Questions? Contact jeff@jvon.org or michael@jvon.org

Setting up a BeagleBone Blue for robotics using Cloud9 and Python

- A BeagleBone Blue is an amazing tiny robotics-oriented computer
- Cloud9 is a browser-based integrated development environment
- Python is a programming language that's good for robotics

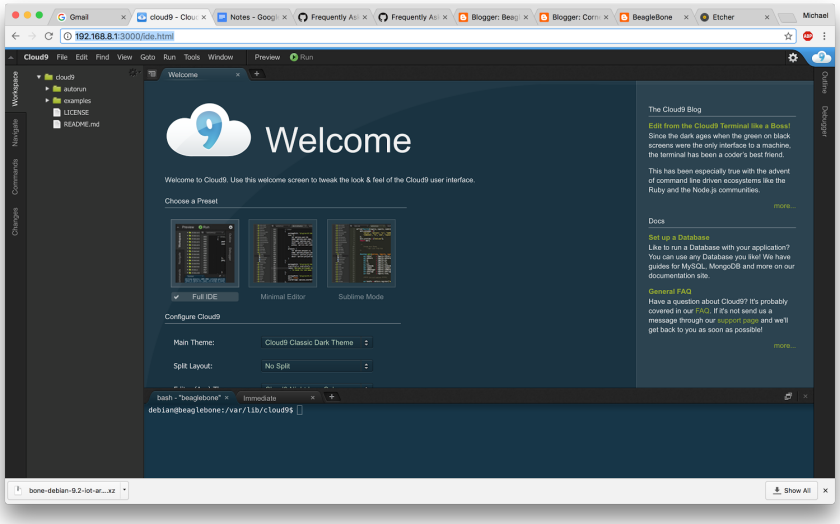
Make a bootable microSD card using the debian (linux) operating system

1. Go to http://beagleboard.org/latest-images
2. Choose: *Stretch IoT (non-GUI) for BeagleBone and PocketBeagle via microSD card* ("Stretch" refers to the major version of debian and IoT (non-GUI) omits user interface components that are not needed)
    2.1. Install Etcher
    2.2. Use Etcher to move the downloaded image to a microSD card
    2.3. Etcher is ridiculously easy to use – but the process takes a while
    2.4. Install the microSD card into the BeagleBone

Power up the BeagleBone and connect to Cloud9, by using either (1) or (2):

1. using a USB cable: browse to either http://192.168.6.2:3000 or http://192.168.7.2:3000, depending on the USB networking drivers provided by your operating system.
2. using an external power supply: connect to the BeagleBoard wifi access point (SSID: *BeagleBone-XXXX,* where XXXX is a unique ID; Password: *BeagleBone*) and browse to http://192.168.8.1:3000.

   Either way, Cloud9 should appear in the browser. Notice that the lower right pane is actually a terminal (shell) session giving command-line access:



Alternative way to gain command-line access

1. As an alternative to gain command-line access, connect using a USB cable and use: ssh debian@192.168.7.2 (password = temppwd)

Connect the BeagleBone to the internet by configuring its wifi adapter

Note that the token highlighted in yellow is an example; use a choice listed by "services":

debian@beaglebone:~$ sudo -s (become superuser/root)
[sudo] password for debian: temppwd (use the default debian password)
root@beaglebone:/home/debian# connmanctl (starts the connmanctl program)
connmanctl> tether wifi off (not really necessary on latest images)
connmanctl> enable wifi (not really necessary)
connmanctl> scan wifi (scans for available network access points)
connmanctl> services (lists services in a strange technical format)
connmanctl> agent on
connmanctl> connect wifi_f45eab2f1ee1_6372797774616c_managed_psk
connmanctl> quit

Install any pending software updates for debian & roboticscape

debian@beaglebone:~$ sudo apt-get update
[sudo] password for debian: temppwd

debian@beaglebone:~$ sudo apt-get upgrade roboticscape
[sudo] password for debian: temppwd

If prompted to choose a program to run when roboticscape starts, choose "existing".

