

\*\*\*\*\*Default\*\*\*\*\*

**Raspberry Pi 64 bit OS  
TensorFlow 2.8  
TensorFlow Lite 2.10  
Lazarus IDE (Ultibo Edition)  
2.5.123-082722-64bit  
Ultibo\_Projects Bare Metal**

**Openocd  
QEMU 6.2  
Pico-SDK 1.4  
Pico WIFI Development Environment  
WireShark  
nmap  
Octave  
MQTT**

**Ultibo\_Projects/Pauls-ultibo-mqtt  
Ultibo\_Projects/Pauls-ultibo-mqtt RPi3 RPi2 QEMU  
KiCad picoprobe-pcb  
rp2040-freeros-projects  
klt-feature-detect  
minicom  
pico-sdk C/C++  
11/07/22**

\*\*\*\*\*Default\*\*\*\*\*

All the documents and images used to document were done with the software on the Rpi

sudo su

cd /etc

```
cp hostname hostname.orig
diff hostname hostname.orig
1c1
< pi4-37
---
> raspberrypi
cp dphys-swapfile dphys-swapfile.orig
diff dphys-swapfile dphys-swapfile.orig
16c16
< CONF_SWAPSIZE=1000
---
> CONF_SWAPSIZE=100
```

fetch pkg installers

```
scp -r pi4-27:~/xx/my-projects-docs/pkg* .
```

```
dpkg -l | sort > pkgs.txt
```

```
cp pkg-install-scripts/ex* .
```

adds first set of packages

```
./extra_pkgs_64bit.sh
```

```
dpkg -l | sort > pkgs-a.txt
```

```
cp pkg-install-scripts/tensorflow/ex* .
```

adds 2nd set of packages

```
./extra-1.sh
```

```
dpkg -l | sort > pkgs-b.txt
```

```
./extra-2.sh
```

```
dpkg -l | sort > pkgs-c.txt
```

```
./extra-3.sh
```

```
dpkg -l | sort > pkgs-d.txt
```

```
./extra-4.sh
```

```
dpkg -l | sort > pkgs-e.txt
```

This is the software to program the picos with SWD

```
installed-openocd082722-228ede-64bit.img
```

```
openocd082722-228ede-64bit.img
```

Bare Metal for Raspbery Pi

```
ultibo2.5.123-082722-64bit.img
```

```
sudo unsquashfs -d ultibo ultibo2.5.123-082722-64bit.img
```

```
qemu-6.2.0-rpios-64bit.img
```

```
sudo unsquashfs -d qemu-6.2.0-rpios qemu-6.2.0-rpios-64bit.img
```

```
git clone https://github.com/develone/Ultibo_Projects.git
```

```
cd Ultibo_Projects/jpeg2000/src/
```

```
./compile_ultibo.sh
```

```
cd ../QEMU/
```

```
./libbuild.sh
```

```
vi ~/.local/share/applications/ultibo.desktop
```

[Desktop Entry]

```

Name=Lazarus IDE (Ultibo Edition)
Comment=A free pascal platform for bare metal development
Exec=/home/devel/ultibo/core/lazarus.sh
Icon=/home/devel/ultibo/core/images/icons/lazarus.ico
Terminal=false
Type=Application
Categories=Development;IDE;
X-Desktop-File-Install-Version=0.26
scrot -d 3 -s qemujpeg.png
scrot -d 3 -s qemujpeg-1.png
. ~/Ultibo_Projects/picoultibo.sh
/home/devel/ultibo/core:/home/devel/qemu-6.2.0-rpios/bin:/home/devel/local/openocd/bin:/home/
devel/picotool/build:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/local/games:/
usr/games

./startqemu.sh

```

This is what is used to program pico's with SWD.

```

cd ~/
mkdir local
sudo unsquashfs -d local/openocd/ installed-openocd082722-228ede-64bit.img
Parallel unsquashfs: Using 4 processors
800 inodes (950 blocks) to write

```

```

[=====] 950/950
100%

```

```

created 800 files
created 33 directories
created 0 symlinks
created 0 devices
created 0 fifos
which openocd
/home/devel/local/openocd/bin/openocd
openocd -V
Open On-Chip Debugger 0.11.0-g228ede4-dirty (2022-08-27-19:45)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
openocd: invalid option -- 'V'

```

```

curl https://pyenv.run | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload  Total  Spent    Left  Speed
100 270 100 270    0    0  704    0 --:--:-- --:--:-- --:--:--  703
Cloning into '/home/devel/.pyenv'...
remote: Enumerating objects: 1007, done.
remote: Counting objects: 100% (1007/1007), done.
remote: Compressing objects: 100% (436/436), done.
remote: Total 1007 (delta 581), reused 707 (delta 442), pack-reused 0
Receiving objects: 100% (1007/1007), 495.52 KiB | 3.02 MiB/s, done.
Resolving deltas: 100% (581/581), done.

```

```
Cloning into '/home/devel/.pyenv/plugins/pyenv-doctor'...
remote: Enumerating objects: 11, done.
remote: Counting objects: 100% (11/11), done.
remote: Compressing objects: 100% (9/9), done.
remote: Total 11 (delta 1), reused 5 (delta 0), pack-reused 0
Receiving objects: 100% (11/11), 38.72 KiB | 777.00 KiB/s, done.
Resolving deltas: 100% (1/1), done.
Cloning into '/home/devel/.pyenv/plugins/pyenv-installer'...
remote: Enumerating objects: 16, done.
remote: Counting objects: 100% (16/16), done.
remote: Compressing objects: 100% (13/13), done.
remote: Total 16 (delta 1), reused 7 (delta 0), pack-reused 0
Receiving objects: 100% (16/16), 5.88 KiB | 2.94 MiB/s, done.
Resolving deltas: 100% (1/1), done.
Cloning into '/home/devel/.pyenv/plugins/pyenv-update'...
remote: Enumerating objects: 10, done.
remote: Counting objects: 100% (10/10), done.
remote: Compressing objects: 100% (6/6), done.
remote: Total 10 (delta 1), reused 6 (delta 0), pack-reused 0
Receiving objects: 100% (10/10), done.
Resolving deltas: 100% (1/1), done.
Cloning into '/home/devel/.pyenv/plugins/pyenv-virtualenv'...
remote: Enumerating objects: 63, done.
remote: Counting objects: 100% (63/63), done.
remote: Compressing objects: 100% (55/55), done.
remote: Total 63 (delta 11), reused 28 (delta 1), pack-reused 0
Receiving objects: 100% (63/63), 38.44 KiB | 2.75 MiB/s, done.
Resolving deltas: 100% (11/11), done.
Cloning into '/home/devel/.pyenv/plugins/pyenv-which-ext'...
remote: Enumerating objects: 10, done.
remote: Counting objects: 100% (10/10), done.
remote: Compressing objects: 100% (6/6), done.
remote: Total 10 (delta 1), reused 6 (delta 0), pack-reused 0
Receiving objects: 100% (10/10), done.
Resolving deltas: 100% (1/1), done.
```

WARNING: seems you still have not added 'pyenv' to the load path.

```
# Load pyenv automatically by appending
# the following to
~/.bash_profile if it exists, otherwise ~/.profile (for login shells)
and ~/.bashrc (for interactive shells) :

export PYENV_ROOT="$HOME/.pyenv"
command -v pyenv >/dev/null || export PATH="$PYENV_ROOT/bin:$PATH"
eval "$(pyenv init -)"

# Restart your shell for the changes to take effect.

# Load pyenv-virtualenv automatically by adding
# the following to ~/.bashrc:
```

```
eval "$(pyenv virtualenv-init -)"
```

These steps save a lot of time installing a lot of python code.

```
tensorflow
```

```
test-1-2.8.img
```

```
sudo unsquashfs -d test-1-2.8 test-1-2.8.img
```

This setup virtual environment

```
cd test-1-28
```

```
devel@pi4-37:~/test-1-2.8 $ python3 -m venv env
```

```
devel@pi4-37:~/test-1-2.8 $ source env/bin/activate
```

```
(env) devel@pi4-37:~/test-1-2.8 $
```

```
devel@pi4-37:~/test-1-2.8 $ ipython3 Copy_of_train_hello_world_model.ipynb
```

```
0x01, 0x00, 0x00, 0x00, 0x1f, 0x00, 0x00, 0x00, 0x73, 0x65, 0x72, 0x76,  
0x69, 0x6e, 0x67, 0x5f, 0x64, 0x65, 0x66, 0x61, 0x75, 0x6c, 0x74, 0x5f,  
0x64, 0x65, 0x6e, 0x73, 0x65, 0x5f, 0x32, 0x5f, 0x69, 0x6e, 0x70, 0x75,  
0x74, 0x3a, 0x30, 0x00, 0x02, 0x00, 0x00, 0x00, 0x01, 0x00, 0x00, 0x00,  
0x01, 0x00, 0x00, 0x00, 0x0c, 0x00, 0x0c, 0x00, 0x00, 0x00, 0x00, 0x00,  
0x04, 0x00, 0x08, 0x00, 0x0c, 0x00, 0x00, 0x00, 0x14, 0x00, 0x00, 0x00,  
0x04, 0x00, 0x00, 0x00, 0x01, 0x00, 0x00, 0x00, 0x80, 0xff, 0xff, 0xff,  
0xff, 0xff, 0xff, 0xff, 0x01, 0x00, 0x00, 0x00, 0x5d, 0x4f, 0xc9, 0x3c,  
0x04, 0x00, 0x04, 0x00, 0x04, 0x00, 0x00, 0x00
```

```
};
```

```
unsigned int g_model_len = 2408;
```

```
(env) devel@pi4-37:~/test-1-2.8 $ exec $SHELL
```

```
tensorflow lite
```

```
sudo unsquashfs -d project-rpi-tflite project-rpi-tflite102222.img
```

add to the end of ~/.bashrc

```
export PICO_SDK_PATH=/home/devel/sdk/pico-sdk
```

```
export PATH="$HOME/.pyenv/bin:$PATH"
```

```
eval "$(pyenv init --path)"
```

```
eval "$(pyenv virtualenv-init -)"
```

```
mkdir sdk
```

```
cd sdk
```

This is when the repo is yours.

```
git clone git@github.com:develone/pico-sdk.git
```

With this you can not push changes.

```
git clone https://github.com/develone/pico-sdk.git
```

```
cd pico-sdk/
```

```
git submodule update --init
```

Submodule 'lib/cyw43-driver' (<https://github.com/georgerobotics/cyw43-driver.git>) registered for path 'lib/cyw43-driver'

```
Submodule 'lib/lwip' (https://github.com/lwip-tcpip/lwip.git) registered for path 'lib/lwip'
Submodule 'tinyusb' (https://github.com/hathach/tinyusb.git) registered for path 'lib/tinyusb'
Cloning into '/home/devel/sdk/pico-sdk/lib/cyw43-driver'...
Cloning into '/home/devel/sdk/pico-sdk/lib/lwip'...
Cloning into '/home/devel/sdk/pico-sdk/lib/tinyusb'...
Submodule path 'lib/cyw43-driver': checked out '195dfcc10bb6f379e3dea45147590db2203d3c7b'
Submodule path 'lib/lwip': checked out '239918ccc173cb2c2a62f41a40fd893f57faf1d6'
Submodule path 'lib/tinyusb': checked out '4bfab30c02279a0530e1a56f4a7c539f2d35a293'
```

```
cd ../../
```

This is when the repo is yours.

```
git clone git@github.com:develone/devel-pico-tflmicro.git
git clone https://github.com/develone/devel-pico-tflmicro.git
cd devel-pico-tflmicro
mkdir build
cd build
cmake -DPICO_BOARD=pico .. about 4 hours
Using PICO_SDK_PATH from environment ('/home/devel/sdk/pico-sdk')
PICO_SDK_PATH is /home/devel/sdk/pico-sdk
Defaulting PICO_PLATFORM to rp2040 since not specified.
Defaulting PICO platform compiler to pico_arm_gcc since not specified.
-- Defaulting build type to 'Release' since not specified.
PICO compiler is pico_arm_gcc
-- The C compiler identification is GNU 8.3.1
-- The CXX compiler identification is GNU 8.3.1
-- The ASM compiler identification is GNU
-- Found assembler: /usr/bin/arm-none-eabi-gcc
Build type is Release
PICO target board is pico.
Using board configuration from /home/devel/sdk/pico-sdk/src/boards/include/boards/pico.h
-- Found Python3: /usr/bin/python3.9 (found version "3.9.2") found components: Interpreter
TinyUSB available at /home/devel/sdk/pico-sdk/lib/tinyusb/src/portable/raspberrypi/rp2040;
enabling build support for USB.
cyw43-driver available at /home/devel/sdk/pico-sdk/lib/cyw43-driver
lwIP available at /home/devel/sdk/pico-sdk/lib/lwip
-- Configuring done
-- Generating done
-- Build files have been written to: /home/devel/devel-pico-tflmicro/build
make this will take about 4 hours
```

```
-rw-r--r-- 1 devel devel 1788264 Oct 25 22:10 libpico-tflmicro.a
-rw-r--r-- 1 devel devel 234456 Oct 25 21:46 libpico-tflmicro_test.a
```

```
./pico-sdk/src/rp2_common/boot_stage2/bs2_default.elf
./examples/micro_speech/command_responder_test.elf
./examples/micro_speech/audio_provider_mock_test.elf
./examples/micro_speech/audio_provider_test.elf
./examples/micro_speech/recognize_commands_test.elf
./examples/magic_wand/magic_wand.elf
./examples/magic_wand/gesture_output_handler_test.elf
./examples/magic_wand/magic_wand_test.elf
```

```
./examples/magic_wand/gesture_predictor_test.elf
./examples/hello_world/hello_world.elf
```

This is when the repo is yours.

```
git clone git@github.com:develone/my-projects-docs.git
git clone https://github.com/develone/my-projects-docs.git
```

This project uses cmake Important to understand cmake the source code is 1 level above build.

