OS Lab05

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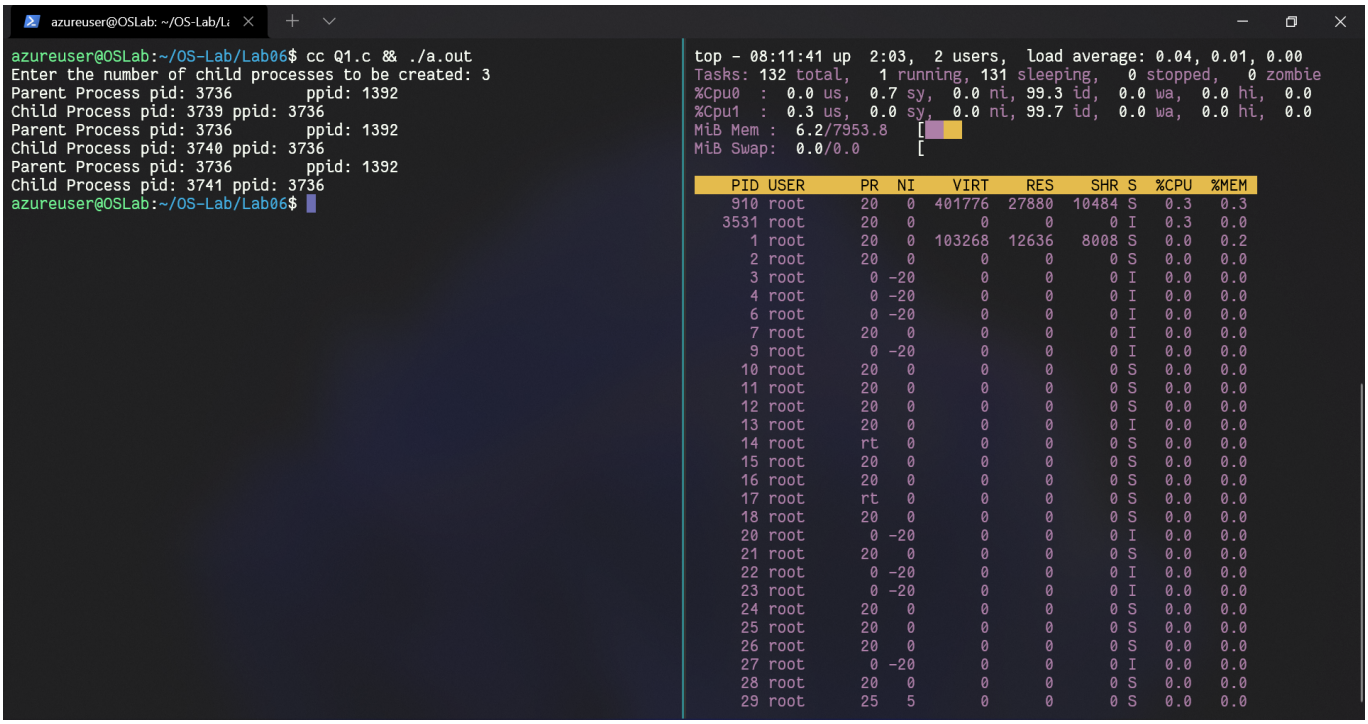
Question 1

Write a C program where the parent process has to wait till the completion of all the child processes so that no child processes will become orphan

Solution

```c
#include <stdio.h>
#include <sys/wait.h>
#include <unistd.h>
#include <stdlib.h>
#include <sys/types.h>
#include <assert.h>

int main(int argc, char *argv[]) {
    int N;
    printf("Enter the number of child processes to be created: ");
    scanf("%d",&N);
    pid_t t = 0;

    for (int i = 0; i<N;i++) {
        t = fork();
        assert(t >= 0);
        if (t == 0) {
            printf("Child Process pid: %d\tppid: %d\n",getpid(), getppid());
            exit(0);
        } else {
            printf("Parent Process pid: %d\tppid: %d\n",getpid(), getppid());
            //wait(NULL);
        }
    }
    while (wait(NULL) != -1);
    remove(argv[0]);
    return 0;
}
```

