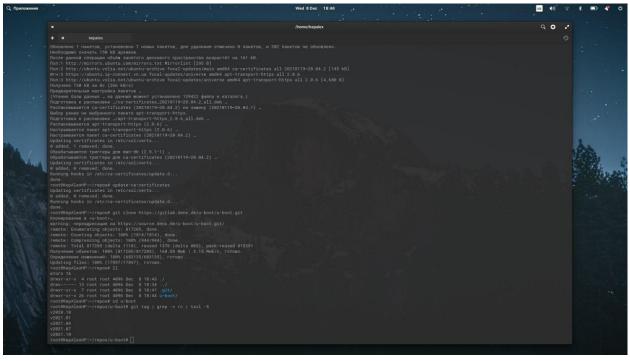Міністерство освіти і науки України

Національний технічний університет України

«Київський політехнічний інститут ім. Ігоря Сікорського»

Факультет інформатики та обчислювальної техніки

Кафедра обчислювальної техніки

ЛАБОРАТОРНА РОБОТА № 4

з дисципліни «АК» на тему

ВИКОНАВ:

студент III курсу ФІОТ

групи IВ-91

Гришин О.С.

Київ – 2021

```
Обновлено 1 пакетов, установлено 1 новых пакетов, для удаления отмечено 0 пакетов, и 202 пакетов не обновлено.
Необходимо скачать 150 kB архивов.
После данной операции объём занятого дискового пространства возрастёт на 161 kB.
Пол:1 http://mirrors.ubuntu.com/mirrors.txt Mirrorlist [295 B]
Пол:2 http://ubuntu.volia.net/ubuntu-archive focal-updates/main amd64 ca-certificates all 20210119~20.04.2 [145 kB]
Игн:3 https://ubuntu.ip-connect.vn.ua focal-updates/universe amd64 apt-transport-https all 2.0.6
Пол:3 http://ubuntu.volia.net/ubuntu-archive focal-updates/universe amd64 apt-transport-https all 2.0.6 [4,680 B]
Получено 150 kB за 0с (366 kB/s)
Предварительная настройка пакетов …
(Чтение базы данных … на данный момент установлено 139422 файла и каталога.)
Подготовка к распаковке .../ca-certificates_20210119~20.04.2_all.deb …
Распаковывается ca-certificates (20210119~20.04.2) на замену (20210119~20.04.1) …
Выбор ранее не выбранного пакета apt-transport-https.
Подготовка к распаковке .../apt-transport-https_2.0.6_all.deb …
Распаковывается apt-transport-https (2.0.6) …
Настраивается пакет apt-transport-https (2.0.6) …
Настраивается пакет ca-certificates (20210119~20.04.2) …
Updating certificates in /etc/ssl/certs...
0 added, 1 removed; done.
Обрабатываются триггеры для man-db (2.9.1-1) …
Обрабатываются триггеры для ca-certificates (20210119~20.04.2) …
Updating certificates in /etc/ssl/certs...
0 added, 0 removed; done.
Running hooks in /etc/ca-certificates/update.d...
done.
root@KepAlexHP:~/repos# update-ca-certificates
Updating certificates in /etc/ssl/certs...
0 added, 0 removed; done.
Running hooks in /etc/ca-certificates/update.d...
done.
root@KepAlexHP:~/repos# git clone https://gitlab.denx.de/u-boot/u-boot.git
Клонирование в «u-boot»…
warning: переадресация на https://source.denx.de/u-boot/u-boot.git/
remote: Enumerating objects: 817205, done.
remote: Counting objects: 100% (1814/1814), done.
remote: Compressing objects: 100% (944/944), done.
remote: Total 817205 (delta 1110), reused 1376 (delta 863), pack-reused 815391
Получение объектов: 100% (817205/817205), 160.89 МиБ | 3.15 МиБ/с, готово.
Определение изменений: 100% (683135/683135), готово.
Updating files: 100% (17897/17897), готово.
root@KepAlexHP:~/repos# ll
итого 16
drwxr-xr-x  4 root root 4096 Dec  8 18:43 ./
