CSE2005L - Operating Systems Lab

User-level & Kenel-Level Threads

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Kernel Thread

kernelthread.c

```
#include <linux/module.h>
#include <linux/times.h>
#include <linux/kthread.h>
#include <linux/kernel.h>
#include <linux/delay.h>
#include <linux/init.h> // included for __init and __exit macros
static struct task_struct *thread_st;
struct timeval t0,t1;
static int thread_fn(void *unused_var){
while(!kthread_should_stop()){
printk(KERN_INFO "Kernel Thread running");
do_gettimeofday(&t1);
printk("time taken: %ld millisec\n",
1000 * (t1.tv_sec - t0.tv_sec) +
(t1.tv_usec - t0.tv_usec) / 1000);
ssleep(5);
}
do_exit(0);
return 0;
}
static int __init init_thread(void){
do_gettimeofday(&t0);
printk(KERN_INFO "Creating thread\n");
thread_st = kthread_run(thread_fn, NULL, "sThread");
if(thread_st){
printk("Thread created successfully");
}
else{
printk(KERN_ERR "Thread creation failed");
```

```
}
return 0;
}


static void __exit cleanup_thread(void){
printk(KERN_INFO "Cleaning Up\n");
if (thread_st)
{
kthread_stop(thread_st);
printk(KERN_INFO "Thread stopped");
}
}
MODULE_LICENSE("GPL");
MODULE_AUTHOR("PRANAVCHENDUR T K");
module_init(init_thread);
module_exit(cleanup_thread);
```

Makefile

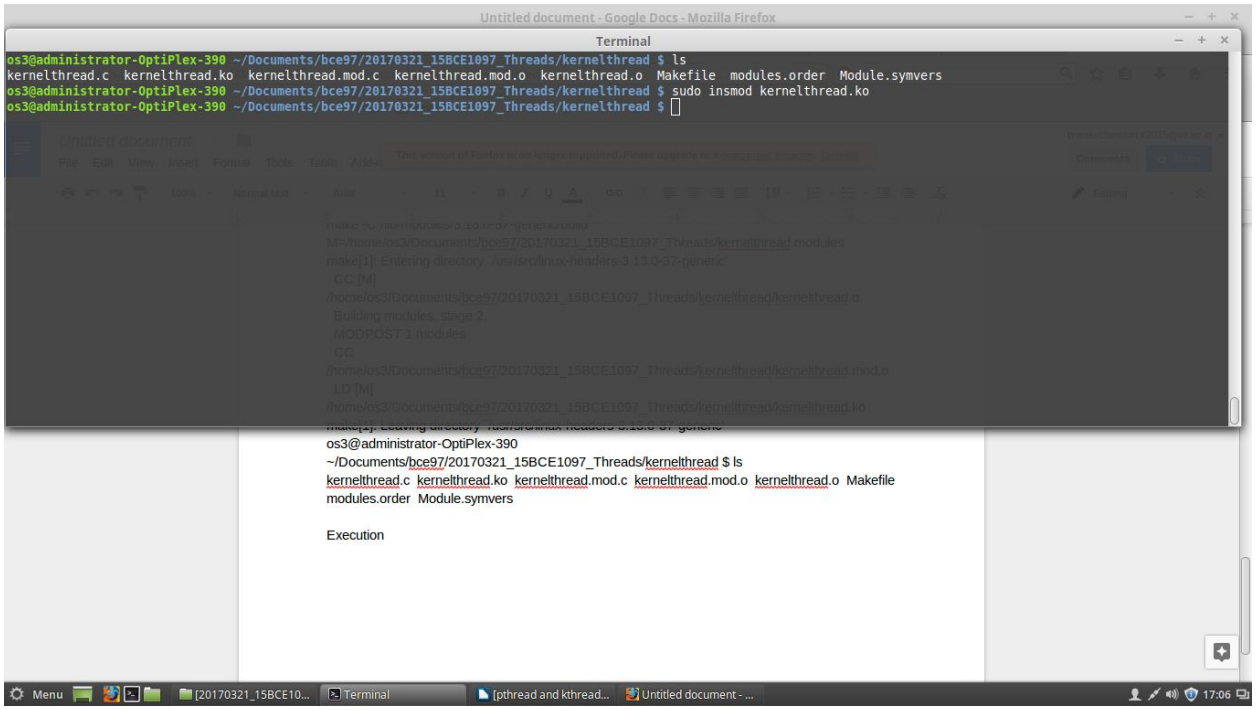
```
obj-m += kernelthread.o
all:
   make -C /lib/modules/$(shell uname -r)/build M=$(PWD) modules
clean:
   make -C /lib/modules/$(shell uname -r)/build M=$(PWD) clean
```

