Name: _____

Beagle Bone and Hardware

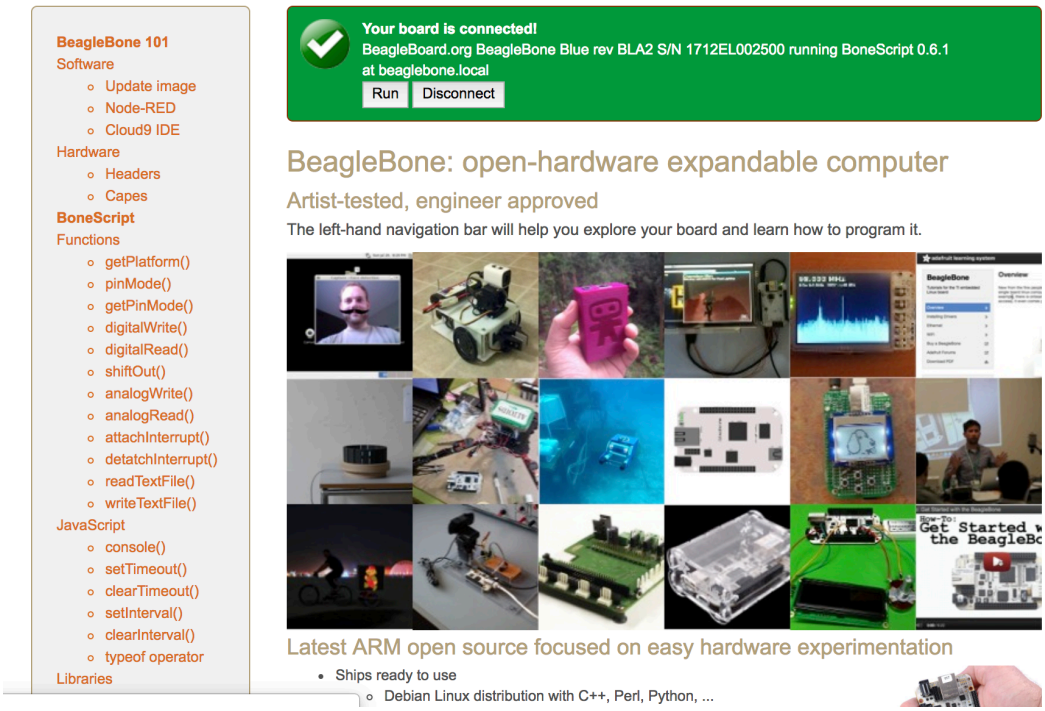
Setup: For this lab you will need

- BeagleBone Blue
- USB cable
- Computer

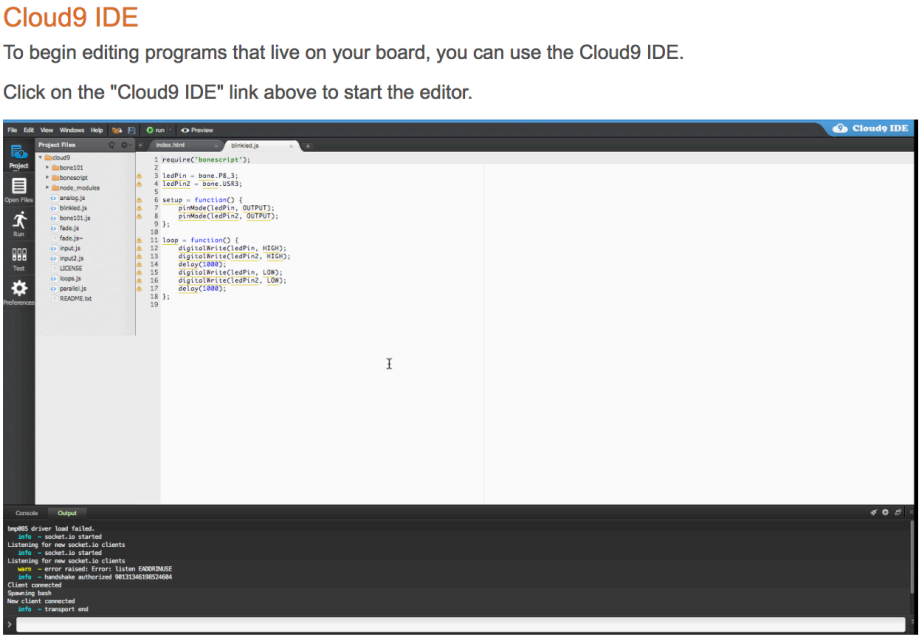
Figure 1: Beagle Bone Blue [1]

