

# Probando la Orange Pi

Un proyecto de BricoLabs

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Probando la Orange Pi y aprendiendo a usarla.  
TRABAJO EN CURSO NO TERMINADO

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# 1 Empezar rápido desde linux

Para usar la Orange Pi Zero tendremos que crear imágenes arrancables en tarjetas micro SD.

## 1.1 Crear una SD arrancable

Dependiendo de donde conectemos la tarjeta tendremos que usar diferentes rutas. En el procedimiento descrito a continuación `${card}` será la ruta al dispositivo de la tarjeta y `${p}` la partición (si la hay).

Si la tarjeta se conecta via adaptador USB, linux la va a asociar a un dispositivo `/dev/sdx`, por ejemplo en mi portátil el disco duro es `/dev/sda` las distintas particiones serán `/dev/sda1`, `/dev/sda2`, etc.

Si conectamos una memoria con un adaptador USB linux la podría mapear en `/dev/sdb` por ejemplo.

Si la memoria se conecta mediante una ranura SD, linux la asociará a un dispositivo `/dev/mmcblk0` o `/dev/mmcblk1`, etc. etc. Dependerá de la ranura usada. Las particiones en este tipo de dispositivos tienen rutas como por ejemplo `/dev/mmcblk0p1`.

Los datos se pueden almacenar directamente en la memoria SD o en una partición creada en la memoria.

Resumiendo:

- `${card}` será `/dev/sdb` o `/dev/mmcblk0`
- `card{p}` será `/dev/sdb1` o `/dev/mmcblk0p1`

Antes de seguir adelante hay que estar completamente seguro del dispositivo asociado a nuestra memoria SD para no armar ningún estropicio.

Hay varias comprobaciones que se pueden hacer:

`dmesg | tail` nos permitirá echar un ojo a los últimos mensajes en el log del sistema. Si acabamos de insertar la memoria veremos el dispositivo usado.

`sudo fdisk -l` nos permite ver las particiones montadas en nuestro linux, por ejemplo con mi SD en la ranura SD de mi portatil la salida es (entre otras cosas, he obviado las particiones de los discos duros):

```
Disk /dev/mmcblk0: 7.4 GiB, 7948206080 bytes, 15523840 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x00000000
```

`cat /proc/partitions` también nos dará una lista de particiones, en mi portátil las que interesan son:

```
179      0      7761920 mmcblk0
179      1      7757824 mmcblk0p1
```

Descargamos la imagen de Jessie adaptada a la *Orange Pi Zero* desde la página <https://www.armbian.com/download/>

Descomprimos la imagen y la grabamos en la tarjeta SD con el comando:

```
sudo dd if=./Armbian_5.24_Orangezero_Debian_jessie_3.4.113.img of=/dev/mmcblk0
```

Insertamos la tarjeta en la *Orange Pi* y le damos alimentación. El primer arranque llevará alrededor de tres minutos, y tras ese tiempo aun hará falta un minuto más para poder hacer login. Este retardo es debido a que el sistema intentará actualizar la lista de paquetes y creará un area de swap de emergencia en la SD, y además cambiará el tamaño de la partición que hemos creado para ocupar todo el espacio libre en la SD.

De momento solo la he arrancado y efectivamente las particiones han cambiado tras el arranque así que tiene buena pinta.

Volvemos a insertar la SD en la *Orange Pi* y la conectamos con un cable ethernet al router de casa. El Armbian viene configurado por defecto para obtener su IP desde un servidor DHCP.

Como mi cutre-router no me da información de las IP asignadas usamos *nmap*:

```
nmap -sP 192.168.0.0/24
```

Con eso averiguamos la IP asignada a la *Orange Pi Zero* y ya podemos hacer login con el siguiente comando <sup>1</sup>:

```
ssh root@192.168.0.109
```

¡Y ya estamos!