This is when the repo is yours.

```
git clone https://github.com/develone/pico-examples -b dev
cd pico-examples
mkdir build
```

This is when the repo is yours. -b dev is branch dev

```
git clone --recursive git@github.com:develone/rp2040-freertos-project.git -b dev
git clone --recursive https://github.com/develone/rp2040-freertos-project.git -b dev
cd rp2040-freertos-project/
mkdir build
cd build
```

```
cmake -DPICO_BOARD=pico ..
```

Using PICO\_SDK\_PATH from environment ('/home/devel/sdk/pico-sdk')

PICO\_SDK\_PATH is /home/devel/sdk/pico-sdk

Defaulting PICO\_PLATFORM to rp2040 since not specified.

Defaulting PICO platform compiler to pico\_arm\_gcc since not specified.

-- Defaulting build type to 'Release' since not specified.

PICO compiler is pico\_arm\_gcc

-- The C compiler identification is GNU 8.3.1

-- The CXX compiler identification is GNU 8.3.1

-- The ASM compiler identification is GNU

-- Found assembler: /usr/bin/arm-none-eabi-gcc

Build type is Release

PICO target board is pico.

Using board configuration from /home/devel/sdk/pico-sdk/src/boards/include/boards/pico.h

-- Found Python3: /home/devel/test-1-2.8/env/bin/python3.9 (found version "3.9.2") found components: Interpreter

TinyUSB available at /home/devel/sdk/pico-sdk/lib/tinyusb/src/portable/raspberrypi/rp2040; enabling build support for USB.

cyw43-driver available at /home/devel/sdk/pico-sdk/lib/cyw43-driver

lwIP available at /home/devel/sdk/pico-sdk/lib/lwip

-- Configuring done

-- Generating done

-- Build files have been written to: /home/devel/rp2040-freertos-project/build  
make

The elf files are loaded with openocd

```
. ~/Ultibo/picoulitibo.sh
```

this program a file system performs either klt or dwt lifting step,

```

openocd -f interface/raspberrypi-swd.cfg -f target/rp2040.cfg -c "program test-read-crc16/test-read-
crc16.elf verify reset exit"
ls ../doc lots of documentation
ls ../doc/rp2040-logic-analyzer/rp2040-logic-analyzer.pdf
qpdfview ../doc/rp2040-logic-analyzer/rp2040-logic-analyzer.pdf
./first_pwm/50_pwm.elf
./pico-lifting/pico-lifting.elf
./ultibo_blink/ultibo_blink.elf
./rp2040-logic-analyzer/rp2040-logic-analyzer.elf
./Scheduling/Scheduling.elf
./pico-sdk/src/rp2_common/boot_stage2/bs2_default.elf
./pico-littlefs/e-rw-r--r-- 1 devel devel 1788264 Oct 25 22:10 libpico-tflmicro.a
-rw-r--r-- 1 devel devel 234456 Oct 25 21:46 libpico-tflmicro_test.axample0.elf
./pico-littlefs/example2.elf
./pico-littlefs/example1.elf
./pico-ultibo/pico-ultibo.elf
./test-read/test-read.elf
./ProjectFiles/blink.elf
./kldwt-ultibo/kldwt-ultibo.elf
./2tasks/2tasks.elf
./2cores/multicore.elf
./pico-lifting-sf/hello_usb.elf
./test-read-crc16/test-read-crc16.elf
./Mutex/Mutex.elf
./HCSR04/HCSR04.elf
./Semaphore/Semaphore.elf
./klt-test/klt-test.elf

```

This needed for octave

```

.octaverc
graphics_toolkit("gnuplot");

```

```

https://github.com/develone/svd_rgb.git
cd svd_rgb/src/
devel@pi4-37:~/svd_rgb/src $ make
gcc -c -o obj/svd.o svd.c -I../include
gcc -c -o obj/disp_mat.o disp_mat.c -I../include
gcc -c -o obj/mul_mat.o mul_mat.c -I../include
gcc -c -o obj/pnmio.o pnmio.c -I../include
gcc -c -o obj/error.o error.c -I../include
gcc -c -o obj/mythread.o mythread.c -I../include
gcc -c -o obj/trans_mat.o trans_mat.c -I../include
gcc -c -o obj/master.o master.c -I../include
gcc -o master obj/svd.o obj/disp_mat.o obj/mul_mat.o obj/pnmio.o obj/error.o obj/mythread.o
obj/trans_mat.o obj/master.o -I../include -lm -lpthread

./master

```

```

octave
In a 2nd shell

```



```
scrot -d 3 -s redpgm.png
```

```
scrot -d 3 -s rcblu.png
```

```
scrot -d 3 -s rcblu-1.png
```

```
quit
```

```
git clone https://github.com/ArduCAM/pico-tflmicro.git
```

```
Cloning into 'pico-tflmicro'...
```

```
remote: Enumerating objects: 1812, done.
```

```
remote: Counting objects: 100% (106/106), done.
```

```
remote: Compressing objects: 100% (47/47), done.
```

```
remote: Total 1812 (delta 73), reused 59 (delta 59), pack-reused 1706
```

```
Receiving objects: 100% (1812/1812), 13.92 MiB | 14.64 MiB/s, done.
```

```
Resolving deltas: 100% (950/950), done.
```

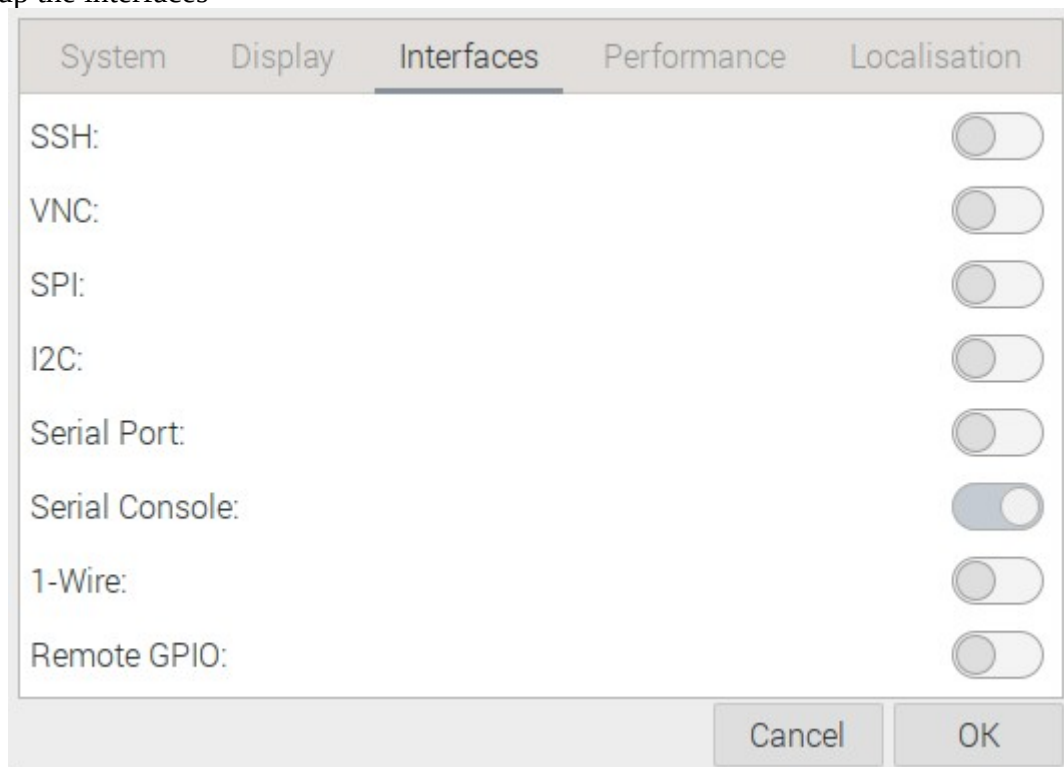
\$30.00 at Amazon

```
devel@pi4-37:~/pico-tflmicro/bin
```

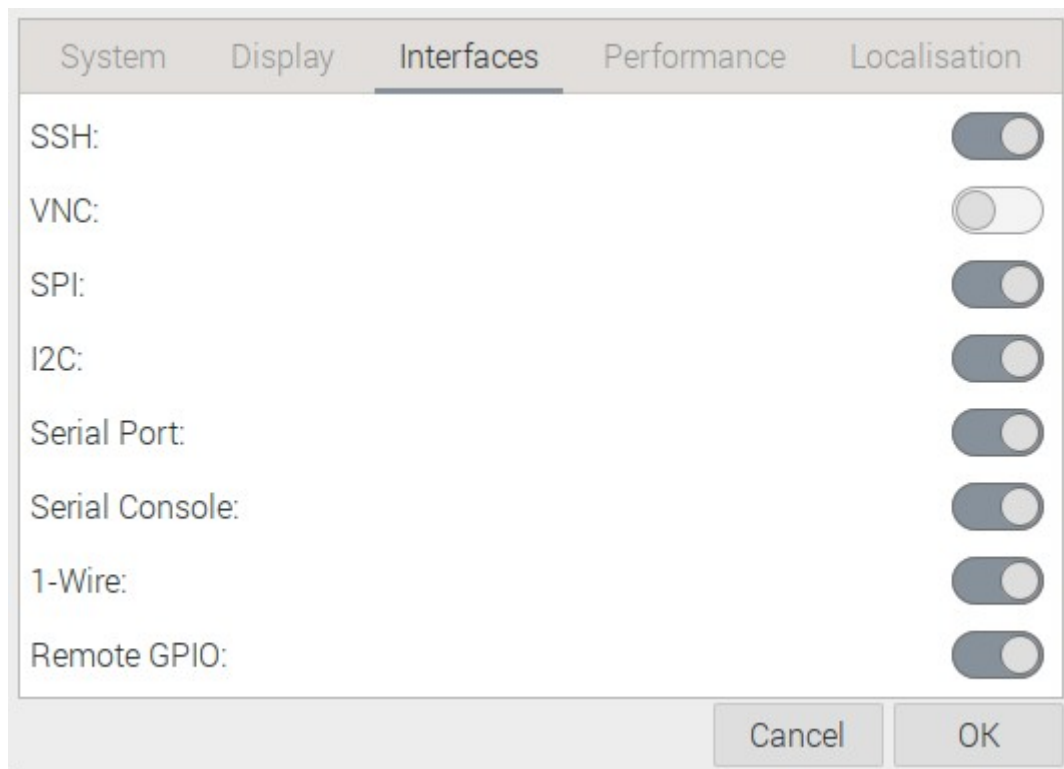
```
magic_wand_ble.uf2 person_detection_benchmark.uf2 pico4ml_ble_magic_wand.uf2
```

```
micro_speech.uf2 person_detection_int8.uf2 pico4ml_magic_wand.uf2
```