Output



Question 2

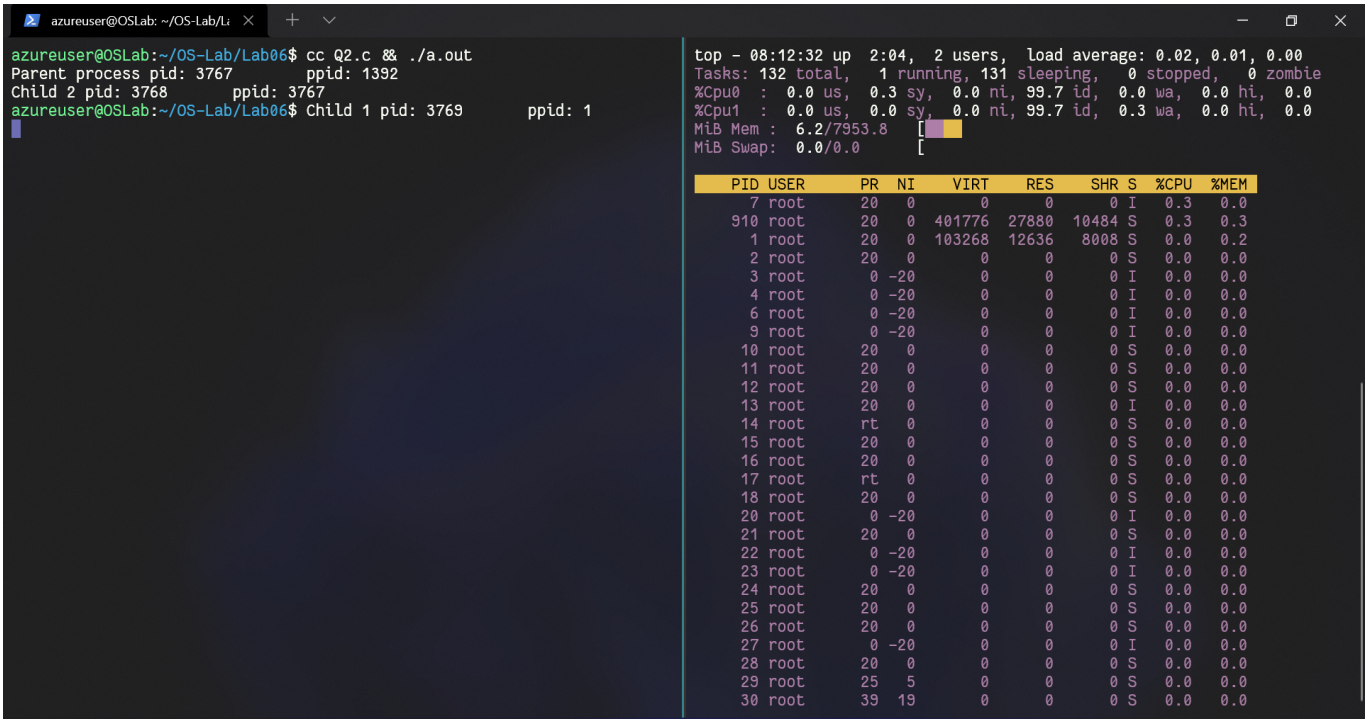
Create two child processes C1 and C2 make sure that only C1 becomes an orphan process

Solution

```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/wait.h>
#include <sys/types.h>
#include <assert.h>

int main(int argc, char *argv[])
{
    pid_t t = 0;
    printf("Parent process pid: %d\tppid: %d\n", getpid(), getppid());

    t = fork();

    if (t == 0) {
        printf("Child 2 pid: %d\tppid: %d\n", getpid(), getppid());
        exit(0);
    }

    while (wait(NULL) != -1);


    t = fork();
    if (t > 0)
        exit(0);
```

```
    sleep(1);
    printf("Child 1 pid: %d\tppid: %d\n", getpid(), getppid());


    return 0;
}
```