---

<sup>1</sup>La password por defecto de Armbian es **1234**, nos pedirá cambiarla en el primer login.



```
Encryption key:off
Power Management:on
```

```
eth0      no wireless extensions.
```

Todo tiene buena pinta, vamos a ver si detecta WIFIs:

```
root@orangezero:~# iwlist wlan0 scan |grep ESSID
      ESSID:"wificlientesR"
      ESSID:"casa_de_verano"
      ESSID:"MOVISTAR_BEEF"
      ESSID:"wificlientesR"
      ESSID:"R-wlan90"
      ESSID:"MOVISTAR_BAAF"
      ESSID:"ababab"
      ESSID:"WLAN 77"
      ESSID:"castillo"
      ESSID:"unaWifi"
      ESSID:""
      ESSID:"mikasa"
```

Para configurar el wifi echamos un ojo al fichero /etc/network/interfaces pero en ese mismo fichero encontramos el aviso:

```
# Armbian ships with network-manager installed by default. To save you time
# and hassles consider using 'sudo nmtui' instead of configuring Wi-Fi settings
# manually.
```

Así que basta con ejecutar `sudo nmtui` y ya podemos dar de alta nuestra wifi (yo la prefiero con IP estática).

Ejecutamos `ifconfig` y ya vemos nuestro nuevo interface configurado:

```
ifconfig
```

```
wlan0    Link encap:Ethernet  HWaddr a4:7c:f2:9a:97:7c
          inet addr:192.168.0.120  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::a67c:f2ff:fe9a:977c/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:328 (328.0 B)  TX bytes:852 (852.0 B)
```

Edit Connection

Profile name

mikasa

Device

WI-FI

SSID

mikasa

Mode

<Client>

Security

<WPA & WPA2 Personal>

Password

\*\*\*\*\*

☐ Show password

BSSID

Cloned MAC address

MTU

(default)

IPv4 CONFIGURATION

<Manual>

<Hide>

Addresses

192.168.0.120/24

<Remove>

<Add...>

Gateway

192.168.0.1

DNS servers

8.8.8.8

<Remove>

4.4.4.4

<Remove>

<Add...>

Figura 2: Configuración WIFI

## 2 Orange Pi Zero, características técnicas

La tarjeta de desarrollo Orange Pi Zero viene equipada con un procesador Cortex A7 Allwinner H2+ quad core, con 256 o 512MB RAM, Ethernet, y puertos USB. Disponible en Aliexpress (tienda oficial) por 6.99 dolares, mas 3.39 dolares como gastos de envío.

### 2.1 Especificaciones

- SoC – Allwinner H2(+) quad core Cortex A7 processor @ 1.2 GHz with Mali-400MP2 GPU @ 600 MHz
- System Memory – 256 to 512 MB DDR3-1866 SDRAM
- Storage – micro SD card slot
- Connectivity – 10/100M Ethernet + 802.11 b/g/n WiFi (Allwinner XR819 WiFi module) with u.FL antenna connector and external antenna
- USB – 1x USB 2.0 host ports, 1x micro USB OTG port
- Expansion headers – Unpopulated 26-pin “Raspberry Pi B+” header + 13-pin header with headphone, 2x USB 2.0, TV out, microphone and IR receiver signals
- Debugging – Unpopulated 3-pin header for serial console
- Misc – 2x LEDs
- Power Supply – 5V via micro USB port or optional PoE
- Dimensions – 52 x 46 mm
- Weight – 26 grams

### 2.2 Esquema de pines

Un excelente esquema de pines puede conseguirse en [OSHLab](#)

### 2.3 Esquemas eléctricos

Pueden bajarse de [aquí](#)

## 3 Accediendo al hardware desde linea de comandos

La memoria es más que suficiente para correr programas. El Armbian consume únicamente 40Mb en funcionamiento.