Task 1: Flash your board

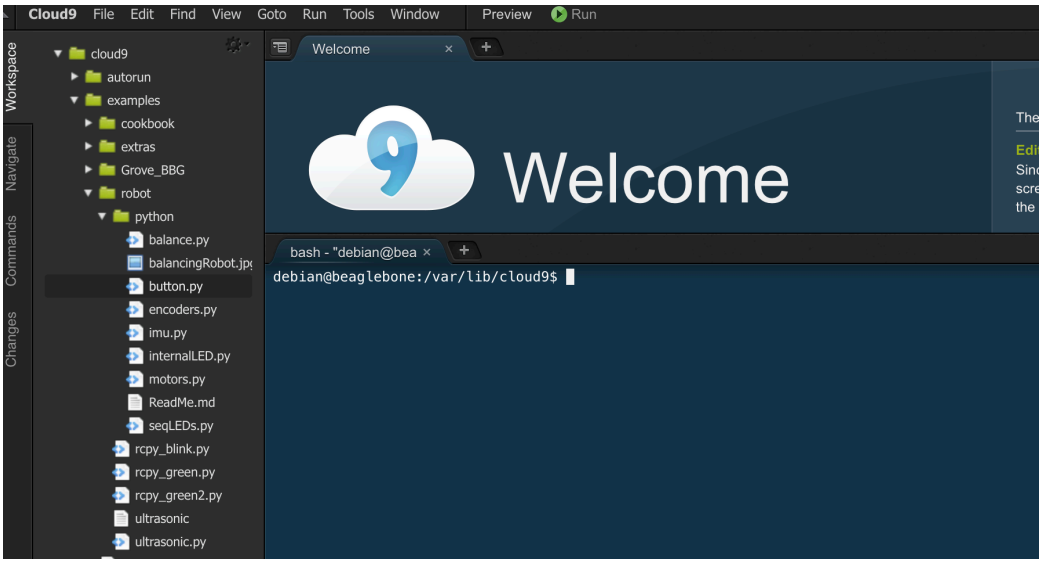
1. If you have used a beagle Bone before, you can go down to task 3.
2. Power your device by using a USB cable plugged into your computer
3. Plug in the SD card and hold the SD button down while powering. You may release the SD button once the lights start going back and forth
4. Do not remove the SD card until the lights go off. Once this happens you may remove the SD card and repower
5. Either using Chrome or Firefox, open the website: http://192.168.7.2
    a. If this fails, try: http://192.168.6.2
    b. If this step fails, go to https://beagleboard.org/getting-started and scroll down to step 1
    c. Download the proper driver for mac or PC and restart your computer.
    d. Try to connect again, if this step fails, continue to step 2e
    e. Ask Dr. Troy for assistance
6. If successful, you should see a screen as follows



7. Scroll down to Cloud IDE and click the link



8. You will see a screen that looks as such:



9. Go to your command line, where it says “debian@beaglebone:/var/lib/cloud9$” and type the following command.
   - connmanctl
10. Once conmanctl has been typed, your terminal window will change to show you are operating in that command

   - connmanctl> tether wifi off
   - connmanctl> enable wifi
   - connmanctl> scan wifi
   - connmanctl> services
11. After you type services you should see a list as follows, particularly note Solar-Chase

```
connmanctl> tether wifi off
Error disabling wifi tethering: Already disabled
connmanctl> enable wifi
Error wifi: Already enabled
connmanctl> scan wifi
Scan completed for wifi
connmanctl> services
*AO Solar-Chase          wifi_506583e74545_536f6c61722d4368617365_managed_psk
    LK2V3                wifi_506583e74545_4c4b325633_managed_psk
    Raven Guest          wifi_506583e74545_526176656e204775657374_managed_none
    Raven Wireless       wifi_506583e74545_526176656e20576972656c657373_managed_ieee8021x
    AUWireless           wifi_506583e74545_4155576972656c657373_managed_psk
connmanctl>
```

12. Type agent on
13. Type connect wifi_506583e74545_536f6c61722d4368617365_managed_psk, where the wifi name can be copied from the list above, when prompted for a password type

"eNgin33ring" without the quotes. **The wifi_* portion may differ, do not copy the one on the document.**

14. Type quit
15. Test your connection by typing ping google.com. Hit ctrl + C after you see it run a bit. If there are no packets dropped you are good to update.

```
debian@beaglebone:/var/lib/cloud9$ ping google.com
PING google.com (216.58.192.142) 56(84) bytes of data.
64 bytes from ord36s01-in-f142.1e100.net (216.58.192.142): icmp_seq=1 ttl=50 time=10.6 ms
64 bytes from ord36s01-in-f142.1e100.net (216.58.192.142): icmp_seq=2 ttl=50 time=10.9 ms
64 bytes from ord36s01-in-f142.1e100.net (216.58.192.142): icmp_seq=3 ttl=50 time=13.9 ms
64 bytes from ord36s01-in-f142.1e100.net (216.58.192.142): icmp_seq=4 ttl=50 time=10.0 ms
^C
--- google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 7024ms
rtt min/avg/max/mdev = 10.037/11.397/13.917/1.498 ms
debian@beaglebone:/var/lib/cloud9$
```