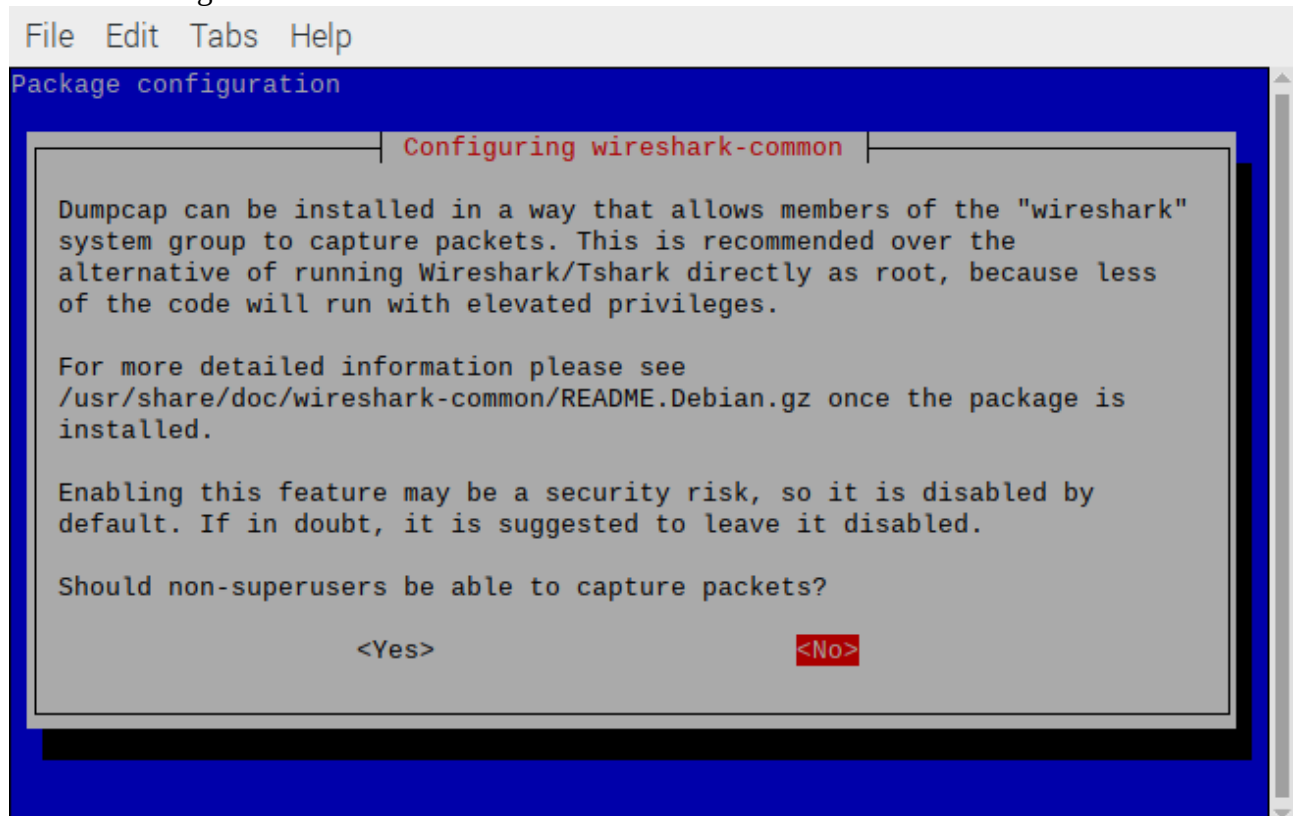
Setting up the interfaces



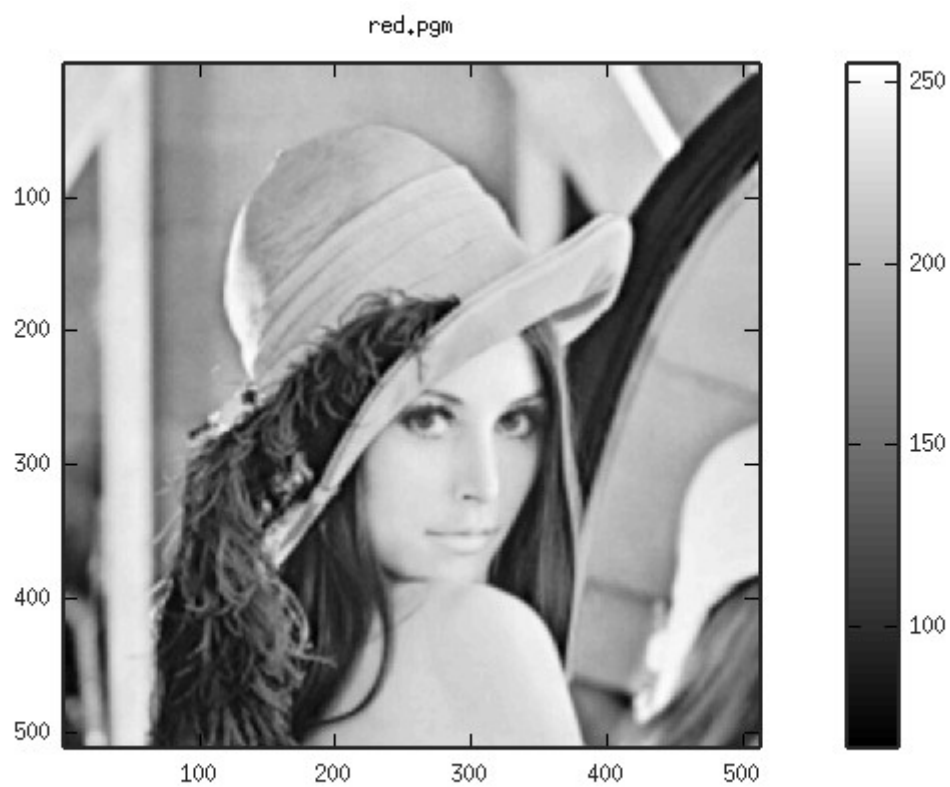
Setting up the interfaces



When installing

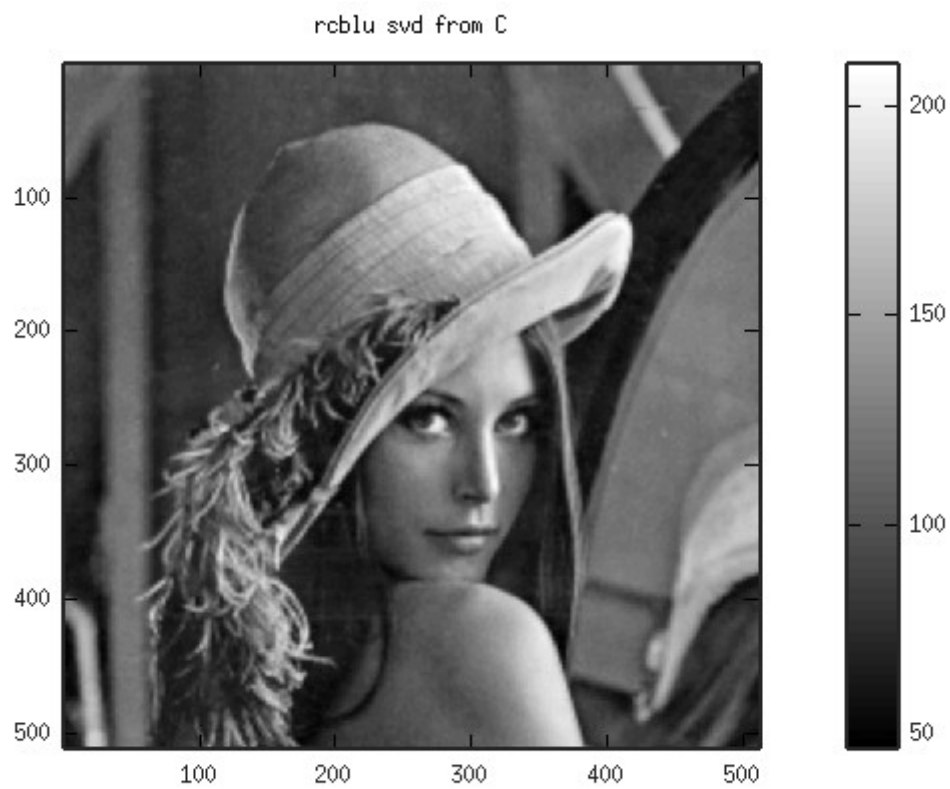


svd\_rgb



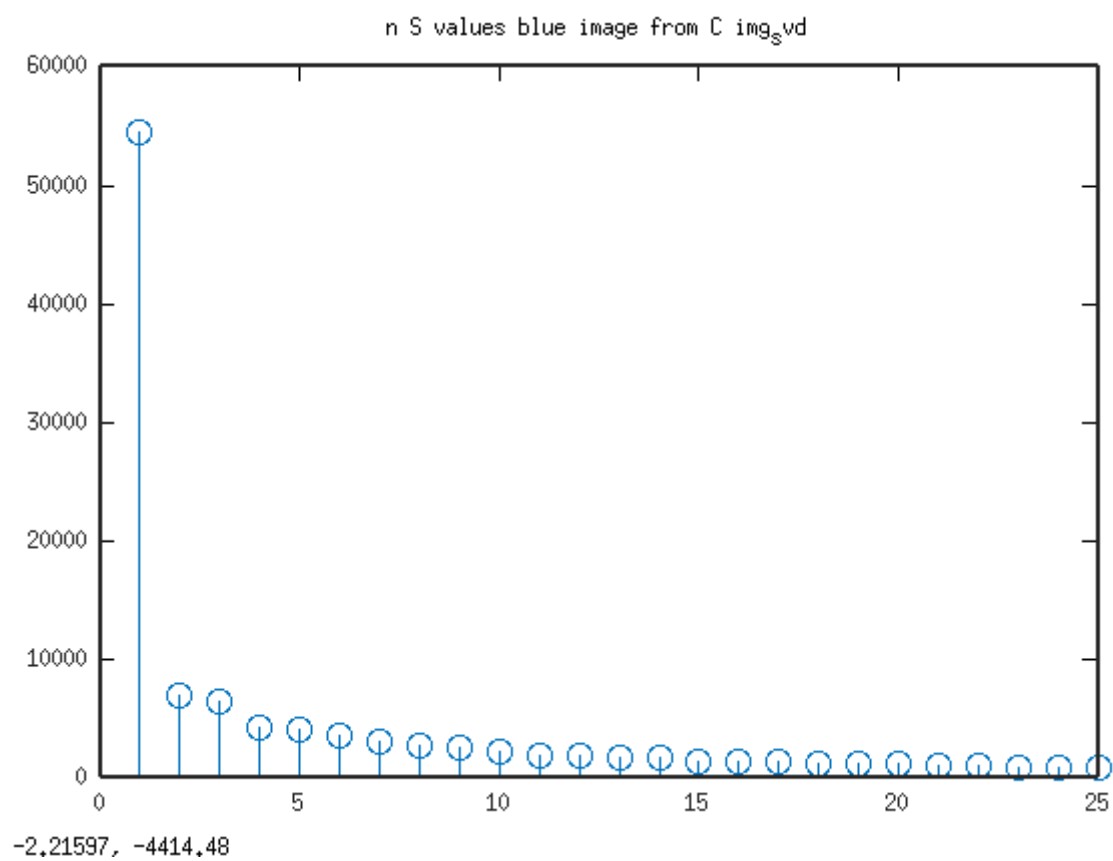
$\chi^2 = 230.686$

reconstructed



$\chi^2 = 23.8538$

svd



Arducam PicoML

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← → ↻

https://www.google.com/search?client=firefox-b-1-e&q=arducam+pico4ml

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About 10,100 results (0.43 seconds)

https://www.arducam.com › Raspberry Pi Pico

**Arducam Pico4ML TinyML Dev Kit: RP2040 Board w**


Arducam Pico4ML Specifications · Microcontroller: Raspberry Pi RP2040 · IMU: ICM-20948 (low power) · Mono channel microphone w/ direct PCM output · Camera Module: ...



https://www.arducam.com › pico4ml-an-rp2040-based-...

**Pico4ML: Raspberry Pi RP2040 Based Board for Machine**

...  
Mar 5, 2021 — The single-board microcontroller – powered by Raspberry Pi's RP2040 chip – to support all Tensorflow Lite Micro tiny machine learning examples ...




https://www.amazon.com › Arducam-Pico4ML-TinyM...


**Arducam Pico4ML TinyML Dev Kit, RP2040 Board w ...**

Arducam Pico4ML is a microcontroller dev board based on the Raspberry Silicon (RP2040 chip), exclusively for running and training machine learning examples.  
Camera Module: HiMax HM01B0, Up to ... Board Size: 2" x 0.83" ( 51mm x 21m...


