

Throughput Testing Single-Board Computer for Wireless LAN Professionals

## Setting up Odroid C2 As Test End-Point

Inventory Project Items

Unpack and knoll the following items

- □ Impact Strong 5200 mAh USB Battery
  - And it has a flashlight as well!
- □ USB Micro Power Cable (comes with Battery)
- □ Micro SD Card to eMCC adapter (Blueish green)
- eMCC Memory Card (small with Red label)
- Transcend USB 3.0 SD Card Reader
- Odroid Wi-Fi 4 NIC (Black)
- □ USB 'U-bend' Adaper (Black
- □ Odroid C2 Single Board Computer
- □ #WLPC\_EU USB Drive (has the Image)
- Odroid Case Kit (Black)

Later we will have you use as part of the testing (not in your own kit)

- Small Phillips Screwdriver (to assemble your case)
- Short Ethernet Cable (to test your unit when attached to a switch port)
- □ If you are running Windows copy the Win32DiskImager-0.9.5-binary executable as well.

If you are running Windows follow the Windows directions, if Mac OS – move to the Mac OS directions.

## Configure Image

Copy Image File from the #WLPC\_EU USB drive (in the Odroid for #WLPC\_EU folder) to your Desktop... the file name is DietPi\_v133\_OdroidC2-arm64-(WLAN\_PRO)



- Open Image File Boot Drive
- □ Should have a Folder Call "Boot"



□ Find the dietpi.txt

We are changing setting so your Odroid device can join a local SSID and download more files we'll need.

- Under the Wi-Fi Details section change the Wi-Fi SSID to WLPC\_EU-01 with a PSK of password.
   #Enter your wifi details below, if applicable (Case Sensitive).
   wifi\_SSID=WLPC\_EU-01
   wifi\_KEY=password
- Under WiFi Hotspot Settings, change this to be Firstname\_Lastname and Change wpa\_passphrase from change me to 'password' or a password you can remember

(remember PSKs are case-senstive)
# >> Wifi Hotspot/AP Settings -----

# - Set Wi-Fi Name/SSID
wifi\_hotspot\_ssid=Firstname\_Lastname

# - Set Wi-Fi PSK - minimum of 8 characters
wifi\_hotspot\_key=password

- □ Save the changes in dietpi.txt
- Open the file again to confirm the changes
- □ Eject 'Boot' Image (*REMEMBER TO DO THIS!*)

Move Configured Image to eMMC Card

Dev MicroSD Adapter into Transcend SD/Micro SD USB Adapter



□ Mount eMMC card into MicroSD adapter



□ Place combination into Laptop USB Port

□ You should find a new drive labeled "boot" on your desktop

This is the default image – we will be overwriting this.

• Open Terminal window



 Type in command "diskutil list"
 You are looking for the External Disk with a Linux partition In this case it is /dev/disk2 – write this down

\*very important\* always triple check that is the correct device, if you mess up the next step you could risk data loss on your main system

	👚 K	KeithParsons 1 — -bash — 84×25		
[MacBook /dev/di	gin: Sun Oct 9 10:23:42 o .:~ KeithParsons\$ diskutil sk0 (internal):	list		
#: 0: 1: 2:	GUID_partition_scheme	EFT	SIZE 500.3 GB 314.6 MB 423 4 GB	IDENTIFIER disk0 disk0s1 disk0s2
2: 3: 4:		Macintosh HD Recovery HD BOOTCAMP	650.0 MB 76.0 GB	disk0s3 disk0s4
/dev/di #: 0:	skl (internal, virtual): TYPE	NAME Macintosh HD Logical Volume on diskO 8770224B-2D20-4E79-9BFE Unencrypted	s2	IDENTIFIER disk1 b0
/dev/df #: 0: 1: 2:	sk2 (external, physical): TYPE FDisk_partition_scheme windows_FAT_32 Linux	NAME	SIZE *31.3 GB 134.2 MB 31.1 GB	IDENTIFIER disk2 disk2s1 disk2s2
Type in comman	nd " <mark>diskuti</mark> ]	unmountdi	sk /	dev/disk <mark>x</mark>
Should receive a	a successful re	port		

[MacBook:~ KeithParsons\$ diskutil unmountdisk /dev/disk2 Unmount of all volumes on disk2 was successful

In this next step we will copy over the image on the eMMC with the image we want.

