Configuring the BeagleBone Black's Ethernet Port for SSH Access

NimbeLink Corp

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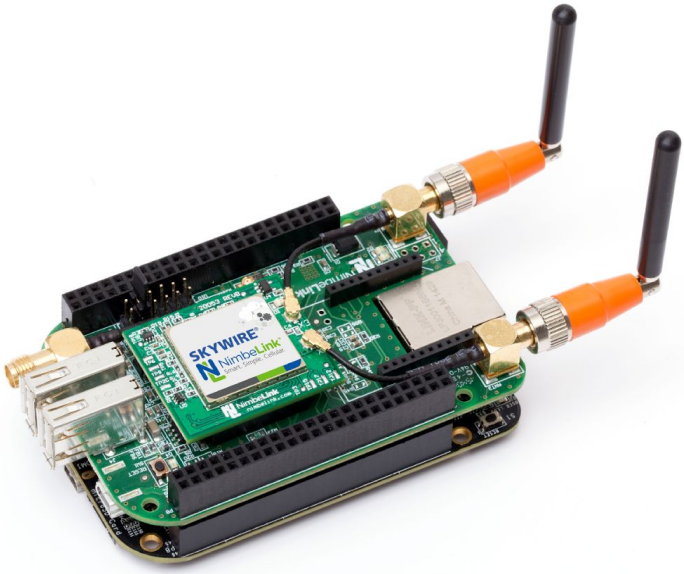

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1. Introduction

1.1 Orderable Part Numbers

Orderable Device	Description	Carrier	Network Type
NL-AB-BBBC	Skywire BeagleBone Black Cape	Any	Any

1.2 Overview

While the BeagleBone Black comes with a serial access port via USB, it may be more convenient to use the Ethernet port for development. This enables more familiar access for developers who are used to using SSH, as well as enables the tools associated with an SSH connection to be used.

This guide will set up the BeagleBone Black's Ethernet port with a static IP address, which will allow the user to access the BeagleBone Black via SSH. This guide also provides a working example of setting up a PPP connection using a Skywire® LE910.

This document assumes you want to connect your workstation directly to the BeagleBone Black with an Ethernet cable.

NOTE: This procedure works only if you have your BeagleBone Black connected to your workstation when the BeagleBone Black boots. This procedure does not work if you unplug the ethernet from your BeagleBone Black after boot, or plug in the ethernet after boot. You will need to power cycle your BeagleBone Black with the Ethernet connection connected.

1.3 Testing

This procedure was tested on the following OSs and hardware:

Hardware
BeagleBone Black Rev. 3

Operating Systems
Debian 7.10 (Kernel 3.8.13-bone79)

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2. BeagleBone Black Setup

2.1 Overview

For many people, developing on Linux systems is much more convenient using SSH, rather than a USB/Serial connection. By setting up the Ethernet port with a static IP address, one can plug an Ethernet cable directly from their workstation into the BeagleBone Black, bypassing the USB-Serial port.

The easiest way to setup SSH on the BeagleBone Black is to set a Static IP address on the Ethernet port.

2.2 Setup Static IP on BeagleBone Black

To setup a static IP address on your BeagleBone Black, start your BeagleBone Black and login as `root`. Edit the file `/etc/network/interfaces` using your favorite editor (this application note uses `nano`):

```
# nano /etc/network/interfaces
```

This is the configuration file for your BeagleBone Black. If you have settings related to `eth0`, comment them out with `#`. For example:

```
# The primary network interface
#auto eth0
#iface eth0 inet dhcp
# Example to keep MAC address between reboots
#hwaddress ether DE:AD:BE:EF:CA:FE
```

Add the following lines:

```
auto eth0
iface eth0 inet static
      address (your desired IP)
      netmask (your desired netmask)
```

replacing “(your desired IP address)” and “(your desired netmask)” with your respective values. For example, if you would like to give your BeagleBone Black an IP address of 192.168.0.25:

```
auto eth0
iface eth0 inet static
      address 192.168.0.25
      netmask 255.255.255.0
```

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If your workstation has an internet connection using wireless or a different ethernet port, do not use the same network for the BeagleBone Black. For example, if your workstation has an IP address of 192.168.1.***, do not set your BeagleBone Black to be on the 192.168.1.*** network.

Save and close the file, and shutdown your BeagleBone Black:

```
# shutdown -h now
```

Once the lights are off on the BeagleBone Black, unplug it from power and USB.

3. Workstation Setup

3.1 Setup Static IP Address on Your Workstation

Setup your workstation's ethernet IP address to be on the same network as your BeagleBone Black from the last section. For example, if you set your BeagleBone Black's IP address to be:

`192.168.0.25`

set your IP address to be on the `192.168.0.***` network. For example, use:

`192.168.0.30`

Below are guides for setting a static IP address on Windows, OSX, and Linux:

Note: Only set the values of "IP Address" or "Route", and "Subnet Mask" or "Netmask". Leave everything else blank.

