^Z
[2]+  Stopped                 yes > /dev/null
root@eragdzhabekova:/home/eragdzhabekova# fg 2
yes > /dev/null
^C
root@eragdzhabekova:/home/eragdzhabekova#
```

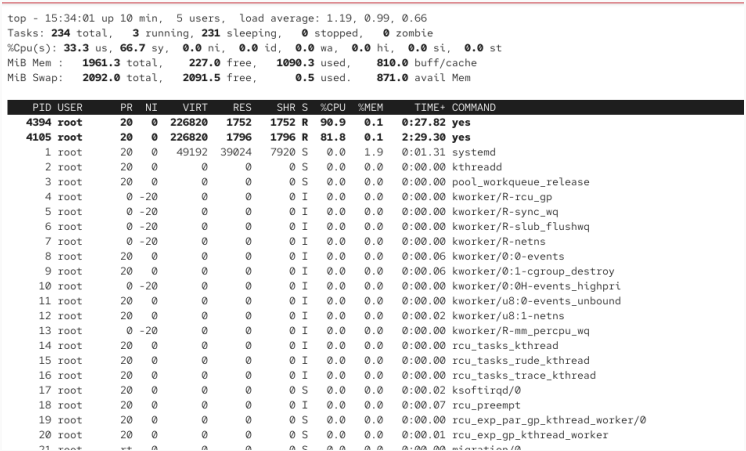
Рис. 7: Запуск и управление процессами yes

Использование nohup

```
root@eragdzhabekova:/home/eragdzhabekova# jobs
[1]+  Running                 yes > /dev/null &
root@eragdzhabekova:/home/eragdzhabekova# fg 1
yes > /dev/null
^Z
[1]+  Stopped                 yes > /dev/null
root@eragdzhabekova:/home/eragdzhabekova# jobs
[1]+  Stopped                 yes > /dev/null
root@eragdzhabekova:/home/eragdzhabekova# bg 1
[1]+ yes > /dev/null &
root@eragdzhabekova:/home/eragdzhabekova# jobs
[1]+  Running                 yes > /dev/null &
root@eragdzhabekova:/home/eragdzhabekova# nohup yes > /dev/null &
[2] 4394
nohup: ignoring input and redirecting stderr to stdout
root@eragdzhabekova:/home/eragdzhabekova#
```

Рис. 8: Работа с nohup и проверка состояния процессов

Наблюдение за процессами в top



```
top - 15:34:01 up 10 min,  5 users,  load average: 1.19, 0.99, 0.66
Tasks: 234 total,   3 running, 231 sleeping,   0 stopped,   0 zombie
%Cpu(s): 33.3 us, 66.7 sy,  0.0 ni,  0.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   1961.3 total,    227.0 free,   1090.3 used,    810.0 buff/cache
MiB Swap:   2092.0 total,   2091.5 free,      0.5 used.    871.0 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   4394 root      20   0  226820   1752   1752 R  90.9   0.1   0:27.82 yes
   4105 root      20   0  226820   1796   1796 R  81.8   0.1   2:29.30 yes
      1 root      20   0   49192  39024   7920 S   0.0   1.9   0:01.31 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   0:00.06 kworker/0:0-events
      9 root      20   0       0      0      0 I   0.0   0.0   0:00.06 kworker/0:1-cgroup_destroy
     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/u8:0-events_unbound
     12 root      20   0       0      0      0 I   0.0   0.0   0:00.02 kworker/u8:1-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   0:00.02 ksoftirqd/0
     18 root      20   0       0      0      0 I   0.0   0.0   0:00.07 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
```

Рис. 9: Отслеживание процесса yes в top

Завершение процессов yes

```
root@eragdzhabekova:/home/eragdzhabekova# jobs
[3]+  Running                 yes > /dev/null &
root@eragdzhabekova:/home/eragdzhabekova# kill -1 4618
[3]+  Hangup                  yes > /dev/null
root@eragdzhabekova:/home/eragdzhabekova# kill -1 4394
root@eragdzhabekova:/home/eragdzhabekova# kill -1 4105
root@eragdzhabekova:/home/eragdzhabekova# yes > /dev/null &
[1] 4753
root@eragdzhabekova:/home/eragdzhabekova# yes > /dev/null &
[2] 4755
root@eragdzhabekova:/home/eragdzhabekova# yes > /dev/null &
[3] 4757
root@eragdzhabekova:/home/eragdzhabekova# killall yes
[1]   Terminated              yes > /dev/null
[3]+  Terminated              yes > /dev/null
[2]+  Terminated              yes > /dev/null
root@eragdzhabekova:/home/eragdzhabekova#
```

Рис. 10: Завершение процессов yes

Сравнение приоритетов и renice

```
root@eragdzhabekova:/home/eragdzhabekova# yes > /dev/null &
[1] 4834
root@eragdzhabekova:/home/eragdzhabekova# nice -n 5 yes > /dev/null &
[2] 4856
root@eragdzhabekova:/home/eragdzhabekova# ps -l
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0    4522    4486  0  80   0 - 58153 do_wai pts/0    00:00:00 su
4 S     0    4533    4522  0  80   0 - 57543 do_wai pts/0    00:00:00 bash
4 R     0    4834    4533 98  80   0 - 56705 -      pts/0    00:00:10 yes
4 R     0    4856    4533 95  85   5 - 56705 -      pts/0    00:00:03 yes
4 R     0    4858    4533  0  80   0 - 57682 -      pts/0    00:00:00 ps
root@eragdzhabekova:/home/eragdzhabekova# renice -n 5 4834
4834 (process ID) old priority 0, new priority 5
root@eragdzhabekova:/home/eragdzhabekova# ps -l
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0    4522    4486  0  80   0 - 58153 do_wai pts/0    00:00:00 su
4 S     0    4533    4522  0  80   0 - 57543 do_wai pts/0    00:00:00 bash
4 R     0    4834    4533 98  85   5 - 56705 -      pts/0    00:00:29 yes
4 R     0    4856    4533 97  85   5 - 56705 -      pts/0    00:00:22 yes
4 R     0    4903    4533  0  80   0 - 57682 -      pts/0    00:00:00 ps
root@eragdzhabekova:/home/eragdzhabekova# killall yes
[2]+  Terminated              nice -n 5 yes > /dev/null
[1]+  Terminated              yes > /dev/null
root@eragdzhabekova:/home/eragdzhabekova#
```

Рис. 11: Изменение приоритета процессов yes

Итоги работы

Вывод

В ходе лабораторной работы были изучены основные приёмы управления заданиями и процессами в Linux.

Освоены способы запуска процессов в фоновом и переднем режиме, их приостановки, возобновления и завершения.

Получены практические навыки использования команд `jobs`, `fg`, `bg`, `kill`, `killall`, `ps`, `top`, а также изменения приоритетов процессов с помощью `nice` и `renice`.