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USER MANAGEMENT

Add new user:
$ **useradd [username]**

Set or change password (requires current or root priv)
$ **passwd [username]**

Set or change password (requires current or root priv)
$ **passwd [username]**

Create new Group
$ **groupadd [groupname]**

Set or change group password (requires current or root priv)
$ **gpasswd [username]**

Linux stores user information in /etc/passwd and /etc/shadow

/etc/passwd is world-readable

user password information stored in /etc/shadow,readable only by root

Switch user
$ **su [username]**

Switch user and run command
$ **su -c whoami**

Switch user to root
$ su -

Switch user and do once [permissions controlled by sudoers file
$ **sudo [command]**

STDIN, STDOUT & STDERR

Redirection allows you to redirect the standard I/O streams to different locations, such as to a file or a pipe. For example, you can redirect STDIN to read data from a file instead of from the keyboard, redirect STDOUT to write to a file instead of the screen, and redirect STDERR to hide its output.

Redirect STDIN from a file:
$ command < file

Redirect STDOUT to a file:
$ command > file

Redirect STDERR to a file (note the file descriptor "2"):
$ command 2> file

Append STDOUT to a file (write STDOUT to the end of an existing file):
$ command >> file

Redirect STDOUT and STDERR to a file (the "2>&1" sends 2 to file descriptor 1, which is STDOUT):
$ command > file 2>&1

These operators can be combined:
$ command < infile > outfile 2>> errlog

The above command would receive input from "infile", save the output to "outfile" (overwriting "outfile" if it already exists), and append any error messages to "errlog".

SDR Class Cheat Sheet – Linux and Software Defined Radios

Bill Vaughn

Client Login Information

Username:redacted password:redacted

equals the number of your workstation

Purpose

This cheat sheet provides a reference for Linux CLI commands and various tips for to interact with UHD 205Minis, HackRFs, GNU Radio-Companion, and other hardware and software used in the SDR Class.

PIPES & PATHS

Pipes are used to connect the STDOUT of one program to the STDIN of another.

Example:

Read users, search for ":0:", sort alpha.
$ cat /etc/passwd | grep :0: | sort

Search and Redirect STDERR to STDOUT
$ find example | grep *.grc 2>&1

PATH is an environment variable that determines where the shell looks for executable programs

Example: /usr/local/bin:/usr/bin:/bin

Run program not listed in PATH
$ cd [dir containing binary]
$ ls -l (ensure execute capability)
$ ./runthis.sh

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File Permissions

List file permissions

$ **ls -l [dir]**

```
***output below
-rwxr-x--- 1 owner group   1776 July  4 04:03 awesomeDoc.txt
***(1776 is size)
File permissions are 750
```

Change Permissions of a file

$ **chmod [###] [file]**

$ **chmod 750 thisfile.sh**

(effective permissions user - All, Group - Read and Execute, and Other - none.)

Change file with same User/Group/Other permissions

$ **chmod [u/g/o][+/-/=][r/w/x] [file]**

$ **chmod o-rwx this file**

(remove all for other)

Software Define Radio commands

SDR Device connectivity validation and hardware and driver configuration information commands.

Validate HackRF Connectivity and Hardware Data

$ **hackrf_info**

USRP Hardware Driver Discovery utility

$ **uhd_find_devices**

USRP Hardware Driver Report utility

$ **uhd_usrp_probe**

USRP Hardware Driver Build Configuration info

$ **uhd_config_info**

Software Define Radio commands

HackRF and UHD/USRP functional Command line programs

HackRF Spectrum Sweep, output to STDOUT

$ **hackrf_sweep**

Output Fields:
Date, time, hz_low, hz_high, hz_bin_width, num_samples, and the dB readings for bins

HackrRF Transfer (rx)

$ **hackrf_transfer -s [samplesize] -f [freq] -r [rx_saved_filename]**

Example:
$hackrf_transfer -s 2000000 -f 315000000 -r capture_keyfob.raw

HackrRF Transfer (tx)

$hackrf_transfer -s [sample] -f [freq] -t [tx_filename] -a [amp_enable bool] -x [TX_IF_Gain]

