OS: Project Report

Kernel module that lists all current tasks in a Linux system beginning from the init task

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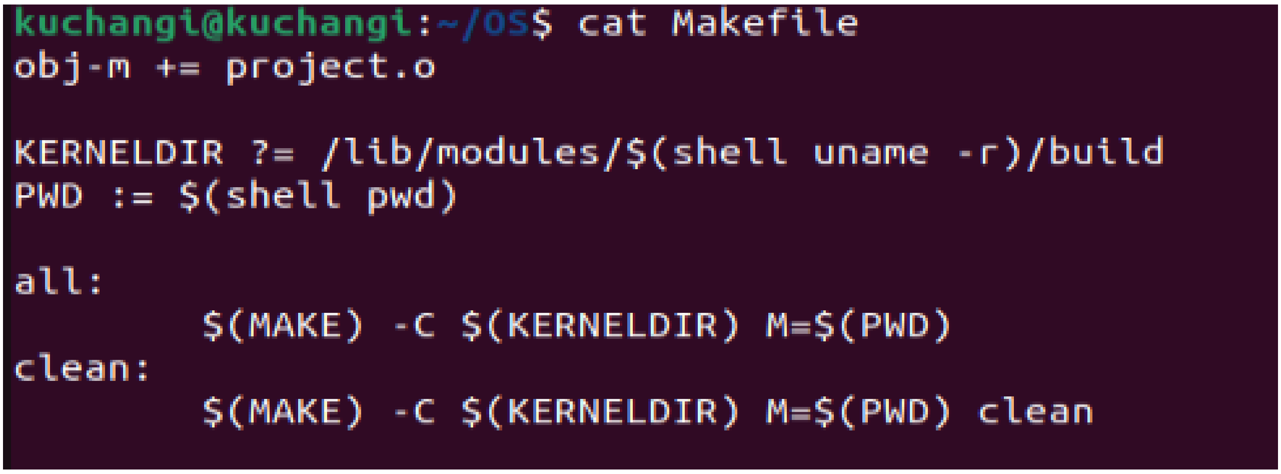
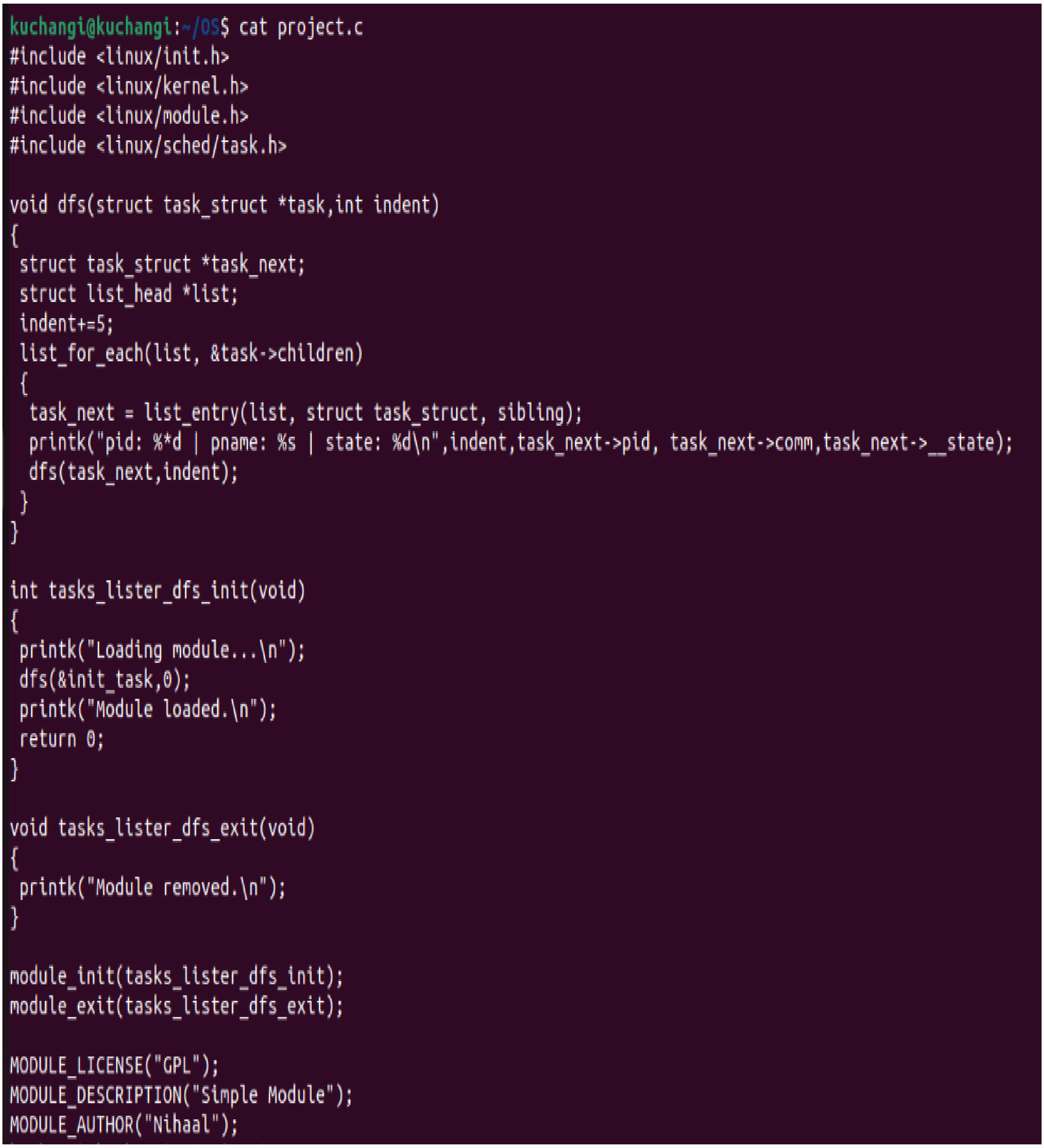
Code:

Makefile



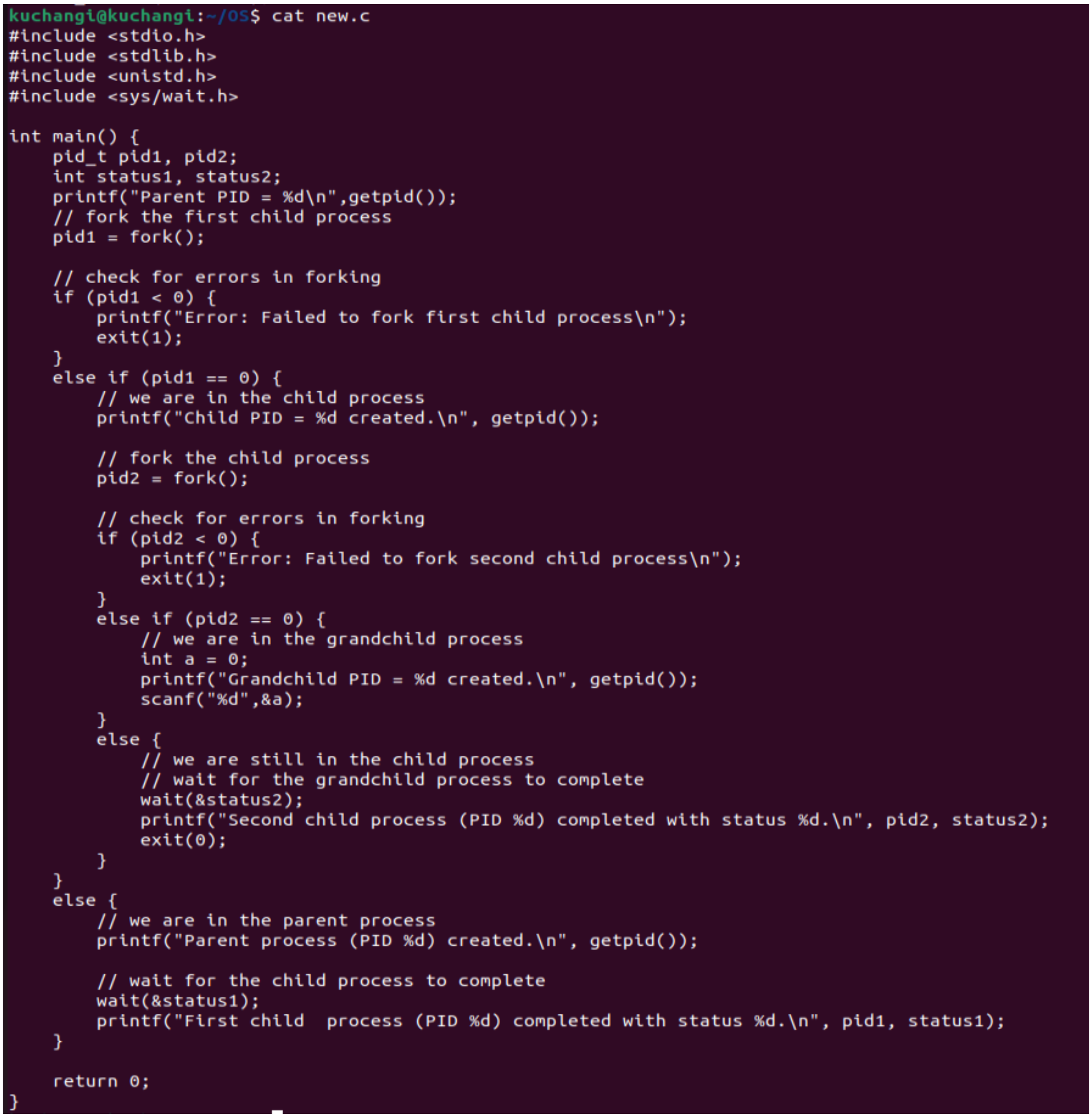
```
kuchangi@kuchangi:~/OS$ cat Makefile
obj-m += project.o

KERNELDIR ?= /lib/modules/$(shell uname -r)/build
PWD := $(shell pwd)

all:
	$(MAKE) -C $(KERNELDIR) M=$(PWD)
clean:
	$(MAKE) -C $(KERNELDIR) M=$(PWD) clean
```

Project: Kernel module



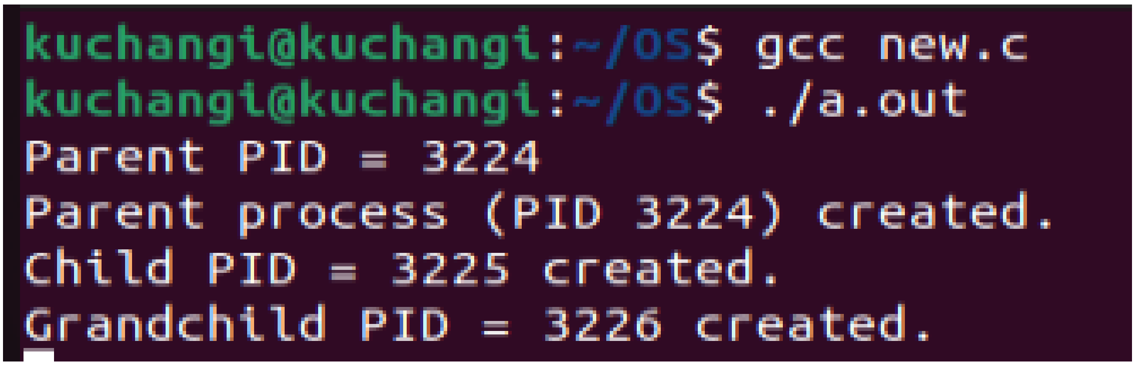
```
kuchangi@kuchangi:~/OS$ cat project.c
#include <linux/init.h>
#include <linux/kernel.h>
#include <linux/module.h>
#include <linux/sched/task.h>

void dfs(struct task_struct *task,int indent)
{
 struct task_struct *task_next;
 struct list_head *list;
 indent+=5;
 list_for_each(list, &task->children)
 {
  task_next = list_entry(list, struct task_struct, sibling);
  printk("pid: %*d | pname: %s | state: %d\n",indent,task_next->pid, task_next->comm,task_next->__state);
  dfs(task_next,indent);
 }
}

int tasks_lister_dfs_init(void)
{
 printk("Loading module...\n");
 dfs(&init_task,0);
 printk("Module loaded.\n");
 return 0;
}

void tasks_lister_dfs_exit(void)
{
 printk("Module removed.\n");
}

module_init(tasks_lister_dfs_init);
module_exit(tasks_lister_dfs_exit);

MODULE_LICENSE("GPL");
MODULE_DESCRIPTION("Simple Module");
MODULE_AUTHOR("Nihaal");
```