drwx------ 13 root root 4096 Dec  8 18:34 ../
drwxr-xr-x  7 root root 4096 Dec  8 18:41 .git/
drwxr-xr-x 26 root root 4096 Dec  8 18:44 u-boot/
root@KepAlexHP:~/repos# cd u-boot
root@KepAlexHP:~/repos/u-boot# git tag | grep -v rc | tail -5
v2020.10
v2021.01
v2021.04
v2021.07
v2021.10
root@KepAlexHP:~/repos/u-boot#
```

```
Please press Enter to activate this console.
/ # uname -a
Linux (none) 4.19.220 #1 SMP Wed Dec  8 19:48:41 EET 2021 armv7l GNU/Linux
/ # ls -l
total 0
drwxr-xr-x   2 root     root            0 Dec  8 18:14 bin
drwxr-xr-x   2 root     root            0 Dec  8 18:19 boot
drwxr-xr-x   3 root     root            0 Dec  8 18:25 dev
drwxr-xr-x   3 root     root            0 Dec  8 18:22 etc
lrwxrwxrwx   1 root     root           11 Dec  8 18:18 init -> bin/busybox
drwxr-xr-x   3 root     root            0 Dec  8 18:21 lib
lrwxrwxrwx   1 root     root           11 Dec  8 18:14 linuxrc -> bin/busybox
dr-xr-xr-x  91 root     root            0 Jan  1  1970 proc
drwxr-xr-x   2 root     root            0 Dec  8 18:15 root
drwxr-xr-x   2 root     root            0 Dec  8 18:14 sbin
dr-xr-xr-x  12 root     root            0 Dec  8 18:25 sys
drwxr-xr-x   2 root     root            0 Dec  8 18:15 tmp
drwxr-xr-x   4 root     root            0 Dec  8 18:14 usr
/ # dmesg | grep init
[    0.000000] random: get_random_bytes called from start_kernel+0x9c/0x47c with crng_init=0
[    0.000000] Memory: 406424K/524288K available (12288K kernel code, 1619K rwdata, 4784K rodata, 2048K init, 393K bss, 52328K reserved, 65536K cma-reserved, 0K highmem)
[    0.000000]           .init : 0x(ptrval) - 0x(ptrval)   (2048 kB)
[    0.102647] devtmpfs: initialized
[    0.134202] pinctrl core: initialized pinctrl subsystem
[    0.305726] SCSI subsystem initialized
[    0.542405] Trying to unpack rootfs image as initramfs...
[    2.375271] Freeing initrd memory: 25096K
[    2.539695] SuperH (H)SCI(F) driver initialized
[    2.541029] msm_serial: driver initialized
[    2.541424] STMicroelectronics ASC driver initialized
[    2.542640] STM32 USART driver initialized
[    2.889493] Run /init as init process
/ # busybox --help | head -5
BusyBox v1.34.1 (2021-12-08 20:11:58 EET) multi-call binary.
BusyBox is copyrighted by many authors between 1998-2015.
Licensed under GPLv2. See source distribution for detailed
copyright notices.

/ # poweroff
/ # umount: can't unmount /: Invalid argument
swapoff: can't open '/etc/fstab': No such file or directory
The system is going down NOW!
Sent SIGTERM to all processes
Sent SIGKILL to all processes
Requesting system poweroff
[   74.969553] reboot: Power down
root@KepAlexHP:~/repos/busybox#
```

```