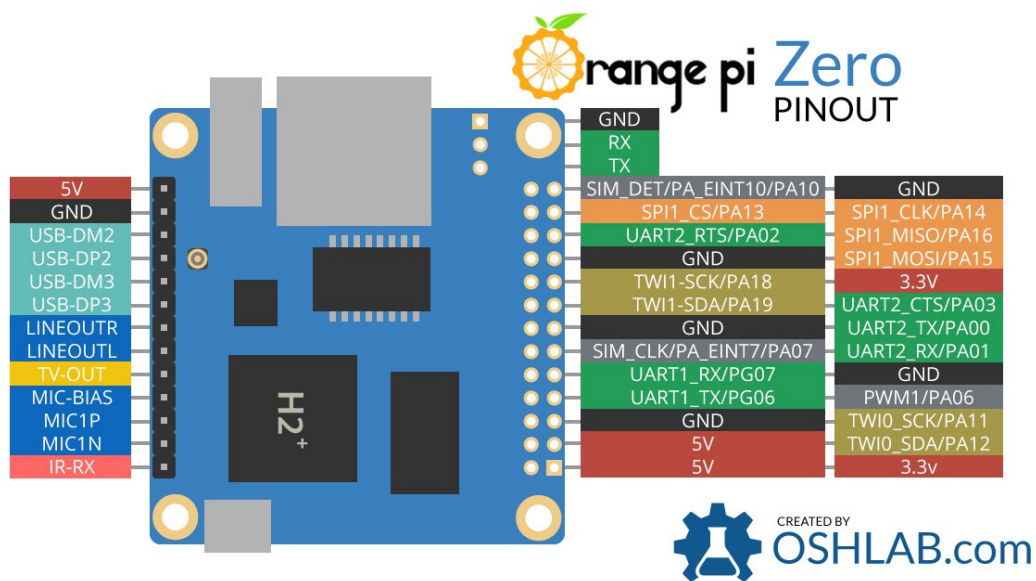


Figura 3: Pineado Orange Pi

```
root@orangepizero:~# free
              total        used        free      shared    buffers     cached
Mem:          247068      122300      124768         4620         7908         69548
-/+ buffers/cache:        44844        202224
Swap:         131068           0         131068
```

Vamos a hacer algunas pruebas con el hardware. En Armbian, como todo Unix que se precie, todo es un fichero.

En el directorio `/sys/class` encontraremos cosas interesantes:

```
root@orangepizero:~# ls /sys/class
backlight  cuse      graphics  i2c-dev   mdio_bus  power_supply  script  spidev      thermal  v
bdi        devfreq  hdmi      ieee80211 mem        ppp          scsi_device  spi_master  tty      vtconsole
block      disp     hidraw    input     misc      rc           scsi_disk   sunxi_cma_test  udc
bsg        dma      hwmon     leds      mmc_host  rfkill       scsi_host   sunxi_dump  usb_device
cedar_dev  gpio     i2c-adapter  lirc      net       rtc          sound      sunxi_info  vc
```

### 3.1 LEDs

Si miramos dentro del directorio `leds` veremos que hay un directorio que representa cada uno de los leds de la placa:



```
root@orangepizero:~# cd /sys/class/leds/
root@orangepizero:/sys/class/leds# ls
green_led  red_led
```

Podemos ver, por ejemplo, a que evento está asociado cada led ejecutando `cat green_led/trigger` (tiene el valor `default-on`) o `cat red_led/trigger` (tiene el valor `none`).

```
root@orangepizero:/sys/class/leds# cat green_led/trigger
none mmc0 mmc1 timer heartbeat backlight [default-on] rfkill0 phy1rx phy1tx phy1assoc phy1radio
root@orangepizero:/sys/class/leds# cat red_led/trigger
[none] mmc0 mmc1 timer heartbeat backlight default-on rfkill0 phy1rx phy1tx phy1assoc phy1radio
```

O podemos encender el led rojo ejecutando `echo 1 > red_led/brightness`, y para apagarlo ya os podéis imaginar que es `echo 0 > red_led/brightness`.

