

Міністерство освіти і науки України
**Національний технічний університет України «КПІ» імені Ігоря
Сікорського**
Кафедра обчислювальної техніки ФІОТ

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

Тема:

Підготовка та налаштування плати BBB

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```
#include <linux/init.h>

#include <linux/module.h>

#include <linux/printk.h>

MODULE_AUTHOR("Kolesnykov Roman");
MODULE_DESCRIPTION("Hello, world in Linux Kernel Training");
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 "Entered parameter equals 0");
    } else if (amount >= 5 && amount <= 10) {
        printk(KERN_WARNING "Entered parameter is between 5 and 10");
    } else if (amount > 10) {
        printk(KERN_ERR "Entered parameter is bigger than 10");
        return -EINVAL;
    }

    for (i = 0; i < amount; i++) {
        printk(KERN_EMERG "Hello, world!\n");
    }
}
```

```
    printk(KERN_INFO "Amount: %d\n", amount);
```

```
    return 0;
```

```
}
```

```
static void __exit hello_exit(void) {
```

```
    /* Do nothing here right now */
```

```
}
```

```
module_init(hello_init);
```

```
module_exit(hello_exit);
```

MakeFile

```
ifneq ($(KERNELRELEASE),)
```

```
# kbuild part of makefile
```

```
obj-m := hello.o
```

```
else
```

```
# normal makefile
```

```
KDIR ?= /lib/modules/`uname -r`/build
```

```
default:
```

```
    $(MAKE) -C $(KDIR) M=$$PWD
```

```
clean:
```

```
    $(MAKE) -C $(KDIR) M=$$PWD clean
```

```
endif
```

```
panhead32@DESKTOP-UF4UM3P: ~/repos/busybox/_install
panhead32@DESKTOP-UF4UM3P:~/repos/busybox/_install$ cd repos/busybox/_install/
panhead32@DESKTOP-UF4UM3P:~/repos/busybox/_install$ ls
--append --machine bin boot dev etc hello.ko init lib linuxrc proc root sbin sys tmp usr
panhead32@DESKTOP-UF4UM3P:~/repos/busybox/_install$ -
```



```
* SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

*/
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#include <linux/module.h>
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{
    uint i = 0;

    if(amount == 0)
    {
        printk(KERN_WARNING "Entered parameter equals 0");
    }
    else if(amount >= 5 && amount <= 10)
    {
        printk(KERN_WARNING "Entered parameter is between 5 and 10");
    }
    else if(amount > 10)
    {
        printk(KERN_ERR "Entered parameter is bigger than 10");
        return -EINVAL;
    }

    for(i=0; i<amount; i++)
    {
        printk(KERN_EMERG "Hello, world!\n");
    }

    printk(KERN_INFO "Amount: %d\n", amount);
}

return 0;
}

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

module_init(hello_init);
module_exit(hello_exit);
panhead32@DESKTOP-UF4UM3P:~/lab5/ak5/test1$
```

```
panhead32@DESKTOP-UF4UM3P:~/repos/busybox/_install$ find . | cpio -o -H newc | gzip > ../rootfs.cpio.gz; cd ..;
118001 blocks
panhead32@DESKTOP-UF4UM3P:~/repos/busybox$ qemu-system-arm -kernel _install/boot/zImage -initrd rootfs.cpio.gz -machine virt -nographic -m 512 --append "root=/dev/ram0 rw console=ttyAMA0,115200 mem=512M"
[    0.00000] Booting Linux on physical CPU 0x0
[    0.00000] Linux version 4.19.220 (panhead32@DESKTOP-UF4UM3P) (gcc version 8.3.0 (GNU Toolchain for the A-profile Ar
chitecture 8.3-2019.03 (arm-rel-8.36))) #1 SMP Thu Dec 9 21:09:30 EET 2021
[    0.00000] CPU: ARMv7 Processor [412fc0f1] revision 1 (ARMV7), cr=10c5387d
[    0.00000] CPU: div instructions available: patching division code
[    0.00000] CPU: PIPT / VIPT nonaliasing data cache, PIPT instruction cache
[    0.00000] OF: fdt: Machine model: linux,dummy-virt
[    0.00000] Memory policy: Data cache writealloc
[    0.00000] efi: Getting EFI parameters from FDT:
[    0.00000] efi: UEFI not found.
[    0.00000] cma: Reserved 64 MiB at 0x5c000000
[    0.00000] psci: probing for conduit method from DT.
[    0.00000] psci: PSCIv0.2 detected in firmware.
[    0.00000] psci: Using standard PSCI v0.2 function IDs
[    0.00000] psci: Trusted OS migration not required
[    0.00000] random: get_random_bytes called from start_kernel+0x9c/0x47c with crng_init=0
[    0.00000] percpu: Embedded 16 pages/cpu s36620 r8192 d20724 u65536
[    0.00000] Built 1 zonelists, mobility grouping on. Total pages: 130048
[    0.00000] Kernel command line: root=/dev/ram0 rw console=ttyAMA0,115200 mem=512M
[    0.00000] Dentry cache hash table entries: 65536 (order: 6, 262144 bytes)
[    0.00000] Inode-cache hash table entries: 32768 (order: 5, 131072 bytes)
[    0.00000] Memory: 406720K/524288K available (12288K kernel code, 1599K rdata, 4696K rodata, 2048K init, 393K bss,
52032K reserved, 65536K cma-reserved, 0K highmem)
[    0.00000] Virtual kernel memory layout:
[    0.00000]      vector : 0xfffff0000 - 0xfffff1000   ( 4 kB)
```

```
Выбрать panhead32@DESKTOP-UF4UM3P: ~/repos/busybox
[    2.13947] uart-pl011 9000000.pl011: no DMA platform data
[    2.226609] Freeing unused kernel memory: 2048K
[    2.241424] Run /init as init process

Please press Enter to activate this console.
/ # modinfo hello.ko
filename:          hello.ko
author:           Kolesnykov Roman
description:       Hello, world in Linux Kernel Training
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
[    53.643271] hello: loading out-of-tree module taints kernel.
[    53.652490] Entered parameter is between 5 and 10
[    53.652515] Hello, world!
[    53.654700] Hello, world!
[    53.655506] Hello, world!
[    53.656284] Hello, world!
[    53.657064] Hello, world!
[    53.658264] Amount: 5
/ # cat sys/module/h
hello/    hid/      hisi_rng/
/ # cat sys/module/hello/parameters/amount
5
/ #
```