[2015 Fall] Wireless Networking - Fundamentals and Applications

Lab3 - LiveUSB SDR Environment Installation Guide

1. Prepare a USB stick with at least 16GB capacity. (32GB is recommended, maybe you will install and run other applications on it)
2. Prepare a computer w1ith Linux OS. Download the follow three files from http://files.ettus.com/liveusb/2.1/

1. fat.zip (~ 742M) **2. casper-rw.tar.bz2 (~ 1.3G)** **3. create_live_sdr_fs.sh (~ 8.7K)**

3. Connect the USB stick to the computer, open the terminal and run the follow commands

chmod u+x create_live_sdr_fs.sh **sudo ./create_live_sdr_fs.sh /dev/sdX fat.zip casper-rw.tar.bz2**

where /dev/sdX is your USB stick (for example, mine is /dev/sdC, you can use the command: sudo fdisk -l to check the partition)
(You can also refer to http://files.ettus.com/liveusb/2.1/sample_output.txt)
(It will take about 20 minutes or more to burn the image…)

4. Boot the liveUSB
Restart your computer, choose the USB in the boot menu.
After enter into the OS, you will see the OS is Ubuntu 12.10(x86) with a green desktop wallpaper.

Your default account is ubuntu and password is NONE.
You will see everything is already installed in the OS, such as GNU Radio and UHD.

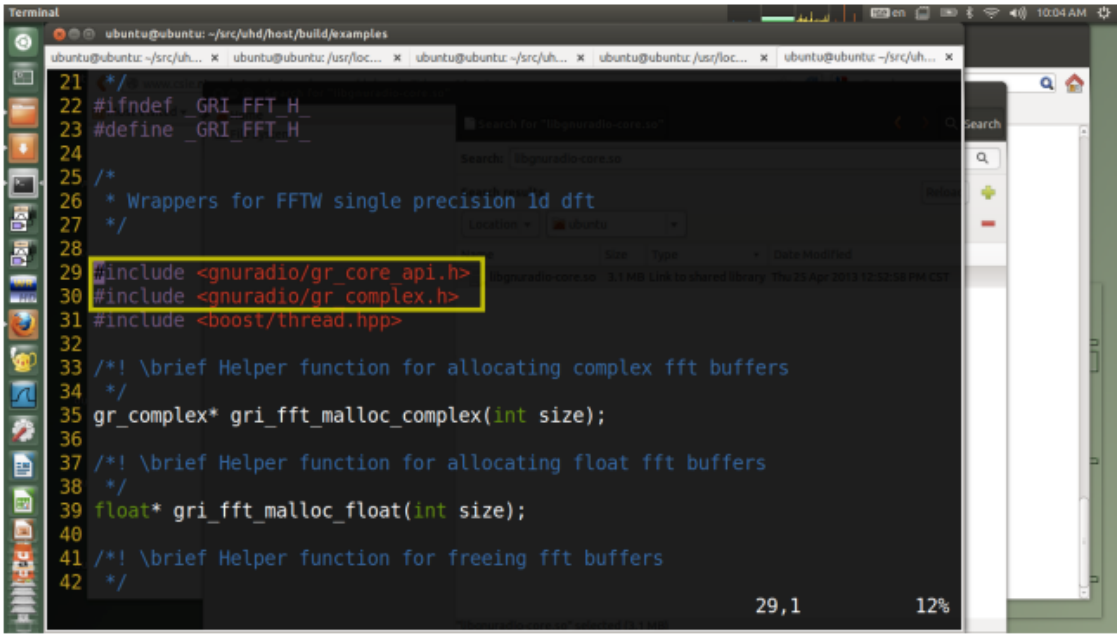
5. Compile GNU Radio code

   Run the following commands

```
cd /home/ubuntu/src/gnuradio
mkdir build
cd build
cmake ../
make (It will take about 30~40 minutes or more to build….)
sudo make install
```

```
sudo vim /usr/local/include/gnuradio/gri_fft.h
```

Modify line 29, 30: add gnuradio/ before gr_core_api.h and gr_complex.h



6. Compile UHD code

   Download the sample code from the course website

   http://www.csie.ntu.edu.tw/~hsinmu/courses/_media/wn_15spring/wn_lab3_code_v2.zip

   Run the following commands

```
cd /home/ubuntu/src/uhd/host/examples
```

Put **single_tx.cpp , single_rx.cpp, single_rx.h and single_tx.h** into **/home/ubuntu/src/uhd/host/examples**

