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Національний технічний університет України «КПІ» імені Ігоря
Сікорського
Кафедра обчислювальної техніки ФІОТ**

**ЗВІТ
з лабораторної роботи №5
з навчальної дисципліни
«Архітектура комп'ютерів-2. Процесори»**

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Перевірив:

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Hello.c

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

MODULE_AUTHOR("Hutsaliuk Oleh IV-93");
MODULE_DESCRIPTION("Lab5");
MODULE_LICENSE("Dual BSD/GPL");

static int amount = 1;
module_param(amount, uint, S_IRUGO);
MODULE_PARM_DESC(times, "Amount of outputting Hello worlds");

static int __init hello_init(void)
{
    uint i = 0;

    if (amount == 0) {
        printk(KERN_WARNING "0 was entered, doing nothing....");
    } else if (amount >= 3 && amount <= 7) {
        for (i = 0; i < amount; i++) {
            printk(KERN_EMERG "Hello, world!\n");
        }
    } else if (amount > 10) {
        printk(KERN_ERR "Too many Hellos!!! Les than 7 pls");
        return -EINVAL;
    }

    return 0;
}

static void __exit hello_exit(void)
{
    /* Do nothing here right now */
}
```

}

module_init(hello_init);

module_exit(hello_exit);

```
langelius@langelius-Ubuntu: ~/repos/busybox
langelius@langelius-Ubuntu:~/repos/busybox$ qemu-system-arm -kernel _install/boot/zImage -initrd rootfs.cpio.gz -machine virt -nographic -m 512 --append "root=/dev/ram0 rw console=ttyAMA0,0x4000000"

0.000000] Booting Linux on physical CPU 0x0
0.000000] Linux version 4.19.220 (langelius@langelius-Ubuntu) (gcc version 8.3.0 (GNU Toolchain for the A-profile Architecture 8.3-2019.03 (arm-rel-8.30))) #1 SMP Thu Dec 9 07:20:31 E
0.000000] CPU: ARMv7 Processor [412fc0f1] revision 1 (ARMv7), cr=10c5307d
0.000000] CPU: div instructions available: patching division code
0.000000] CPU: PIPT / VIPT nonaliasing data cache, PIPT instruction cache
0.000000] DFI: fdt: Machine model: linux,dummy-virt
0.000000] Memory policy: Data cache writealloc
0.000000] efi: Getting EFI parameters from FDT:
0.000000] efi: EFI not found!
0.000000] cma: Reserved 64 MB at 0x5c000000
0.000000] psci: probing for conduit method from DT.
0.000000] psci: PSCIv0.2 detected in firmware.
0.000000] psci: Using standard PSCI v0.2 function IDs
0.000000] psci: Trusted OS migration not required
0.000000] random: get_random_bytes called from start_kernel+0x9c/0x47c with crng_init=0
0.000000] percpu: Embedded 16 pages/cpu s36620 r8192 d20724 u65536
0.000000] Built 1 zonelists, mobility grouping on. Total pages: 130048
0.000000] Kernel command line: root=/dev/ram0 rw console=ttyAMA0,115200 mem=512M
0.000000] Dentry cache hash table entries: 65536 (order: 0, 262144 bytes)
0.000000] Inode-cache hash table entries: 32768 (order: 5, 131072 bytes)
0.000000] Memory: 4096K/524288K available (12288K kernel code, 1619K rwdata, 4784K rodata, 2048K init, 393K bss, 52348K reserved, 65536K cma-reserved, 0K highmem)
0.000000] Virtual kernel memory layout:
0.000000] vector : 0xffff0000 - 0xffff1000 ( 4 kB)
0.000000] fixmap : 0xffc00000 - 0xfffb0000 (3072 kB)
0.000000] vmalloc : 0xe0000000 - 0xffff0000 ( 496 MB)
0.000000] lowmem : 0xc0000000 - 0xe0000000 ( 512 MB)
0.000000] pkmap : 0xbfe00000 - 0xc0000000 ( 2 MB)
0.000000] modules : 0xbf000000 - 0xbfe00000 ( 14 MB)
0.000000] .text : 0x(ptrval) - 0x(ptrval) (13200 kB)
0.000000] .init : 0x(ptrval) - 0x(ptrval) (2048 kB)
0.000000] .data : 0x(ptrval) - 0x(ptrval) (1620 kB)
0.000000] .bss : 0x(ptrval) - 0x(ptrval) ( 394 kB)
0.000000] SLUB: HWalign=64, Order=0-3, MinObjects=0, CPUs=1, Nodes=1
0.000000] rcu: Hierarchical RCU implementation.
0.000000] rcu: RCU event tracing is enabled.
0.000000] rcu: RCU restricting CPUs from NR_CPUS=16 to nr_cpu_ids=1.
0.000000] rcu: Adjusting geometry for rcu_fanout_leaf=16, nr_cpu_ids=1
0.000000] NR_IRQS: 16, nr_irqs: 16, preallocated irqs: 16
0.000000] GICv2m: range[mem 0x08020000-0x08020fff], SPI[0:143]
0.000000] arch_timer: cp15 timer(s) running at 62.50MHz (virt).
0.000000] clocksource: arch_sys_counter: mask: 0xffffffffffffff max_cycles: 0x1cd42e20bc, max_idle_ns: 881590465314 ns
0.002222] sched_clock: 56 bits at 62MHz, resolution 16ns, wraps every 4398046511096ns
0.000406] Switching to timer-based delay loop, resolution 16ns
0.004451] console: colour dummy device 80x30
0.005546] Calibrating delay loop (skipped), value calculated using timer frequency.. 125.00 BogoMIPS (lpj=625000)
0.006742] pid_max: default: 32768 minimum: 301
0.008137] Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
0.008184] Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)
0.025963] CPU: Testing write buffer coherency: ok
0.027170] CPU0: Spectre v2: firmware did not set auxiliary control register IBE bit, system vulnerable
0.030851] /cpus/cpu00 missing clock-frequency property
0.039222] CPU0: thread -1, cpu 0, socket 0, mpidr 80000000
0.046077] Setting up static identity map for 0x40300000 - 0x403000a0
0.048444] CPU: Hierarchical RCU implementation.
```

