

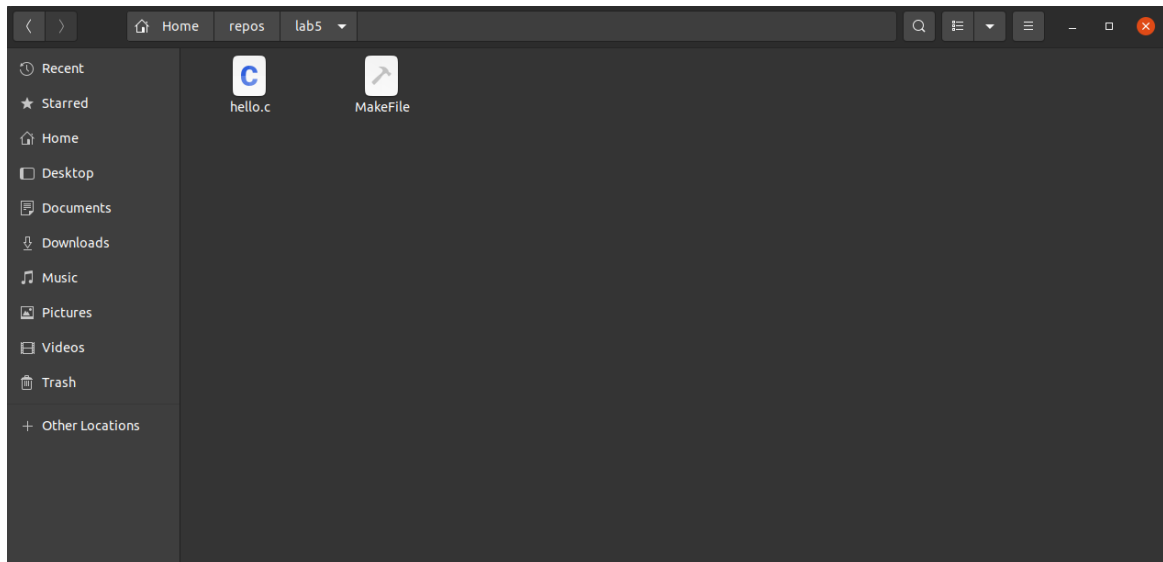
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ЛАБОРАТОРНА РОБОТА №5

З дисципліни “Архітектура комп’ютерів 2”

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Код файла hello.c:

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

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

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

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

```
MODULE_AUTHOR("Derachyts Vitalii IV-91");
```

```
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 "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);

```

```
vide@vide-VirtualBox: ~/repos/lab5
vide@vide-VirtualBox:~/repos/lab5$ export ARCH=arm; export PATH=/opt/gcc-arm-8.3-2019.03-x86_64-arm-linux-gnueabi/bin:$PATH;
export CROSS_COMPILE="ccache arm-linux-gnueabi-"; export KDIR=$HOME/repos/linux-stable
vide@vide-VirtualBox:~/repos/lab5$ make
make -C /home/vide/repos/linux-stable M=$PWD
make[1]: Entering directory '/home/vide/repos/linux-stable'
CC [M] /home/vide/repos/lab5/hello.o
Building modules, stage 2.
MODPOST 1 modules
CC /home/vide/repos/lab5/hello.mod.o
LD [M] /home/vide/repos/lab5/hello.ko
make[1]: Leaving directory '/home/vide/repos/linux-stable'
vide@vide-VirtualBox:~/repos/lab5$
```

Перевірка результатів:

```
vide@vide-VirtualBox: ~/repos/busybox
vide@vide-VirtualBox:~/repos/busybox/_install$ find . | cpio -o -H newc | gzip >
../rootfs.cpio.gz; cd ..
118785 blocks
vide@vide-VirtualBox:~/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"
[ 0.000000] Booting Linux on physical CPU 0x0
[ 0.000000] Linux version 4.19.224 (vide@vide-VirtualBox) (gcc version 8.3.0
 (GNU Toolchain for the A-profile Architecture 8.3-2019.03 (arm-rel-8.36))) #1 SM
P Wed Jan 5 18:36:40 EET 2022
[ 0.000000] CPU: ARMv7 Processor [412fc0f1] revision 1 (ARMv7), cr=10c5387d
[ 0.000000] CPU: div instructions available: patching division code
[ 0.000000] CPU: PIPT / VIPT nonaliasing data cache, PIPT instruction cache
[ 0.000000] OF: fdt: Machine model: linux,dummy-virt
[ 0.000000] Memory policy: Data cache writealloc
[ 0.000000] efi: Getting EFI parameters from FDT:
[ 0.000000] efi: UEFI not found.
[ 0.000000] cma: Reserved 64 MiB 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/0x480 with
crng_init=0
```

```
vide@vide-VirtualBox: ~/repos/busybox
parm:          amount:Amount of outputting Hello worlds
depends:
vermagic:      4.19.224 SMP mod_unload ARMv7 p2v8
/ # insmod hello.ko amount=7
[ 74.445484] hello: loading out-of-tree module taints kernel.
[ 74.452883] Entered parameter is between 5 and 10
[ 74.452927] Hello, world!
[ 74.453479] Hello, world!
[ 74.453609] Hello, world!
[ 74.453744] Hello, world!
[ 74.454392] Hello, world!
[ 74.454570] Hello, world!
[ 74.454700] Hello, world!
[ 74.454901] Amount: 7
/ # rmmod hello.ko
/ # insmod hello.ko amount=0
[ 110.026808] Entered parameter equals 0
[ 110.026882] Amount: 0
/ # rmmod hello.ko
/ # insmod hello.ko amount=12
insmod: can't insert 'hello.ko': invalid parameter
/ # rmmod hello.ko
rmmod: remove 'hello': No such file or directory
/ #
```

```
vide@vide-VirtualBox: ~/repos/busybox
[ 3.586630] Run /init as init process

Please press Enter to activate this console.
/ # modinfo hello.ko
filename:      hello.ko
author:        Derachyts Vitalii IV-91
description:    Lab5
license:       Dual BSD/GPL
parm:          amount:Amount of outputting Hello worlds
depends:
vermagic:      4.19.224 SMP mod_unload ARMv7 p2v8
/ # insmod hello.ko amount=7
[ 74.445484] hello: loading out-of-tree module taints kernel.
[ 74.452883] Entered parameter is between 5 and 10
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[ 74.453744] Hello, world!
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[ 74.454570] Hello, world!
[ 74.454700] Hello, world!
[ 74.454901] Amount: 7
/ # rmmod hello.ko
/ #
```