

2022년 IoT기반 스마트 솔루션 개발자 양성과정



Programming : Python

1-Raspberry Pi

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Raspberry Pi

개 발 사	라즈베리 파이 재단
종 류	마이크로 컴퓨터
출 시 일	2012년 1월 29일
운영체제	리눅스(라즈비안, 데비안 GNU/Linux, 아크 리눅스등)
CPU	모델 A, B, B+ - ARM1176JZF-S 700 MHz 싱글코어 (오버클럭시 최대 1000MHz만큼의 성능을 낼 수 있다.) 2 - 900MHz ARM Cortex-A7 쿼드코어
전 원	2.5 W (모델 A), 3.5 W (모델 B, B+), 4 W (2 모델 B)
저장매체	SD 카드(B+, 2 모델 B는 Micro SD Card)
RAM	모델 A, 모델 A+ - 256 MB 모델 B, 모델 B+, 모델 0 - 512 MB 모델 2 - 1 GB
GPU	비디오코어 IV
입 력	USB 1개(A, A+, B 모델은 2개, B+, 2세대 모델은 USB포트 4개, CSI, GPIO 포트, LAN 포트(모델 A, A+ 제외))



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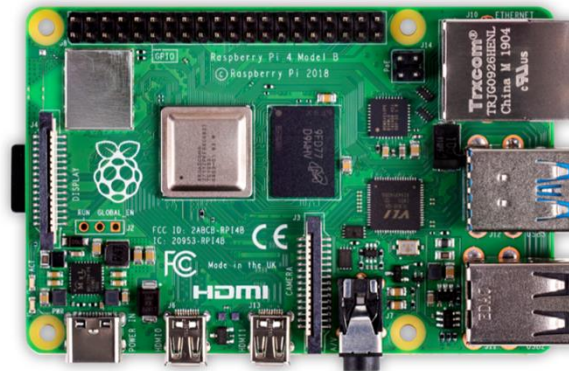
Arduino vs RaspberryPi

Board	Arduino	Rpi A+	Rpi B+	Rpi2 B	Rpi3 B+	Rpi4 B
Price	\$30	\$20	\$35	\$35	\$30	\$75
Processor	ATmega328	ARM11		Cortex A7	A53	Cortex A72
Clock	16Mhz	700Mhz		900Mhz	1.4Ghz	64bit Soc @ 1.5Ghz
Core	Single	Single		Quad	Quad	Quad
RAM	2KB	256MB	512MB	1GB	1GB	2GB,4GB,8GB
Flash	32KB	Micro SD				
GPIO	20	Raspberry Pi standard 40 pin GPIO				
Ethernet	N/A	10/100				Gigabit Ethernet
USB	N/A	USB2.0x1	USB2.0x4			USB2.0x2, USB3.0x2
WIFI	N/A				2.4/5.0Ghz WIFI	
Bluetooth	N/A				BLE 4.0	BLE 5.0
Video Out	N/A	Composite	HDMI			Micro HDMI x 2
Audio Out	N/A	Analog	HDMI/Analog			4 Pole Stereo



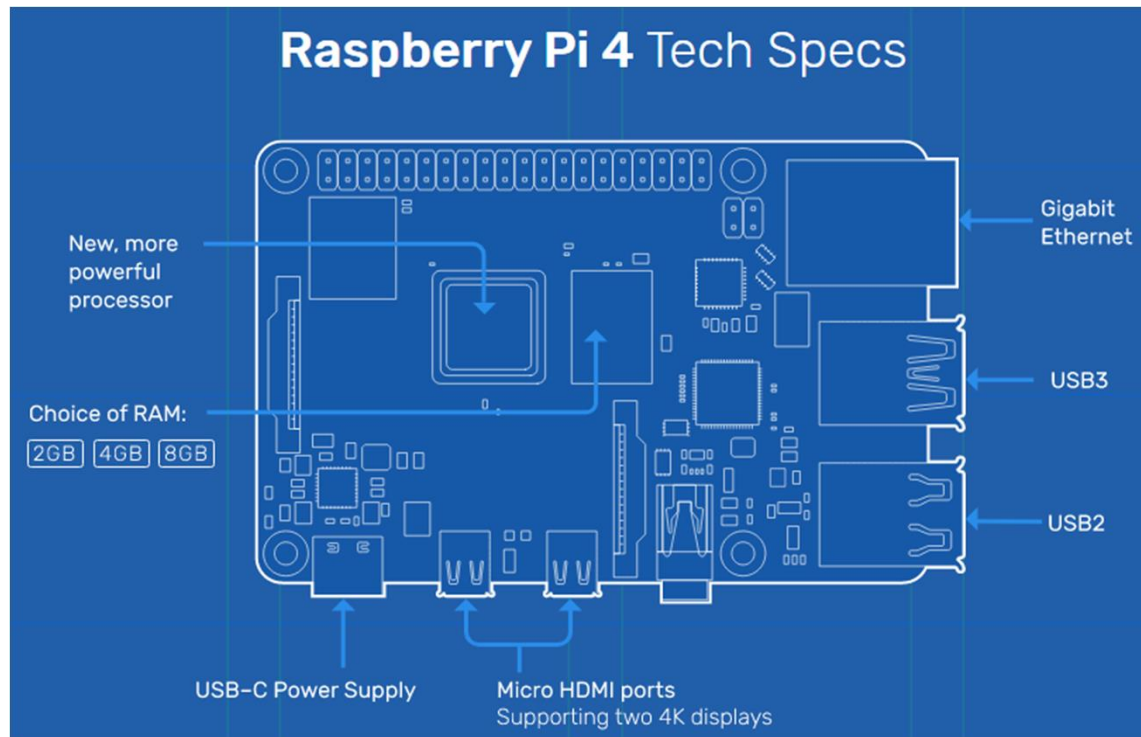
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Model