The command is "sudo dd if=file.img bs=1m of=/dev/rdisk2" It is easiest to just drag the file to the placeholder file.img following the "if="

Remember to to keep the 'r' in 'rdiskX'

Enter your SUDO password – your machine password [MacBook:~ keithParsons\$ sudo dd if=/Users/KeithParsons\ 1/Desktop/DietPi\_v133\_Odro) idC2-arm64-\(WLAN\_PRO\).img bs=1m of=/dev/rdisk2 497+0 records in 497+0 records out 521142272 bytes transferred in 11.781195 secs (44235095 bytes/sec)

It will take a bit to do this process... wait for the prompt to return.

- □ To confirm check the 'Boot' disk and it should have your changes.
- □ Now Unmount drive from your laptop (Eject 'boot)
- □ Remove the USB Adapter
- Remove the eMCC card and place it in the bottom of the Odroid device. (It should only go one way)



Now jump to the Prepare Odroid C2 Section

Instructions to create image on SD card and customize dietpi.txt file on a machine running Windows OS:

Configure Image

- Copy Image File from the #WLPC\_EU USB drive (in the Odroid for #WLPC\_EU folder) to your Desktop... the file name is DietPi\_v133\_OdroidC2-arm64-(WLAN\_PRO)
- □ Install disk burning software by running the Win32DiskImager-0.9.5-install.exe file provided with your USB drive. Follow all installation defaults.
- Once installed, run Win32DiskImager from your start menu. Click on the Image File icon to select the image to burn.

👒 Win32 Disk Im	ager		_	
Image File				Device
				[D:\] 🔻
Copy MD5 Has	h:			(
Version: 0.9.5	Cancel	Read	Write	Exit

Locate the WLPC\_EU Image folder in the USB provided and select the file image named

DietPi\_v133\_OdroidC2-arm64-(WLAN\_PRO).img and click **Open**:

<ul> <li>← → · ↑</li></ul>	Select a disk image	×
A Quick access Desktop Desktop Documents Downloads Pictures V	$\leftarrow$ $\rightarrow$ $\checkmark$ $\uparrow$ $\blacksquare$ « WLP $\rightarrow$ DietPi_v133_OdroidC2-arm64-(WL $\checkmark$ $\circlearrowright$	Search DietPi_v133_OdroidC2 P
↓ Downloads       ↓         Pictures       ↓	Organize 🔻 New folder	III 🔹 🕶 🔲 😲
Desktop Documents Downloads Pictures V V	▲ Name	Date modified Type
Downloads     Pictures     V	DietPi v133 OdroidC2-arm64-(WLAN PRO).img	10/9/2016 12:16 PM Disc Image File
Pictures * < >		
	🖊 Downloads 👒	
File <u>n</u> ame: DietPi_v133_OdroidC2-arm64-(WLAN_PRO).img v Disk Images (*.img *.IMG) v	Pictures 🖈 🗸	>
Open Cancel	File <u>n</u> ame: DietPi_v133_OdroidC2-arm64-(WLAN_PRO).img	

□ Insert the USB adapter with the SD memory card into your computer and verify that your drive is listed under the Device area. If the drive listed is not correct, select the drop down list and select the right drive unit. In this example we are selecting drive D:\



Click on Write and confirm overwrite of your eMMC memory card by clicking Yes:

👒 Win32 Disk Im	ager			
Image File				Device
AN_PRO).img/DietPi_	v133_OdroidC2	-arm64-(WLAN_	PRO).img 📔	[D:\] -
Copy MD5 Has	h:			
Version: 0.9.5	Cancel	Read	Write	Exit
🎭 Confirm	overwrite			×
🔰 🔔 (	Vriting to a phy Target Device: Are you sure yo	[D:\] "boot")	-	device.
		Yes		lo

You will see a progress bar and upon completion you should see a Write Successful window, press OK to finish burning process.



□ In your Windows Explorer select the eMMC Memory Card where the image was burnt to and open the file *dietpi.txt* and from

🕳   🛃 🚽 🚽 boot (D:)				
File Home Share View				
$\leftarrow$ $\rightarrow$ $\checkmark$ $\uparrow$ $\blacksquare$ > boot (D:) >				
	Name	Date modified	Туре	Size
📌 Quick access	dietpi	9/11/2016 7:02 PM	File folder	
le OneDrive	boot.ini	10/9/2016 12:11 PM	Configuration sett	3 KB
💻 This PC	CHANGELOG.txt	10/8/2016 8:51 AM	Text Document	109 KB
- marc	🔼 config.txt	10/8/2016 8:51 AM	Text Document	2 KB
🔜 boot (D:)	config-3.14.78+	9/11/2016 11:01 AM	78+ File	109 KB
dietpi	🖉 dietpi.txt	10/9/2016 12:58 PM	Text Document	10 KB
	📄 Image 🛛 🦰	9/11/2016 6:53 PM	File	12,629 KB
ODROID (E:)	initrd.img-3.14.78+	9/11/2016 6:53 PM	78+ File	4,140 KB
💣 Network	meson64_odroidc2.dtb	9/11/2016 11:51 AM	DTB File	29 KB
	README.md	10/8/2016 8:51 AM	MD File	7 KB
	System.map-3.14.78+	9/11/2016 11:49 AM	78+ File	2,842 KB
	ulnitrd	9/11/2016 6:53 PM	File	4,140 KB
	ulnitrd-3.14.29+	6/1/2016 3:18 PM	29+ File	4,531 KB
	ulnitrd-3.14.65+	9/11/2016 6:53 PM	65+ File	4,141 KB
	ulnitrd-3.14.78+	9/11/2016 6:53 PM	78+ File	4,140 KB
	vmlinuz-3.14.78+	9/11/2016 11:49 AM	78+ File	12,629 KB

