BBB and RPi2 Wireless Notes

While I still strongly suggest that you use a wired connection whenever possible in cases where you cannot, like in portable operation, wireless seems to work fine as long a you follow certain restrictions.

Direct wireless can be made to work but a preferred method would be to use a standalone wireless to Ethernet adapter. This takes the load off of the server and is easier to setup and maintain. It also eliminates the need for a USB hub on the BBB which only has one USB port. Here are some models available at amazon.com

~~**Vonets VAR11N - $16.60 - powered from USB or 5 volt**~~ **Not recommended**
IOGEAR GWU627 - $34.49
Netgear N300 WNCE2001 - $49.95

All of these adapters will connect to your wireless network and have wired Ethernet which will connect to your servers Ethernet port. No special setup is required on the server when using these external adapters.

Update – although it has been reported that the Vonets VAR11N works I was not successful in using one so I returned it. It would not connect to my wifi router in bridge mode and the WIFI was very flakey in router mode. You mileage may vary but be aware that it is typical Chinese electronics and has virtually no support.

If you do choose to use direct wireless on the BBB I highly recommend that you use an ASUS N10 wireless FOB. It works on the BBB version 1.2.1 and this how-to is basically written around this FOB. Chris, W0ANM has spent a lot of time refining this and all of the software and drivers are installed. If you use any other FOB you are basically on your own. Others will probably work but why fool around when you know this one works. It costs about $17 at Amazon. Also There are hundreds of hubs out there and they are not all created equal. Listed below are those we tested that work. Again there are certainly others that work but be aware many have issues.

Many thanks to W0ANM, Chris for getting this working and writing this document.

NOTE - This how-to is ONLY for BBB Allstar version 1.2.1 at this time! The networking method has changed on the RPi2 1.0 release and we have not yet developed a foolproof wireless scheme using the Asus N10. Using an external wired to wireless adapter on the RPi2 as described above is the preferred method if you cannot use a wired connection.

Doug, WA3DSP

IMPORTANT – the following instructions are only for the BBB version 1.2.1

This is a very basic set of setup instructions for the BeagleBone Black (BBB) arm computer using Allstar version 1.2.1. These instructions assume that you already have your Allstar Link node configured running using the hardware Ethernet connection. If possible, use a keyboard and monitor to setup any network connection as if you mis-configure your network, the BBB will not be accessible by the network. If you do not have a wired network connect, you must use a keyboard and monitor. You will also need to setup the node prior to attempting to setup wireless network connection. A wired network connection is strongly suggested for BBB Allstar Link access.

Known Working Devices

- USB Network device - ASUS N10
  http://www.asus.com/Networking/USBN10/

- BELKIN F4U040 Powered 4 port

- BELKIN F4U006 Travel USB Hub
  http://www.belkin.com/us/p/P-F4U006/

- BELKIN 7 PORT DESKTOP Powered Hub - F4U022
  http://www.belkin.com/th/IWCatProductPage.process?Product_Id=551527

WiFi Adapter Problems

- WiPi – DO NOT USE, incoming data buffering problem
- TP-Link TL-WN725N, driver unstable. Fails to work, do not use!
- Compact USB Wi-Fi Adapter for BBB (Inspire Logic Supply)
  This works OK, but requires a driver package to be installed. There may be some slight audio distortion due to packet buffering. Not recommended.

Useful Links

- ArchWiki - https://wiki.archlinux.org/index.php/Netctl
- elinux.org – Rpi Powered USB Hubs
  http://elinux.org/RPi_Powered_USB_Hubs
- elinux.org – Rpi wifi Adpaters
  http://elinux.org/RPi_USB_Wi-Fi_Adapters

My current recommendation is to use the Asus N10 usb adapter. It support Linux and the driver is stable. I had the best audio results and network performance. I would refer to the above links as a guide, but be aware that I consider Arch Linux for the BBB cutting edge and there may be incompatiblities between the Raspberry Pi and Beaglebone Black boards and Linux distributions.

NOTE: You will be potentially connectionless after installing netctl if your network services are misconfigured.