# configuration written to .config
#
root@KepAlexHP:~/repos/u-boot# ll
итого 584
drwxr-xr-x  25 root root   4096 Dec  8 18:53 ./
drwxr-xr-x   4 root root   4096 Dec  8 18:43 ../
drwxr-xr-x   2 root root   4096 Dec  8 18:50 api/
drwxr-xr-x  15 root root   4096 Dec  8 18:50 arch/
-rw-r--r--   1 root root  17164 Dec  8 18:50 .azure-pipelines.yml
drwxr-xr-x 174 root root   4096 Dec  8 18:50 board/
-rw-r--r--   1 root root    817 Dec  8 18:50 .checkpatch.conf
drwxr-xr-x   9 root root   4096 Dec  8 18:50 cmd/
drwxr-xr-x   5 root root   4096 Dec  8 18:50 common/
-rw-r--r--   1 root root  45168 Dec  8 18:53 .config
-rw-r--r--   1 root root   2157 Dec  8 18:50 config.mk
drwxr-xr-x   2 root root  69632 Dec  8 18:51 configs/
drwxr-xr-x   2 root root   4096 Dec  8 18:51 disk/
drwxr-xr-x  19 root root  12288 Dec  8 18:51 doc/
drwxr-xr-x  70 root root   4096 Dec  8 18:51 drivers/
drwxr-xr-x   2 root root   4096 Dec  8 18:51 dts/
drwxr-xr-x   2 root root   4096 Dec  8 18:51 env/
drwxr-xr-x   4 root root   4096 Dec  8 18:51 examples/
drwxr-xr-x  14 root root   4096 Dec  8 18:51 fs/
drwxr-xr-x   8 root root   4096 Dec  8 18:51 .git/
-rw-r--r--   1 root root    169 Dec  8 18:50 .gitattributes
drwxr-xr-x   2 root root   4096 Dec  8 18:50 .github/
-rw-r--r--   1 root root    939 Dec  8 18:50 .gitignore
-rw-r--r--   1 root root   9870 Dec  8 18:50 .gitlab-ci.yml
drwxr-xr-x  35 root root  20480 Dec  8 18:51 include/
-rw-r--r--   1 root root    783 Dec  8 18:50 Kbuild
-rw-r--r--   1 root root  15502 Dec  8 18:50 Kconfig
drwxr-xr-x  23 root root   4096 Dec  8 18:51 lib/
drwxr-xr-x   2 root root   4096 Dec  8 18:50 Licenses/
-rw-r--r--   1 root root   2393 Dec  8 18:50 .mailmap
-rw-r--r--   1 root root  33511 Dec  8 18:50 MAINTAINERS
-rw-r--r--   1 root root  77587 Dec  8 18:50 Makefile
drwxr-xr-x   2 root root   4096 Dec  8 18:51 net/
drwxr-xr-x   5 root root   4096 Dec  8 18:51 post/
-rw-r--r--   1 root root 162907 Dec  8 18:50 README
-rw-r--r--   1 root root    502 Dec  8 18:50 .readthedocs.yml
drwxr-xr-x   6 root root   4096 Dec  8 18:51 scripts/
drwxr-xr-x  15 root root   4096 Dec  8 18:51 test/
drwxr-xr-x  15 root root   4096 Dec  8 18:51 tools/
root@KepAlexHP:~/repos/u-boot#
```

```
  LD [M]  sound/usb/snd-usb-audio.ko
  LD [M]  sound/usb/snd-usbmidi-lib.ko
root@KepAlexHP:~/repos/linux-stable# ll | grep arch
drwxr-xr-x  26 root root   4096 Dec  8 19:46 arch/
root@KepAlexHP:~/repos/linux-stable#
```

```
    INSTALL sound/soc/tegra/snd-soc-tegra20-i2s.ko
    INSTALL sound/soc/tegra/snd-soc-tegra20-spdif.ko
    INSTALL sound/soc/tegra/snd-soc-tegra30-ahub.ko
    INSTALL sound/soc/tegra/snd-soc-tegra30-i2s.ko
    INSTALL sound/soundcore.ko
    INSTALL sound/usb/snd-usb-audio.ko