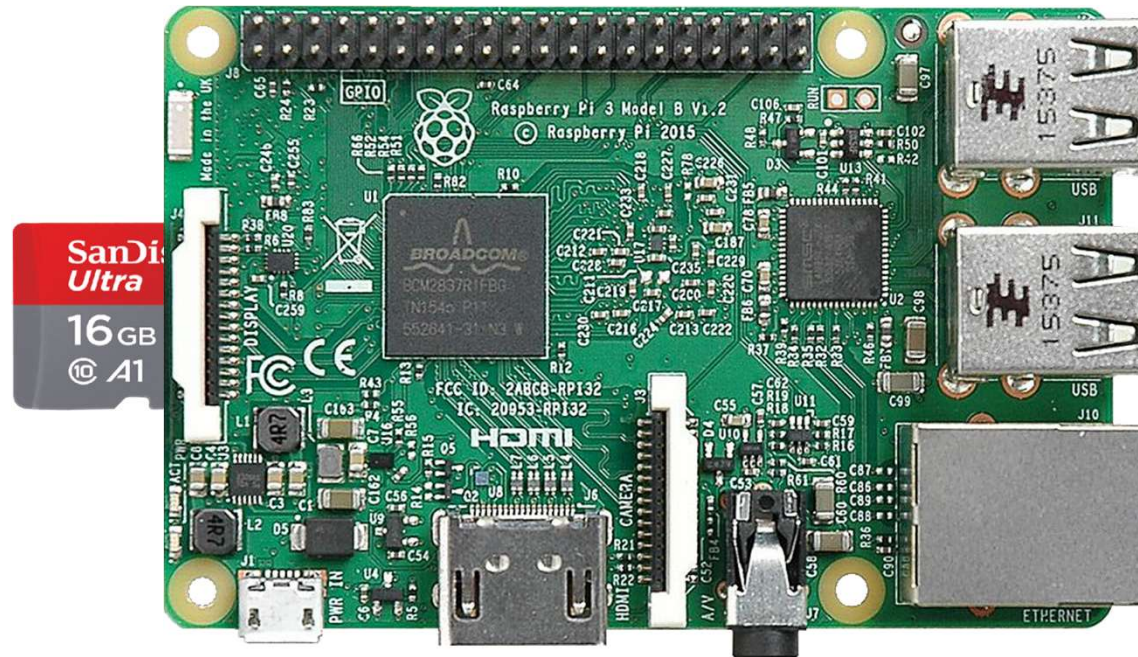
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Raspberry Pi 4 Model B



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Raspberry Pi 3 Model B



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Raspberry Pi 3 Model B Spec.

- SoC: Broadcom BCM2837 (roughly 50% faster than the Pi 2)
- CPU: 1.2 GHZ quad-core ARM Cortex A53 (ARMv8 Instruction Set)
- GPU: Broadcom VideoCore IV @ 400 MHz
- Memory: 1 GB LPDDR2-900 SDRAM
- USB ports: 4
- Network: 10/100 MBPS Ethernet, 802.11n Wireless LAN, Bluetooth 4.0
- Storage: Micro-SD
- GPIO: 40-pin GPIO header, populated
- Ports: HDMI, 3.5mm analogue audio-video jack, 4x USB 2.0, Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI)



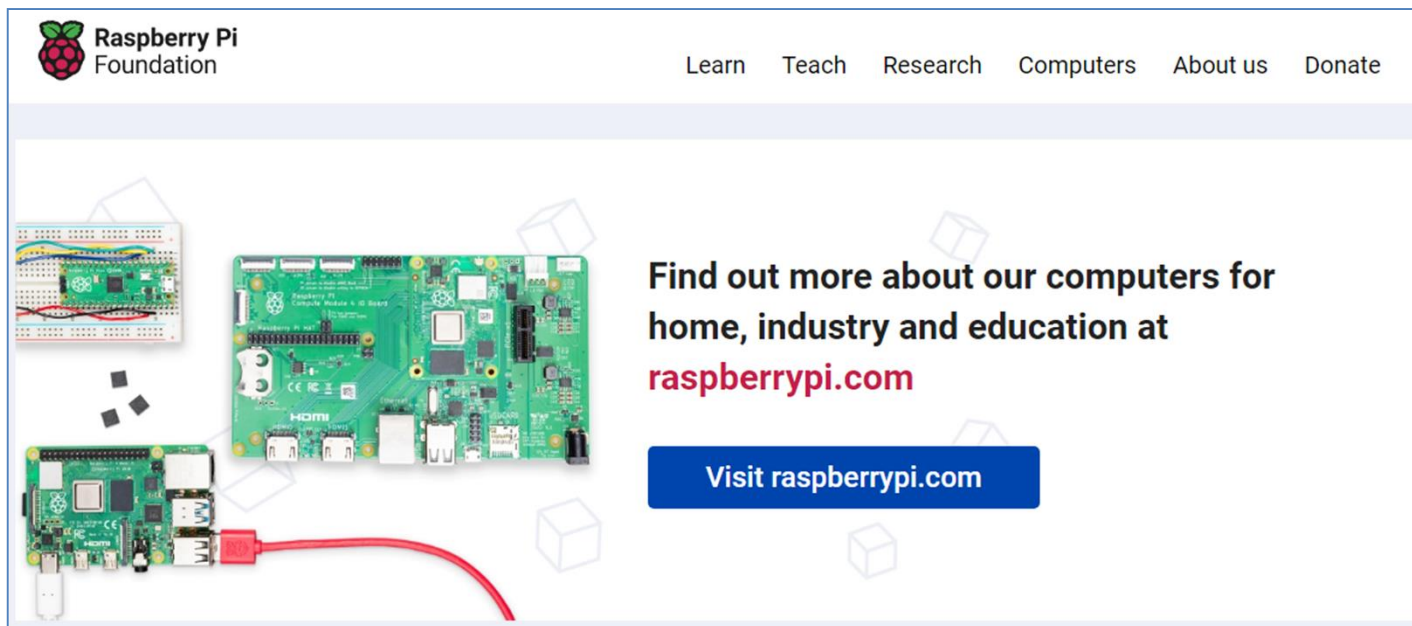
Operating System

- Arch Linux ARM
- 데비안 6.0 (Squeeze)
- Gentoo Linux
- Puppy Linux
- Raspberry Pi Fedora Remix
- Raspbian (Wheezy port with faster FP support)
- RiscOS
- Slackware ARM (formally ARMedslack)
- FreeBSD 10 ARM (RPI-B)
- QtonPi (임베디드 리눅스)
- Redsleeve (ARM용 RedHat 기반)
- Ubuntu (라즈베리 파이 2)
- 윈도우 10 IoT Core (라즈베리 파이 2)
- Tizen IoT (라즈베리 파이3)