I initially used the standard hardware interface (eth0) with an ssh session to the Beaglebone Black to set up wireless profile with the same static address. Once the wireless devices is setup, I halted the system, remove the eth0 cable and rebooted. If there is an issue with the setup, all you need to do is to install the eth0 cable and reboot. Make sure you have made an image backup prior to setting up a

wireless device.

Setting Up Wireless on the Beagle Bone Black

The following method only allows you to start one profile per interfaces.

1. Install the USB HUB device.

2. Install the USB network device and URI device. Verify that the devices are being seen by using the *lsusb* command:

```
# lsusb
Bus 002 Device 004: ID 0b05:1786 ASUSTek Computer, Inc. USB-N10 802.11n
  Network Adapter [Realtek RTL8188SU]
Bus 002 Device 003: ID 0d8c:013a C-Media Electronics, Inc.
Bus 002 Device 002: ID 05e3:0608 Genesys Logic, Inc. Hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

Above example shows the Asus N10 wireless usb adapter.

3. Verify that a network device is loaded by using the *lsmod* command:

```
lsmod | more

Module                  Size  Used by
r8712u                160499  0
```

This driver may be different depending upon the wireless adapter used.

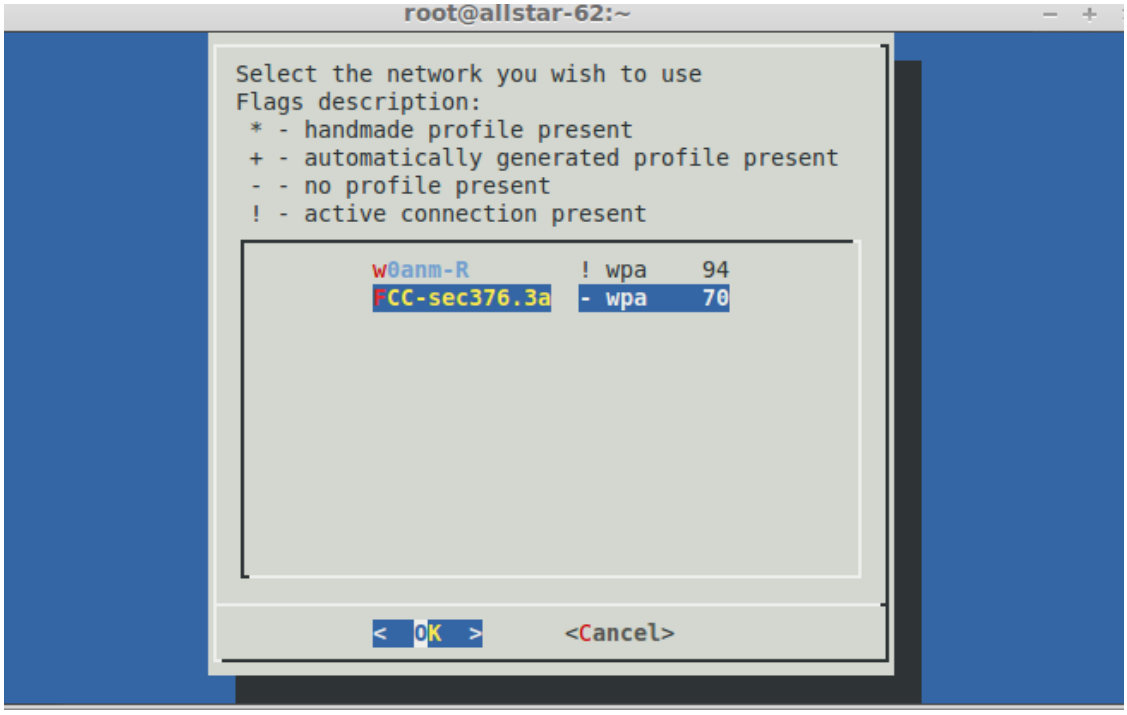
4. Enable the netctl-ifplugd service by entering:

```
systemctl enable netctl-ifplugd@eth0.service
```

5. The easiest way to setup the wireless configuration is to run the wifi-menu utility. This will scan for wireless access points and will prompt you for the password/key (wpa).

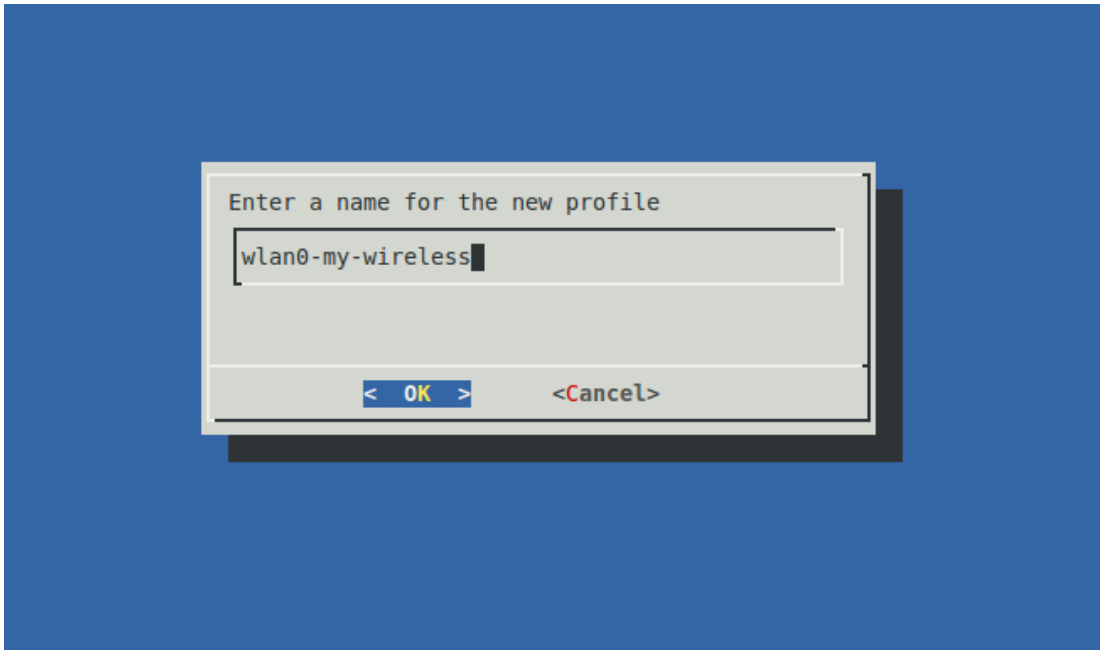
```
wifi-menu -o
```

The wireless usb adapter will scan the environment and you will be presented the networks that the adapter sees for the wireless networks:



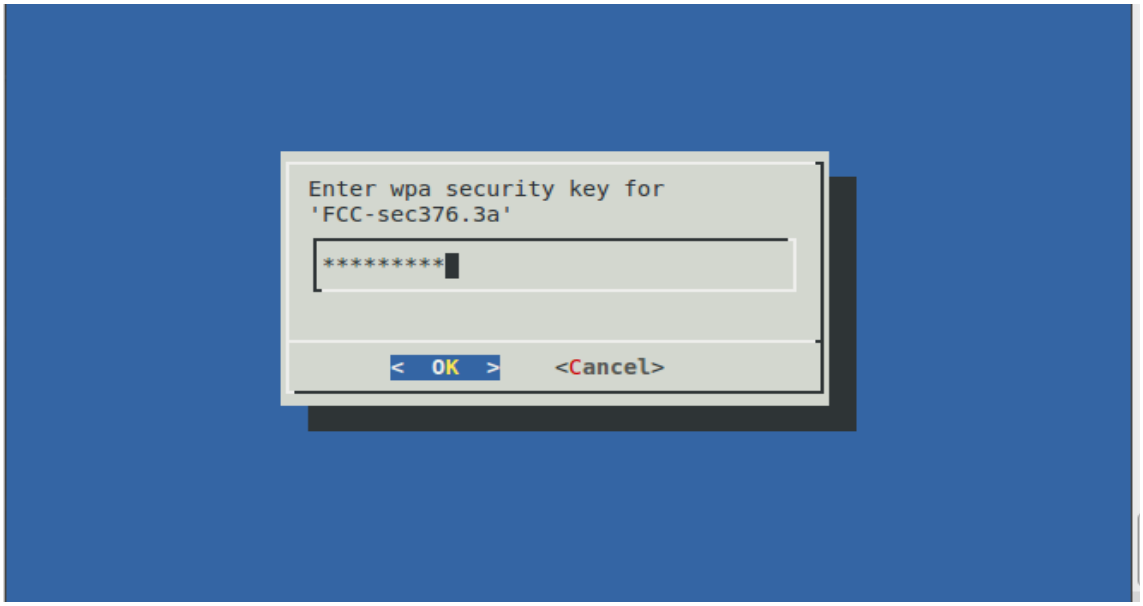
Select the desired wireless network by moving the cursor to the desired selection and enter key. You will be prompted for the name of the new profile. A profile name is the name which you want to call your “wireless device settings”. In the example below, I am using “wlan0-my-wireless”.

Enter the profile name:



After selecting “OK”, you will be prompted for a security key if applicable (open wireless networks will not require this entry and will be skipped). This key is the access security password for your wireless network. The security key and the network name (essid) need to be correct, or you will not be able to access your wireless network.

Enter the security key:



A file will be created in */etc/netctl* directory. In this example, the profile created is called *wlan0-my-wireless*. The contents are shown below:

```
Description='Automatically generated profile by wifi-menu'
Interface=wlan0
Connection=wireless
Security=wpa
ESSID=FCC-sec376.3a
IP=dhcp
Key=\"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

** Key contains the wifi key.
```

6. For static IP address, you will need to further edit and append the wireless profile file:

```
Description='Automatically generated profile by wifi-menu'
Interface=wlan0
Connection=wireless
Security=wpa
ESSID=w0anm-R
IP=static
Key=\"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
Address='192.168.15.210/24'
Gateway='192.168.15.1'
DNS=('127.0.0.1')
```

The IP= needs to be changed to **static,** and the **Address=**, **Gateway=**, and **DNS=** addresses need to be added. The Address value also contains the netmask (/24) is is equivalent to a netmask of 255.255.255.0. For further explanation, refer to the following website:

http://www.netfilter.org/documentation/HOWTO/networking-concepts-HOWTO-4.html

7. Enable the wireless profile by executing:

```
netctl enable <profile>
netctl start  <profile>
```

Keeping with the above example, the <profile> will be replaced with “wlan0-my-wireless” :

```
netctl enable wlan0-my-wireless
netctl start  wlan0-my-wireless
```

Testing

Your system is now ready to be tested. The BBB network is setup to switch to the wireless if the eth0 cable is disconnected and rebooted. This will force the network to start the wireless services. With DHCP services, you will most likely get a different IP address for your BBB. If you are using static IP addressing and you have set up the IP address to be the same, then address will be identical.

1. Shutdown the BBB by issue the shutdown command:

```
shutdown -h now
```

2. Once the active lights on the BBB has stopped, then remove the power. Disconnect the eth0 device, and then re-apply the power.

You should see the BBB start it's boot process and if the wireless adapter has an activity led indicator, it should light when the wireless network service starts.

3. Once the BBB is online and wireless activity light is lit, You can see what the IP address by reviewing the blue LED furthest form the Ethernet connector. At boot it starts the heartbeat blink and then sends a Morse "HI" twice followed by the IP address. The address is in four groups. The groups separated by periods. So 192.168.0.132 would be sent as - HI HI 192 168 0 123 This sequence is repeated three times. If you miss it you can always reboot. It comes up approximately 15-20 seconds after power is applied.

4. Using the IP address, you should not be able to re-access the node using ssh.

5. Verify the basic network operations, such as gateway connectivity and dns lookup.

- Try to ping the gateway device.