    INSTALL sound/usb/snd-usbmidi-lib.ko
    DEPMOD  4.19.220
root@KepAlexHP:~/repos/linux-stable# cd -
/root/repos/busybox
root@KepAlexHP:~/repos/busybox# ${CROSS_COMPILE}readelf -d _install/bin/busybox | grep NEEDED
 0x00000001 (NEEDED)                     Shared library: [libm.so.6]
 0x00000001 (NEEDED)                     Shared library: [libresolv.so.2]
 0x00000001 (NEEDED)                     Shared library: [libc.so.6]
root@KepAlexHP:~/repos/busybox#
```

```
root@KepAlexHP:~/repos/busybox# cd ~/repos/busybox
root@KepAlexHP:~/repos/busybox# cd _install
root@KepAlexHP:~/repos/busybox/_install# find . | cpio -o -H newc | gzip > ../rootfs.cpio.gz
118815 блоков
root@KepAlexHP:~/repos/busybox/_install#
```

```
bin  boot  dev  etc  init  lib  linuxrc  proc  root  sbin  sys  tmp  usr
root@KepAlexHP:~/repos# ls busybox/_install/etc/
group  init.d  mdev.conf  passwd  resolv.conf  shadow
root@KepAlexHP:~/repos#
```

```
group  init.d  mdev.conf  passwd  resolv.conf  shadow
root@KepAlexHP:~/repos# cat busybox/_install/etc/init.d/rcS
#!/bin/sh
mount -t sysfs none /sys
mount -t proc none /proc
mount -t debugfs none /sys/kernel/debug
echo /sbin/mdev > /proc/sys/kernel/hotplug
mdev -s
root@KepAlexHP:~/repos#
```

```
mdev -s
root@KepAlexHP:~/repos# ls linux-stable/
arch          certs     crypto         firmware   include  Kbuild   lib        Makefile          modules.order   README   security   tools   vmlinux
block         COPYING   Documentation  fragments  init     Kconfig  LICENSES   mm                Module.symvers  samples  sound      usr     vmlinux.o
built-in.a    CREDITS   drivers        fs         ipc      kernel   MAINTAINERS modules.builtin  net                      scripts    System.map  virt
root@KepAlexHP:~/repos#
```

```
built-in.a  CREDITS  drivers        fs         ipc        kernel    MAINTAINERS
root@KepAlexHP:~/repos# cat linux-stable/fragments/bbb.cfg
# Use multi_v7_defconfig as a base for merge_config.sh
# --- USB ---
# Enable USB on BBB (AM335x)
CONFIG_USB_ANNOUNCE_NEW_DEVICES=y
CONFIG_USB_EHCI_ROOT_HUB_TT=y
CONFIG_AM335X_PHY_USB=y
CONFIG_USB_MUSB_TUSB6010=y
CONFIG_USB_MUSB_OMAP2PLUS=y
CONFIG_USB_MUSB_HDRC=y
CONFIG_USB_MUSB_DSPS=y
CONFIG_USB_MUSB_AM35X=y
CONFIG_USB_CONFIGFS=y
CONFIG_NOP_USB_XCEIV=y
# For USB keyboard and mouse
CONFIG_USB_HID=y
CONFIG_USB_HIDDEV=y
# For PL2303, FTDI, etc
CONFIG_USB_SERIAL=y
CONFIG_USB_SERIAL_PL2303=y
CONFIG_USB_SERIAL_GENERIC=y
CONFIG_USB_SERIAL_SIMPLE=y
CONFIG_USB_SERIAL_FTDI_SIO=y
# For USB mass storage devices (like flash USB stick)
CONFIG_USB_ULPI=y
CONFIG_USB_ULPI_BUS=y
# --- Networking ---
CONFIG_BRIDGE=y
# --- Device Tree Overlays (.dtbo support) ---
CONFIG_OF_OVERLAY=y
root@KepAlexHP:~/repos#
```