raspberrypi.org

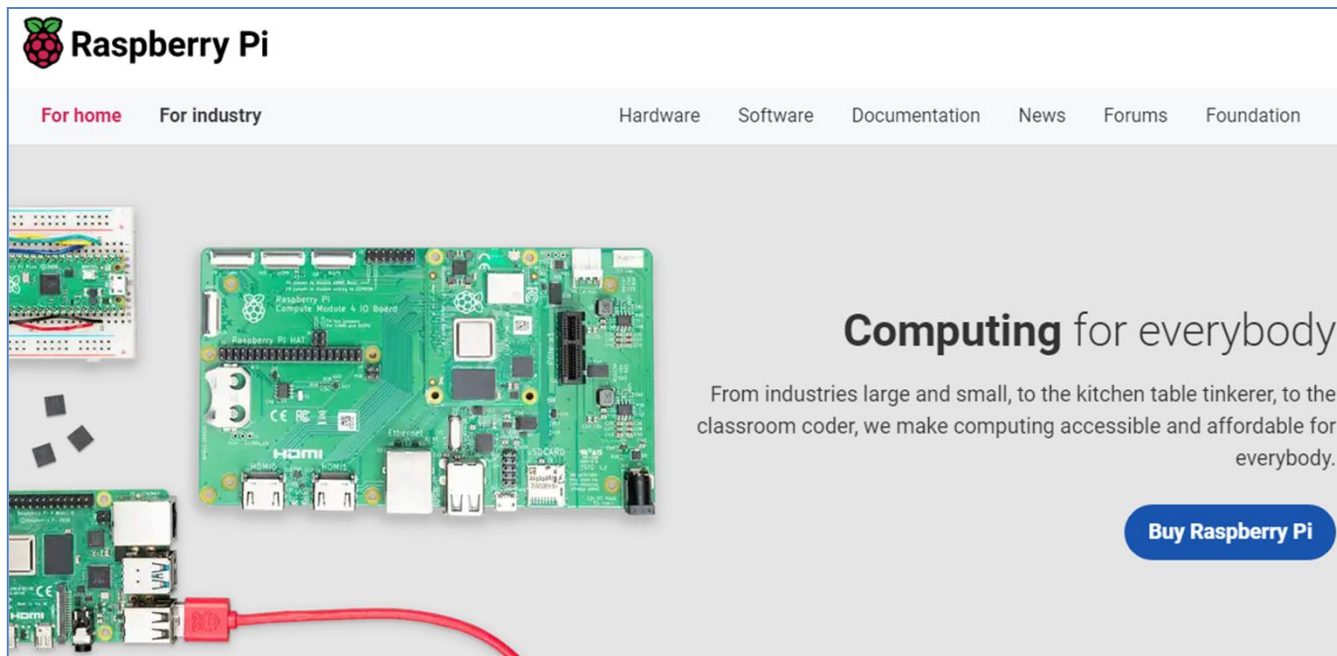
- <https://www.raspberrypi.org/>



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raspberrypi.com

- <https://www.raspberrypi.com/>



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raspberrypi.com/software/



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Raspberry Pi OS

Your Raspberry Pi needs an operating system to work. This is it. Raspberry Pi OS (previously called Raspbian) is our official supported operating system.



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Raspberry Pi Imager

Install Raspberry Pi OS using Raspberry Pi Imager

Raspberry Pi Imager is the quick and easy way to install Raspberry Pi OS and other operating systems to a microSD card, ready to use with your Raspberry Pi.

[Watch our 45-second video](#) to learn how to install an operating system using Raspberry Pi Imager.

Download and install Raspberry Pi Imager to a computer with an SD card reader. Put the SD card you'll use with your Raspberry Pi into the reader and run Raspberry Pi Imager.

[Download for Windows](#)

[Download for macOS](#)

[Download for Ubuntu for x86](#)



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Micro SD

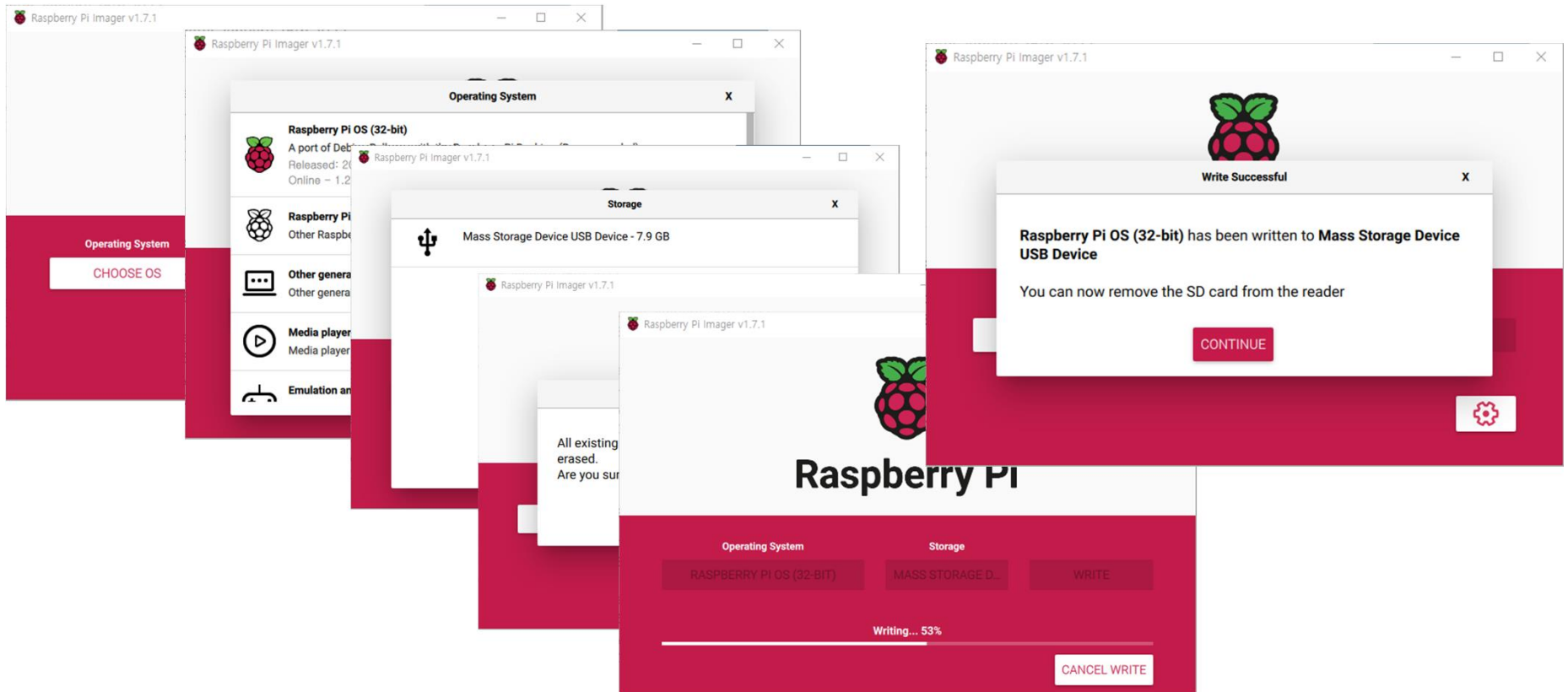


Class	성능	용도
Class 2	2MB/s	SD 영상기록
Class 4	4Mb/s	HD 영상기록
Class 6	6Mb/s	Full HD 영상기록
Class 10	10Mb/s	연속적인 HD 영상기록
UHS-1	10Mb/s	실시간 영상 기록
UHS-3	30Mb/s	Ultra HD 영상기록