Output



Question 3

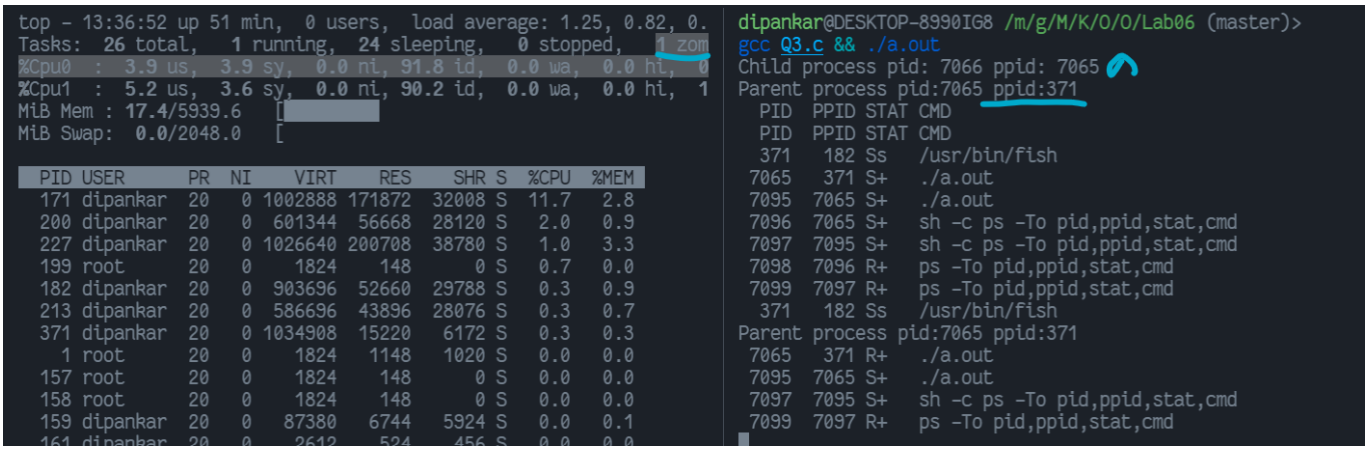
Create a scenario where a parent has two child C1 & C2 ,such that C1 becomes a zombie while C2 becomes an orphan process

