Hummingboard Radio Collect Instructions

1. Unit Descriptions:

Unit 0: ATSC Unit
hostname: cubox-00-i
username: aanderson
password: changeme
description: older unit requiring WiFi dongle

ssh example:

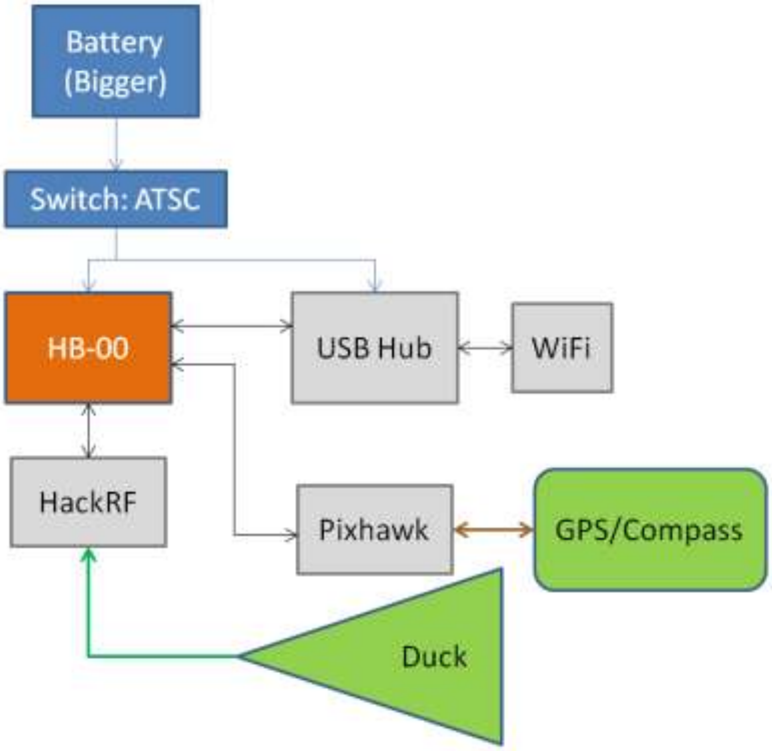
```
$ ssh aanderson@cubox-00-i.local
```

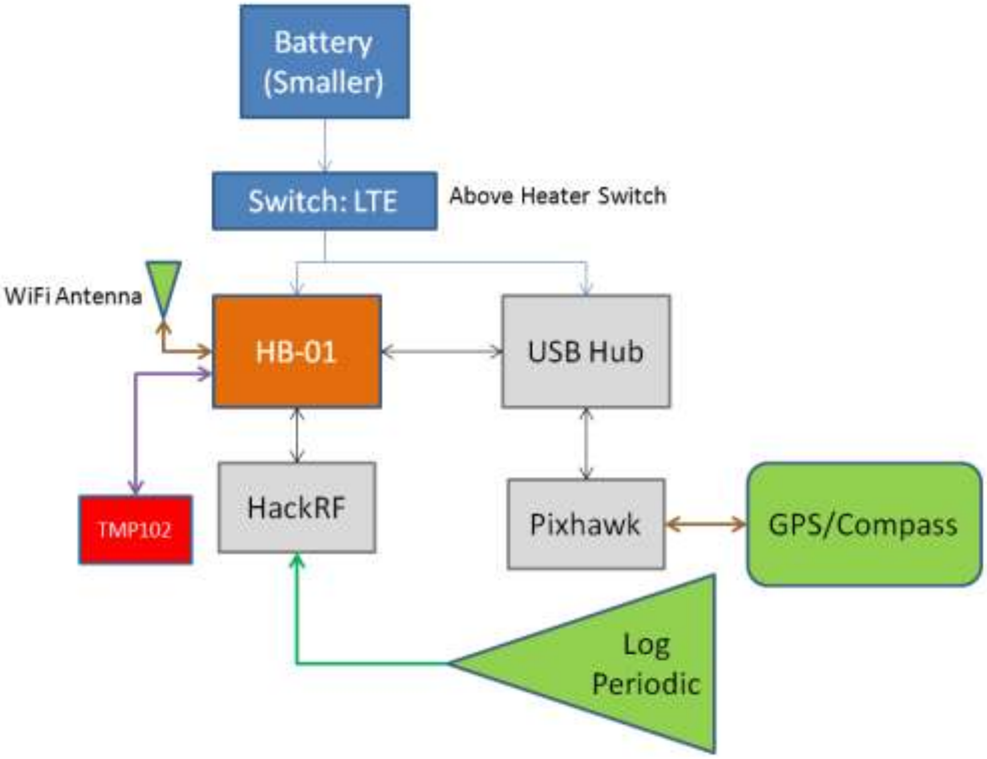
Unit 1: LTE Unit
hostname: cubox-01-i
username: aanderson
password: changeme
description: newer unit with integrated WiFi

ssh example:

```
$ ssh aanderson@cubox-01-i.local
```

2. Connectivity Diagram:





3. Connecting to the hummingboards:

Currently both boards are configured to connect to a WiFi network with the following credentials:

```
ssid="cubox_network"
key_mgmt=WPA-PSK
psk="analog_password"
```

In order to connect to them, you'll need to set your computer to act as a mobile hotspot using with that SSID, password (psk), and security set to WPA-PSK. This is easily done through Ubuntu (and MACs I think).