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Imaging BullsEye



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Legacy / PC Version

Raspberry Pi OS (Legacy)

A stable legacy version of Raspberry Pi OS Buster.
[Not sure which version to download?](#)

Compatible with:

[All Raspberry Pi models](#)

Raspberry Pi OS (Legacy) with desktop

Release date: January 28th 2022
System: 32-bit
Kernel version: 5.10
Debian version: 10 (buster)
Size: 1.116MB
[Show SHA256 file integrity hash:](#)
[Release notes](#)

[Download](#)

[Download torrent](#)
[Archive](#)

Raspberry Pi OS Lite (Legacy)

Release date: January 28th 2022
System: 32-bit
Kernel version: 5.10

[Download](#)

Raspberry Pi Desktop

Compatible with:

PC and Mac

Debian Buster with Raspberry Pi Desktop

Release date: January 11th 2021
System: 32-bit
Kernel version: 4.19
Debian version: 10 (buster)
Size: 2.948MB
[Show SHA256 file integrity hash:](#)

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Raspberry Pi Doc

Raspberry Pi Documentation

Q Search CTRL K

Computers

Accessories

Microcontrollers

Computers

Getting Started

- Setting up your Raspberry Pi
 - Optional items
 - Troubleshooting
- Installing the Operating System
 - Using Raspberry Pi Imager
 - Downloading an Image
- Installing over the Network
 - Using Network Installation
- Installing Images on Chrome OS
- Installing Images on Linux

Getting Started

Setting up your Raspberry Pi

[Edit this on GitHub](#)

To get started with your Raspberry Pi computer you'll need the following accessories:

A computer monitor, or television. Most should work as a display for the Raspberry Pi, but for best results, you should use a display with HDMI input. You'll also need an appropriate **display** cable, to connect your monitor to your Raspberry Pi.

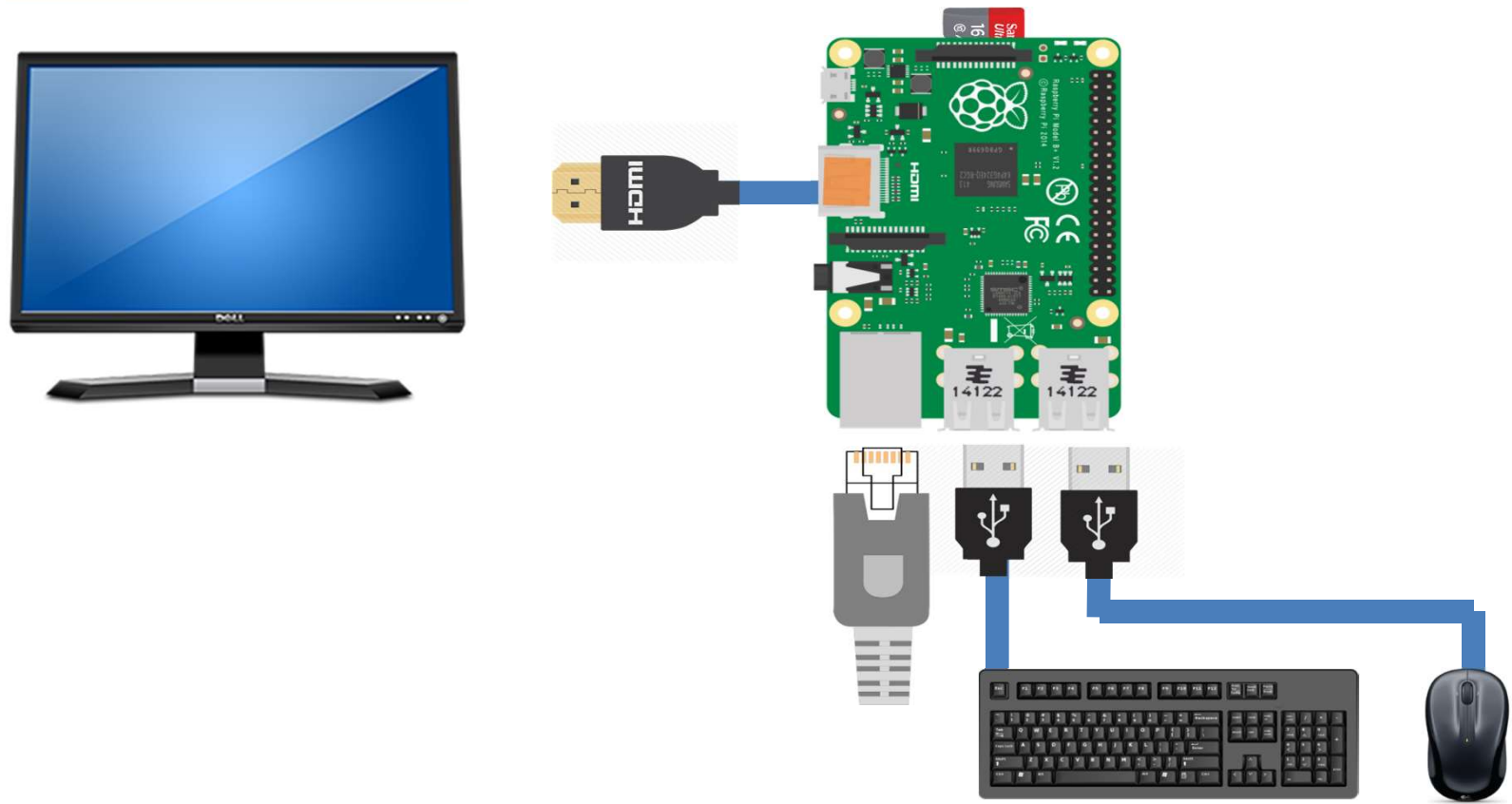
NOTE

If your display uses an HDMI connection and has built-in speakers, you can use it to output sound.