## 3.2 GPIO

Podemos ver los GPIO disponibles ejecutando:

```
root@orangepizero:~# cat /sys/kernel/debug/gpio
GPIOs 0-383, platform/sunxi-pinctrl, sunxi-pinctrl:
gpio-10 (? ) out hi
gpio-17 (red_led ) out lo
gpio-202 (xradio_irq ) in lo
gpio-354 (? ) out hi
gpio-362 (green_led ) out hi
```

Podemos activar un nuevo puerto GPIO, digamos el 15:

```
root@orangepizero:~# echo 15 >/sys/class/gpio/export
```

Ahora veremos el puerto activo:

```
root@orangepizero:~# cat /sys/kernel/debug/gpio
GPIOs 0-383, platform/sunxi-pinctrl, sunxi-pinctrl:
gpio-10 (? ) out hi
gpio-15 (sysfs ) in lo
gpio-17 (red_led ) out lo
gpio-202 (xradio_irq ) in lo
gpio-354 (? ) out hi
gpio-362 (green_led ) out hi
```

En el directorio `/sys/class/gpio/gpio15/` tendremos los interfaces usuales para puertos gpio definidos en el kernel de linux.

## 4 Bibliotecas útiles

### 4.1 Python

#### 4.1.1 Instalación de virtualenv

Para probar bibliotecas de Python instalamos:

```
sudo aptitude install python-pip
sudo aptitude install python-virtualenv
sudo aptitude install python-dev
```

El caso es que el virtualenv no me funciona después de ejecutar estos pasos. Finalmente he tenido que ejecutar, como *root*, los siguientes comandos:

```
pip install --upgrade pip
pip install --upgrade virtualenv
```

Después de eso ya he podido usar *virtualenv* sin problemas.

#### 4.1.2 orangepi\_PC\_gpio\_pyH3

Nos clonamos el repo. Voy a hacer todas las pruebas desde la cuenta de **root**.

```
git clone https://github.com/duxingkei33/orangepi_PC_gpio_pyH3
```

Hay que cambiar el fichero `orangepi_PC_gpio_pyH3/pyA20/gpio/mapping.h`

La definición de *STATUS\_LED* debe quedar en el *GPA17* en lugar de *GPA15*:

```
{ "STATUS_LED", SUNXI_GPA(17), 2 },
```

Creamos un entorno para pruebas y lo activamos:

```
virtualenv test_A
source test_A/bin/activate
```

Compilamos la biblioteca:

```
cd orangepi_PC_gpio_pyH3
python setup.py install
```

Y ya podemos probar los ficheros de ejemplo.

### 4.1.3 Acceso desde C

La biblioteca de Python *orange\_pi\_PC\_gpio\_pyH3*, en realidad se basa en bibliotecas escritas en C que tenemos disponibles dentro del repo en el directorio *pyA20*

```
cd pyA20
ls
gpio/ i2c/ __init__.py spi/ utilities/
```

Nos interesa probar las bibliotecas en los directorios *gpio* e *i2c*, al menos de momento. Serían *gpio\_lib* e *i2c\_lib* respectivamente.

Probamos el acceso al *gpio* desde C con un programa sencillo que nos haga encender y apagar el led de la OPI.

```
sunxi_gpio_init();
sunxi_gpio_set_cfgpin(SUNXI_GPA(17), SUNXI_GPIO_OUTPUT);
while(1) {
    sunxi_gpio_output(SUNXI_GPA(17), 1);
    sleep(1);
    sunxi_gpio_output(SUNXI_GPA(17), 0);
    sleep(1);
}
```

## 4.2 Referencias

- [Probando la Orange Pi Zero](#)
- [GPIO from commandline](#)
- [mas de lo mismo](#)
- [hilo GPIO en foro](#)
- [WiringPi\\_OrangePi explicación lanefu](#)
- [El repo donde pretende unificar WiringPI](#)
- [Otro Repo mas](#)
- [Otro mas, este tio no para](#)
- [Hilo en el foro hablando de unificación de bibliotecas](#)
- [Otro hilo](#)
- [Otro hilo más con I2C SPI](#)

## 5 Monitorizar temperatura

Podemos ver estadísticas de nuestra OPI con:

```
sudo armbianmonitor -m
```

Stop monitoring using [ctrl]-[c]