★★★★★ Rating: 4.5 · 13 reviews · \$29.99




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Arducam Mini




ArduCam



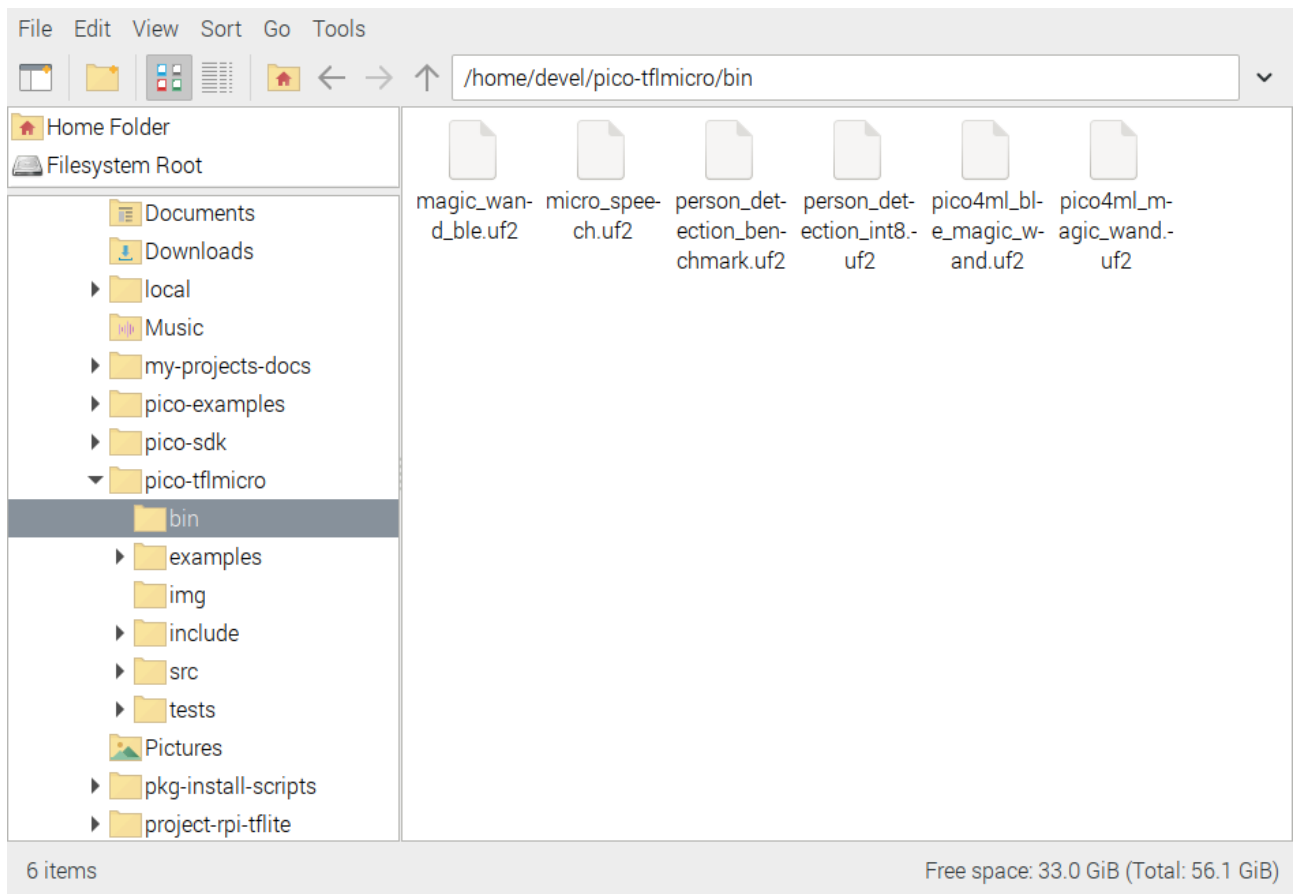
Arducam



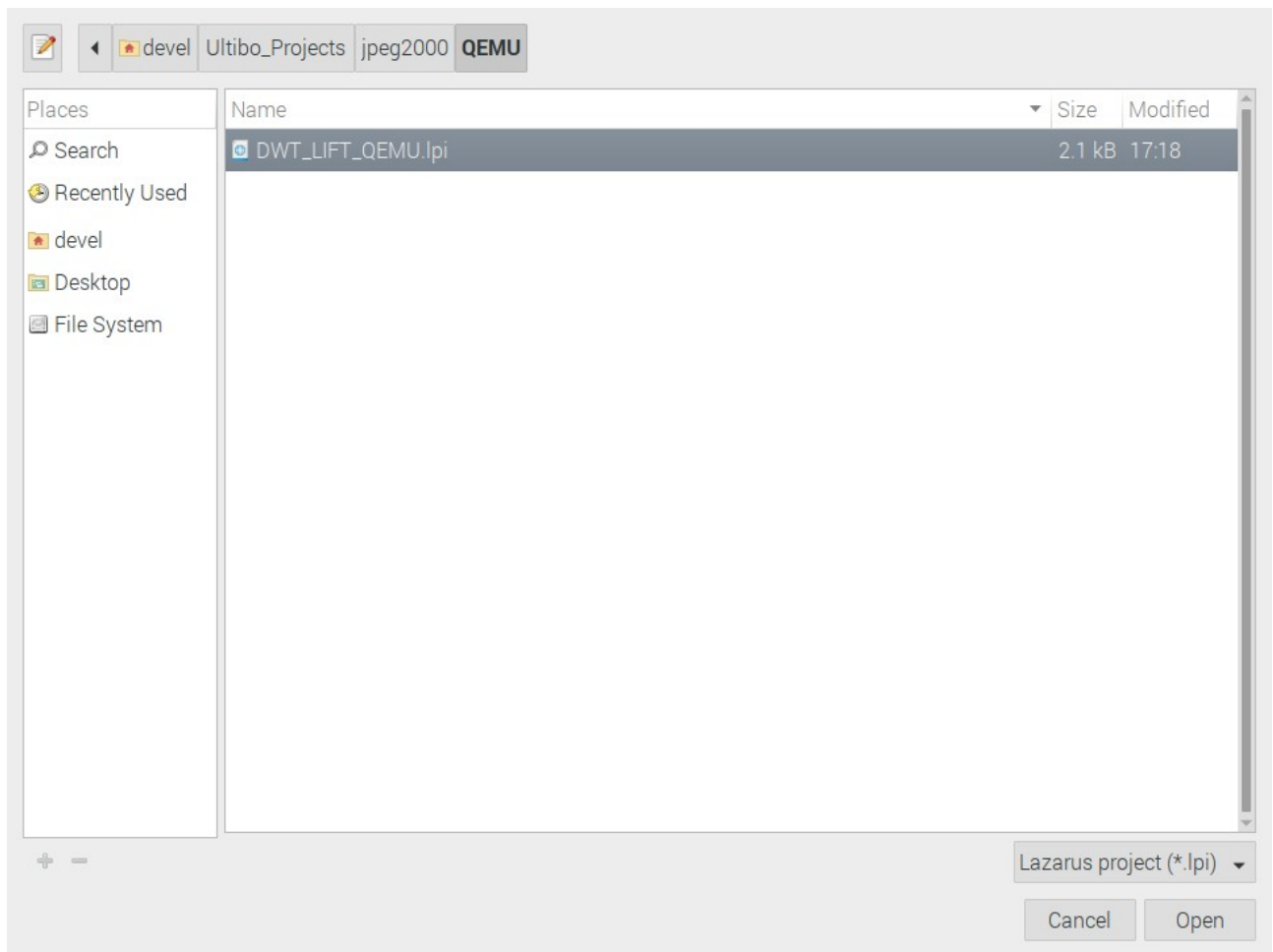
Arducam



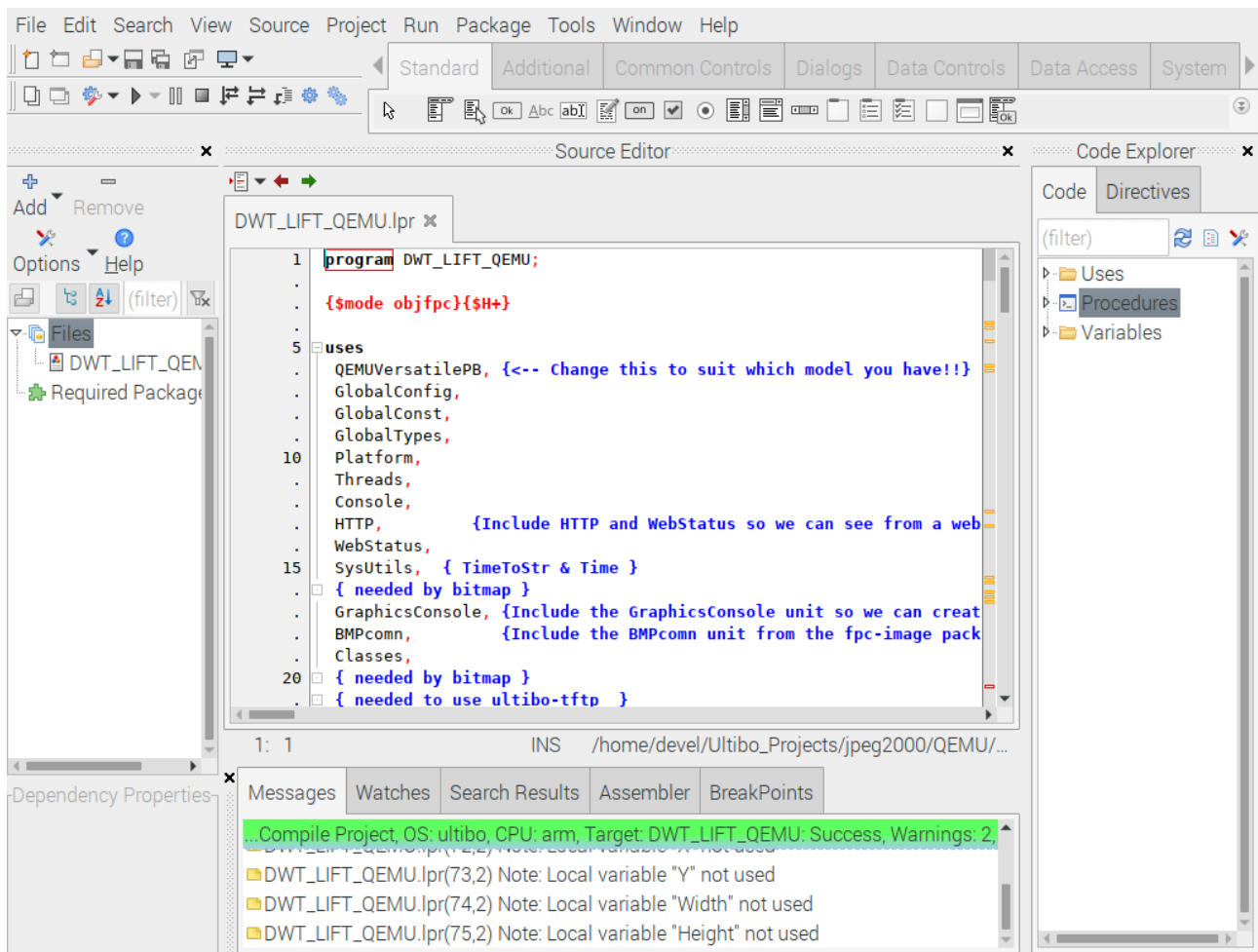
UF2



QEMU



QEMU



QEMU





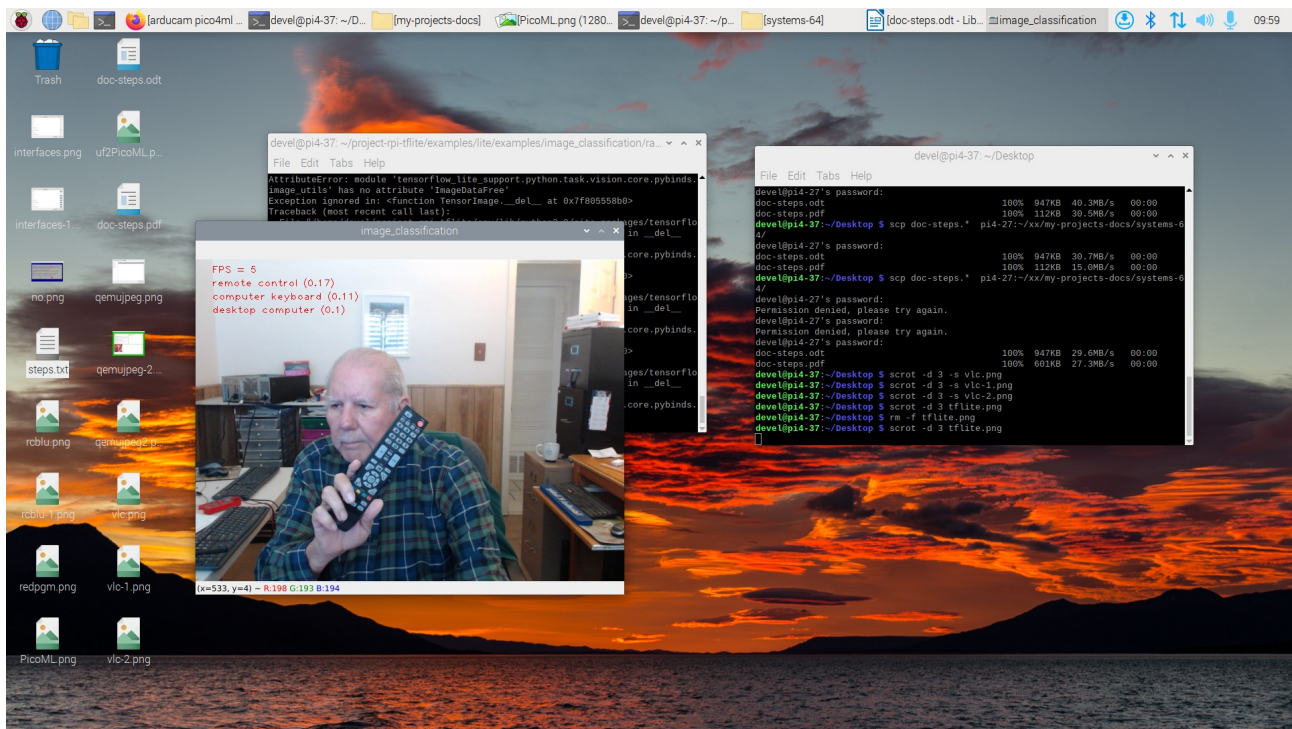
Starting here will be in an update.

```
cd ~/project-rpi-tflite/  
python3 -m venv env  
source env/bin/activate  
(env) devel@pi4-37:~/project-rpi-tflite $
```