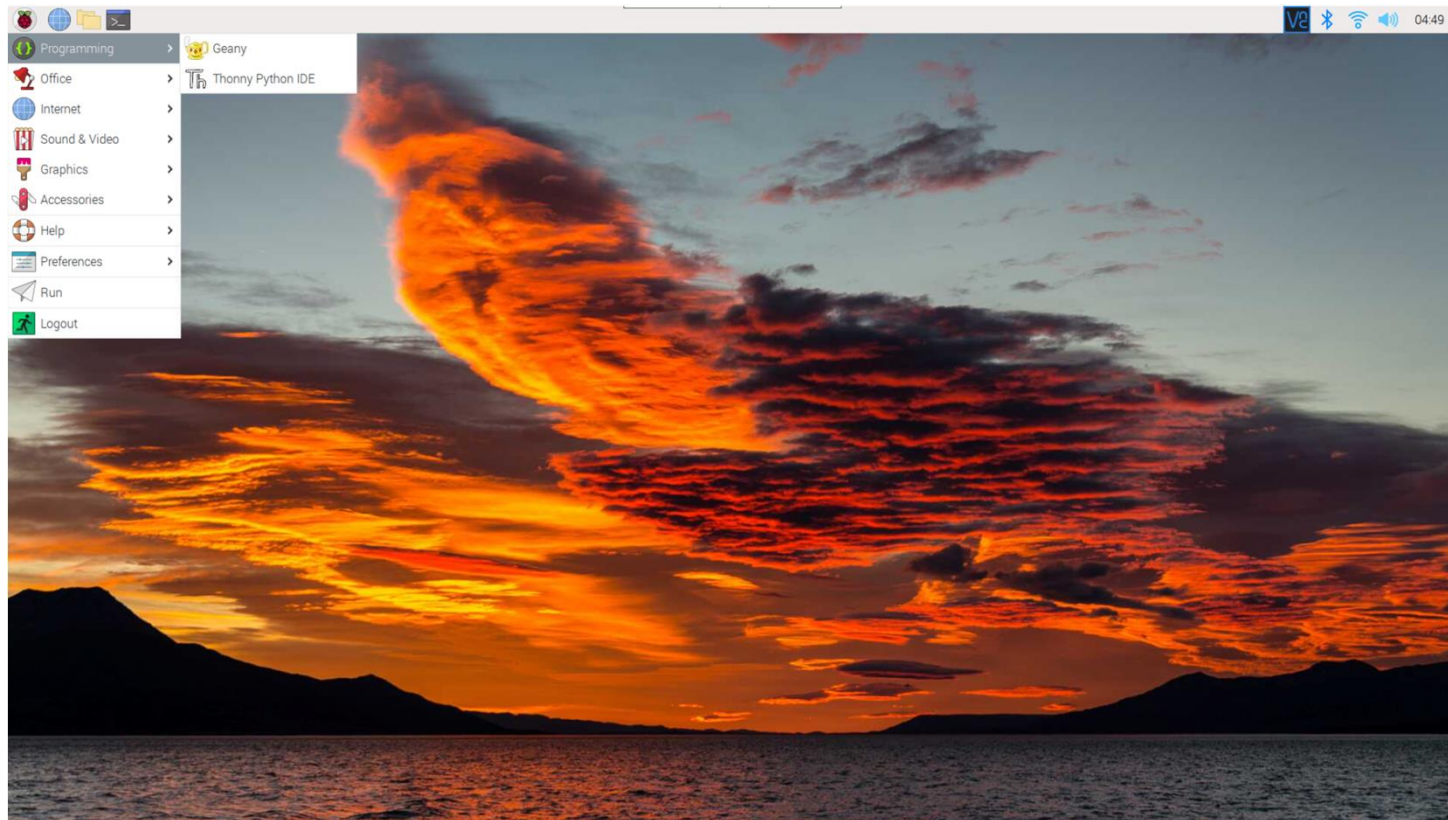
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Wiring



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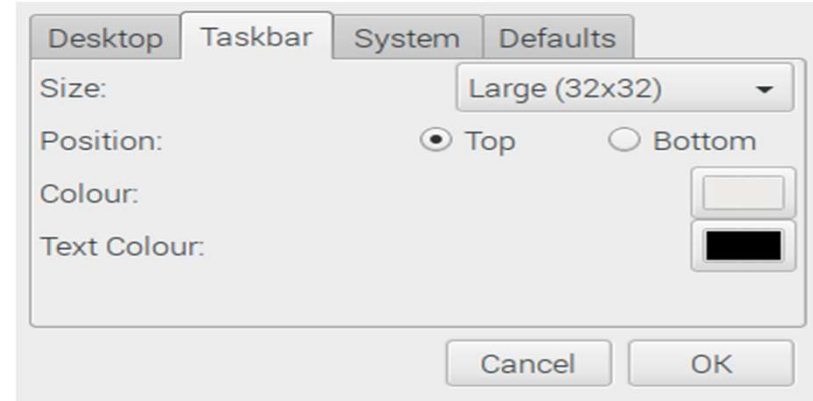
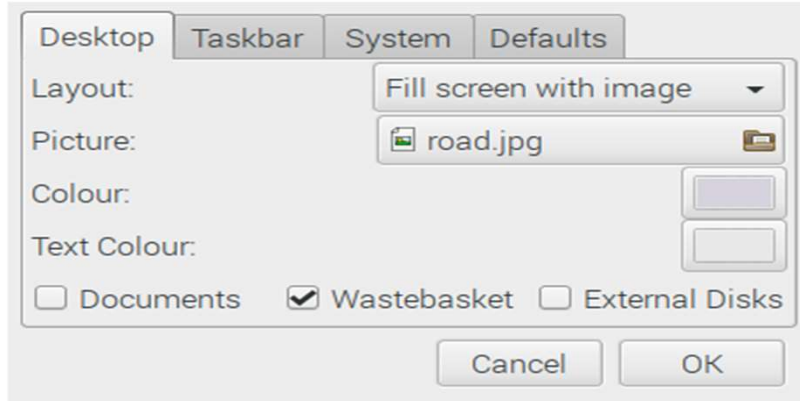
Rasbian Bullseye