Scroll down to the section #Enter your Wifi details below and enter the SSID and Key for the wireless network you will be joining for initial setup. In this example we will use settings as follows:

#Enter your Wifi details below, if applicable (Case Sensitive). Wifi\_SSID=**wLPC\_EU-01** Wifi\_KEY=**password**  Scroll down to the section # >> Wifi Hotspot/AP Settings and enter the WiFi hotspot SSID and password. This SSID will be the one assigned to your own personal Odroid and must be easy for you to identify, either your name, last name or something unique in the audience. In this example we will configure as follows:

# >> Wifi Hotspot/AP Settings ------

# - Set Wi-Fi Name/SSID wifi\_hotspot\_ssid=**Firstname\_Lastname** 

# - Set Wi-Fi PSK - minimum of 8 characters
wifi\_hotspot\_key=MySecuredPassword

Once you are done editing your deitpi.txt file, make sure you close and save the file.



- □ To confirm check the 'Boot' disk and it should have your changes in place.
- □ Now Unmount drive from your laptop (Eject 'boot)
- □ Remove the USB Adapter
- Remove the eMCC card and place it in the bottom of the Odroid device. (It should only go one way)



Now jump to the Prepare Odroid C2 Unit section

## Prepare Odroid C2 Unit

- □ Insert USB 'U-turn' device top-center USB
- □ Insert Odroid Wi-Fi NIC into USB 'U-turn'
- □ Plug USB Micro cable into your Battery
- Plug other end into Micro USB slot on Odroid C2
- □ Make sure the battery is on by pressing the On Button
- □ WAIT Patiently This next step may take up to 10-15 minutes



- □ When completed after waiting 10-15 minutes...
- Dever-cycle your Odroid.
- □ You should see your Firstname\_Lastname SSID being broadcast.



Associate to your new SSID (the one being transmitted by your own Odroid device) with the PSK you assigned. (we recommending 'password' at this point to make it easy)

Status: Connected	Turn Wi-Fi Off
Wi-Fi is connected to Keit	h_Parsons and has
the IP address 192.168.42	2.63.

- Open a browser and go to <a href="http://192.168.42.1">http://192.168.42.1</a> the default gateway for your SSID
- Log in as admin/admin

← → C 隆 https://192.168.42.1:8443	
FruityWiFi	
	Login
	user: admin
	pass: •••••
	login

□ The FruityWiFi status screen should show up. *Note: there is no IP address for the Ethernet port. Since you haven't yet attached your Odroid to a wired network.* 

FruityWiFi	status	status-ws	config	modules	logs	logout	v2.4
Services			Interfaces	/IP			
Wireless en Modules	abled   s	top	eth0: wlan0: 192 public: re				
No modules have been Install them from the list.		-	Stations	a:1b:15 (on v	vlan()		
1150.			DHCP	a.ib.ib (0ii (	viano)		
			192.168.42	.63 a8:66:7f	:1a:1b:15	MacBook	

- At this point, use your Terminal Client of choice, Hyperterm, puTTY, etc. and SSH to your Odroid device's IP Address. (puTTY is on your WLPC\_EU USB drive under "Other Wi-Fi Tools")
- Hostname Root@192.168.42.1 Password "dietpi"

• • •	
v134	oDroid C2 (aarch64)
IP Address	192.168.200.27
Web : Twitter : Donate : Device image DietPi's web dietpi-launc	Daniel Knight http://DietPi.com http://twitter.com/dietpi_ http://twitter.com/dietpi_ http://goo.gl/pzISt9 e possible thanks to: Meveric b hosting is powered by: MyVirtualServer.com cher = All the DietPi programs in one place. ig = Feature rich configuration tool for your device. rare = Select optimized software for installation. = Resource monitor. = Shows CPU information and stats.
root@wLAN_PRO	):~#

□ Try the command **ifconfig** to see the current status of your device interfaces.