```
langelius@langelius-Ubuntu: ~/repos/busybox

[ 2.182226] can: raw protocol (rev 20170425)
[ 2.182471] can: broadcast manager protocol (rev 20170425 t)
[ 2.182735] can: netlink gateway (rev 20170425) max_hops=1
[ 2.183845] Key type dns_resolver registered
[ 2.184313] ThumbEE CPU extension supported.
[ 2.184483] Registering SWP/SWPB emulation handler
[ 2.186091] Loading compiled-in X.509 certificates
[ 2.195289] input: gpio-keys as /devices/platform/gpio-keys/input/input0
[ 2.198417] rtc-pl031 9010000.pl031: setting system clock to 2021-12-22 21:05:40 UTC (1640207140)
[ 2.205762] uart-pl011 90000000.pl011: no DMA platform data
[ 2.321203] Freeing unused kernel memory: 2048K
[ 2.326966] Run /init as init process

Please press Enter to activate this console.
/ # modinfo hello.ko
filename:      hello.ko
author:        Hutsaliuk Oleh  IV-93
description:   Lab5
license:       Dual BSD/GPL
parm:          times:Amount of outputting Hello worlds
depends:
vermagic:      4.19.220 SMP mod_unload ARMv7 p2v8
/ #
```

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description:    Lab5
license:        Dual BSD/GPL
parm:          times:Amount of outputting Hello worlds
depends:
vermagic:      4.19.220 SMP mod_unload ARMv7 p2v8
/ # insmod hello.ko amount=5
[ 373.289340] hello: loading out-of-tree module taints kernel.
[ 373.297313] Hello, world!
[ 373.297466] Hello, world!
[ 373.297550] Hello, world!
[ 373.297627] Hello, world!
[ 373.297699] Hello, world!
/ #
```