New: To create a process

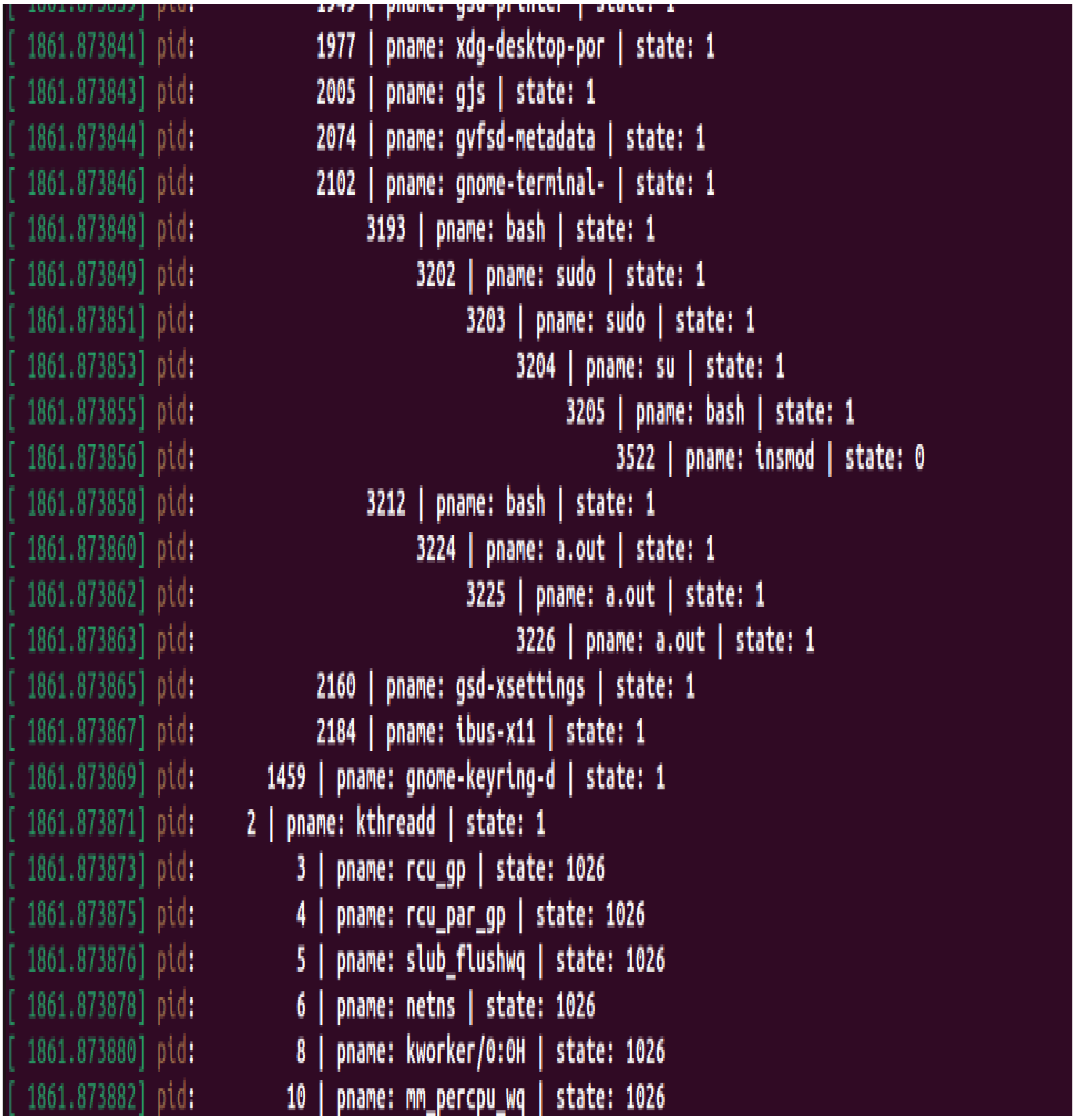


```
kuchangi@kuchangi:~/OS$ cat new.c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/wait.h>

int main() {
    pid_t pid1, pid2;
    int status1, status2;
    printf("Parent PID = %d\n",getpid());
    // fork the first child process
    pid1 = fork();

    // check for errors in forking
    if (pid1 < 0) {
        printf("Error: Failed to fork first child process\n");
        exit(1);
    }
    else if (pid1 == 0) {
        // we are in the child process
        printf("Child PID = %d created.\n", getpid());

        // fork the child process
        pid2 = fork();

        // check for errors in forking
        if (pid2 < 0) {
            printf("Error: Failed to fork second child process\n");
            exit(1);
        }
        else if (pid2 == 0) {
            // we are in the grandchild process
            int a = 0;
            printf("Grandchild PID = %d created.\n", getpid());
            scanf("%d",&a);
        }
        else {
            // we are still in the child process
            // wait for the grandchild process to complete
            wait(&status2);
            printf("Second child process (PID %d) completed with status %d.\n", pid2, status2);
            exit(0);
        }
    }
    else {
        // we are in the parent process
        printf("Parent process (PID %d) created.\n", getpid());

        // wait for the child process to complete
        wait(&status1);
        printf("First child  process (PID %d) completed with status %d.\n", pid1, status1);
    }

    return 0;
}
```