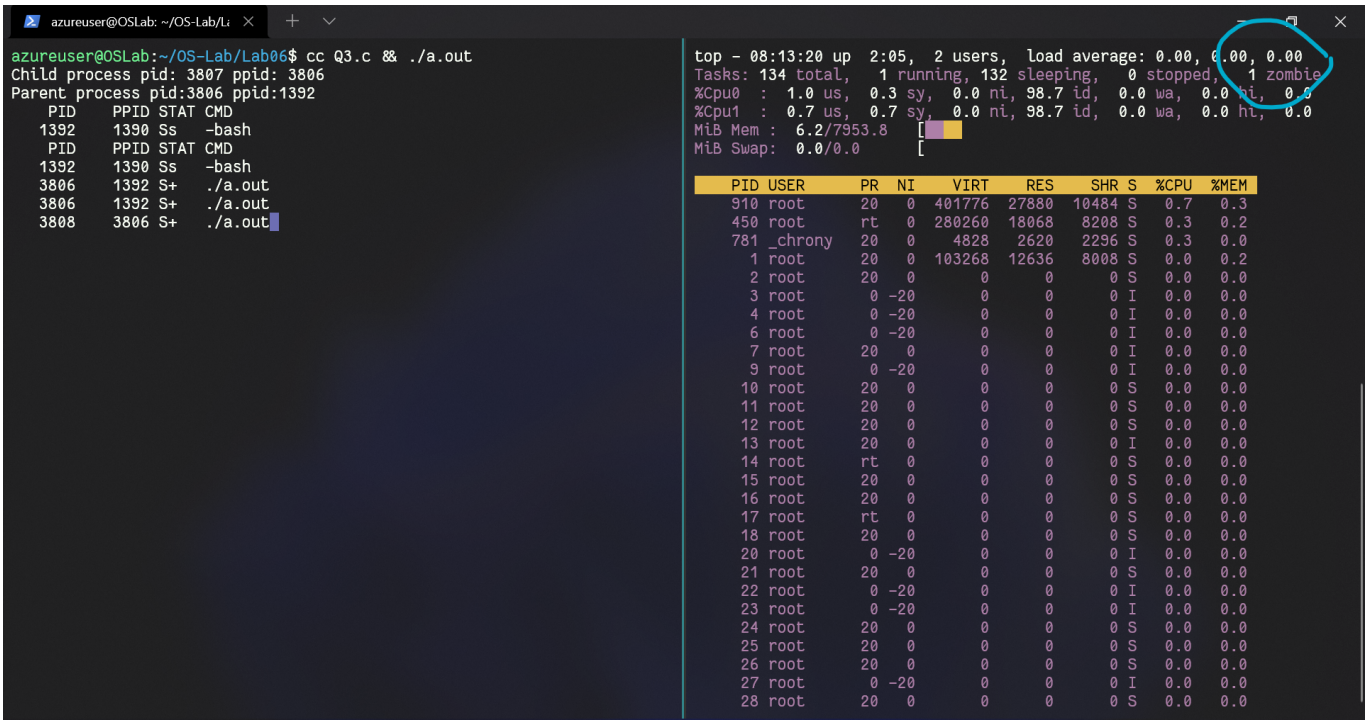
Solution

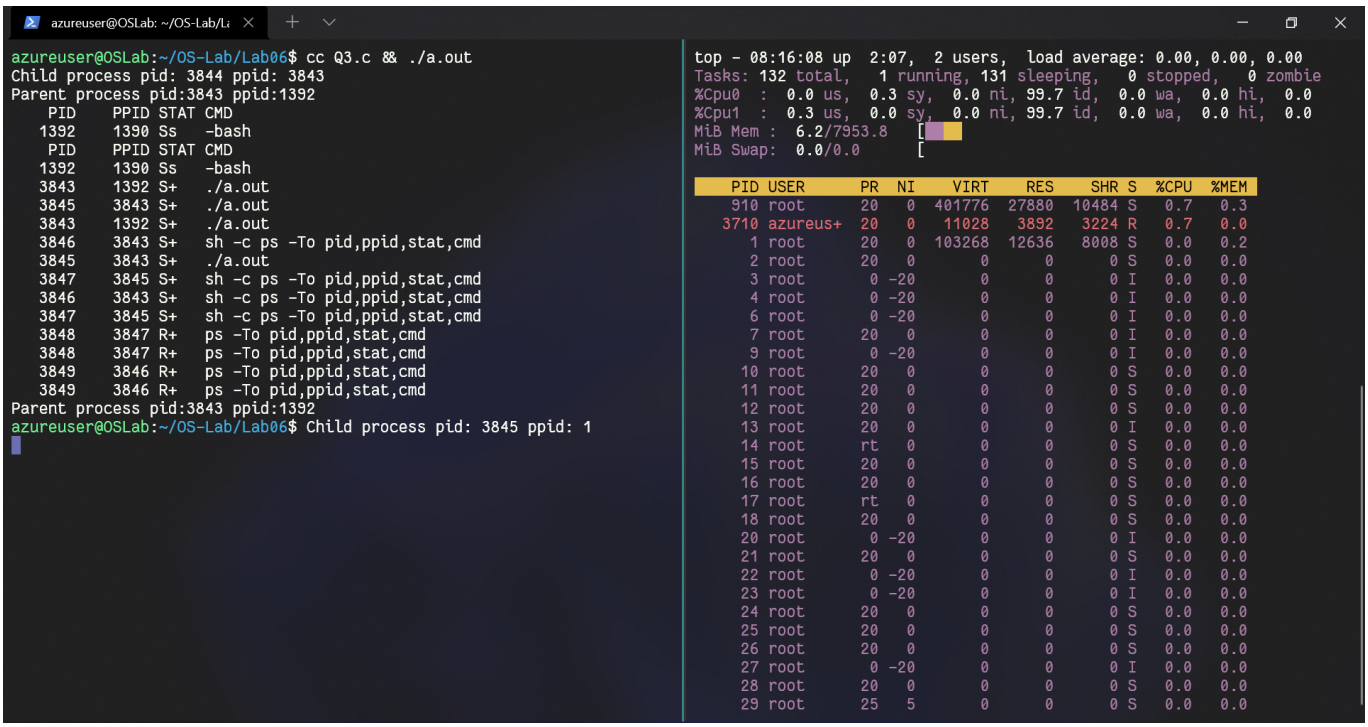
```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/wait.h>
#include <sys/types.h>
#include <assert.h>

int main(int argc, char *argv[])
{
    for (int i = 1; i <= 2; i++) {
        pid_t t = fork();

        assert(t >= 0);

        if ( i == 1 ) {
```

```
            if (t > 0) {
                sleep(2);
                printf("Parent process pid:%d\tppid:%d\n", getpid(), getppid());
                wait(NULL);
            }else{
                printf("Child process pid: %d\tppid: %d\n", getpid(), getppid());
                exit(0);
            }
        }else {
            system("ps -To pid,ppid,stat,cmd");
            if (t > 0) {
                sleep(0.2);
                printf("Parent process pid:%d\tppid:%d\n", getpid(), getppid());
            } else {
                sleep(1);
                printf("Child process pid: %d\tppid: %d\n", getpid(), getppid());
            }
        }
    }
    return 0;
}
```