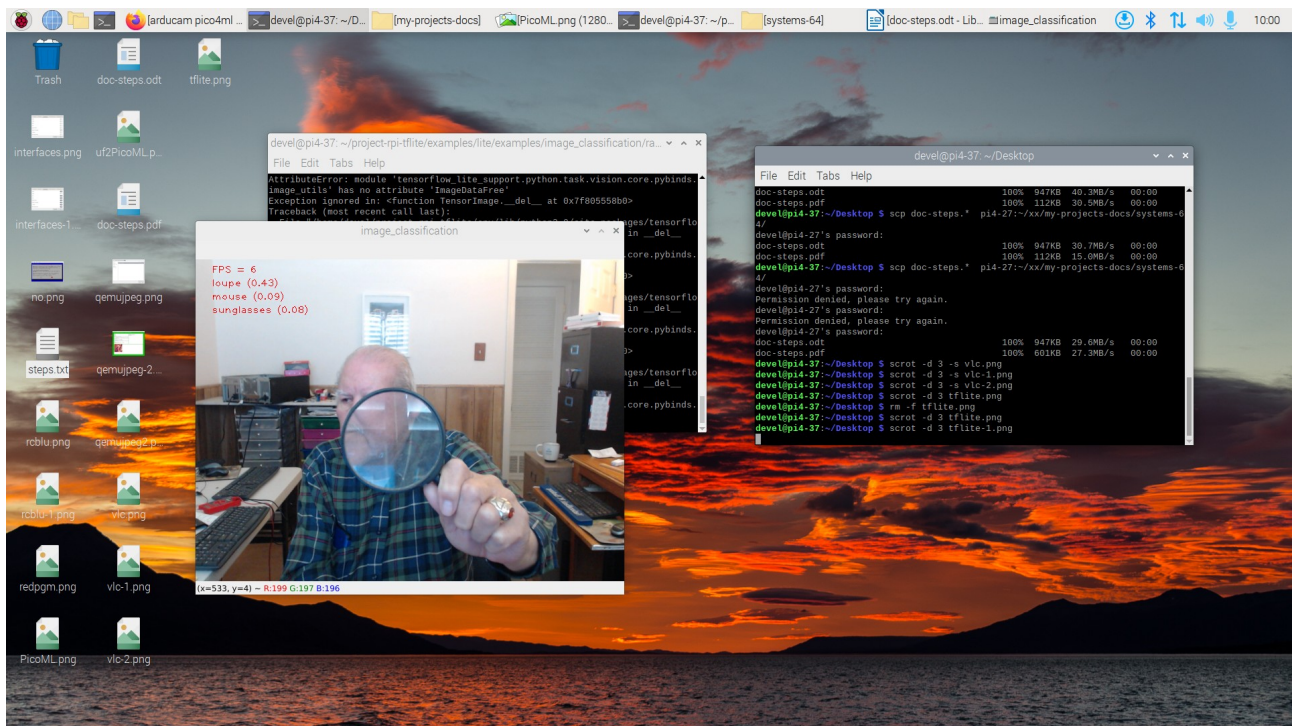
```
cd examples/lite/examples/image_classification/raspberry_pi/
```

```
python3 classify.py
```

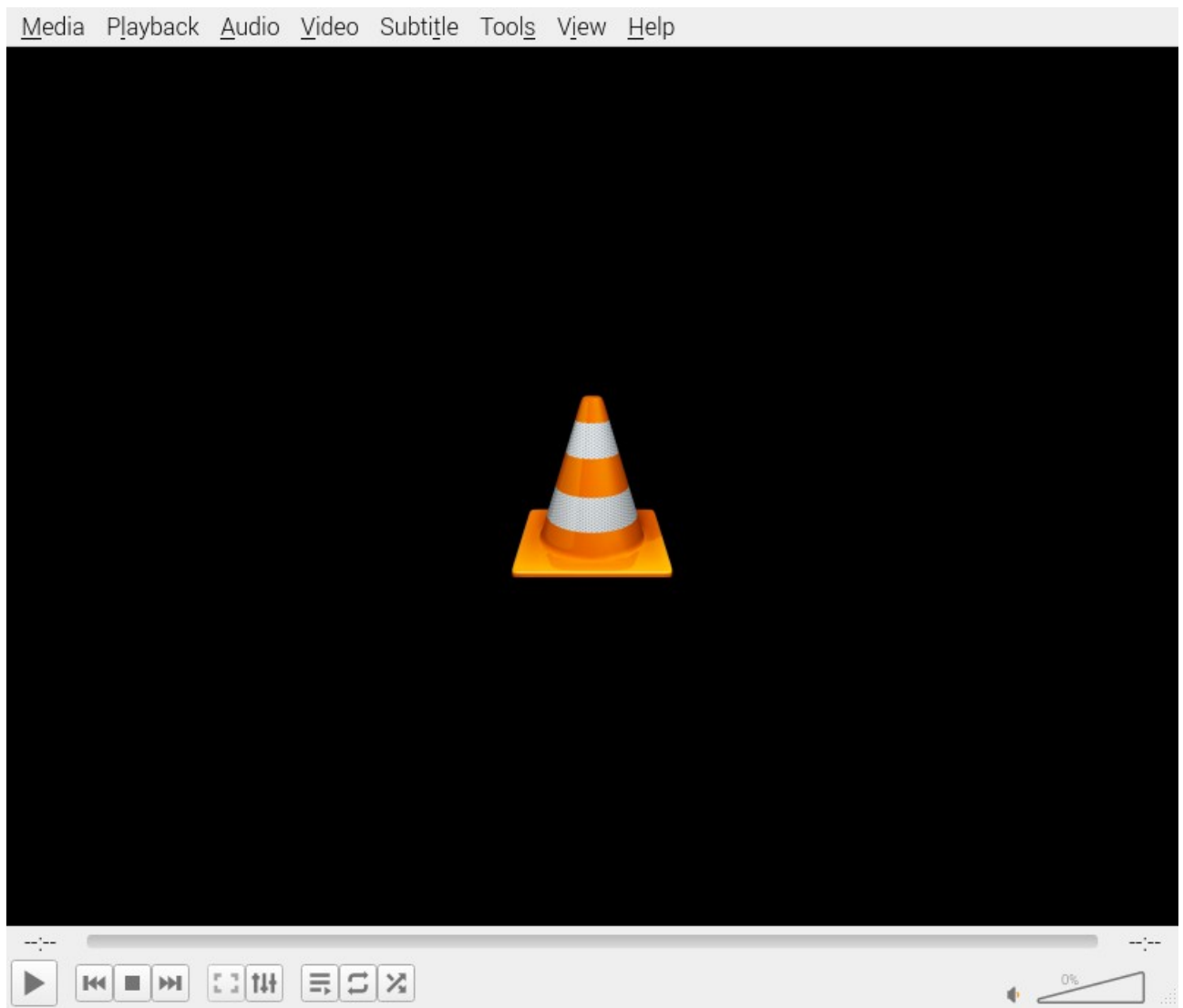
TensorFlow Lite detects remote control



## TensorFlow Lite detects loupe



vlc & camera



selecting the video device

FileDiscNetworkCapture Device

Capture modeVideo camera

Device Selection

Video device name/dev/video0

Audio device name

Options

Video standardUndefined

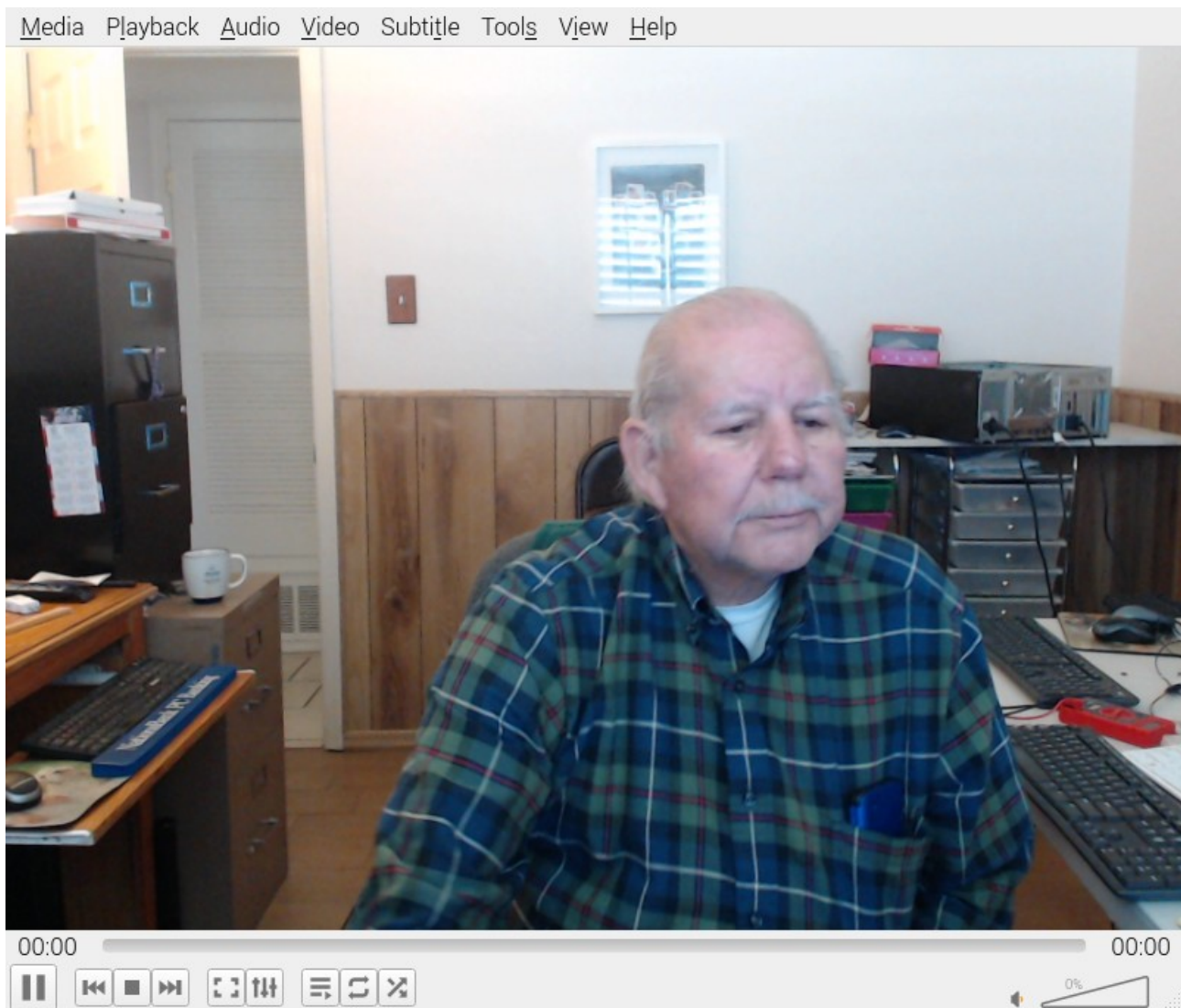
advanced options.

☐ Show more options

PlayCancel

me in my lab





```
ps -ax | grep python3
xxxx pts/3  Sl+  39:15 python3 classify.py
kill -9 xxxx
```

version control

```
cd my-projects-docs/
devel@pi4-37:~/my-projects-docs $ git pull
hint: Pulling without specifying how to reconcile divergent branches is
hint: discouraged. You can squelch this message by running one of the following
hint: commands sometime before your next pull:
hint:
hint: git config pull.rebase false # merge (the default strategy)
hint: git config pull.rebase true  # rebase
hint: git config pull.ff only      # fast-forward only
hint:
hint: You can replace "git config" with "git config --global" to set a default
hint: preference for all repositories. You can also pass --rebase, --no-rebase,
```

hint: or --ff-only on the command line to override the configured default per  
hint: invocation.

remote: Enumerating objects: 9, done.

remote: Counting objects: 100% (9/9), done.

remote: Compressing objects: 100% (3/3), done.

remote: Total 5 (delta 2), reused 5 (delta 2), pack-reused 0

Unpacking objects: 100% (5/5), 7.61 MiB | 4.31 MiB/s, done.