## Now we are going to have you go over to the tables with the Switches and Ethernet cables.

- □ Un-plug the battery from your Odroid device
- Plug in one of the Ethernet cables connected to a Switch
- Dever on your Odroid device by plugging back in the USB Power cable
- Return to your laptop and re-connect to your SSID (with your Firstname\_Lastname) you should now return to the browser (the FruityWiFi should be on 192.168.42.1) and refresh the screen to see the IP Address of the switchport you are connected to.



□ Some other commands you might want to try with the SSH terminal Interface:

•••	
v134	oDroid C2 (aarch64)
IP Add	ress   192.168.200.27
Create Web Twitte Donate	
	image possible thanks to: Meveric 's web hosting is powered by: MyVirtualServer.com
dietpi dietpi htop cpu	<pre>-launcher = All the DietPi programs in one place. -config = Feature rich configuration tool for your device. -software = Select optimized software for installation. = Resource monitor. = Shows CPU information and stats.</pre>
	KeithParsons 1 — root@WLAN_PRO: ~ — ssh root@192.168.200.27 — 81×21
DietP	Pi-config       DietPi - Network Options: Adapters         Ethernet       : Available   Enabled   Connected         Wifi       : Available   Enabled   Wifi Hotspot Mode         IPv6       : Enabled         Internet       : Please run Internet Test         Proxy       : Disabled         Ethernet Change Wired Network Settings         WiFi       Change Wireless Network Settings         Test       Run the Internet Connection Test         IPv6       Toggle IPv6 Support         Proxy       Configure proxy settings
	<0k> <back></back>
• •	☆ KeithParsons 1 — root@WLAN_PRO: ~ — ssh root@192.168.42.1 — 94×40
• • • Web Twitter Donate	: http://DietPi.com
Web Twitter Donate Device i	: http://DietPi.com : http://twitter.com/dietpi_
Web Twitter Donate Device i DietPi's dietpi-1	: http://DietPi.com : http://twitter.com/dietpi_ : http://goo.gl/pzISt9 mage possible thanks to: Meveric
Web Twitter Donate Device i Dietpi's dietpi-c dietpi-s htop cpu	<pre>: http://DietPi.com : http://twitter.com/dietpi_ : http://goo.gl/pzISt9 mage possible thanks to: Meveric ; web hosting is powered by: MyVirtualServer.com auncher = All the DietPi programs in one place. config = Feature rich configuration tool for your device. coftware = Select optimized software for installation. = Resource monitor.</pre>
Web Twitter Donate Device i DietPi's dietpi-1 dietpi-c dietpi-s htop cpu root@WLAN eth0	<pre>: http://DietPi.com : http://twitter.com/dietpi_ : http://goo.gl/pzISt9 mage possible thanks to: Meveric : web hosting is powered by: MyVirtualServer.com dauncher = All the DietPi programs in one place. :ooffig = Feature rich configuration tool for your device. :offware = Select optimized software for installation.</pre>
Web Twitter Donate Device i DietPi's dietpi-1 dietpi-c dietpi-s htop cpu	<pre>: http://DietPi.com : http://twitter.com/dietpi_ : http://goo.gl/pzISt9 mage possible thanks to: Meveric : web hosting is powered by: MyVirtualServer.com Hauncher = All the DietPi programs in one place. :ooffig = Feature rich configuration tool for your device. : seture rich configuration tool for your device. : shows CPU information and stats. LPRO:~# ifconfig Link encap:Ethernet HWaddr 00:1e:06:33:a9:26 inet addr:192.168.200.27 Bcast:192.168.200.255 Mask:255.255.255.0 UP BROADCAST MULTICAST MTU:1500 Metric:1 RX packets:952 errors:0 dropped:0 overruns:0 frame:0 TX packets:907 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:176890 (172.7 KiB) TX bytes:530704 (518.2 KiB) Interrupt:40 Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 UP LOOPBACK RUNNING MTU:4096 Metric:1 RX packets:402 errors:0 dropped:0 overruns:0 frame:0 TX packets:402 errors:0 dropped:0 overruns:0 frame:0</pre>

At this point you now have a working Odroid device and you know it's IP Address in the air, and on the wire.

This image is currently running support for the following services:

- ePerf (for use with Ekahau ESS Throughput Surveys)
- iPerf 2
- iPerf 3
- Kismet
- End-Point for Adrian Granados' WiFi Explorer Pro

This is just a start of the things you can do. FruityWiFi has more modules you can test and play with.

At this point you can assemble the case for your Odroid device. Take apart the pieces you are currently using, mount in the provided plastic case. And Re-assemble.