vim CMakeLists.txt

Add two lines **single_tx.cpp, single_rx.cpp** around line 39,40

Add **/usr/local/lib/libgnuradio-core.so** to **TARGET_LINK_LIBRARIES** at line 47

```
18 ########################################################################
19 # example applications
20 ########################################################################
21 SET(example_sources
22     benchmark_rate.cpp
23     network_relay.cpp
24     rx_multi_samples.cpp
25     rx_samples_to_file.cpp
26     rx_samples_to_udp.cpp
27     rx_timed_samples.cpp
28     test_dboard_coercion.cpp
29     test_messages.cpp
30     test_pps_input.cpp
31     test_timed_commands.cpp
32     transport_hammer.cpp
33     tx_bursts.cpp
34     tx_samples_from_file.cpp
35     tx_timed_samples.cpp
36     tx_waveforms.cpp
37     txrx_loopback_to_file.cpp
38     latency_test.cpp
39     single_tx.cpp
40     single_rx.cpp
41 )
```

```
42
43 #for each source: build an executable and install
44 FOREACH(example_source ${example_sources})
45     GET_FILENAME_COMPONENT(example_name ${example_source} NAME_WE)
46     ADD_EXECUTABLE(${example_name} ${example_source})
47     TARGET_LINK_LIBRARIES(${example_name} uhd /usr/local/lib/libgnuradio-core.so )
48     INSTALL(TARGETS ${example_name} RUNTIME DESTINATION ${PKG_LIB_DIR}/examples COMPONENT
   examples)
49 ENDFOREACH(example_source)
```

cd ../ (now at /home/ubuntu/src/uhd/host/)
mkdir build
cd build
cmake ../
make (It will take about 10~20 minutes to build….)
sudo make install

Now you will see an **examples/** directory in the **build/** directory.

The above commands only need to do once!!!

In other words, next time when you finish modifying single_tx.cpp or single_rx.cpp in **/home/ubuntu/src/uhd/host/examples**, just go to **/home/ubuntu/src/uhd/host/build/examples** and run command

make

then you will see the execution files (single_tx, single_rx).

7. Test with USRP

   Connect the USRP to the computer (through Ethernet cable).

   Power on the USRP.

   open the terminal and run the follow commands

```
sudo service network-manager stop
sudo ifconfig ethX 192.168.10.100
```

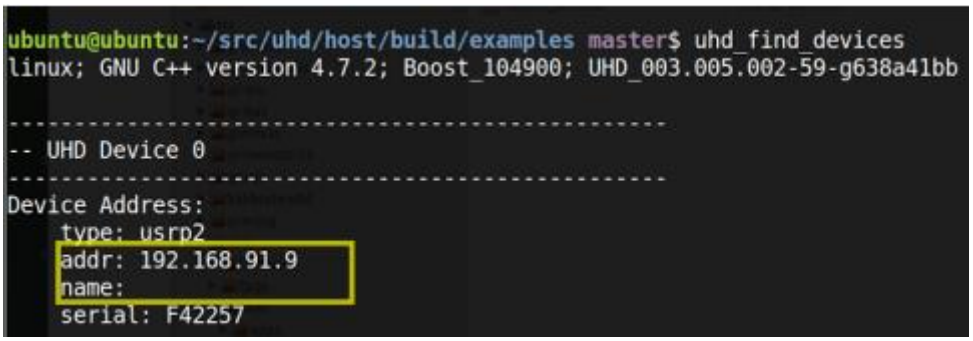
   where X is a unique number corresponding to a specific interface.

   You can use “ifconfig” cmd to check the number.

```
uhd_find_devices
```

   Devices attached to your system can be discovered.

   The sample output will be like this



   You will see the ip 192.168.10.x(or 192.168.91.x depend on USRP’s ip) of the USRP.

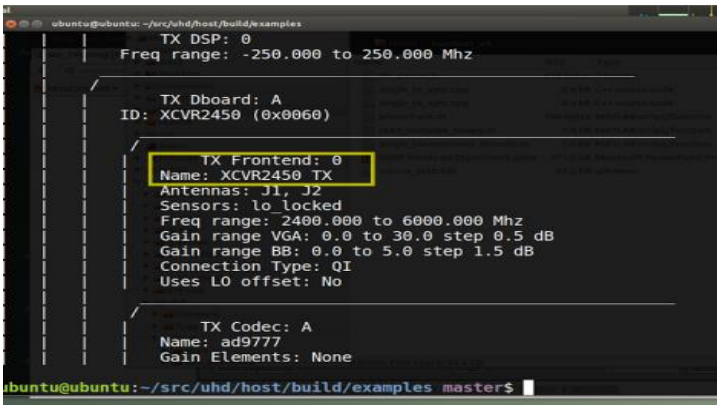
   (If the device is not found, make sure you have connected the Gigabit Ethernet cable and powered on the USRP and do the correct interface configuration.)

```
uhd_usrp_probe
```

   Properties of devices attached to your system can be probed.

   The sample output will be like this

   You will see the name XCVR2450 TX/RX daughterboard(or RFX 2400) which is a high- performance transceiver intended for operation 2.4 GHz and 5.9 GHz range.



Now get ready to execute the program!

```
cd /home/ubuntu/src/uhd/host/build/examples
mkdir wn_trace
```

Put your **src_data_1.bin** (generated by signal_generator.m) into wn_trace.

```
./single_tx --r0="addr=192.168.91.A" --in="./wn_trace/src_data_1.bin" --i=128 --f=2.49
./single_rx --r0="addr=192.168.91.A" --out="./wn_trace/recv_signal.bin" --i=128 --f=2.49
```

Where A, B are the ip address of two USRPs (one is acted as tx, the other is acted as rx)

8. Get ready to do lab3

   It takes about 2~4 hours to complete all things above, please be patient.

   Remember to reserve the USRP as soon as possible.

   Make sure every step has been done correctly.

   You can ask teammates or TAs for help =)