Nanopi m1 wiki :

- http://wiki.friendlyarm.com/wiki/index.php/NanoPi_M1 (http://wiki.friendlyarm.com/wiki/index.php/NanoPi_M1)

Prepare (in your linux computer)

Download Nanopi M1 offical debian image(you could find the download site in Nanopi M1 English wiki) and unzip it.

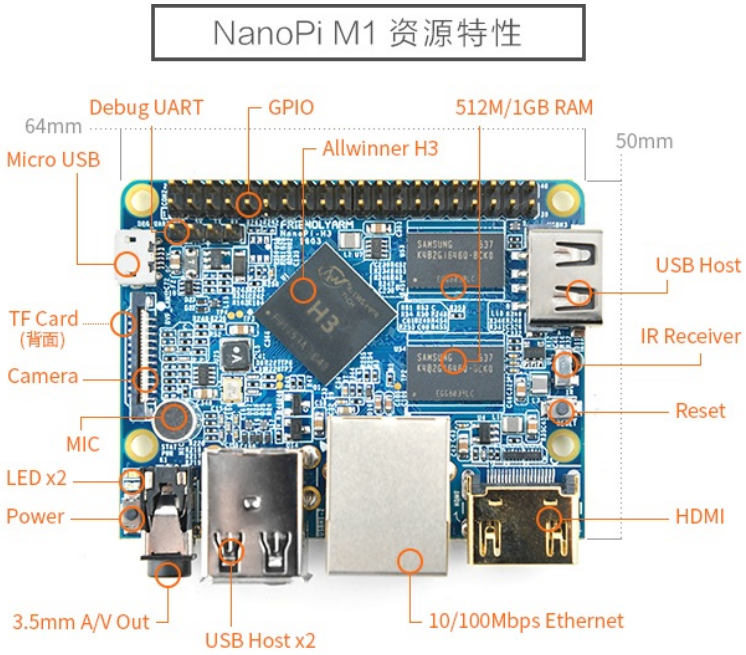
```
wget http://www.mediafire.com/file/6a9wmjz826rvngw/nanopi-m1-debian-sd4g-20160907.img.zip
unzip nanopi-m1-debian-sd4g-20160907.img.zip
```

Nanopi M1 Hardware spec

Hardware Spec

- CPU: Allwinner H3, Quad-core Cortex-A7@1.2GHz
- GPU: Mali400MP2@600MHz，Supports OpenGL ES2.0
- DDR3 RAM: 512MB/1GB
- Connectivity: 10/100M Ethernet
- Audio: 3.5mm audio jack/Via HDMI
- Microphone: Onboard microphone
- IR Receiver: Onboard IR receiver
- USB Host：Type A, USB 2.0 x 3
- MicroSD Slot x 1
- MicroUSB: for data transmission and power input, OTG
- Video Output: HDMI 1.4 1080P, CVBS
- DVP Camera Interface: 24pin, 0.5mm pitch FPC seat
- Debug Serial Port: 4Pin, 2.54mm pitch pin header
- GPIO: 2.54mm spacing 40pin, compatible with Raspberry Pi's GPIO. It includes UART, SPI, I2C, IO etc
- User Key: Power LED x 1, Reset x 1
- PC Size: 64 x 56mm
- Power Supply: DC 5V/2A
- OS/Software: u-boot，Ubuntu MATE，Debian

Nanopi M1 layout



- Nanopi M1 GPIOs pin

Pin#	Name	Linux gpio	Pin#	Name	Linux gpio
1	SYS_3.3V		2	VDD_5V	
3	I2C0_SDA		4	VDD_5V	
5	I2C0_SCL		6	GND	
7	GPIOG11	203	8	UART1_TX/GPIOG6	198
9	GND		10	UART1_RX/GPIOG7	199
11	UART2_TX/GPIOA0	0	12	PWM1/GPIOA6	6
13	UART2_RTS/GPIOA2	2	14	GND	
15	UART2_CTS/GPIOA3	3	16	UART1_RTS/GPIOG8	200
17	SYS_3.3V		18	UART1_CTS/GPIOG9	201
19	SPI0_MOSI/GPIOC0	64	20	GND	
21	SPI0_MISO/GPIOC1	65	22	UART2_RX/GPIOA1	1
23	SPI0_CLK/GPIOC2	66	24	SPI0_CS/GPIOC3	67
25	GND		26	SPDIF-OUT/GPIOA17	17
27	I2C1_SDA/GPIOA19/PCM0_CLK/I2S0_BCK	19	28	I2C1_SCL/GPIOA18/PCM0_SYNC/I2S0_LRCK	18
29	GPIOA20/PCM0_DOUT/I2S0_SDOUT	20	30	GND	
31	GPIOA21/PCM0_DIN/I2S0_SDIN	21	32	GPIOA7	7
33	GPIOA8	8	34	GND	
35	UART3_CTS/SPI1_MISO/GPIOA16	16	36	UART3_TX/SPI1_CS/GPIOA13	13
37	GPIOA9	9	38	UART3_RTS/SPI1_MOSI/GPIOA15	15
39	GND		40	UART3_RX/SPI1_CLK/GPIOA14	14

