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ФАКУЛЬТЕТ «Информатика и системы управления»

КАФЕДРА «Программное обеспечение ЭВМ и информационные технологии»

О Т Ч Е Т

по лабораторной работе № _____

Дисциплина: *Операционные системы*

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Москва, 2021

I. Tasklet

```
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/init.h>
#include <linux/interrupt.h>

#define SHARED_IRQ 1

MODULE_LICENSE("Dual BSD/GPL");
MODULE_AUTHOR("Nguyensanghso@gmail.com");

static int my_dev_id;
char tasklet_data[] = "This is tasklet data";

void tasklet_handler(unsigned long data);

DECLARE_TASKLET(my_tasklet, tasklet_handler, (unsigned long)
&tasklet_data);

void tasklet_handler(unsigned long data)
{
    printk(KERN_INFO "[TL] Tasklet: state - %ld, count - %d, data - %s\n",
        my_tasklet.state, my_tasklet.count, my_tasklet.data);
}

static irqreturn_t my_interrupt(int irq, void *dev_id)
{
    if (irq == SHARED_IRQ)
    {
        printk(KERN_INFO "[TL] Tasklet scheduled\n");
        tasklet_schedule(&my_tasklet);
        return IRQ_HANDLED;
    }
    else
        return IRQ_NONE;
}

static int __init my_tasklet_init(void)
{
    if (request_irq(SHARED_IRQ, my_interrupt, IRQF_SHARED, "my_interrupt",
&my_dev_id))
    {
        printk(KERN_ERR "[TL] Error on request_irq\n");
        return -1;
    }

    printk(KERN_INFO "[TL] Module loaded!\n");
    return 0;
}

static void __exit my_tasklet_exit(void)
{
    tasklet_kill(&my_tasklet);
    free_irq(SHARED_IRQ, &my_dev_id);
    printk(KERN_INFO "[TL] Module unloaded!\n");
}

module_init(my_tasklet_init);
module_exit(my_tasklet_exit);
```

```

nguyensang@K-virtual-machine:~/Desktop/OS2021/Tasklet$ sudo insmod tasklet.ko
[sudo] password for nguyensang:
nguyensang@K-virtual-machine:~/Desktop/OS2021/Tasklet$ lsmod | head -5
Module                Size  Used by
tasklet                16384  0
nls_utf8               16384  1
isofs                  49152  1
rfcomm                 81920  4
nguyensang@K-virtual-machine:~/Desktop/OS2021/Tasklet$ cat /proc/interrupts | head
-5
           CPU0      CPU1
 0:         2         0  IO-APIC  2-edge  timer
 1:        90        241  IO-APIC  1-edge  i8042, my_interrupt
 8:         1         0  IO-APIC  8-edge  rtc0
 9:         0         0  IO-APIC  9-fastio  acpi
nguyensang@K-virtual-machine:~/Desktop/OS2021/Tasklet$

```

```

nguyensang@K-virtual-machine:~/Desktop/OS2021/Tasklet$ dmesg | tail -10
[ 620.875421] [TL] Tasklet scheduled
[ 620.875443] [TL] Tasklet: state - 2, count - 0, data - This is tasklet data
[ 620.875597] [TL] Tasklet scheduled
[ 620.875601] [TL] Tasklet: state - 2, count - 0, data - This is tasklet data
[ 620.875722] [TL] Tasklet scheduled
[ 620.875725] [TL] Tasklet: state - 2, count - 0, data - This is tasklet data
[ 620.875939] [TL] Tasklet scheduled
[ 620.875942] [TL] Tasklet: state - 2, count - 0, data - This is tasklet data
[ 621.936506] [TL] Tasklet scheduled
[ 621.936524] [TL] Tasklet: state - 2, count - 0, data - This is tasklet data
nguyensang@K-virtual-machine:~/Desktop/OS2021/Tasklet$

```

II. Work Queue

```
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/init.h>
#include <linux/interrupt.h>
#include <linux/workqueue.h>

#define IRQ 1

MODULE_LICENSE("Dual BSD/GPL");
MODULE_AUTHOR("Nguyensanghso@gmail.com");

static int my_dev_id;
static int irq_call_n = 0;

struct workqueue_struct *wq;

void my_workqueue_function(struct work_struct *work)
{
    printk(KERN_INFO "[WQ] Workqueue: counter %d\n", ++irq_call_n);
}

DECLARE_WORK(my_workqueue, my_workqueue_function);

static irqreturn_t my_interrupt(int irq, void *dev_id)
{
    if (irq == IRQ)
    {
        queue_work(wq, &my_workqueue);
        printk(KERN_INFO "[WQ] Workqueue in my_interrupt\n");
        return IRQ_HANDLED;
    }
    else
        return IRQ_NONE;
}

static int __init my_workqueue_init(void)
{
    if (request_irq(IRQ, my_interrupt, IRQF_SHARED, "my_interrupt", &my_dev_id))
    {
        printk(KERN_ERR "[WQ] Error: can't register handler\n");
        return -1;
    }

    wq = create_workqueue("workqueue");
    if (wq)
        printk(KERN_INFO "[WQ] Workqueue created!\n");
    else
    {
        free_irq(IRQ, &my_dev_id);
        printk(KERN_ERR "[WQ] Error: can't create workqueue\n");
        return -ENOMEM;
    }

    printk(KERN_INFO "[WQ] Module loaded!\n");

    return 0;
}

static void __exit my_workqueue_exit(void)
{
    flush_workqueue(wq);
    destroy_workqueue(wq);
    free_irq(IRQ, &my_dev_id);
    printk(KERN_INFO "[WQ] Module unloaded\n");
}
```

```
module_init(my_workqueue_init)
module_exit(my_workqueue_exit)
```

```
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$ sudo insmod wq.ko
[sudo] password for nguyensang:
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$ lsmod | head -5
Module                Size  Used by
wq                     16384  0
nls_utf8               16384  1
isofs                  49152  1
rfcomm                 81920  4
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$ cat /proc/interrupts |
head -5
cat: /proc/interrupts: No such file or directory
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$ cat /proc/interrupts |
head -5
           CPU0      CPU1
 0:         2         0   IO-APIC   2-edge   timer
 1:       754       476   IO-APIC   1-edge   i8042, my_interrupt
 8:         1         0   IO-APIC   8-edge   rtc0
 9:         0         0   IO-APIC   9-fasteoi acpi
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$
```

```
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$ dmesg | tail -10
[ 1001.025631] [WQ] Workqueue: counter 310
[ 1001.158254] [WQ] Workqueue in my_interrupt
[ 1001.158379] [WQ] Workqueue: counter 311
[ 1001.286365] [WQ] Workqueue in my_interrupt
[ 1001.286581] [WQ] Workqueue: counter 312
[ 1001.312813] [WQ] Workqueue in my_interrupt
[ 1001.312830] [WQ] Workqueue: counter 313
[ 1001.523826] [WQ] Workqueue in my_interrupt
[ 1001.523970] [WQ] Workqueue in my_interrupt
[ 1001.524091] [WQ] Workqueue: counter 314
nguyensang@K-virtual-machine:~/Desktop/OS2021/WorkQueue$
```