Output


top - 13:36:52 up 51 min, 0 users, load average: 1.25, 0.82, 0.
Tasks: 26 total, 1 running, 24 sleeping, 0 stopped, 1 zom
%Cpu0 : 3.9 us, 3.9 sy, 0.0 ni, 91.8 id, 0.0 wa, 0.0 hi, 0
%Cpu1 : 5.2 us, 3.6 sy, 0.0 ni, 90.2 id, 0.0 wa, 0.0 hi, 1
MiB Mem : 17.4/5939.6
MiB Swap: 0.0/2048.0
PID USER PR NI VIRT RES SHR S %CPU %MEM
171 dipankar 20 0 1002888 171872 32008 S 11.7 2.8
200 dipankar 20 0 601344 56668 28120 S 2.0 0.9
227 dipankar 20 0 1026640 200708 38780 S 1.0 3.3
199 root 20 0 1824 148 0 S 0.7 0.0
182 dipankar 20 0 903696 52660 29788 S 0.3 0.9
213 dipankar 20 0 586696 43896 28076 S 0.3 0.7
371 dipankar 20 0 1034908 15220 6172 S 0.3 0.3
1 root 20 0 1824 1148 1020 S 0.0 0.0
157 root 20 0 1824 148 0 S 0.0 0.0
158 root 20 0 1824 148 0 S 0.0 0.0
159 dipankar 20 0 87380 6744 5924 S 0.0 0.1
dipankar@DESKTOP-8990IG8 /m/g/M/K/O/O/Lab06 (master)>
gcc Q3.c && ./a.out
Child process pid: 7066 ppid: 7065
Parent process pid:7065 ppid:371
PID PPID STAT CMD
PID PPID STAT CMD
371 182 Ss /usr/bin/fish
7065 371 S+ ./a.out
7095 7065 S+ ./a.out
7096 7065 S+ sh -c ps -To pid,ppid,stat,cmd
7097 7095 S+ sh -c ps -To pid,ppid,stat,cmd
7098 7096 R+ ps -To pid,ppid,stat,cmd
7099 7097 R+ ps -To pid,ppid,stat,cmd
371 182 Ss /usr/bin/fish
Parent process pid:7065 ppid:371
7065 371 R+ ./a.out
7095 7065 S+ ./a.out
7097 7095 S+ sh -c ps -To pid,ppid,stat,cmd
7099 7097 R+ ps -To pid,ppid,stat,cmd


azureuser@OSLab: ~/OS-Lab/La
azureuser@OSLab:~/OS-Lab/Lab06$ cc Q3.c && ./a.out
Child process pid: 3807 ppid: 3806
Parent process pid:3806 ppid:1392
PID PPID STAT CMD
1392 1390 Ss -bash
PID PPID STAT CMD
1392 1390 Ss -bash
3806 1392 S+ ./a.out
3806 1392 S+ ./a.out
3808 3806 S+ ./a.out
top - 08:13:20 up 2:05, 2 users, load average: 0.00, 0.00, 0.00
Tasks: 134 total, 1 running, 132 sleeping, 0 stopped, 1 zombie
%Cpu0 : 1.0 us, 0.3 sy, 0.0 ni, 98.7 id, 0.0 wa, 0.0 hi, 0.0
%Cpu1 : 0.7 us, 0.7 sy, 0.0 ni, 98.7 id, 0.0 wa, 0.0 hi, 0.0
MiB Mem : 6.2/7953.8
MiB Swap: 0.0/0.0
PID USER PR NI VIRT RES SHR S %CPU %MEM
910 root 20 0 401776 27880 10484 S 0.7 0.3
450 root rt 0 280260 18068 8208 S 0.3 0.2
781 _chrony 20 0 4828 2620 2296 S 0.3 0.0
1 root 20 0 103268 12636 8008 S 0.0 0.2
2 root 20 0 0 0 0 S 0.0 0.0
3 root 0 -20 0 0 0 I 0.0 0.0
4 root 0 -20 0 0 0 I 0.0 0.0
6 root 0 -20 0 0 0 I 0.0 0.0
7 root 20 0 0 0 0 I 0.0 0.0
9 root 0 -20 0 0 0 I 0.0 0.0
10 root 20 0 0 0 0 S 0.0 0.0
11 root 20 0 0 0 0 S 0.0 0.0
12 root 20 0 0 0 0 S 0.0 0.0
13 root 20 0 0 0 0 I 0.0 0.0
14 root rt 0 0 0 0 S 0.0 0.0
15 root 20 0 0 0 0 S 0.0 0.0
16 root 20 0 0 0 0 S 0.0 0.0
17 root rt 0 0 0 0 S 0.0 0.0
18 root 20 0 0 0 0 S 0.0 0.0
20 root 0 -20 0 0 0 I 0.0 0.0
21 root 20 0 0 0 0 S 0.0 0.0
22 root 0 -20 0 0 0 I 0.0 0.0
23 root 0 -20 0 0 0 I 0.0 0.0
24 root 20 0 0 0 0 S 0.0 0.0
25 root 20 0 0 0 0 S 0.0 0.0
26 root 20 0 0 0 0 S 0.0 0.0
27 root 0 -20 0 0 0 I 0.0 0.0
28 root 20 0 0 0 0 S 0.0 0.0