- Debug Port (UART0)

Pin#	Name
1	GND
2	VDD_5V
3	UART_TXD0
4	UART_RXD0

- DVP Camera IF Pin Spec

Pin#	Name	Description
1, 2	SYS_3.3V	3.3V power output, to camera modules
7,9,13,15,24	GND	Gound, 0V
3	I2C2_SCL	I2C Clock Signal
4	I2C2_SDA	I2C Data Signal
5	GPIOE15	Regular GPIO, control signals output to camera modules
6	GPIOE14	Regular GPIO, control signals output to camera modules
8	MCLK	Clock signals output to camera modules
10	NC	Not Connected
11	VSYNC	vertical synchronization to CPU from camera modules
12	HREF/HSYNC	HREF/HSYNC signal to CPU from camera modules
14	PCLK	PCLK signal to CPU from camera modules
16-23	Data bit7-0	data signals

Prepare (in your linux Computer)

ready a 4GB sd card with USB card reader plug in your computer or you just use sd slot for instead.

```
# /dev/sdx is your sd card usb reader
# in my case is /dev/sdc
# you should umount all partation in /dev/sdx if part. exist
ls /dev/sd*
ls /dev/sdc*
sudo umount /dev/sdc1
sudo umount /dev/sdc2
sudo dd if=nanopi-m1-debian-sd4g-20160907.img of=/dev/sdc
```

Connect Nanopi with uart

ready a usb-ttl and connect Nanopi M1 uart pin also plug into your linux computer. After you done, power on your Nanopi M1 by mirco usb cable plug in usb charger(5V 2A is recommand)

- If the green LED is on and the blue LED is blinking this indicates your NanoPi M1 has successfully booted.
- If no LED blinking is undersupply.

- Debug Port (UART0) connect to USB-TTL

NanoPi	NanoPi	Usb-TTL
Pin#	Name	Name
1	GND	GND
2	VDD_5V	No Need
3	UART_TXDo	RXD
4	UART_RXDO	TXD

```
# connect to Nanopi M1 by uart connection at buadrate at 115200
sudo apt-get install screen -y
screen /dev/ttyUSB0 115200
```

Nanopi M1

- Nanopi M1 default user

Username	Password
fa	fa
root	fa

Let login in with user:root passwd:fa

Configure Nanopi M1 envoirment

Network Connection

- Add Google dns

```
# as always add google dns in your /etc/resovl.conf
echo "nameserver 8.8.8.8" >> /etc/resolv.conf
```

- Rename your usb wifi adapter

```
# find out the Hardware address of wifi NIC
ifconfig wlan | grep HWaddr
# in my case
# wlan0     Link encap:Ethernet  HWaddr 60:bb:5c:06:2e:1c

# you may find a usb device register as similar info of above
# simple edit the NAME="wlan0" to NAME="wifi0"
nano /etc/udev/rules.d/70-persistent-net.rules
# USB device 0x:0x (rtl8188eu)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="60:bb:5c:06:2e:1c", ATTR{dev_id}=="0x0", ATTR{type}=="1", K
ERNEL=="wlan*", NAME="wifi0"

# most easy way to get the new name by reboot
# udevadm control --reload-rules # if this not work, you have to reboot
reboot
# also login as root as always
ifconfig wifi0 start #make sure have start up
# now type ifconfig, you sure see the NIC but no wlan0
```