4. Hummingboard File System Setup:

Both units are equipped with 128GB SSDs. Each unit is configured identically with:
/dev/sda1 -> 10GB partition devoted to swap, automatically mounted at boot up
/dev/sda2 -> remainder of 128GB SSD devoted to data storage
/dev/sda2 -> /mnt/data (mounted to this directory automatically on boot, collected data is written here)

/home/aanderson/ros-sdr -> contains all files relevant for data collect
/home/aanderson/ros-sdr/proto -> contains makefiles for protobuffer code and basic data processing python script: sdr_data_recs.py
/home/aanderson/ros-sdr/catkin_ws -> ROS workspace
/home/aanderson/ros-sdr/catkin_ws/ -> ROS workspace
/home/aanderson/ros-sdr/catkin_ws/src/ros_sdr -> Contains all files relevant to data collect

/home/aanderson/ros-sdr/catkin_ws/src/ros_sdr/src -> has source files relevant to data collect
/home/aanderson/ros-sdr/catkin_ws/src/ros_sdr/scripts -> has data collect tuning scripts, atsc_tuner.py
/home/aanderson/ros-sdr/catkin_ws/launch -> contains bash script to launch collect: balloon_launch.sh
/etc/rc.local -> startup script for automatic logging

5. Power up Procedure:

1. Flip switch on the side of the box for both units. The batteries should detect load and turn on.
2. Boot up takes ~2 minutes.
3. After boot up is complete, the recording starts automatically after another minute.
4. Launch script takes ~30 seconds.
3. After >4 minutes SSH into the devices.

6. Manually Launching a Collect:

MANUAL DIRECTIONS ONLY! IGNORE UNLESS ATTEMPTING MANUAL COLLECT! (Collects are automatic)

In the directory:
/home/aanderson/ros-sdr/catkin_ws/launch

run:
$ ./balloon_launch.sh

this will execute the full collect based on this script:

```
#!/bin/bash
source ../devel/setup.bash # Source the setup file before run
roslaunch mavros px4.launch & # launch the mavros script to start roscore and run the pixhawk
sleep 10s # sleep for 10 seconds to let the mavros script startup
rosrun temp_mon temp_mon_node & # run the temperature monitoring node if it's attached
sleep 2s # sleep for 2 seconds to let the temperature monitoring come up
rosrun ros_sdr hackrf_sdr & # turn on the hackrf
sleep 5s # wait 5 seconds while the hackrf comes up and is set in default mode
roslaunch ros_sdr sdr_rec.launch & # launch the recorder, launch file connects relevant topics
sleep 5s # sleep for 5 seconds while the recorder comes up
rosrun ros_sdr atsc_tuner.py & # start the actual tuner and trigger the start of recordings
```

The sleep times are likely conservative, but recording will start 10+2+5+5=22 seconds this script is launched.

This script is currently configured for an atsc collect. A new recording script will need to be generated, put in the ros_sdr/scripts directory, and the highlighted line in the balloon_launch.sh script will need to be updated!

Once a launch is triggered, simply close the terminal connection. The & call at the end of each line in the bash script means independent threads will be generated and run so even a ctrl+c shouldn't kill the run.

7. Transferring Data Off:

An example command to transfer data is:

For ATSC:

```
local_machine$ scp aanderson@cubox-01-i.local:/mnt/data/atsc-iq-2015-12-XX-XX-XX-XX-part000X.hackrf_data <name of local file.bin>
local_machine$ scp aanderson@cubox-01-i.local:/mnt/data/atsc-proto-XXXXXX.proto <name of local file.proto>
```

For LTE:

```
local_machine$ scp aanderson@cubox-01-i.local:/mnt/data/scanner-iq-2015-12-XX-XX-XX-XX-part000X.hackrf_data <name of local file.bin>
local_machine$ scp aanderson@cubox-01-i.local:/mnt/data/scanner-proto-XXXXXX.proto <name of local file.proto>
```

For post processing:

sdr_data_recs.py - can be used to process proto buffer meta data and extract desired IQ runs

hb_rad_col_proc_atsc.m -> Coming soon! used to process ATSC files in MATLAB

8. Troubleshooting

The data recording is now automatic. The boards will start recording ~3-4 minutes after the switch is flipped. To check health of the recording ssh in and check:

1. $ top -> look for mavros, hackrf_sdr, sdr_recording etc. in the list of running programs

    -> If you need to kill the processes for any reason use pkill:

    $ pkill 12345 -> where 12345 is the number associated with the different running programs

2. To check that mavros is running correctly (the software running INS and GPS collection) run:

$ rostopic echo /mavros/state -> you should see the pixhawk state printed out at ~ 1 Hz intervals

if you only see one state printed out and it hangs, the pixhawk is dead and the cable will need to be re-seated.

    -> You can try to just power cycle it and check if this fixd the problem

    -> Alternatively kill the running processes, re-seat the cable, and use the manual recording

3. To check if the recording is generally performing alright check if the data files are growing:

$ cd /mnt/data -> to navigate to where the data is being populated

$ watch ls -lh -> and watch the size of the files to make sure the right ones are growing

-> if the data isn't growing that's a bad sign, maybe try to reboot or check permissions on /mnt/data