Reboot the BeagleBone

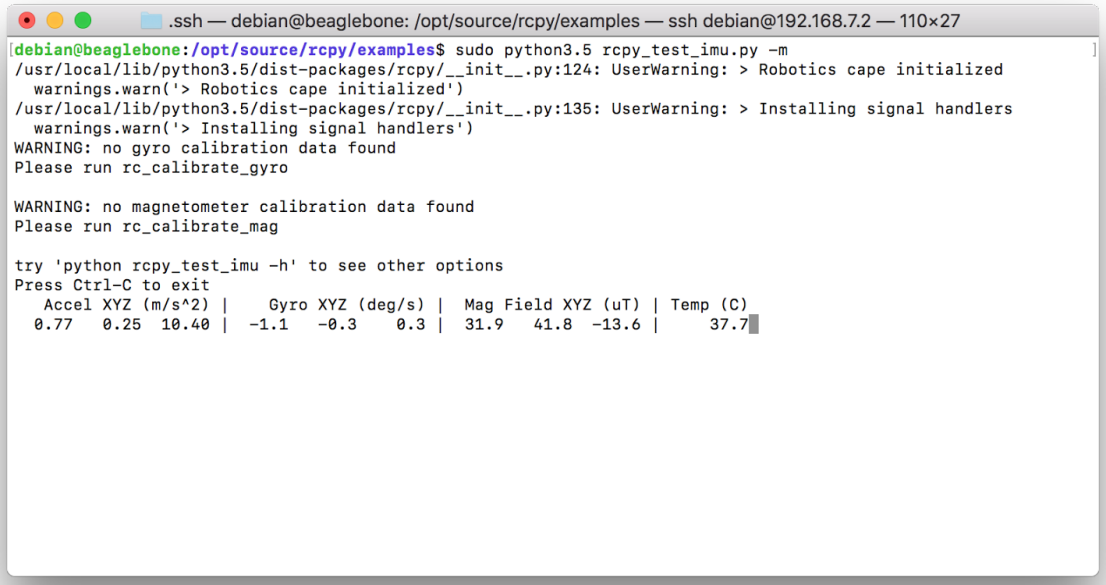
debian@beaglebone:~$ sudo reboot
(reconnect using Cloud9 or ssh)

Install Python3.x, pip, and rcpy

debian@beaglebone:~$ sudo apt install python3 python3-pip
debian@beaglebone:~$ sudo pip3 install rcpy

Try running some of the rcpy examples… note: roboticscape only runs as root user

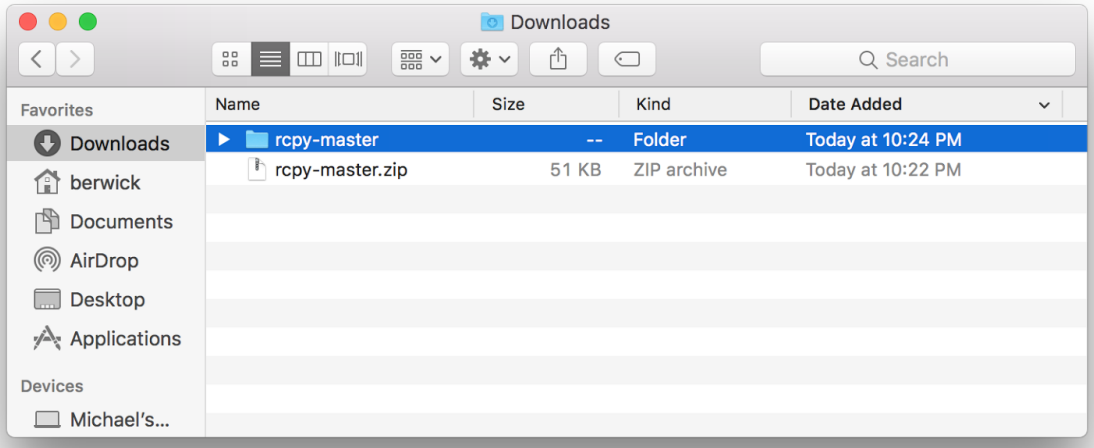
debian@beaglebone:~$ cd /opt/source/rcpy/examples
debian@beaglebone:/opt/source/rcpy/examples$ sudo python3.5 rcpy_test_imu.py -m