- Setting up wifi connection

```
#
nano /etc/network/interfaces.d/wifi0
# type in
allow-hotplug wifi0
iface wifi-fast inet dhcp
wpa-conf /etc/wpa_supplicant/wpa_supplicant.conf

#add your wifi connection info.
nano /etc/wpa_supplicant/wpa_supplicant.conf
# type in
country=GB
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
    ssid="YourWiFiSSID"
    psk="YourWiFiPassword"
    #psk=1b66ca678d6f439f7360686ff5eeb7519cdc44b76a40d96515e4eb807a6d408b
    #key_mgmet="WPA-PSK"
    #ap-scan="1"
}

#If your WiFi password has special characters or you don't want your password saved as plain text you can use "wpa_passphra
se" to generate a psk for your WiFi password. Here is how you can do it:
wpa_passphrase YourWiFiESSID

ifdown wifi0
ifup wifi0

# as assume your wifi working well. now you can access the Internet
```

Package installation

- Update your package

```
apt-get update -y
```

- Use i2c connection

```
apt-get install i2c-tools -y
# Determine which bus is in use and address
i2cdetect -y -r 0
# You may see the address is 3c on bus 1
i2cdetect -y -r 1
```

- Backup the sd card(clone the sd card)

```
 shutdown -h -t now

 # Linux computer side
 # get your sd card and plug in your linux computer
 # alwyas umount partation
 sudo umount /dev/sdc1
 sudo umount /dev/sdc2
 dd if=/dev/sdc of=nanopi_m1_backup.img

#>
#note : Network configuration finish and installed i2c-tools only
```

- Use ssh to connect Nanopi M1

  your linux computer side

```
# to find out what machine connect in the same network
arp
# in my case, the nanopi m1 ip is 192.168.42.3
ssh -l root 192.168.42.3
```

- Install FamilyArm offical C gpio library : Martix

```
git clone https://github.com/friendlyarm/matrix.git
cd matrix
make && make install
# test
cd demo
cd matrix-gpio_out
make
./Matrix-gpio_out
#Led on pin(7) blinking, is work
```

- Install python library

```
apt-get update -y
apt-get install python-pip -y
# pip install sysv_ipc # IPC communcation
```

- ***- (not work)pip install gpio***
  gpio is not work for nanopi m1(h3)

```
pip install gpio
#
#File : test.py
#!/usr/bin/env python
import gpio
      gpio.setup(7,'out')
      gpio.set(7,0)

python test.py
DEBUG:gpio:Write 7: 0
DEBUG:gpio:writing: <open file '/sys/class/gpio/gpio7/value', mode 'w+' at 0xb6a56e90>: 0
DEBUG:gpio:Write 7: 1
DEBUG:gpio:writing: <open file '/sys/class/gpio/gpio7/value', mode 'w+' at 0xb6a56e90>: 1

# remove gpio because dont work
pip uninstall gpio
```

- ***- (not work)pip install cgpio***

> Souces : cgpio 0.7 : Python Package Index (https://pypi.python.org/pypi/cgpio/0.7)
>
> > a gpio class based on gpio-0.1.2
> > Accesiing Pi-gpio the standard linux [sysfs interface],
> > tested on RPI, NanoPi M1

```
pip install cgpio
#
#File : test.py
#!/usr/bin/env python
import gpio
      gpio.setup(7,'out')
      gpio.set(7,0)

python test.py
DEBUG:gpio:Write 7: 0
DEBUG:gpio:writing: <open file '/sys/class/gpio/gpio7/value', mode 'w+' at 0xb6a56e90>: 0
DEBUG:gpio:Write 7: 1
DEBUG:gpio:writing: <open file '/sys/class/gpio/gpio7/value', mode 'w+' at 0xb6a56e90>: 1

# remove gpio because dont work
pip uninstall cgpio
```

- use command to access sysfs interface
  GPIO Sysfs Interface for Userspace (https://www.kernel.org/doc/Documentation/gpio/sysfs.txt)

by caluate pin linux gpio
pin = GROUP start offset + pin#
GPIOG_11 = 192 + 11 = 203

chip	group	register
gpiochip0	GPIOA	32bit
gpiochip32	GPIOB	32bit
gpiochip64	GPIOC	32bit
gpiochip96	GPIOD	32bit
gpiochip128	GPIOE	32bit
gpiochip160	GPIOF	32bit
gpiochip192	GPIOG	32bit
gpiochip224	GPIOH	32bit

after caluation or
according to the Nanopi M1 gpio layout, GPIOG_11(pin# 7) which linux gpio is 203

```
cd /sys/class/gpio
echo "203" > export
cd gpio203
cat directin # output in
cat value # output 0
echo "out" > direction
echo "1" > value
# led light # I have connected a LED.
```