Terminal Log

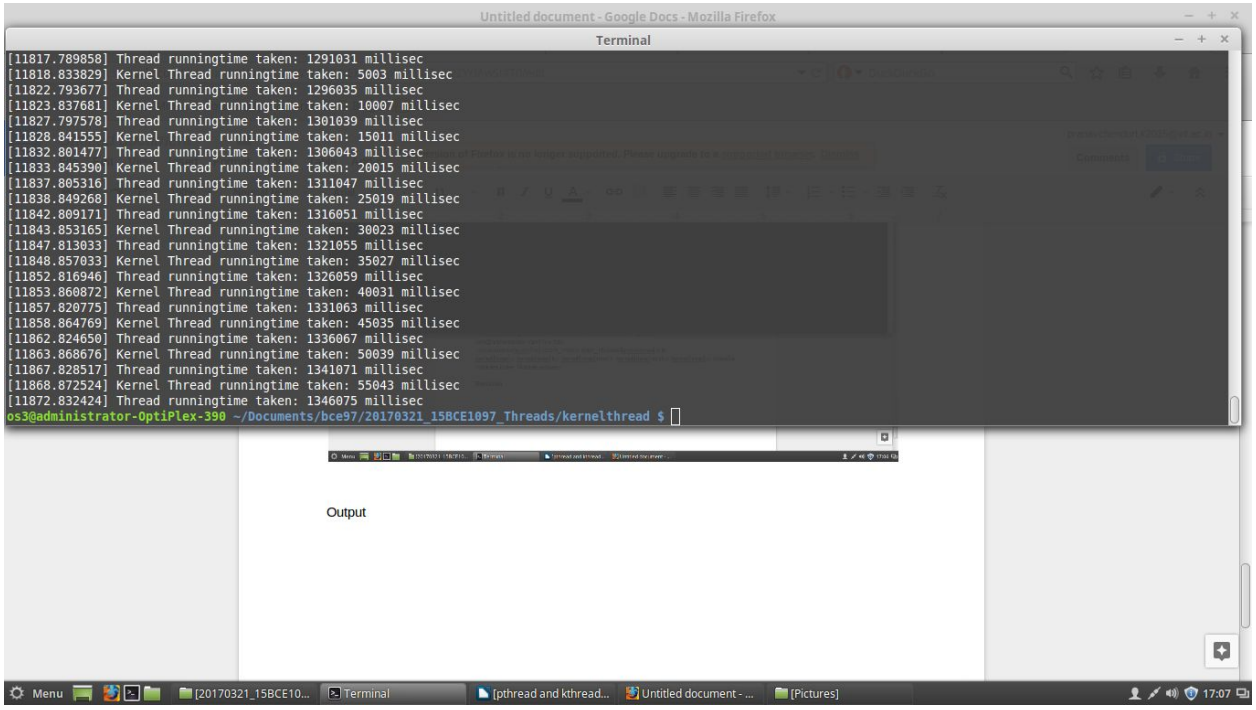
```
os3@administrator-OptiPlex-390
~/Documents/bce97/20170321_15BCE1097_Threads/kernelthread $ make
make -C /lib/modules/3.13.0-37-generic/build
M=/home/os3/Documents/bce97/20170321_15BCE1097_Threads/kernelthread modules
make[1]: Entering directory `/usr/src/linux-headers-3.13.0-37-generic'
  CC [M]
/home/os3/Documents/bce97/20170321_15BCE1097_Threads/kernelthread/kernelthread.o
  Building modules, stage 2.
  MODPOST 1 modules
  CC
/home/os3/Documents/bce97/20170321_15BCE1097_Threads/kernelthread/kernelthread.mod.o
  LD [M]
/home/os3/Documents/bce97/20170321_15BCE1097_Threads/kernelthread/kernelthread.ko
```

```
make[1]: Leaving directory `/usr/src/linux-headers-3.13.0-37-generic'
os3@administrator-OptiPlex-390
~/Documents/bce97/20170321_15BCE1097_Threads/kernelthread $ ls
kernelthread.c  kernelthread.ko  kernelthread.mod.c  kernelthread.mod.o  kernelthread.o
Makefile  modules.order  Module.symvers
```

Execution



Output



[11833.845390] Kernel Thread runningtime taken: 20015 millisec

[11837.805316] Thread runningtime taken: 1311047 millisec
[11838.849268] Kernel Thread runningtime taken: 25019 millisec
[11843.853165] Kernel Thread runningtime taken: 30023 millisec
[11848.857033] Kernel Thread runningtime taken: 35027 millisec
[11853.860872] Kernel Thread runningtime taken: 40031 millisec
[11858.864769] Kernel Thread runningtime taken: 45035 millisec
[11863.868676] Kernel Thread runningtime taken: 50039 millisec
[11868.872524] Kernel Thread runningtime taken: 55043 millisec

User-level Thread

user_thread.c

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <linux/times.h>
#include <pthread.h>
#include <linux/kernel.h>
void *myThreadFun(void *vargp)
{
sleep(5);
printf("Printing Darknurd from Thread \n");
return NULL;
}
int main()
{
struct timespec begin, end;
double elapsed;
clock_gettime(CLOCK_MONOTONIC, &begin);
pthread_t tid;
printf("Before Thread\n");
pthread_create(&tid, NULL, myThreadFun, NULL);
pthread_join(tid, NULL);
printf("After Thread\n");
clock_gettime(CLOCK_MONOTONIC, &end);
elapsed = end.tv_sec - begin.tv_sec;
elapsed += (end.tv_nsec - begin.tv_nsec) / 1000000000.0;
printf("Elapsed Time %f",elapsed);
}
```

Output (Terminal Log)

```
os3@administrator-OptiPlex-390 ~/Documents/bce97/20170321_15BCE1097_Threads $ gcc
-pthread user_thread.c
os3@administrator-OptiPlex-390 ~/Documents/bce97/20170321_15BCE1097_Threads $ ./a.out
Before Thread
Printing Darknurd from Thread
```

After Thread
Elapsed Time 5.000347