Task 2: Updating your BeagleBone

1. Once logged in type "sudo apt-get update" If prompted for a password type your "temppwd".
2. If it asks yes or no questions, respond with yes and wait.
3. This process may take a long time, if it appears you have frozen, don't do anything and just wait. If asked for an option other than yes or no, such as "rc_blinks", choose rc_blinks.
4. Next, install the "autoconf-archive" package using
   sudo apt install autoconf-archive
5. Type "
   git clone https://github.com/brgl/libgpiod
6. Go into the new directory you just created
   cd libgpiod
7. Enter the following, this step will require a while to run
   ./autogen.sh --enable-tools=yes --enable-bindings-python --prefix=/usr/local
8. Now enter "make"
9. Now enter "sudo make install"
10. Do step 7 again.
11. Now type and enter the following
1. sudo mv /usr/local/lib/python3.5/site-packages/* /usr/local/lib/python3.5/dist-packages/.
12. Next, type
    cd /usr/local/lib/python3.5/dist-packages/rcpy-0.5.0-py3.5-linux-armv7l.egg/rcpy
13. Next enter
    sudo ldconfig
14. Then go back to your folder by
    cd /var/lib/cloud9

Task 3: Get your Beagle Bone SSID

1. Go to a terminal and type ifconfig –a
2. The first device should read SoftAp0 and look as follows

```
debian@beaglebone:/var/lib/cloud9$ ifconfig -a
SoftAp0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.8.1  netmask 255.255.255.0  broadcast 192.168.8.255
        inet6 fe80::5265:83ff:fe68:b4b4  prefixlen 64  scopeid 0x20<link>
        ether 50:65:83:68:b4:b4  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 35  bytes 6789 (6.6 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

3. Note the last 4 characters of ether and inet6 are b4b4, this is unique to your beaglebone.
4. Click on your wifi button in the taskbar.
5. Look for BeagleBone-XXXX.
6. Connect to your BeagleBone. Password is BeagleBone.
7. With a permanent marker, write the number represented by XXXX on the largest black square on your BeagleBone.
8. Open your web browser of choice. Type in:
9. 192.168.8.1:3000.

Task 4: Make Python3 Default

1. Go to Cloud9->Preferences->Project Settings->Python Support. Check Python 3.
2. In a terminal, open your bash runtime commands by typing in:
   vim _/.bashrc
3. Press i to start editing text. Then hit RETURN to add a new line and type:
   alias python=’python3.5’
4. To stop editing and exit, hit the ESC key and type in :x.
5. Close your terminal and reopen it.
6. Confirm that you’ve done this correctly by typing in:
   python -V
   This will let you know which Python version is default.

Task 5: PushLights

Today we'll be using button presses to turn on lights on the BeagleBone.

WARNING: o not press your buttons too hard. Any time we interact with the BeagleBone hardware, you have to exercise caution or you could damage it.

Functionality

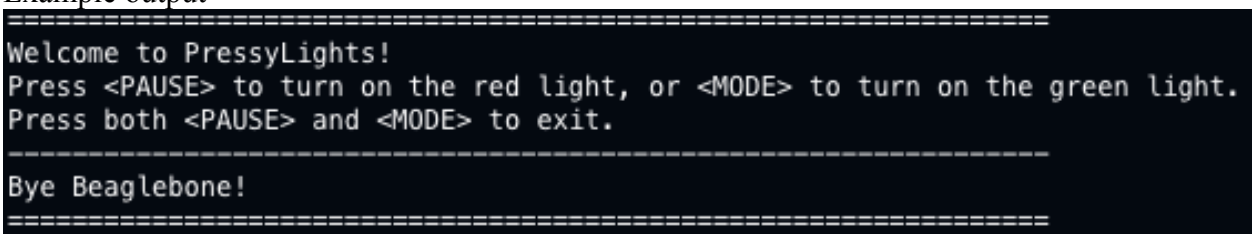
Your finished code should do the following:

- Print a welcome message.
- Acquire an input number from the user via button press (not via keyboard entry!). See next section for specifics on how to detect a button press.
  - If the user presses the pause button, turn on the red LED.
  - If the user presses the mode button, turn on the green LED.
  - If the user presses both buttons, exit the program.
- When finished, print an exit message and turn off all lights.

Steps

1. Create a folder by typing
   mkdir ENGR2310
2. Go into the directory by typing
   Cd ENGR2310
3. Download the file by typing (ALL ONE LINE)
   curl -o "PushLights.py" -k
   https://raw.githubusercontent.com/wstroy/ENGR2310/master/PushLights.py
4. To run the code type
   sudo python3 PushLights.py

Example output



Example output. Note that there is no text input or output when a button is pressed.

Hints

- Your imports should look something like:

  Import rcpy
  from rcpy.button import mode, pause
  from rcpy.led import red, green

  These import the "mode" and "pause" buttons, as well as the red and green LEDs.
- To initialize rcpy, type rcpy.set_state(rcpy.RUNNING).
- To check if the pause button is pressed, use pause.is_pressed(). This will return either True or False.
- To turn the red light on or off, use red.on() or red.off(), respecitvely.
- If you use the "Run" button, Cloud9 may complain that you must run rcpy as root. To avoid this, run Python from the terminal:
  1. Navigate to your Python file. For example, since mine is in my ENGR 2310 folder, I would use cd ENGR2310.
  2. To run Python, enter sudo python3 PressLights.py (my file is named "PressLights.py", but yours may be different). The password is temppwd.

References

[1] https://beagleboard.org/blue