- (Custom version)FramilyArm Martix-Python
  Sources : friendlyarm/matrix-python (https://github.com/friendlyarm/matrix-python)

  Offical Martix-Python Martix.GPIO/gpio.c file : matrix-python/gpio.c at master · friendlyarm/matrix-python (https://github.com/friendlyarm/matrix-python/blob/master/Matrix.GPIO/gpio.c)

```
#Line 7 - 11
static int pinGPIO[GPIO_MAX_NUM+1] = {-1, -1, -1, 99, -1, 98, -1,  60, 117, -1, 113,
    61, 58, 62, -1, 63, 78,  -1,  59, 95, -1,
    96, 97, 93, 94, -1, 77, 103, 102, 72, -1,
    73, 92, 74, -1, 76, 71,  75, 162, -1, 163,
};
```

  Offical Martix Martix.GPIO/gpio.c file : (matrix/gpio.c at master · friendlyarm/matrix)https://github.com/friendlyarm/matrix/blob/master/lib/gpio.c (https://github.com/friendlyarm/matrix/blob/master/lib/gpio.c)

```
#Line 22 - 31
case BOARD_NANOPI_2:{
int tempPinGPIO[41] = {-1, -1, -1, 99, -1, 98, -1,  60, 117, -1, 113,
                           61, 58, 62, -1, 63, 78,  -1,  59, 95, -1,
                           96, 97, 93, 94, -1, 77, 103, 102, 72, -1,
                           73, 92, 74, -1, 76, 71,  75, 162, -1, 163,
                          };
memcpy(pinGPIO, tempPinGPIO, sizeof(pinGPIO));
ret = 0;
break;
}
```

  Which mean Martix-Python is design for ***NanoPi 2*** only in gpio section

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Let try to replace the Martix-Python Martix.GPIO/gpio.c pinGPIO array with NanoPi M1 gpio

I find in Martix Martix.GPIO/gpio.c

```
#Line 12 - 21
case BOARD_NANOPI_M1: {
int tempPinGPIO[41] = {-1, -1, -1, -1, -1, -1,  -1, 203, 198, -1, 199,
                            0,  6,  2, -1,  3, 200,  -1, 201, -1, -1,
                           -1,  1, -1, -1, -1,  -1,  -1,  -1, 20, -1,
                           21,  7,  8, -1, 16,  13,   9,  15, -1, 14,
                          };
memcpy(pinGPIO, tempPinGPIO, sizeof(pinGPIO));
ret = 0;
break;
}
```

My version of Martix-Python Martix.GPIO/gpio.c
matrix-python/gpio.c at master · BrokenPen/matrix-python (https://github.com/BrokenPen/matrix-python/blob/master/Matrix.GPIO/gpio.c)

```
#Line 8 - 15
// Todo : other board competitive
// Note : pinGOIO is for NanoPi M1
static int pinGPIO[GPIO_MAX_NUM+1] = {
    -1, -1, -1, -1, -1, -1,  -1, 203, 198, -1, 199,
    0,  6,  2, -1,  3, 200,  -1, 201, -1, -1,
    -1,  1, -1, -1, -1,  -1,  -1,  -1, 20, -1,
    21,  7,  8, -1, 16,  13,   9,  15, -1, 14,
};
```

Let try install my version Martix-Python
Work!!!

```
apt-get install python-dev -y
git clone https://github.com/BrokenPen/matrix-python/
cd matrix-python
cd Matrix.GPIO
python setup.py install
cd test
python matrix_led.py
light on
light off
#pin7 led on and off, is working!!
```

- install wiringNP(wiringPi for NanoPi)

```
git clone https://github.com/friendlyarm/WiringNP
cd WiringNP
chmod +x ./build
./build
#test wiringNP uility
gpio readall
gpio mode 7 out
gpio pin 7 1
gpio pin 7 0
gpio reset
#led on and led off, WiringNP is working!
```

- make a backup again..

- Prepare pyMOD-OLED install dependencies

```
apt-get install python-dev python-setuptools libffi-dev -y
pip install image
```

- install pyMOD-OLED()

```
# i2c need root privileges to access
# make sure you are login in as root
# or use
# sudo python Hello_World.py

# pip install mod-oled-128x64
# or
git clone https://github.com/StefanMavrodiev/pyMOD-OLED
cd pyMOD-OLED
python setup.py install

# test
cd example
python Hello_World.py # work

nano Draw_Bitmap.py
# dis = OLED(1) change to
# dis = OLED(0) # i2c on /dev/i2c-0
python Draw_Bitmap.py
# work but.. the horizontal scroll setup in Hello_World.py also affect the clown in Draw Bitmap too..
# even I try run Draw_Bitmap.py the horizontal affect still
# It is the design of ssd1602

#pip uninstall mod-oled-128x64
```

- make a backup again..