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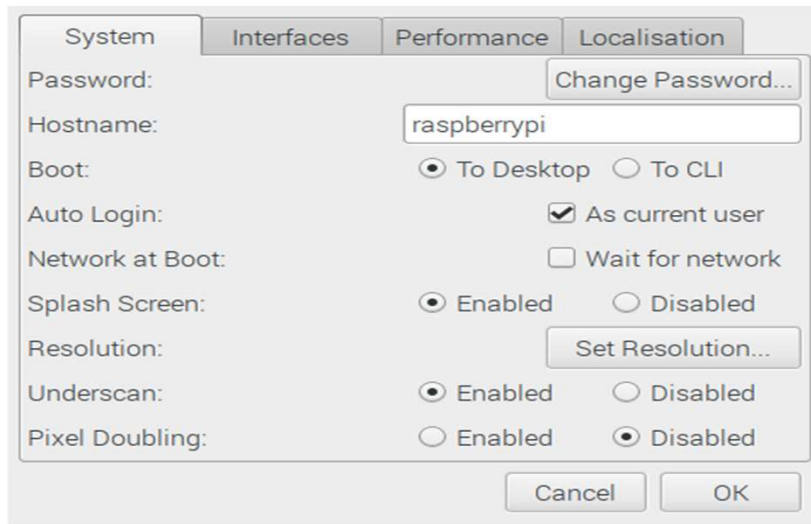
Appearance Settings

- [Menu] [Preferences] [Appearance Settings]



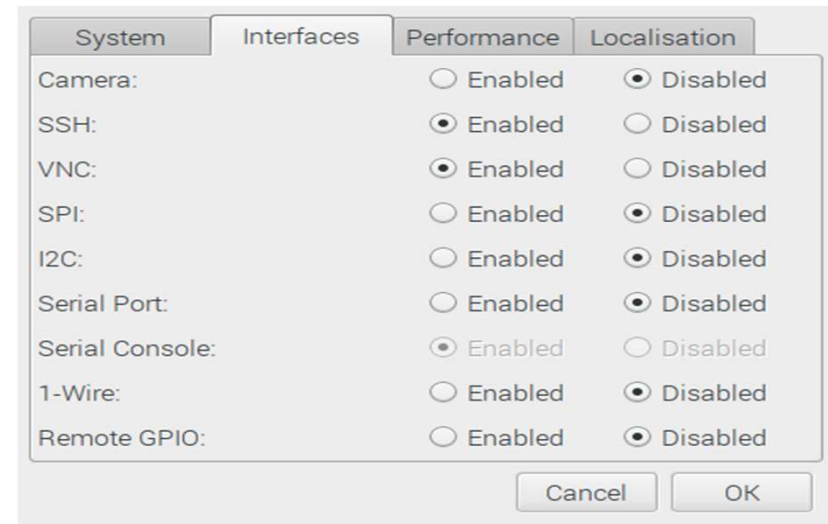
Raspberry Pi Configuration

- [Menu] [Preferences] [Raspberry Pi Configuration]



The image shows the 'System' tab of the Raspberry Pi Configuration window. It contains settings for Password, Hostname (raspberrypi), Boot (To Desktop), Auto Login (As current user), Network at Boot (Wait for network), Splash Screen (Enabled), Resolution (Set Resolution...), Underscan (Enabled), and Pixel Doubling (Disabled). Buttons for 'Change Password...', 'Set Resolution...', 'Cancel', and 'OK' are visible.

System	Interfaces	Performance	Localisation
Password:			Change Password...
Hostname:	raspberrypi		
Boot:	<input checked="" type="radio"/> To Desktop <input type="radio"/> To CLI		
Auto Login:	<input checked="" type="checkbox"/> As current user		
Network at Boot:	<input type="checkbox"/> Wait for network		
Splash Screen:	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled		
Resolution:	Set Resolution...		
Underscan:	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled		
Pixel Doubling:	<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled		
Cancel OK			

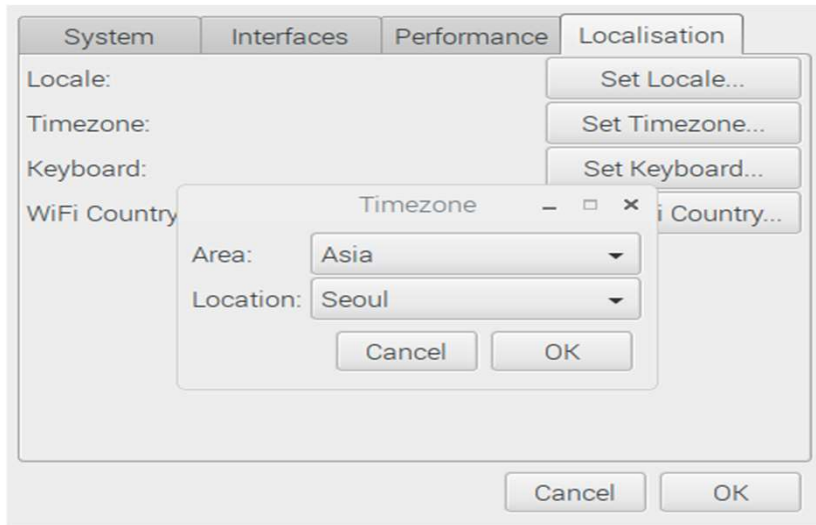


The image shows the 'Interfaces' tab of the Raspberry Pi Configuration window. It lists various interfaces with 'Enabled' and 'Disabled' radio button options. All interfaces are currently set to 'Disabled'.

