

# Linux for Embedded Systems

## Laboratory exercise 1

Completed by Nikita Zakharov

### Task description

1. Vex9 should automatically connect to the network, using DHCP to obtain the network parameters. Disconnection of the cable should shut down the network connection. Connection of the cable should reconnect the network. (In QEMU you may control the network in the monitor mode, using the "set\_inx DEVICE\_NAME on/off" command. You may enter/exit the monitor mode with "CTRL+a c". The device name is reported by "info network".)
2. The system host name should be set to: "firstname\_lastname" of the student (or "lastname1\_lastname2" in case of a 2-person team).
3. When the Internet connection is established, the system clock should be synchronized with an NTP server (preferably using the "NTP server pool")
4. Add the Lua interpreter with the script that after the start of the system tries to download from certain URL update.tar.gz file and unpacks it overwriting the filesystem

### Solution description

First of all in order to start I downloaded the buildroot from <https://buildroot.org> and unpacked it. Then I choose the configuration that is provided with buildroot.

```
make qemu_arm_vexpress_defconfig
```

Making sure that there are no error messages I moved forward to start the first task.

#### Task 1

For completion of this task I opened menuconfig and changed the following configurations:

```
Target packages -> Show packages that are also provided by busybox
Target packages -> Networking applications -> ifplugd
```

## Task 2

In order to set the system hostname the following action in menuconfig was done:

System configuration -> System hostname -> nikita\_zakharov

## Task 3

For clock to be synchronized I changed this:

System configuration->Networking applications ->ntp->ntpd

## Task 4

To make my lua script to correctly be chosen and processed I added changes to Interpreter configuration

Target packages ->Interpreter languages and scripting -> lua

Then I created a new directory called "overlay" one level upper my root directory and placed there my script. After changed configuration in menuconfig:

System configuration->Root filesystem overlay directories->../overlay

To make script to be automatically executed I created a file in overlay directory which directs on the script.

Now concerning the script itself. For the successful launch of it in configuration some lua modules should be added. To do that I followed the following steps:

System configuration->Target packages->  
Interpreter languages and scripting->Lua libraries/modules--->

Over there I marked lua-http, luafilesystem and luasocket

Also for correct system call in menuconfig I added additional module in compress/decompress folder to use tar. Now the system will be able to make the system call

System configuration->Target packages->System tools-->tar

So now an archive will be downloaded without any problems and appear in parent directory. I tried to implement a function unpacking that archive using different lua modules, however none of them didn't give a correct result and I decided to stop on the solution which is a simple call to a system in lua. This worked and all the files were unpacked to a directory /root.

After a build was completed I ran qemu with the following command:

```
nikita@nikita-P67-DS3-B3:~/Desktop/Lines/qwerty/buildroot-2020.02$ qemu-system-a  
rm -M vexpress-a9 -nographic -smp 1 -dtb output/images/vexpress-v2p-ca9.dtb -ker  
nel output/images/zImage -append "rootwait root=/dev/vda console=ttyAMA0" -netde  
v user,id=eth0,hostfwd=tcp::8888-:8810,hostfwd=tcp::2222-:22 -device virtio-net-  
device,netdev=eth0 -drive file=output/images/rootfs.ext2,if=none,format=raw,id=h  
d0 -device virtio-blk-device,drive=hd0
```

Then script started to work and download a buildroot.tar.gz from buildroot.org,

```

Welcome to Buildroot
nikita_zakharov login: Update download started...
random: fast init done
  2.55MB received,  10.20KB/s throughput, 42% done,  5.99m remainingrandom: cr
ng init done
  6.13MB received,  16.34KB/s throughput,  6.40m elapsed
Download is successful!
Unpacking and writing...
Update completed.
#

```

took some time and then system unpacked it to the /root directory

```

dr-xr-xr-x   66 root    root          0 Jan  1  1970 proc
drwx-----   3 root    root       1024 Mar 27 20:26 root
drwxr-xr-x   3 root    root        180 Mar 27 21:18 run
drwxr-xr-x   2 root    root       1024 Mar 27 20:04/sbin
dr-xr-xr-x  12 root    root          0 Mar 27 21:18 sys
-rw-r--r--   1 root    root        47 Mar 27 12:49 test.sh
drwxrwxrwt   2 root    root        80 Mar 27 21:18 tmp
-rw-r--r--   1 root    root      3801 Mar 27 11:49 update.lua
-rw-r--r--   1 root    root    6423862 Mar 27 21:18 update.tar.gz
drwxr-xr-x   6 root    root       1024 Mar 27 20:04/usr
drwxr-xr-x   4 root    root       1024 Mar 27 20:04 var
#

```

And also we can notice changes in the root directory, since a folder appeared over there named buildroot-2020.02, which was successfully unpacked. Therefore script worked fine.

```

Welcome to Buildroot
nikita_zakharov login: root
# ls -l
total 1
drwxrwxr-x   3 root    root       1024 Mar  8 21:23 buildroot-2020.02
#

```