Time	CPU	load	%cpu	%sys	%usr	%nice	%io	%irq	CPU
21:04:18:	1152MHz	0.08	0%	0%	0%	0%	0%	0%	40°C
21:04:23:	240MHz	0.07	0%	0%	0%	0%	0%	0%	39°C
21:04:28:	240MHz	0.15	6%	1%	0%	0%	4%	0%	40°C
21:04:33:	240MHz	0.12	6%	1%	0%	0%	4%	0%	38°C
21:04:38:	240MHz	0.11	2%	1%	0%	0%	0%	0%	39°C
21:04:43:	240MHz	0.11	1%	0%	0%	0%	0%	0%	39°C
21:04:49:	240MHz	0.10	1%	0%	0%	0%	0%	0%	38°C
21:04:54:	240MHz	0.09	1%	0%	0%	0%	0%	0%	39°C
21:04:59:	240MHz	0.08	2%	1%	0%	0%	0%	0%	38°C
21:05:04:	240MHz	0.08	2%	1%	0%	0%	0%	0%	38°C
21:05:10:	240MHz	0.07	2%	1%	0%	0%	0%	0%	40°C
21:05:15:	240MHz	0.06	2%	1%	0%	0%	0%	0%	37°C
21:05:20:	240MHz	0.06	2%	1%	0%	0%	0%	0%	39°C
21:05:25:	240MHz	0.05	2%	1%	0%	0%	0%	0%	37°C
21:05:30:	240MHz	0.05	2%	1%	0%	0%	0%	0%	39°C

También podemos instalar RPi-Monitor con el comando:

```
sudo armbianmonitor -r
```

Una vez instalado podemos visitar desde nuestro navegador la dirección ip de nuestra OPI Zero *http://opi-adress:8888* para ver las estadísticas.

¡Ojo! Las gráficas no se refrescan automáticamente hay que recargar la página.

Para desinstalar el RPi-Monitor basta con:

```
sudo aptitude uninstall rpimonitor
```

## 6 Referencias

- [Página oficial](#)
- [Recursos oficiales](#) aquí hay imágenes y los esquemáticos
- [Tienda en Aliexpress](#)



Figura 4: Estadísticas en RPi-Monitor

- [http://linux-sunxi.org/Bootable\\_SD\\_card](http://linux-sunxi.org/Bootable_SD_card)
- <https://www.armbian.com/orange-pi-zero/>
- [https://docs.armbian.com/User-Guide\\_Getting-Started/](https://docs.armbian.com/User-Guide_Getting-Started/)
- [https://docs.armbian.com/Hardware\\_Allwinner/](https://docs.armbian.com/Hardware_Allwinner/)
- **GPIO** Una explicación de como acceder al gpio desde terminal
- **Info variada** Aquí tenemos el esquema de pines
- **GPIO desde el espacio de usuario**
- **sunxi-gpio**
- **orange pi español**
- **ArchLinux ARM on Orange Pi**
- **Lakka Nightly Builds** Lakka is the official Linux distribution of RetroArch and the libretro ecosystem. Each game system is implemented as a libretro core, while the frontend RetroArch takes care of inputs and display. This clear separation ensures modularity and centralized configuration. Also nightly build for H3 is supported

## 7 META

Este documento está escrito en [Markdown-Pandoc](#). Pandoc es un sistema muy sencillo de documentación que permite generar múltiples formatos de salida.

Las fuentes del documento están en el directorio **doc/src** dentro del árbol de directorios del proyecto.

Los formatos de salida son el fichero **README.md** en formato *Markdown-Github* y los documentos que puedes encontrar en el directorio **doc/out** incluyendo un fichero en formato *pdf*.

Los documentos en los distintos formatos de salida se generan automáticamente sin mas que ejecutar:

```
$ cd doc
$ make
```

Otras opciones que soporta el **makefile** serían:

**reset** para regenerar todos los documentos de salida.

**clean** para borrar todos los fichero de salida

**pdf, latex, mediawiki, epub, odt, docx** genera el fichero de salida en el formato especificado: pdf, latex, etc. etc.

Ejemplos:

```
$ make reset
$ make odt
```

## 7.1 Requisitos

Necesitas tener instalaco **Pandoc**, hay [una pequeña introducción](#) en el el github de BricoLabs.

## 8 Licencia

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