System	Interfaces	Performance	Localisation
Camera:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled	
SSH:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled	
VNC:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled	
SPI:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled	
I2C:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled	
Serial Port:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled	
Serial Console:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled	
1-Wire:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled	
Remote GPIO:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled	
Cancel OK			



Localisation



ifconfig

- 유/무선 네트워크 확인
 - \$ ifconfig

```
File Edit Tabs Help
pi@raspberrypi:~ $ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.27 netmask 255.255.255.0 broadcast 192.168.1.255
    inet6 fe80::b39c:fbf3:7992:f924 prefixlen 64 scopeid 0x20<link>
    ether b8:27:eb:af:b2:9e txqueuelen 1000 (Ethernet)
    RX packets 3396 bytes 432751 (422.6 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 7163 bytes 8832330 (8.4 MiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

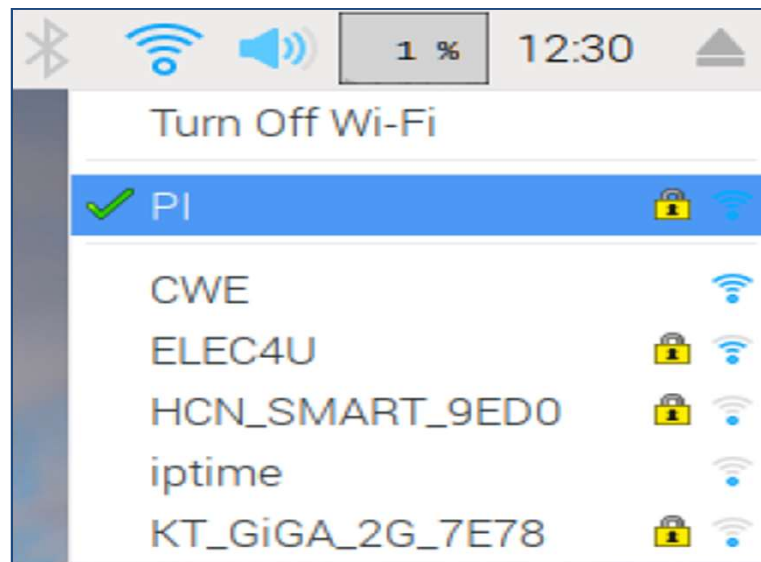
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 27 bytes 1768 (1.7 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 27 bytes 1768 (1.7 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 100.100.100.10 netmask 255.255.255.0 broadcast 100.100.100.255
    inet6 fe80::ba27:ebff:fefa:e7cb prefixlen 64 scopeid 0x20<link>
    ether b8:27:eb:fa:e7:cb txqueuelen 1000 (Ethernet)
    RX packets 10 bytes 1526 (1.4 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 81 bytes 11782 (11.5 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

pi@raspberrypi:~ $
```



WiFi 연결



iwconfig

```
File Edit Tabs Help
pi@raspberrypi:~ $ iwconfig
eth0      no wireless extensions.

lo        no wireless extensions.



wlan0     IEEE 802.11  ESSID:"PI"
          Mode:Managed  Frequency:2.452 GHz  Access Point: 90:9F:33:88:7D:06
          Bit Rate=65 Mb/s   Tx-Power=31 dBm
          Retry short limit:7   RTS thr:off   Fragment thr:off
          Power Management:on
          Link Quality=53/70  Signal level=-57 dBm
          Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
          Tx excessive retries:0  Invalid misc:0  Missed beacon:0

pi@raspberrypi:~ $
```



WiFi Static IP Set

{Wifi} Mouse Left [Wireless & Wired NetWork Setting]

Configure:  SSID  PI

☐ Automatically configure empty options

☐ Disable IPv6

IPv4 Address:

IPv6 Address:

Router:

DNS Servers:

DNS Search:



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/etc/dhcpd.conf

```
File Edit Search Options Help
static private

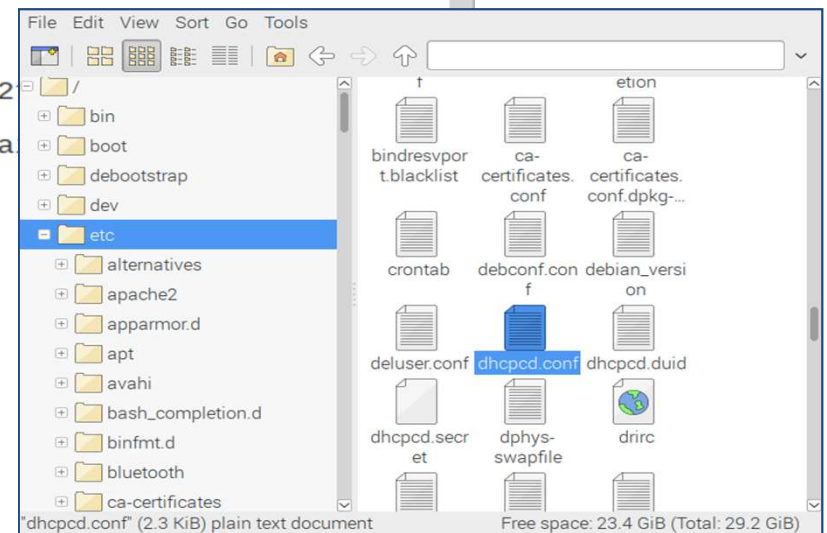
# Example static IP configuration:
#interface eth0
#static ip_address=192.168.0.10/24
#static ip6_address=fd51:42f8:caae:d92e::ff/64
#static routers=192.168.0.1
#static domain_name_servers=192.168.0.1 8.8.8.8 fd51:42f8:caae:d92e::ff/64

# It is possible to fall back to a static IP if DHCP fails
# define static profile
#profile static_eth0
#static ip_address=192.168.1.23/24
#static routers=192.168.1.1
#static domain_name_servers=192.168.1.1

# fallback to static profile on eth0
#interface eth0
#fallback static_eth0

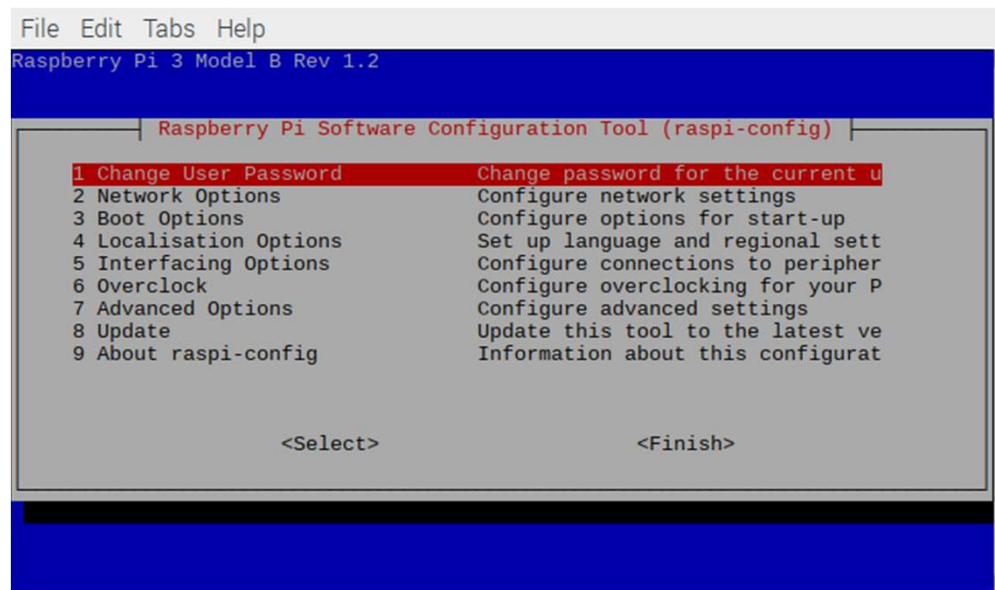
interface wlan0
noipv6

SSID PI
static ip_address=100.100.100.10/24
static routers=100.100.100.1
static domain_name_servers=100.100.100.1
static domain_search=
```