Note: You will need to have a dedicated Ethernet port available on your workstation. If you are currently connected to a personal or work network or internet connection, make sure that connection is on its own dedicated Ethernet port or a Wifi connection.

Windows

http://www.howtogeek.com/howto/19249/how-to-assign-a-static-ip-address-in-xp-vista-or-windows-7/

OSX

http://www.howtogeek.com/howto/22161/how-to-set-up-a-static-ip-in-mac-os-x/

Linux

http://www.cyberciti.biz/faq/linux-configure-a-static-ip-address-tutorial/

4. Test SSH Connection

4.1 Connect Ethernet Cable

Once you have setup the static IP addresses on both your BeagleBone Black and workstation, connect an Ethernet cable between them.

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4.2 Power On BeagleBone Black

Plug your 5V power cable into your BeagleBone Black.

4.3 SSH Into Your BeagleBone Black

Once your BeagleBone Black boots, SSH into it using a terminal program of your choice:

OSX and Linux

```
# ssh root@(BeagleBone Black IP Address)
```

For example, if your BeagleBone Black's IP address was set to 192.168.0.25 in Section 2, type:

```
# ssh root@192.168.0.25
```

Windows

Use PuTTY, TeraTerm, or similar to establish an SSH connection to your BeagleBone Black.

Your workstation will SSH into your BeagleBone Black, and you can use this connection for development and transferring files.

5. Example: PPP Connection using a Skywire NL-SW-LTE-TSVG

5.1 Overview

Now that you have a direct SSH connection to your BeagleBone Black, you can get data access to the BeagleBone Black using PPP. This example shows how to establish a PPP connection using a Skywire NL-SW-LTE-TSVG.

Note: For specific PPP information, see the PPP Guide for your specific Skywire on NimbeLink.com.

5.2 Establish SSH Connection to BeagleBone Black

Follow the guide above, and SSH into your BeagleBone Black. For this guide, the BeagleBone Black's IP is `192.168.0.25`. Replace that IP with the IP that you set for your BeagleBone Black in Section 2.2:

```
# ssh root@192.168.0.25
Debian GNU/Linux 7
BeagleBoard.org Debian Image 2015-11-12
Support/FAQ: http://elinux.org/Beagleboard:BeagleBoneBlack_Debian
```

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```
default username:password is [debian:temppwd]


Last login: Thu Nov 12 19:02:09 2015
root@beaglebone:~#
```

5.3 Create the PPP Script File and PPP Chat File

Create the PPP script file in `/etc/ppp/peers/`, using a text editor of your choice. This guide uses `nano`:

```
root@beaglebone:~# nano /etc/ppp/peers/verizon
```

Enter the following information into the file:

```
/dev/ttyUSB3
115200
connect "/usr/sbin/chat -v -f /etc/ppp/peers/verizon-chat"
noauth
defaultroute
usepeerdns
local
debug
updetach
```

Save your file, and name it "`verizon`" if prompted.

Next, create the PPP chat file in the same directory:

```
root@beaglebone:~# nano /etc/ppp/peers/verizon-chat
```

Enter the following information into the file:

```
TIMEOUT 35
ECHO ON
'' \rATZ
OK 'ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0'
OK AT+CGDCONT=3,"IP","vzwinternet","0.0.0.0",0,0
OK ATD*99***3#
CONNECT ''
```

Note: The quotation marks at the beginning and end of the script file are two single-quote marks (`''`), not one double-quotation mark (`"`).

Note: Replace "`vzwinternet`" with your APN.

Save your file, and name it "`verizon-chat`" if prompted.

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5.4 Start The PPP Connection and Test

Now that your files have been created, you can start your PPP connection:

```
root@beaglebone:~# pon verizon
```

Towards the end of the script output, you should see the PPP protocol getting an IP address, similar to below:

```
local  IP address 100.104.24.9
remote IP address 10.64.64.64
primary   DNS address 198.224.149.135
secondary DNS address 198.224.148.135
```

Once the script finishes running, you can test your PPP connection. First, enter:

```
root@beaglebone:~# ifconfig
```

and you should see your PPP connection, along with an IP address, something similar to below:

```
ppp0      Link encap:Point-to-Point Protocol
          inet addr:100.104.24.9  P-t-P:10.64.64.64  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:30 errors:0 dropped:0 overruns:0 frame:0
          TX packets:31 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:2022 (1.9 KiB)  TX bytes:1933 (1.8 KiB)
```

Finally, you can ping an IP address to verify that you have data access. For instance, pinging "`8.8.8.8`" should return something similar to below:

```
root@beaglebone:/etc/ppp/peers# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_req=1 ttl=43 time=277 ms
64 bytes from 8.8.8.8: icmp_req=2 ttl=43 time=89.5 ms
64 bytes from 8.8.8.8: icmp_req=3 ttl=43 time=58.6 ms
64 bytes from 8.8.8.8: icmp_req=4 ttl=43 time=200 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3003ms
rtt min/avg/max/mdev = 58.676/156.659/277.946/87.663 ms
```

You have now setup and tested your PPP connection over a direct SSH connection with your workstation.

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