Example:
$hackrf_transfer -s 2000000 -f 315000000 -t garagedoor.raw -a 1 -x 32

USRP_rx save samples to file

Binary program Located in the /usr/lib/uhd/examples folder

$:[dir]/rx_samples_to_file --freq [freq] --rate [rate] -gain [gain] -duration [time] [filename]

Example
:[dir]$ ./rx_samples_to_file --freq 315e6 --rate 2e6 --gain 20 --duration 20

Software Define Radio commands

USRP_tx save samples to file

Binary program Located in the /usr/lib/uhd/examples folder

$ ./tx_samples_from_file --freq [freq] --rate [rate] -gain [gain] [filename]

Example
$ tx_samples_to_file --freq 315e6 --rate 2e6 --gain 20 filename

USRP uhd_fft command line to open GUI Spectrum, Waterfall, and Scope output

$ uhd_fft -a type=[hw type] -f [freq] -s [sampling rate]

Example
$ uhd_fft -a type=b200 -f 915M -s 20M

OSMOCOM command line utility to open FFT GUI

$ osmocom_fft -f [freq] -s [samp_rate] -Q

Example
Builds GUI output for FFT that includes Waterfall, Dime, and Constellation Displays

$ osmocom_fft -f 915000000 -s 20000000 -Q

GNU Radio Companion

GNURadio Companion

$ gnuradio-companion [filename].grc
Launch GRC flowchart

$ gnuradio-companion -v
Shows the version of GRC

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GNU Radio Companion

GNURadio Configuration Information

```
$ gnuradio-config-info --version (or –v)
$ gnuradio-config-info –prefix
$ gnuradio-config-info --enabled-components
```

GNURadio Data Types

Click menu "help" → types

Displays port color mapping to the data number type

Find Block in GRC

Press ctrl+f → type block name

For example: ctrl+f type "Source" or "Sink" to see list of source or sink blocks installed

Create Hier Block from flowchart

1. Click Menu New
2. Click "Hier" Block
3. Fill in Options block, to include title
4. Construct your Flowchart
5. Use a Pad Source or Sink block
6. Save and Build file
7. Restart GRC

Choose Source or Sink Pad block dependent on your goals. For example, if the goal is to transmit a simple Cosine Waveform with slight modifications in the flowchart, use a Signal Source block and Pad Sink with whatever block logic in between.

After saving and building, the entire flowchart is saved as a singular block for use as a custom source block.

GNU Radio Companion

You can utilize the GNURadio python library in a Python's Interpreter

>>>import gnuradio

GNURadio Configuration Information

Download and install Out of Tree modules from the Comprehensive GNU Radio Archive Network (CGRAN)

http://www.cgran.org/

```
1.  git clone <repository>
2.  cd <repository-path>
3.  mkdir build && cd build
4.  cmake ../
5.  make -j4
6.  sudo make install
7.  sudo ldconfig
```

Generate Survey Heat Map

Using rx_power located at /usr/local/lib/python3.8/qspectrumanalyzer/backends/rx_power.py

$ cd /usr/local/lib/python3.8/qspectrumanalyzer/backends
$ python ./rx_power.py –f 0.11M:6G:1M –e 24h survey.csv
$cd /usr/share/doc/rtl-sdr/examples/
$python ./heatmap.py survey.csv survey.png

This will create a CSV of the entire range of a HackRF

The heatmap will convert to a huge picture that can be zoomed in on for arears of closer inspection.

CLI Demodulation

Transmit signal over via Network Transport protocol

GQRX Example:

$ gqrx

After GUI Launches

1. -Set GUI Options for applicable SDR Hardware, input rate (Sample Rate), and bandwidth
2. Click the "…" elipsies on audio fft window in right corner
3. Click network tab and set applicable network settings (for the following example host="localhost" and port="7355"
4. Expand filter to include the signal on main fft window for width of desired signal to transmit via udp

Other Options include using SDRAngel, rtl_sdr, spyserver, vlc player. Zmq blocks in GRC, ect.