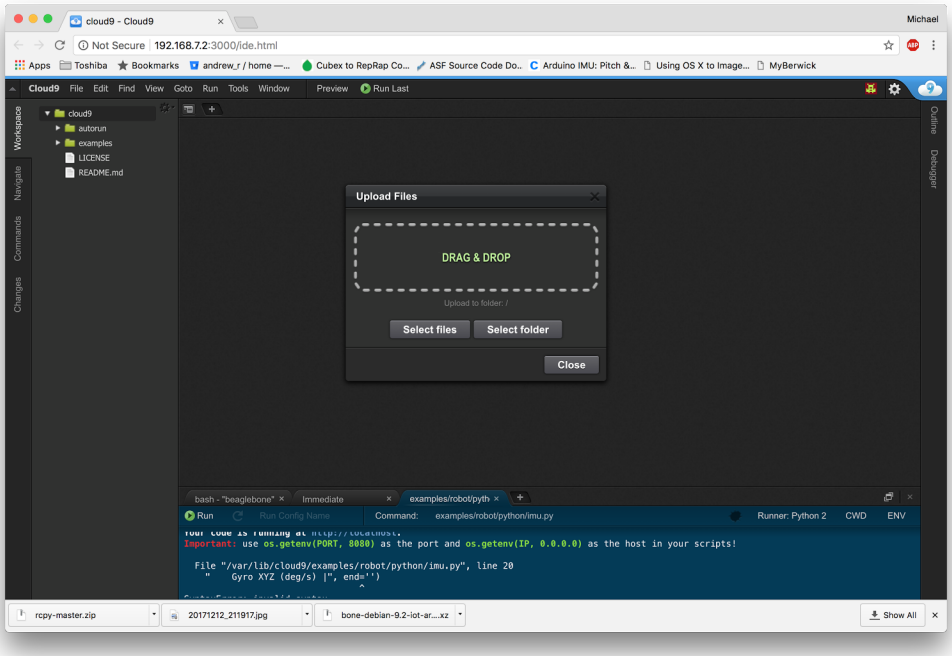
Introduce a copy of rcpy as a Cloud9 project

1. Download a copy from https://github.com/mcdeoliveira/rcpy (use “Clone or download” button to download a zip copy of the entire project)

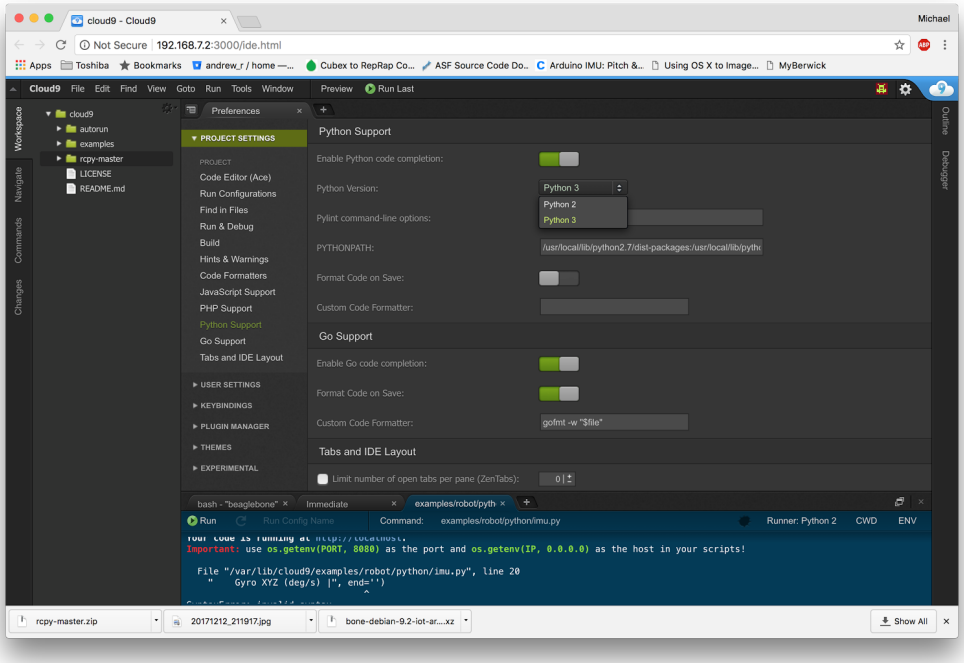
2. Unzip locally:



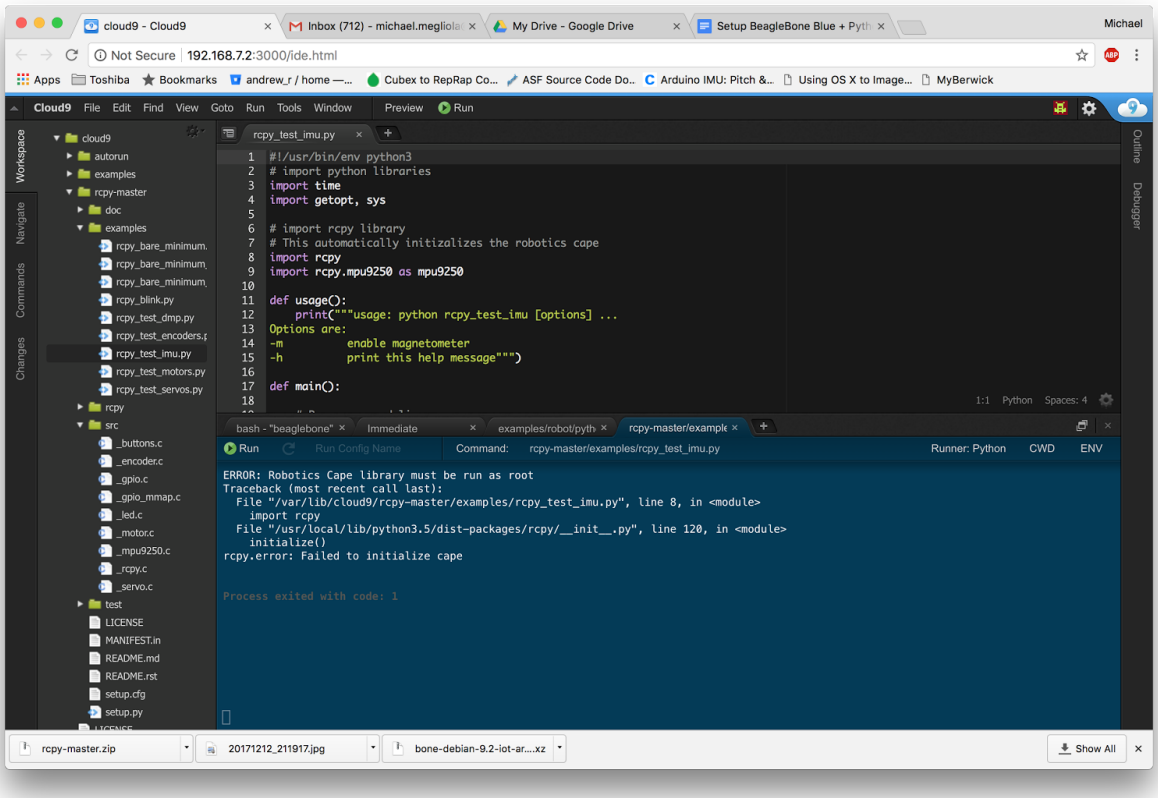
3. Use the Cloud9 *File/Upload Local Files…* menu option to upload the unzipped folder:



4. Use the Cloud9/Preferences menu option to switch from Python2 to Python3:

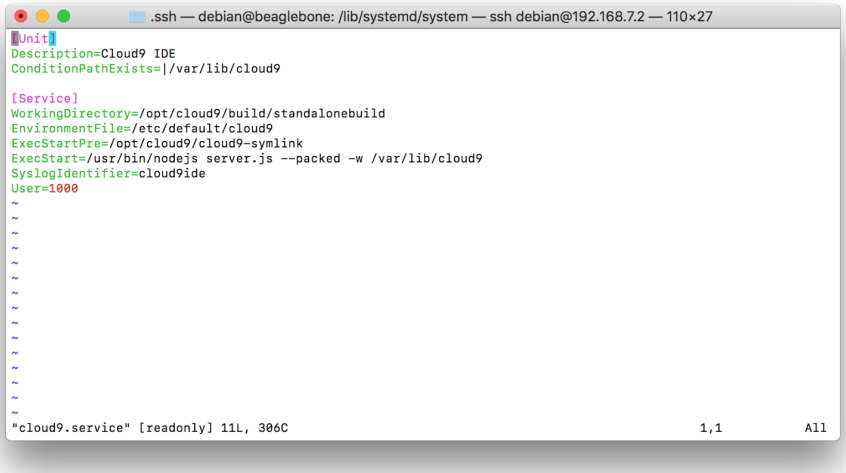


5. Selecting and running **rcpy_test_imu.py** will fail, because Cloud9 does not start as the root user, and the roboticscape software requires root access:



6. To correct this problem: remove the line **User=1000** from /lib/systemd/system/cloud9.service (allowing Cloud9 to run as root) and reboot:

debian@beaglebone:/lib/systemd/system$ sudo vi cloud9.service



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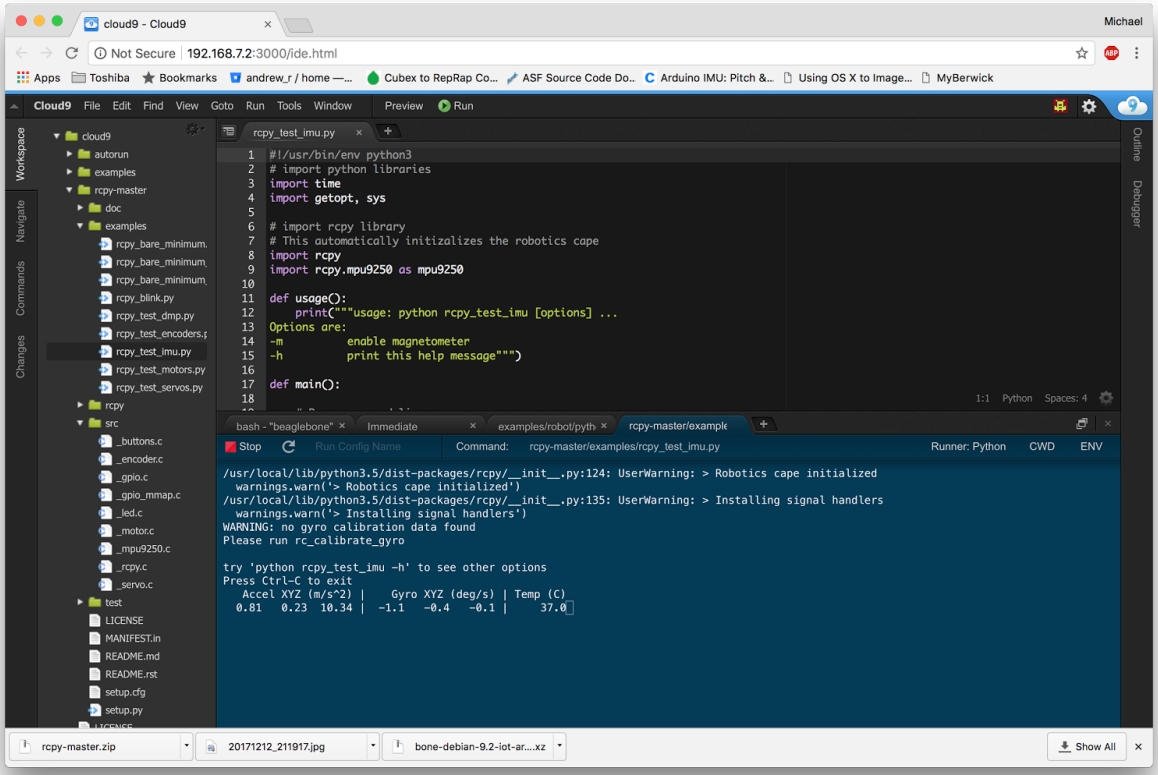
The BeagleBone Blue should now run rcpy under Python3.x in Cloud9:



*Special thanks to Maurício de Oliveira at UCSD for creating **rcpy** and to Robert Nelson at Digi-Key for helping out with item #6.*