From https://github.com/develone/my-projects-docs

078614e..6615ca9 master -> origin/master

Updating 078614e..6615ca9

Fast-forward

systems-64/doc-steps.odt | Bin 969808 -> 6580211 bytes

systems-64/doc-steps.pdf | Bin 615076 -> 1634728 bytes

2 files changed, 0 insertions(+), 0 deletions(-)

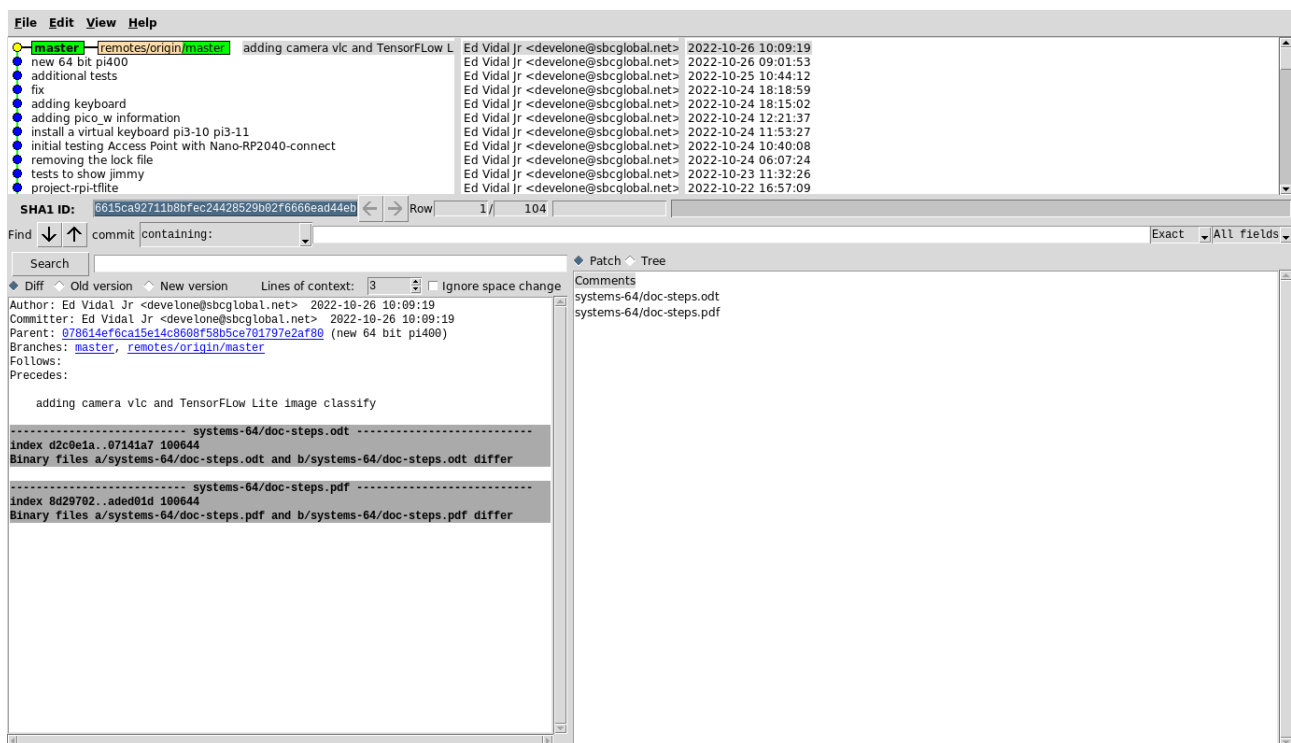
devel@pi4-37:~/my-projects-docs \$ diff systems-64/doc-steps.odt ~/Desktop/doc-steps.odt

devel@pi4-37:~/my-projects-docs \$ diff systems-64/doc-steps.pdf ~/Desktop/doc-steps.pdf

devel@pi4-37:~/my-projects-docs \$ gitk &

[1] 8231

gitk &



git log

commit 6615ca92711b8bfec24428529b02f6666ead44eb (HEAD -> master, origin/master, origin/HEAD)

Author: Ed Vidal Jr <develone@sbcglobal.net>

Date: Wed Oct 26 10:09:19 2022 -0600

adding camera vlc and TensorFlow Lite image classify

commit 078614ef6ca15e14c8608f58b5ce701797e2af80

Author: Ed Vidal Jr <develone@sbcglobal.net>

Date: Wed Oct 26 09:01:53 2022 -0600

new 64 bit pi400

commit 35f6add124a7fe0aac9fb65c697459f3b0dce72c

Author: Ed Vidal Jr <develone@sbcglobal.net>

Date: Tue Oct 25 10:44:12 2022 -0600

additional tests

commit f4b4834fb04e78d8cdda68075eb286c9d854c9e4

Author: Ed Vidal Jr <develone@sbcglobal.net>

Date: Mon Oct 24 18:18:59 2022 -0600

mkdir pi4-28

mkdir pi4-35

cd pi4-28

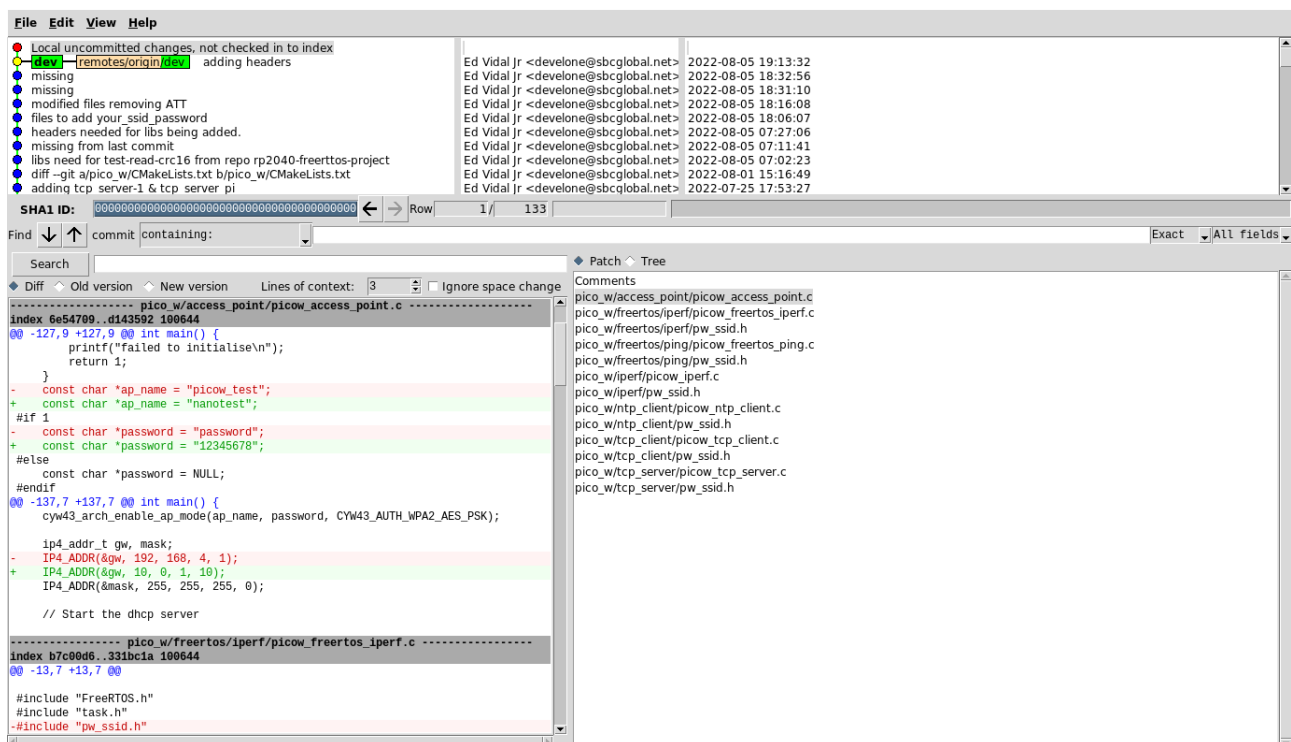
git clone <https://github.com/develone/pico-examples.git> -b dev

cd pico-examples/

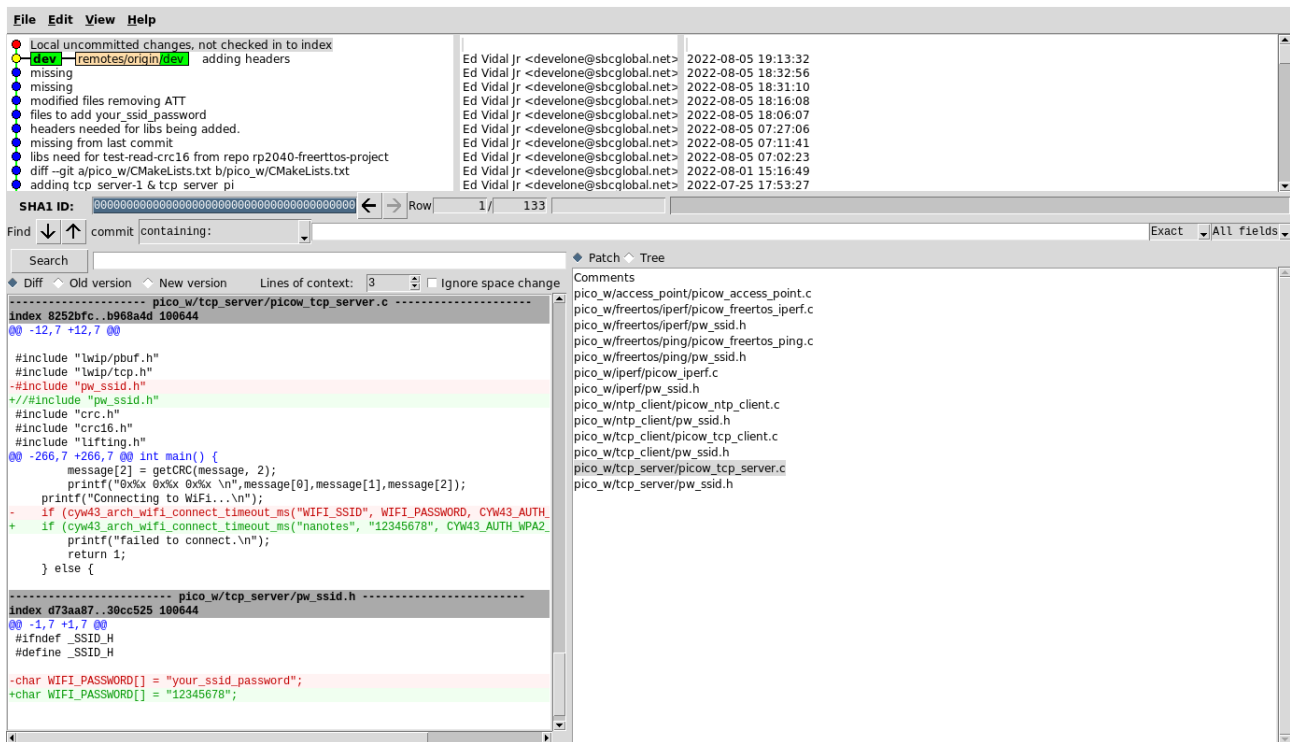
mkdir build

cd build

gitk &



tcp-server



```
cmake -DPICO_BOARD=pico_w -DTEST_TCP_SERVER_IP="10.0.1.13" -
DWIFI_SSID="nanotest" -DWIFI_PASSWORD="12345678" ..
```

Using PICO\_SDK\_PATH from environment ('/home/devel/sdk/pico-sdk')

PICO\_SDK\_PATH is /home/devel/sdk/pico-sdk

Defaulting PICO\_PLATFORM to rp2040 since not specified.

Defaulting PICO platform compiler to pico\_arm\_gcc since not specified.

-- Defaulting build type to 'Release' since not specified.

PICO compiler is pico\_arm\_gcc

-- The C compiler identification is GNU 8.3.1

-- The CXX compiler identification is GNU 8.3.1

-- The ASM compiler identification is GNU

-- Found assembler: /usr/bin/arm-none-eabi-gcc

Build type is Release

PICO target board is pico\_w.