azureuser@OSLab: ~/OS-Lab/La
azureuser@OSLab:~/OS-Lab/Lab06$ cc Q3.c && ./a.out
Child process pid: 3844 ppid: 3843
Parent process pid:3843 ppid:1392
PID PPID STAT CMD
1392 1390 Ss -bash
PID PPID STAT CMD
1392 1390 Ss -bash
3843 1392 S+ ./a.out
3845 3843 S+ ./a.out
3843 1392 S+ ./a.out
3846 3843 S+ sh -c ps -To pid,ppid,stat,cmd
3845 3843 S+ ./a.out
3847 3845 S+ sh -c ps -To pid,ppid,stat,cmd
3846 3843 S+ sh -c ps -To pid,ppid,stat,cmd
3847 3845 S+ sh -c ps -To pid,ppid,stat,cmd
3848 3847 R+ ps -To pid,ppid,stat,cmd
3848 3847 R+ ps -To pid,ppid,stat,cmd
3849 3846 R+ ps -To pid,ppid,stat,cmd
3849 3846 R+ ps -To pid,ppid,stat,cmd
Parent process pid:3843 ppid:1392
azureuser@OSLab:~/OS-Lab/Lab06$ Child process pid: 3845 ppid: 1
top - 08:16:08 up 2:07, 2 users, load average: 0.00, 0.00, 0.00
Tasks: 132 total, 1 running, 131 sleeping, 0 stopped, 0 zombie
%Cpu0 : 0.0 us, 0.3 sy, 0.0 ni, 99.7 id, 0.0 wa, 0.0 hi, 0.0
%Cpu1 : 0.3 us, 0.0 sy, 0.0 ni, 99.7 id, 0.0 wa, 0.0 hi, 0.0
MiB Mem : 6.2/7953.8
MiB Swap: 0.0/0.0
PID USER PR NI VIRT RES SHR S %CPU %MEM
910 root 20 0 401776 27880 10484 S 0.7 0.3
3710 azureus+ 20 0 11028 3892 3224 R 0.7 0.0
1 root 20 0 103268 12636 8008 S 0.0 0.2
2 root 20 0 0 0 0 S 0.0 0.0
3 root 0 -20 0 0 0 I 0.0 0.0
4 root 0 -20 0 0 0 I 0.0 0.0
6 root 0 -20 0 0 0 I 0.0 0.0
7 root 20 0 0 0 0 I 0.0 0.0
9 root 0 -20 0 0 0 I 0.0 0.0
10 root 20 0 0 0 0 S 0.0 0.0
11 root 20 0 0 0 0 S 0.0 0.0
12 root 20 0 0 0 0 S 0.0 0.0
13 root 20 0 0 0 0 I 0.0 0.0
14 root rt 0 0 0 0 S 0.0 0.0
15 root 20 0 0 0 0 S 0.0 0.0
16 root 20 0 0 0 0 S 0.0 0.0
17 root rt 0 0 0 0 S 0.0 0.0
18 root 20 0 0 0 0 S 0.0 0.0
20 root 0 -20 0 0 0 I 0.0 0.0
21 root 20 0 0 0 0 S 0.0 0.0
22 root 0 -20 0 0 0 I 0.0 0.0
23 root 0 -20 0 0 0 I 0.0 0.0
24 root 20 0 0 0 0 S 0.0 0.0
25 root 20 0 0 0 0 S 0.0 0.0
26 root 20 0 0 0 0 S 0.0 0.0
27 root 0 -20 0 0 0 I 0.0 0.0
28 root 20 0 0 0 0 S 0.0 0.0
29 root 25 5 0 0 0 S 0.0 0.0