- install python mqtt library

```
#detail : http://www.hivemq.com/blog/mqtt-client-library-paho-python
pip install paho-mqtt
```

- insatll python uuid library(installation is fial on my nanopim1)

```
pip install uuid
#example code :
import uuid
print uuid.uuid4()
print str(uuid.uuid4().fields[-1])[:5]

pip uninstall uuid
```

- use python random to generate a random id
  http://stackoverflow.com/questions/2257441/random-string-generation-with-upper-case-letters-and-digits-in-python (http://stackoverflow.com/questions/2257441/random-string-generation-with-upper-case-letters-and-digits-in-python)

Install ftp

more ..
https://www.raspberrypi.org/documentation/remote-access/ftp.md (https://www.raspberrypi.org/documentation/remote-access/ftp.md)

- :

```
# I just need to access the file by ftp
# I use fa or root to login ftp.
# so I don't need extra setting
apt-get update -y
apt-get install pure-ftpd -y
```

Try to play music on nanopim1

- : Install pygame

```
pip install pygame
# Error
sh: 1: sdl-config: not found

# fix
wget http://www.libsdl.org/release/SDL-1.2.14.tar.gz
tar -xzvf SDL-1.2.14.tar.gz
cd SDL-1.2.14
./configure
sudo make all
# after a long long long time

pip install pygame
# same problem

# try..
sudo apt-get python-pygame
# problem fix
# but seem don't fix to my mp3 file
# or the default output sound device is wrong

# try vlc library
sudo apt-get install libvlc-dev -y

# vlc code error
# AttributeError: 'NoneType' object has no attribute 'media_player_new'
```

- Install mpg123

```
# real solution omg..
# Try
sudo apt-get install mpg123 -y
aplay -l

#output
card 0: audiocodec [audiocodec], device 0: SUNXI-CODEC sndcodec-0 []
Subdevices: 1/1
Subdevice #0: subdevice #0
card 1: sndhdmi [sndhdmi], device 0: SUNXI-HDMIAUDIO sndhdmi-0 []
Subdevices: 1/1
Subdevice #0: subdevice #0
card 2: Device [USB PnP Sound Device], device 0: USB Audio [USB Audio]
Subdevices: 1/1
Subdevice #0: subdevice #0

#seem my usb sound card is 2
mpg123 -a hw:2,0 *.mp3
mpg123 -a hw:2,0 the_hero.mp3
```

Extra note:

Hardware datasheet

- SSD1306 (OLED)
  https://cdn-shop.adafruit.com/datasheets/SSD1306.pdf (https://cdn-shop.adafruit.com/datasheets/SSD1306.pdf)

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just other funny stuff I found

- Nanopi m1 gpio control in goLang
  https://github.com/bluebanboom/M1HTTPCar/blob/master/gpio/gpio.go
  (https://github.com/bluebanboom/M1HTTPCar/blob/master/gpio/gpio.go)

MQTT

- open soucres mosquitto
  https://mosquitto.org/2013/01/mosquitto-debian-repository/ (https://mosquitto.org/2013/01/mosquitto-debian-repository/)
- a simple chinese mosquitto tutorial
  http://cheng-min-i-taiwan.blogspot.tw/2015/03/raspberry-pimqtt-android.html (http://cheng-min-i-taiwan.blogspot.tw/2015/03/raspberry-pimqtt-android.html)
- hivemq
  http://www.hivemq.com/blog/mqtt-client-library-paho-python (http://www.hivemq.com/blog/mqtt-client-library-paho-python)

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electronic

unfortanly I only have pnp transistor not npn, also I dont have any motor driver, so the car module.. no control unit to access it
also is stupid to use relay to control the ac motor. I leave the car part in next semester

- http://www.dummies.com/programming/electronics/components/electronics-components-use-a-transistor-as-a-switch/ (http://www.dummies.com/programming/electronics/components/electronics-components-use-a-transistor-as-a-switch/)
- http://www.technologystudent.com/elec1/transis1.htm (http://www.technologystudent.com/elec1/transis1.htm)

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