```
ping -c 10 <gateway_IP_addr>
```

- Try dns lookup:
  ```
  nslookup google.com
  ```

6. If you do not get wireless network activity, double check your access key. You can re-edit */etc/netctl/<profile>* and replace the *Key=* entry with an open text as follows:

```
Description='Automatically generated profile by wifi-menu'
Interface=wlan0
Connection=wireless
Security=wpa
ESSID=w0anm-R
IP=static
Key='This.Is.My.Access.Key'
Address='192.168.15.210/24'
Gateway='192.168.15.1'
DNS=('127.0.0.1')
```

In order to edit this file, you will need to shutdown, and re-connect the eth0 cable, and reboot to gain ssh access to the BBB.

You can switch back and forth between wireless and eth0 by simply plugging the eth0 port into an active network connection and then reboot the system.

Useful netctl Commands

```
Usage: netctl {COMMAND} [PROFILE]
              [--help|--version]

Commands:
  list                  List available profiles
  store                 Save which profiles are active
  restore               Load saved profiles
  stop-all              Stops all profiles
  start [PROFILE]       Start a profile
  stop [PROFILE]        Stop a profile
  restart [PROFILE]     Restart a profile
  switch-to [PROFILE]   Switch to a profile
  status [PROFILE]      Show runtime status of a profile
  enable [PROFILE]      Enable the systemd unit for a profile
  disable [PROFILE]     Disable the systemd unit for a profile
  is-enabled [PROFILE]  Check whether a profile is enabled
  reenable [PROFILE]    Reenable the systemd unit for a profile
```

Using journalctl for troubleshooting

To review the system logs you can use the following commands:

```
journalctl -f
```

(this will give you a ongoing output of the log, control-c to interupt)

-or-

```
journalctl -xn
```

This can be very useful to aid in troubleshooting.

(Below should be removed, I just kept it here as a reference)

Compact USB Wi-Fi Adapter for BBB (Inspire Logic Supply)

In order to use the Inspire Logic Supply's USB Wi-Fi for the BBB, you need to install the dkms-mt7601 package.

To install the package enter:

pacman -S dkms-mt7601

You will see the following output:

```
resolving dependencies...
looking for inter-conflicts...

Packages (2): dkms-2.2.0.3-14  dkms-mt7601-v3.0.0.4-1

Total Download Size:    0.95 MiB
Total Installed Size:   6.79 MiB

:: Proceed with installation? [Y/n] y
:: Retrieving packages ...
 dkms-2.2.0.3-14-any       48.2 KiB   328K/s 00:00 [######################] 100%
 dkms-mt7601-v3.0.0....   926.8 KiB   110K/s 00:08 [######################] 100%
(2/2) checking keys in keyring                     [######################] 100%
(2/2) checking package integrity                   [######################] 100%
(2/2) loading package files                        [######################] 100%
(2/2) checking for file conflicts                  [######################] 100%
(2/2) checking available disk space                [######################] 100%
(1/2) installing dkms                              [######################] 100%
Optional dependencies for dkms
    linux-headers: build modules against Arch kernel
    linux-lts-headers: build modules against LTS Arch kernel
(2/2) installing dkms-mt7601                       [######################] 100%
```

```
Creating symlink /var/lib/dkms/mt7601/v3.0.0.4/source ->
                /usr/src/mt7601-v3.0.0.4

DKMS: add completed.

Kernel preparation unnecessary for this kernel.  Skipping...

Building module:
cleaning build area.......(bad exit status: 2)

make KERNELRELEASE=3.16.1-1-
ARCH.....................................................................................................................
.....................................
cleaning build area.....(bad exit status: 2)
Kernel cleanup unnecessary for this kernel.  Skipping...

DKMS: build completed.

mt7601Usta:
Running module version sanity check.
 - Original module
   - No original module exists within this kernel
 - Installation
   - Installing to /usr/lib/modules/3.16.1-1-ARCH/kernel/drivers/net/wireless/

depmod........

DKMS: install completed.
synchronizing filesystem...
```

The driver name used is “**mt7601USta**”

The USB Adapter name is RaLink Technology.

The wireless network device name is “**ra0**”.

```
================================================
# lsmod
Module                  Size  Used by
mt7601Usta             74867  0

================================================
 lsusb
Bus 002 Device 004: ID 148f:7601 Ralink Technology, Corp. MT7601U Wireless Adapter
Bus 002 Device 003: ID 0d8c:013a C-Media Electronics, Inc.
Bus 002 Device 002: ID 05e3:0608 Genesys Logic, Inc. Hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
================================================
```