**"APPLICATION OF SOFTWARE DEFINED RADIO (SDR)"**

**Requirements:**

1. BeagleBone Black
2. Adafruit Ultimate GPS
3. USB to Audio Converter

**Software:**

1. Putty
2. WinSCP (optional)

**Connections:**

1. GPS VIN to BBB SYS 5V
2. GPS GND to BBB DGND
3. GPS TX to BBB P9\_26 (UART1\_RXD)
4. GPS PPS to BBB P8\_16 (GPIO\_46)
5. P8\_12 (GPIO\_44) set as output from PRU
6. P8\_26 (GPIO\_61) as Output

**SYSTEM:**

1. Download image from

<https://beagleboard.org/latest-images>

BeagleBone Black (eMMC flasher)

Debian 7.5 (BeagleBone Black - 2GB eMMC) 2014-05-14

1. To burn image, follow steps on

<https://beagleboard.org/getting-started>

and

<http://derekmolloy.ie/write-a-new-image-to-the-beaglebone-black/>

Flashing the BBB with the SD Card Image

1. Update kernel to latest Debian image

**Command:** uname -r **Output:** 3.8.13-bone84

**INTERNET CONNECTION VIA USB:**

[file:///D:/BeagleBone%20Black/Internet/How%20to%20Connect%20a%20BeagleBone%20Black%20to%20the%20Internet%20Using%20USB.html](D://BeagleBone%20Black/Internet/How%20to%20Connect%20a%20BeagleBone%20Black%20to%20the%20Internet%20Using%20USB.html)

**GPS SETTING:**

1. To enable UART1 at boot

sudo nano /boot/uboot/uEnv.txt

// copy this at the end of file and reboot

optargs=capemgr.enable\_partno=BB-UART1

1. Compiler Flag: -liofunc
2. C Code to Read GPS Data via Serial on the Beaglebone Black

<http://bradsmc.blogspot.com/2013/11/c-code-to-read-gps-data-via-serial-on.html>

**ERROR:**

implicit declaration of function 'write' -> #include <unistd.h>

**GPIO LIBRARY FOR C:** <https://www.element14.com/community/community/designcenter/single-board-computers/next-gen_beaglebone/blog/2013/10/10/bbb--beaglebone-black-io-library-for-c>

**PRU SETTING:**

1. Disable HDMI

sudo nano /boot/uboot/uEnv.txt

uncomment line under “## Disable HDMI”

cape\_disable=capemgr.disable\_partno=BB-BONELT-HDMI,BB-BONELT-HDMIN

1. Enable PRU0 at boot

sudo nano /etc/default/capemgr

Add this line to file

CAPE=BB-BONE-PRU-01

**Check:**

* 1. lsmod | grep pru
  2. ls /dev/uio\*
  3. /ls usr/bin/\*pru

1. PRU Development Tools

Open this link and follow steps in Development Tools section

[file:///F:/MY\_Programs/pru/example/BeagleBone%20Black%20PRU\_%20Hello%20World%20%C2%AB%20Small%20Golden%20Sceptre.html](MY_Programs/pru/example/BeagleBone%20Black%20PRU_%20Hello%20World%20\«%20Small%20Golden%20Sceptre.html)

OR download pru\_sdk from

# sudo wget http://downloads.ti.com/codegen/esd/cgt\_public\_sw/PRU/2.1.0/ti\_cgt\_pr

u\_2.1.0\_armlinuxa8hf\_busybox\_installer.sh

# sudo bash ti\_cgt\_pru\_2.1.0\_armlinuxa8hf\_busybox\_installer.sh

# export PRU\_C\_DIR="/usr/share/ti/cgt-pru/include/;/usr/share/ti/cgtpru/

lib/"

clpru -k pru.c -z /usr/share/ti/cgt-pru/lib/lnk.cmd -m pru.map

hexpru

**Skipping certificate checks with wget:**

--no-check-certificate

**AUDIO SETTING:**

1. Connect USB to audio Converter
2. Check list of Playback Hardware Devices:

aplay -l

1. Sound Setting command:

alsamixer -> F6 -> USB to audio converter -> exit

1. Compiler Flag: -lasound
2. ALSA: <https://gist.github.com/interwebjill/157055cc4e2bd7c33181f7e7e8bf4659>
3. ffmpeg library for audio.

sudo apt-get update

sudo apt-get install ffmpeg

**Check:**

* 1. ffmpeg -version
  2. ffmpeg -h

1. For buffer of type **double**

SND\_PCM\_FORMAT\_FLOAT64\_LE

Ffmpeg format: f64le

**LOCATIONS:**

1. Custom DTO in

/lib/firmware

echo file /sys/devices/bone\_capemgr.9/slots

1. Compiling DTS file with

dtc -O dtb -o gps\_timer-00A0.dtbo -b 0 -@ gps\_timer.dts

1. Shows enable slots

cat /sys/devices/bone\_capemgr.9/slots

1. Pin values

sudo cat /sys/kernel/debug/pinctrl/44e10800.pinmux/pins

1. Pin Groups

/sys/kernel/debug/pinctrl/44e10800.pinmux/pingroups

1. Pin Mux

/sys/kernel/debug/pinctrl/44e10800.pinmux/pinmux-functions

**ROOT:**

1. Working as root: sudo su
2. Exiting root: Ctrl+D
3. nano ~./profile

source ~./profile

cat $SLOTS