Using CMake board configuration from /home/devel/sdk/pico-sdk/src/boards/pico\_w.cmake

Using board configuration from /home/devel/sdk/pico-sdk/src/boards/include/boards/pico\_w.h

-- Found Python3: /usr/bin/python3.9 (found version "3.9.2") found components: Interpreter

TinyUSB available at /home/devel/sdk/pico-sdk/lib/tinyusb/src/portable/raspberrypi/rp2040;

enabling build support for USB.

cyw43-driver available at /home/devel/sdk/pico-sdk/lib/cyw43-driver

lwIP available at /home/devel/sdk/pico-sdk/lib/lwip

Enabling build support for Pico W wireless.

Skipping Pico W FreeRTOS examples as FREERTOS\_KERNEL\_PATH not defined

-- Configuring done

-- Generating done

-- Build files have been written to: /home/devel/pi4-28/pico-examples/build

make

programmed a pico\_w with the file

/home/devel/pi4-28/pico-examples/build/pico\_w/access\_point/picow\_access\_point\_poll.uf2



minicom myusb0

This setup on /dev/ttyUSB0

```
File Edit Tabs Help

Welcome to minicom 2.8

OPTI+-----+
Port| A -   Serial Device       : /dev/ttyUSB0
    | B - Lockfile Location    : /var/lock
Pres| C -   Callin Program      :
    | D -   Callout Program    :
Star| E -   Bps/Par/Bits        : 115200 8N1
DHCP| F - Hardware Flow Control : No
    | G - Software Flow Control : No
    | H -   RS485 Enable        : No
    | I -   RS485 Rts On Send   : No
    | J -   RS485 Rts After Send : No
    | K -   RS485 Rx During Tx  : No
    | L -   RS485 Terminate Bus : No
    | M - RS485 Delay Rts Before: 0
    | N - RS485 Delay Rts After : 0
    |
    | Change which setting? █
    +-----+

CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.8 | VT102 | Offline | ttyUSB0
```

xx

```
File Edit Tabs Help

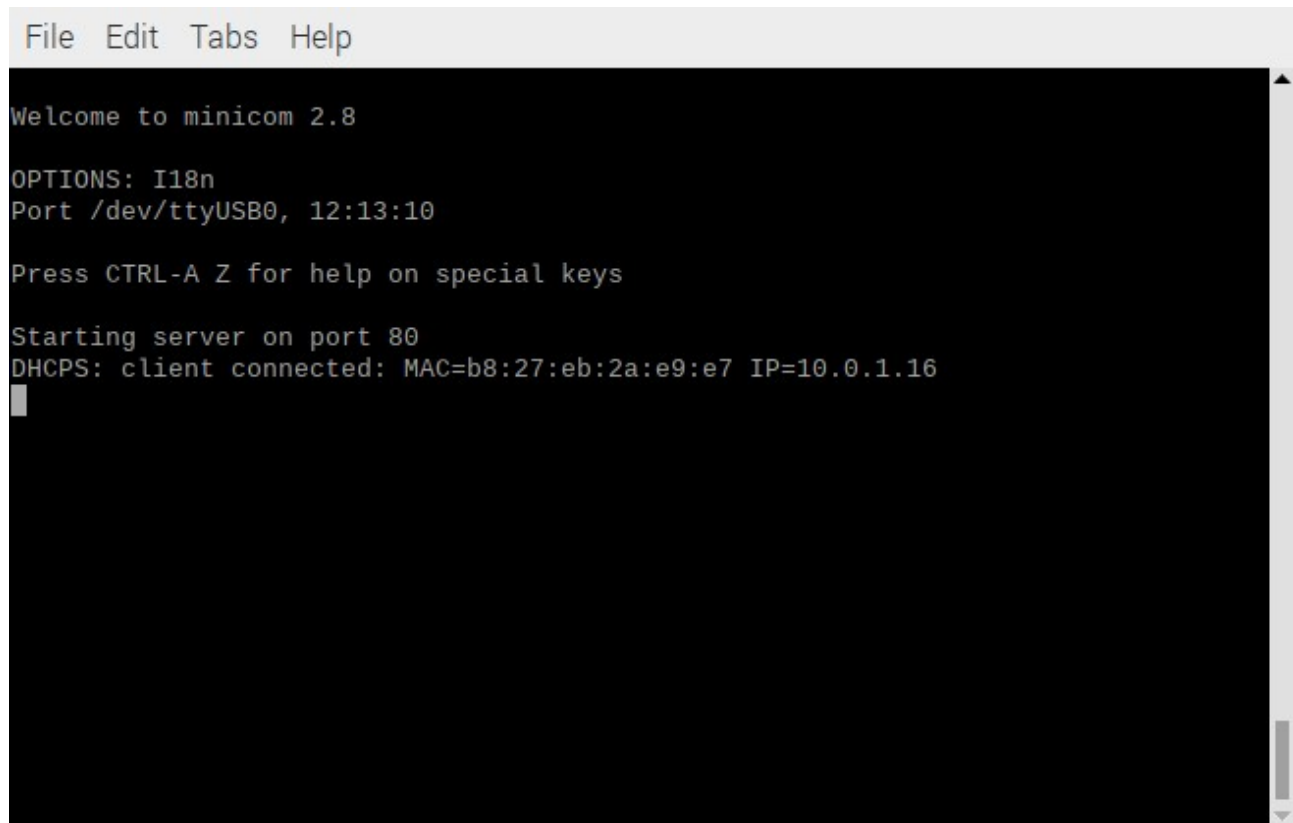
Welcome to minicom 2.8

OPTIONS: I18n
Port /dev/ttyUSB0, 12:13:10

Press CTRL-A Z for help on special keys

Starting server on port 80
█
```

This is when the remote pi3-11 is powered up

A screenshot of a minicom terminal window. The window has a title bar with 'File Edit Tabs Help'. The terminal output shows: 'Welcome to minicom 2.8', 'OPTIONS: I18n', 'Port /dev/ttyUSB0, 12:13:10', 'Press CTRL-A Z for help on special keys', 'Starting server on port 80', and 'DHCP: client connected: MAC=b8:27:eb:2a:e9:e7 IP=10.0.1.16'. A cursor is visible on the line following the DHCP message.

```
File Edit Tabs Help

Welcome to minicom 2.8

OPTIONS: I18n
Port /dev/ttyUSB0, 12:13:10

Press CTRL-A Z for help on special keys

Starting server on port 80
DHCP: client connected: MAC=b8:27:eb:2a:e9:e7 IP=10.0.1.16
█
```

cd pi4-35

This is for creating the 2<sup>nd</sup> pico\_w software.

rsync -avl ../pi4-28/pico-examples .

cd pico-examples

rm -rf build

mkdir build

cd build

cmake -DPICO\_BOARD=pico\_w -DTEST\_TCP\_SERVER\_IP="10.0.1.14" -  
DWIFI\_SSID="nanotest" -DWIFI\_PASSWORD="12345678" ..

make

making a backup of the system

Mount the 64 Gb USB on another system.

As root use gparted

UN-mount the 2<sup>nd</sup> partition

first you shrink the partition

GParted Edit View Device Partition Help

/dev/sdb (57.30 GiB)

/dev/sdb2

28.86 GiB

unallocated

28.18 GiB

Partition	File System	Mount Point	Label	Size	Used	Unused	Flags
unallocated	unallocated			4.00 MiB	---	---	
/dev/sdb1	fat32	/media/dev...	boot	256.00 MiB	31.50 MiB	224.50 MiB	lba
/dev/sdb2	ext4		rootfs	28.86 GiB	24.50 GiB	4.37 GiB	
unallocated	unallocated			28.18 GiB	---	---	

→ Shrink /dev/sdb2 from 57.04 GiB to 28.86 GiB

1 operation pending

As the partition is being shrieked.

Depending on the number and type of operations this might take a long time.

Shrink /dev/sdb2 from 57.04 GiB to 28.86 GiB

*resize2fs -p '/dev/sdb2' 30266368K*

Completed Operations:

0 of 1 operations completed

Details

Cancel

results are successful

Depending on the number and type of operations this might take a long time.

### Completed Operations:

All operations successfully completed

► Details

Save Details

Close

[root@pi4-27:/media/devel/1b763776-4e1d-499c-9f24-a116a58c161f#](#)

df

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
/dev/root	305602156	150970520	141834472	52%	/
devtmpfs	3878868	0	3878868	0%	/dev
tmpfs	4043732	0	4043732	0%	/dev/shm
tmpfs	1617496	2040	1615456	1%	/run
tmpfs	5120	4	5116	1%	/run/lock
/dev/sda1	258095	50707	207389	20%	/boot
tmpfs	808744	24	808720	1%	/run/user/1000
/dev/sdb1	306552464	141394184	149513388	49%	/media/devel/1b763776-4e1d-499c-9f24-a116a58c161f
/dev/sdc1	261108	31222	229886	12%	/media/devel/boot
/dev/sdc2	29719076	22959176	5513828	81%	/media/devel/rootfs

dd bs=16M if=/dev/sdc status='progress' of=pi4-37.img

61522051072 bytes (62 GB, 57 GiB) copied, 3427 s, 18.0 MB/s

3667+1 records in

3667+1 records out

61524148224 bytes (62 GB, 57 GiB) copied, 3427.2 s, 18.0 MB/s

dd bs=16M if=pi4-37.img status='progress' of=/dev/sdc

61524148224 bytes (62 GB, 57 GiB) copied, 5401 s, 11.4 MB/s

3667+1 records in

3667+1 records out

61524148224 bytes (62 GB, 57 GiB) copied, 5401.02 s, 11.4 MB/s

MQTT

pi4-38 & pi4-37

<https://mosquitto.org/documentation/authentication-methods/>

sudo apt-get install mosquitto mosquitto-clients

mosquitto

1667650417: mosquitto version 2.0.11 starting

1667650417: Using default config.  
1667650417: Starting in local only mode. Connections will only be possible from clients running on this machine.  
1667650417: Create a configuration file which defines a listener to allow remote access.  
1667650417: For more details see <https://mosquitto.org/documentation/authentication-methods/>  
1667650417: Opening ipv4 listen socket on port 1883.  
1667650417: Opening ipv6 listen socket on port 1883.  
1667650417: mosquitto version 2.0.11 running  
1667651226: New connection from ::1:45558 on port 1883.  
1667651226: New client connected from ::1:45558 as auto-D507A4C8-6C9D-557C-E95B-9C9FA6E9121F (p2, c1, k60).  
1667651310: New connection from ::1:47850 on port 1883.  
1667651310: New client connected from ::1:47850 as auto-8FD4E2A6-C70D-FBBD-A29E-675081C9DA76 (p2, c1, k60).  
1667651334: Client auto-8FD4E2A6-C70D-FBBD-A29E-675081C9DA76 disconnected.  
1667651379: New connection from ::1:55678 on port 1883.  
1667651379: New client connected from ::1:55678 as auto-C3CC2EA9-8C6A-F7CB-6735-F7757782222D (p2, c1, k60).  
1667651379: Client auto-C3CC2EA9-8C6A-F7CB-6735-F7757782222D disconnected.  
1667651404: New connection from ::1:51540 on port 1883.  
1667651404: New client connected from ::1:51540 as auto-C3C38D98-59AD-C162-1EE8-9AC0CD19F427 (p2, c1, k60).  
1667651404: Client auto-C3C38D98-59AD-C162-1EE8-9AC0CD19F427 disconnected.  
1667651411: New connection from ::1:51556 on port 1883.  
1667651411: New client connected from ::1:51556 as auto-EE2DA2C4-0C40-B57A-2836-1FB8B088D143 (p2, c1, k60).  
1667651411: Client auto-EE2DA2C4-0C40-B57A-2836-1FB8B088D143 disconnected.  
1667651425: New connection from ::1:47258 on port 1883.  
1667651425: New client connected from ::1:47258 as auto-00448448-E30D-465A-DA0B-F162B17D477E (p2, c1, k60).  
1667651425: Client auto-00448448-E30D-465A-DA0B-F162B17D477E disconnected.  
1667652597: Reloading config.

```
cp /usr/share/doc/mosquitto/examples/mosquitto.conf .
```

```
mosquitto_passwd -c /home/devel/mosquitto-pw testuser
```

```
password123
```

```
password123
```

```
less ~/mosquitto-pw
```

```
testuser:$7$101$7OIAauVb8Ow8mP6c$134ZYut+1qEracS7SWlsGXG7pndOKWvr/  
XeBWplTqgT9eShnEDkPBajQUOqPd1sVyt50RSOV4D85JDaYOlkW7A==
```

```
sudo diff mosquitto.conf /home/devel/mosquitto.conf
```

```
512d511
```

```
< allow_anonymous true
```

```
ps -ax | grep mosquitto
```

```
kill -HUP 2058
```

```
sudo cp mosquito.conf /etc/mosquitto/
```

First shell

```
mosquitto_sub -t 'testtopic' -u 'testuser' -P 'password123'
```

In another shell

```
mosquitto_pub -t 'testtopic' -m 'Hello World!' -u 'testuser' -P 'password123'
```