Output:



```
kuchangi@kuchangi:~/OS$ gcc new.c
kuchangi@kuchangi:~/OS$ ./a.out
Parent PID = 3224
Parent process (PID 3224) created.
Child PID = 3225 created.
Grandchild PID = 3226 created.
```



```
[ 1861.873841] pid:         1977 | pname: xdg-desktop-por | state: 1
[ 1861.873843] pid:         2005 | pname: gjs | state: 1
[ 1861.873844] pid:         2074 | pname: gvfsd-metadata | state: 1
[ 1861.873846] pid:         2102 | pname: gnome-terminal- | state: 1
[ 1861.873848] pid:            3193 | pname: bash | state: 1
[ 1861.873849] pid:               3202 | pname: sudo | state: 1
[ 1861.873851] pid:                  3203 | pname: sudo | state: 1
[ 1861.873853] pid:                     3204 | pname: su | state: 1
[ 1861.873855] pid:                        3205 | pname: bash | state: 1
[ 1861.873856] pid:                           3522 | pname: insmod | state: 0
[ 1861.873858] pid:            3212 | pname: bash | state: 1
[ 1861.873860] pid:               3224 | pname: a.out | state: 1
[ 1861.873862] pid:                  3225 | pname: a.out | state: 1
[ 1861.873863] pid:                     3226 | pname: a.out | state: 1
[ 1861.873865] pid:         2160 | pname: gsd-xsettings | state: 1
[ 1861.873867] pid:         2184 | pname: ibus-x11 | state: 1
[ 1861.873869] pid:      1459 | pname: gnome-keyring-d | state: 1
[ 1861.873871] pid:   2 | pname: kthreadd | state: 1
[ 1861.873873] pid:         3 | pname: rcu_gp | state: 1026
[ 1861.873875] pid:         4 | pname: rcu_par_gp | state: 1026
[ 1861.873876] pid:         5 | pname: slub_flushwq | state: 1026
[ 1861.873878] pid:         6 | pname: netns | state: 1026
[ 1861.873880] pid:         8 | pname: kworker/0:0H | state: 1026
[ 1861.873882] pid:        10 | pname: mm_percpu_wq | state: 1026
```