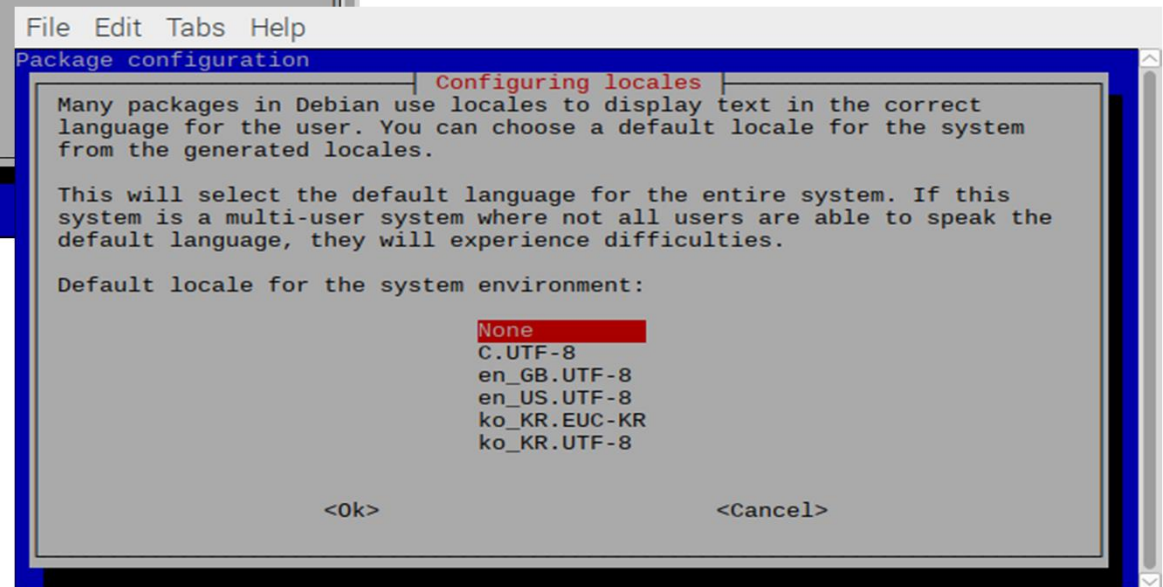
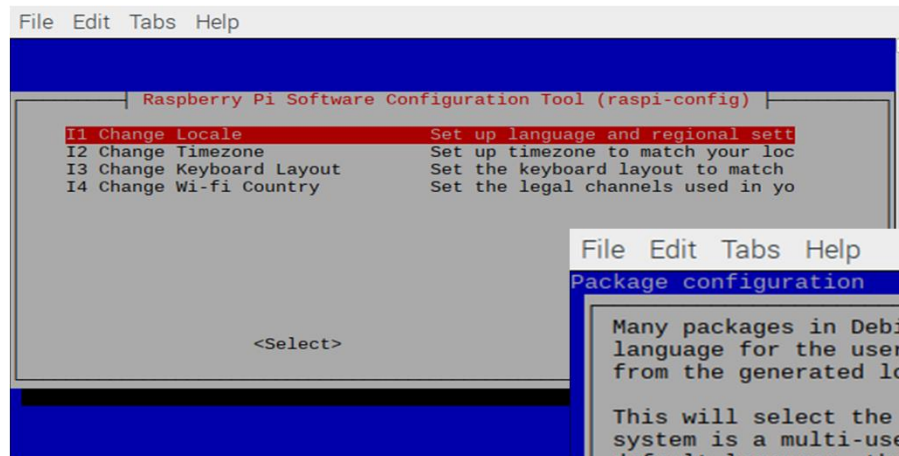


Raspberry Pi Configuration Tool

- `$ sudo raspi-config`



Change Local



sudo

- 유닉스 및 유닉스 계열 운영 체제에서 사용
- superuser do
- 다른 사용자의 보안 권한을 슈퍼유저로서 프로그램을 구동할 수 있도록 하는 프로그램
- sudo 를 사용할 수 있는 사용자와 권한 설정은 /etc/sudoers 파일에 지정



Basic Command

- X-window 실행
 - `$ startx`
- OS Version
 - `$ cat/proc/version`
- CPU Version
 - `$ cat/porc/cpuinfo`
- Firm version
 - `$ vcgencmd version`
- Firm Update
 - `$ sudo rpi-update`
- OS reboot
 - `$ sudo reboot`
 - `$ sudo shutdown -r now`
- OS Shutdown
 - `$ sudo halt`
 - `$ sudo shutdown -h now`



File System Command

- Change Direcory
 - \$ cd xxx
- List
 - \$ ls -a : 모든 파일
 - \$ ls -l : 추가정보 포함
 - \$ ls -d : 디렉토리
- Make directory
 - \$ mkdir xxx
- Remove
 - \$ rm -r xxx : 삭제
 - \$ rm -i xxx : 질의 후 삭제
- Copy
 - \$ cp fileA fileB
- Move
 - \$ mv fileA /home/otheruser/



Advanced Packaging Tool Command

- 우분투(Ubuntu)를 포함한 데비안(Debian)계열의 리눅스에서 쓰이는 패키지 관리 명령어 도구
- apt command
 - \$ sudo apt-get update
 - \$ sudo apt-get upgrade
 - \$ sudo apt-get install *packageName*
 - \$ sudo apt-get remove *packageName*
 - \$ sudo apt-get source *packageName*
 - \$ sudo apt-cache search *packageName*
 - \$ sudo apt-cache show *packageName*
- Package Index 정보 : /etc/apt/sources.list
- apt를 이용해서 설치된 deb패키지는 /var/cache/apt/archive/ 에 설치



Linux File System