First shell

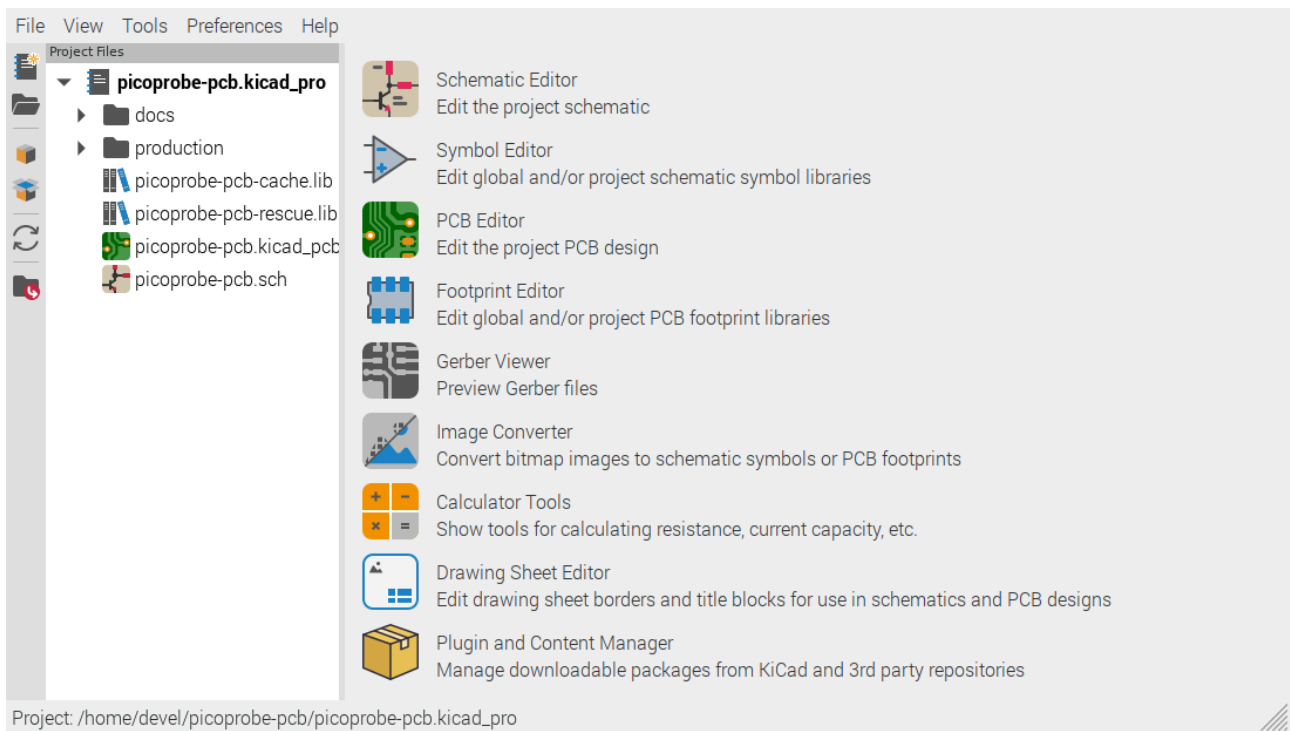
```
mosquitto_sub -t 'testtopic' -u 'testuser' -P 'password123'
```

Hello World!

KiCad

```
cd picoprobe-pcb/
```

```
kicad picoprobe-pcb.pro
```



PCB



File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
21	6.592124618	HUMAX_c7:5e:51	Spanning-tree-(for-...	STP	60	Conf. Root = 0/0/c
22	7.168010284	HUMAX_c7:5e:51	Broadcast	0x7373	121	Ethernet II
23	7.283637117	fe80::7ef9:7eba:7a0...	ff02::fb	MDNS	129	Standard query res
24	7.305740714	fe80::7ef9:7eba:7a0...	ff02::fb	MDNS	129	Standard query res
25	7.617046948	HUMAX_c7:5e:51	Spanning-tree-(for-...	STP	60	Conf. Root = 0/0/c
26	8.192064250	HUMAX_c7:5e:51	Broadcast	0x7373	121	Ethernet II
27	8.640150201	HUMAX_c7:5e:51	Spanning-tree-(for-...	STP	60	Conf. Root = 0/0/c

Frame 1: 121 bytes on wire (968 bits), 121 bytes captured (968 bits) on interface eth0, id 0  
 Ethernet II, Src: HUMAX\_c7:5e:51 (cc:ab:2c:c7:5e:51), Dst: Broadcast (ff:ff:ff:ff:ff:ff)  
 Data (107 bytes)

```

0000  ff ff ff ff ff cc ab 2c c7 5e 51 73 73 12 11  ..... ,^Qss..
0010  00 00 00 43 d9 56 34 63 c8 49 3c 36 ba 43 d1 33  ..·C·V4c ·I<6·C·3
0020  37 d4 c6 9f 1a a0 2c 3a 71 3d 1a c6 c0 bb 7a a1  7·....., : q=.....z·
0030  20 55 ba 1d 00 00 02 01 80 03 06 cc ab 2c c7 5e  U·.....,^
0040  51 04 01 44 07 01 03 1b 01 00 08 06 cc ab 2c c7  Q·D·.....,
0050  5e 51 09 01 02 0e 18 00 00 00 00 00 00 00 00  ^Q·.....
0060  00 00 00 00 00 00 00 00 00 00 00 00 00 00 19  .....
0070  08 40 5c 67 36 a9 20 ba ae                      ·@\g6·  .

```

wireshark\_eth0G4J4U1.pcapng      Packets: 27 · Displayed: 27 (100.0%)      Profile: Default

XX



File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
11	0.923544098	192.168.1.254	192.168.1.173	DNS	121	Standard query res
12	1.463450701	HUMAX_c7:5e:51	Spanning-tree-(for-...	STP	60	Conf. Root = 0/0/c
13	1.719339579	HUMAX_c7:5e:51	Broadcast	0x7373	121	Ethernet II
14	1.845713928	192.168.1.173	192.168.1.178	ICMP	98	Echo (ping) reques
15	2.150466227	192.168.1.178	192.168.1.173	ICMP	98	Echo (ping) reply
16	2.150740910	192.168.1.173	192.168.1.254	DNS	86	Standard query 0x3
17	2.151500496	192.168.1.254	192.168.1.173	DNS	121	Standard query res
18	2.487294932	HUMAX_c7:5e:51	Spanning-tree-(for-...	STP	60	Conf. Root = 0/0/c
19	2.618286727	fe80::ceab:2cff:fec...	ff02::1:fff5:5d75	ICMPv6	86	Neighbor Solicitat
20	2.743310772	HUMAX_c7:5e:51	Broadcast	0x7373	121	Ethernet II
21	2.847410376	192.168.1.173	192.168.1.178	ICMP	98	Echo (ping) reques

Frame 14: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface eth0, id 0

Ethernet II, Src: Raspberr\_06:a2:dd (e4:5f:01:06:a2:dd), Dst: 28:cd:c1:08:17:22 (28:cd:c1:08:17:22)

- Destination: 28:cd:c1:08:17:22 (28:cd:c1:08:17:22)
  - Address: 28:cd:c1:08:17:22 (28:cd:c1:08:17:22)
    - ... 0 ... = LG bit: Globally unique address (factory default)
    - ... 0 ... = IG bit: Individual address (unicast)
- Source: Raspberr\_06:a2:dd (e4:5f:01:06:a2:dd)
  - Address: Raspberr\_06:a2:dd (e4:5f:01:06:a2:dd)
    - ... 0 ... = LG bit: Globally unique address (factory default)
    - ... 0 ... = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

Internet Protocol Version 4, Src: 192.168.1.173, Dst: 192.168.1.178

Internet Control Message Protocol

```

0000  28 cd c1 08 17 22 e4 5f 01 06 a2 dd 08 00 45 00  (...."._.....E.
0010  00 54 73 85 40 00 40 01 42 74 c0 a8 01 ad c0 a8  .Ts.@.@.Bt.....
0020  01 b2 08 00 25 60 00 01 00 0e e1 e6 67 63 00 00  ...%'....gc..
0030  00 00 c4 73 06 00 00 00 00 00 10 11 12 13 14 15  ..s.....
0040  16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25  .....!"#$%
0050  26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35  &'()*+,-./012345
0060  36 37 67
  
```

Ready to load or capture    Packets: 21 · Displayed: 21 (100.0%) · Dropped: 0 (0.0%)    Profile: Default

nmap

devel@pi4-37:~/my-projects-docs \$ namp 192.168.1.0/24

bash: namp: command not found

devel@pi4-37:~/my-projects-docs \$ nmap 192.168.1.0/24

Starting Nmap 7.80 ( <https://nmap.org> ) at 2022-11-06 09:41 MST

Nmap scan report for amazon-c9fc00e54.attlocal.net (192.168.1.67)

Host is up (0.0037s latency).

Not shown: 999 closed ports

PORT STATE SERVICE

8009/tcp open ajp13

Nmap scan report for EPSON663615.attlocal.net (192.168.1.87)

Host is up (0.022s latency).

Not shown: 993 closed ports

PORT STATE SERVICE

80/tcp open http

139/tcp open netbios-ssn

443/tcp open https

445/tcp open microsoft-ds

515/tcp open printer  
631/tcp open ipp  
9100/tcp open jetdirect

Nmap scan report for unknown24ce3396b722.attlocal.net (192.168.1.149)  
Host is up (0.0039s latency).  
Not shown: 999 closed ports  
PORT STATE SERVICE  
8009/tcp open ajp13

Nmap scan report for unknownb4e454b54364.attlocal.net (192.168.1.170)  
Host is up (0.0038s latency).  
Not shown: 999 closed ports  
PORT STATE SERVICE  
8009/tcp open ajp13

Nmap scan report for pi4-37.attlocal.net (192.168.1.173)  
Host is up (0.0011s latency).  
Not shown: 995 closed ports  
PORT STATE SERVICE  
22/tcp open ssh  
111/tcp open rpcbind  
139/tcp open netbios-ssn  
445/tcp open microsoft-ds  
2049/tcp open nfs

Nmap scan report for livingRm.attlocal.net (192.168.1.178)  
Host is up (0.0036s latency).  
Not shown: 999 closed ports  
PORT STATE SERVICE  
5001/tcp open complex-link

Nmap scan report for arduino-8f48.attlocal.net (192.168.1.179)  
Host is up (0.038s latency).  
All 1000 scanned ports on arduino-8f48.attlocal.net (192.168.1.179) are closed

Nmap scan report for pi3-10.attlocal.net (192.168.1.206)  
Host is up (0.0046s latency).  
Not shown: 995 closed ports  
PORT STATE SERVICE  
22/tcp open ssh  
111/tcp open rpcbind  
139/tcp open netbios-ssn  
445/tcp open microsoft-ds  
2049/tcp open nfs

Nmap scan report for nixplay\_W10F-09.attlocal.net (192.168.1.210)  
Host is up (0.019s latency).  
Not shown: 999 closed ports  
PORT STATE SERVICE  
8080/tcp open http-proxy

Nmap scan report for pi4-38.attlocal.net (192.168.1.211)

Host is up (0.0011s latency).

Not shown: 995 closed ports

PORT STATE SERVICE

22/tcp open ssh

111/tcp open rpcbind

139/tcp open netbios-ssn

445/tcp open microsoft-ds

2049/tcp open nfs

Nmap scan report for pi4-27.attlocal.net (192.168.1.229)

Host is up (0.0011s latency).

Not shown: 995 closed ports

PORT STATE SERVICE

22/tcp open ssh

111/tcp open rpcbind

139/tcp open netbios-ssn

445/tcp open microsoft-ds

2049/tcp open nfs

Nmap scan report for pi4-28.attlocal.net (192.168.1.245)

Host is up (0.00091s latency).

Not shown: 995 closed ports

PORT STATE SERVICE

22/tcp open ssh

111/tcp open rpcbind

139/tcp open netbios-ssn

445/tcp open microsoft-ds

2049/tcp open nfs

Nmap scan report for pi4-33.attlocal.net (192.168.1.250)

Host is up (0.0049s latency).

Not shown: 995 closed ports

PORT STATE SERVICE

22/tcp open ssh

111/tcp open rpcbind

139/tcp open netbios-ssn

445/tcp open microsoft-ds

2049/tcp open nfs

Nmap scan report for dsldevice.attlocal.net (192.168.1.254)

Host is up (0.00092s latency).

Not shown: 996 closed ports

PORT STATE SERVICE

53/tcp open domain

80/tcp open http

111/tcp filtered rpcbind

443/tcp open https

Nmap done: 256 IP addresses (14 hosts up) scanned in 24.94 seconds