Direwolf, VLC Player Netcat listener, SOX, and Multimon-NG

Netcat listen for udp on port 7355, use sox to to set the raw I data to the signed data type in a 16 bit format with a sample rate of 48000 and the Q data to 16 bit format with sample rate of 22050, output to STDOUT before passing to multimon-ng for display on scope and CW_MORSE demodulation

$ nc -l -u 7355 | \ sox -t raw -esigned-integer -b16 -r 48000 --esigned-integer -b16 -r 22050 -t raw - | \ multimon-ng -t raw -a SCOPE -a CW_MORSE -f alpha –

VLC CLI raw audio demod
$vlc --demux=rawaud --rawaud-channels=1 --rawaud-samplerate=48000 udp://@:7355

SDR Class Cheat Sheet

Bill Vaughn

This cheat sheet provides a reference for CLI commands and various tips for to interact with UHD 205Minis, HackRFs, GNU Radio-Companion, and other hardware and software used in the SDR Class.

Linux Fundamental Commands and Syntax

Field Key

Command	Explanation	Example

less	Display text from STDIN or a file one screen at a time	`$ less /etc/passwd` `$ cat file | less`
ps	Display a list of running processes	`$ ps aux`
lsof	Display a list of open files	`$ lsof`
netstat	Display TCP & UDP connection info	`$ netstat -na`
ifconfig	Display information about your network interfaces, such as your IP address	`$ ifconfig`
su	Temporarily switch to a different user Root is used if no username is specified	`$ su - [username]`
sort	Sort the contents of a file or STDIN	`$ sort /etc/passwd`
uniq	Remove duplicate lines from a sorted file or sorted STDIN	`$ uniq mylist.txt`

chmod	Change the permissions (mode) of a file or directory	`$ chmod +w file.txt`
stat	View detailed information about a file	`$ stat file.txt`
ping	Send ICMP ECHO_REQUEST to a network host to test connectivity	`$ ping 10.1.1.1`
whoami	Display the current username	`$ whoami`
passwd	Change a user's password, or your own if no username is specified	`$ passwd [username]`
kill	Terminate or send a signal to a running process by process ID (PID)	`$ kill 8573`
ln	Create a hard or symbolic link to a file	`$ ln [file] [link]`

Fundamental Commands

SDR Class Cheat Sheet

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Linux Fundamental Commands and Syntax

Field Key		
Character	**Explanation**	**Example**

/	Directory separator	`$ cd /home/username`
\	Escape character, used to reference other special characters literally	`$ touch wld\*.txt`
.	Current directory. Also used at the beginning of a file or directory name to hide it.	`$ ls ./file` `$ touch .hidden`
..	Parent directory	`$ cd ..`
~	User's home directory	`$ cd ~`
&	Execute a command in the background	`$ gedit &`

*	Represents 0 or more characters in a filename	`$ ls *.txt`
?	Represents a single character in a filename	`$ ls pic?.jpg`
[ ]	Represents a range of values	`$ ls pic[0-9].jpg`
;	Command separator (run multiple commands on a single line)	`$ cmd1 ; cmd2`
&&	Command separator; will only run the second command if the first succeeds/had no errors	`$ cmd1 && cmd2`
||	Command separator; will only run the second command if the first command failed/had errors	`$ cmd1 || cmd2`

Fundamental Concepts

SDR Class Cheat Sheet

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Linux Fundamental Commands and Syntax

Field Key

Command	Explanation	Example

ls	List files in directory; current directory is used if not annotated	$ ls ~/Desktop
cd	Change the current working directory	$ cd /home/centos/
pwd	Print the current working directory	$ pwd /home/centos/
cp	Copy a file	$ cp orig.txt copy.txt
mv	Move or rename a file	$ mv a.txt Desktop/b.txt
rm	Delete a file	$ rm file.txt
mkdir	Create a directory	$ mkdir examples/
rmdir	Delete a directory (must be empty)	$ rmdir examples/

cat	Print one or more files to STDOUT	$ **cat file.txt**
grep	Search for text within a file or STDIN	$ **grep 10.10.1.1 /var/log/apache/***
file	Identify the file type	$ **file image.jpg** image.jpg: JPEG Image Data
head	Display the first 10 lines of a file (use "-n X" to display first X lines)	$ **head /etc/passwd** $ **head -n 5 /etc/passwd**
tail	Display the last 10 lines of a file (use "-n X" to display first X lines)	$ **tail -n 5 .bashrc**
tail -F	Display new data as it is appended to the end of a file (useful for watching logs)	$ **tail -F /var/log/messages**

Fundamental Commands