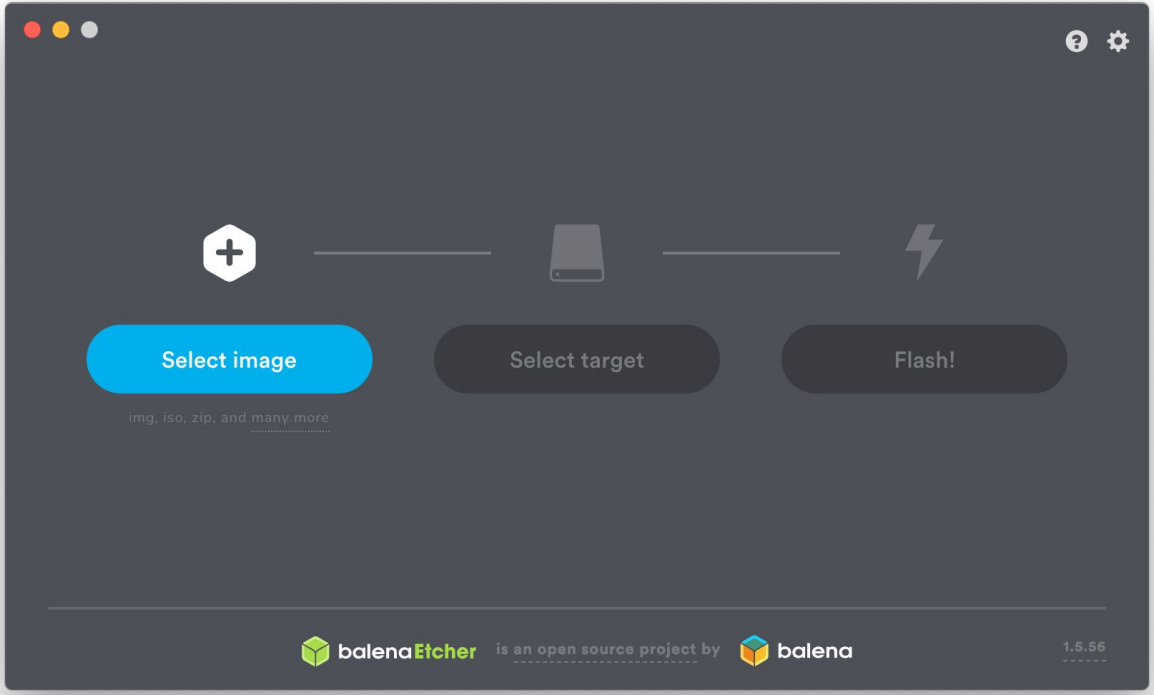
Learn how to use Google Coral for your Edge ML projects with balena

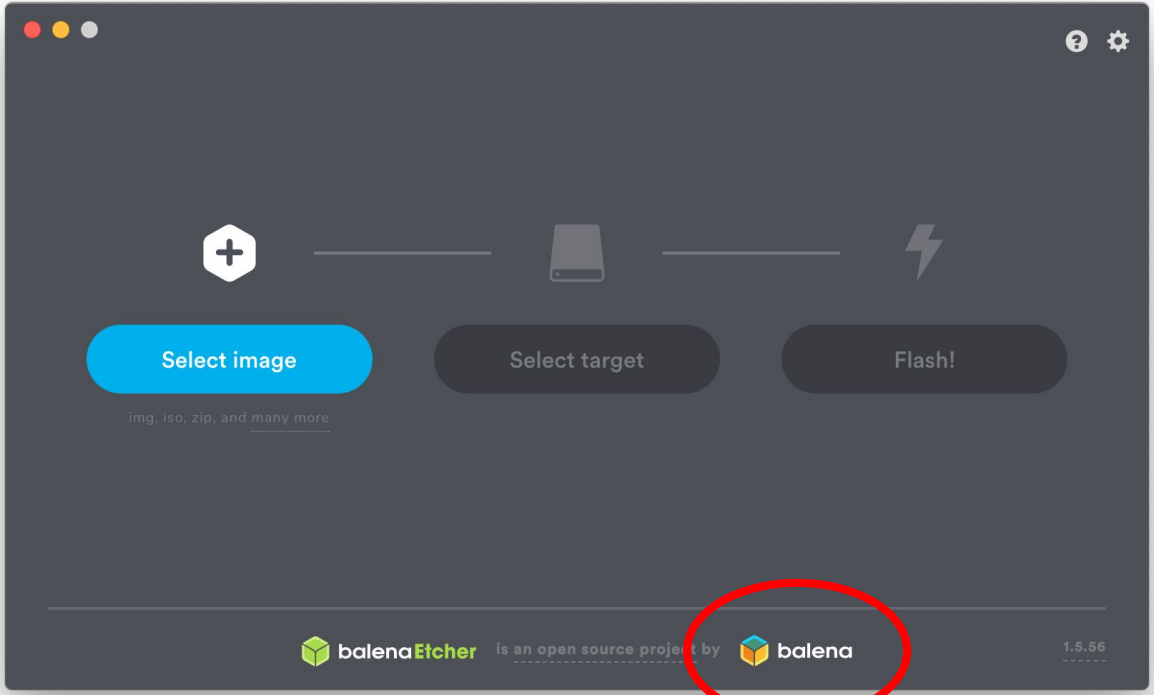
DevFest UK + Ireland - 29th January 2022

Marc Pous

balena.io

Developer Advocate


Select image
Select target
Flash!
img, iso, zip, and many more
balenaEtcher
is an open source project by
balena
1.5.56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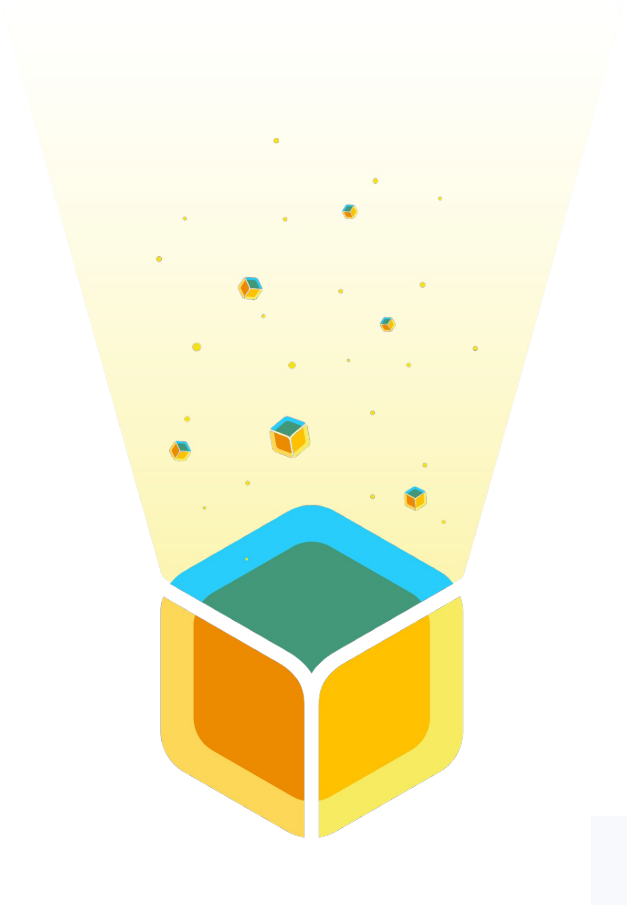
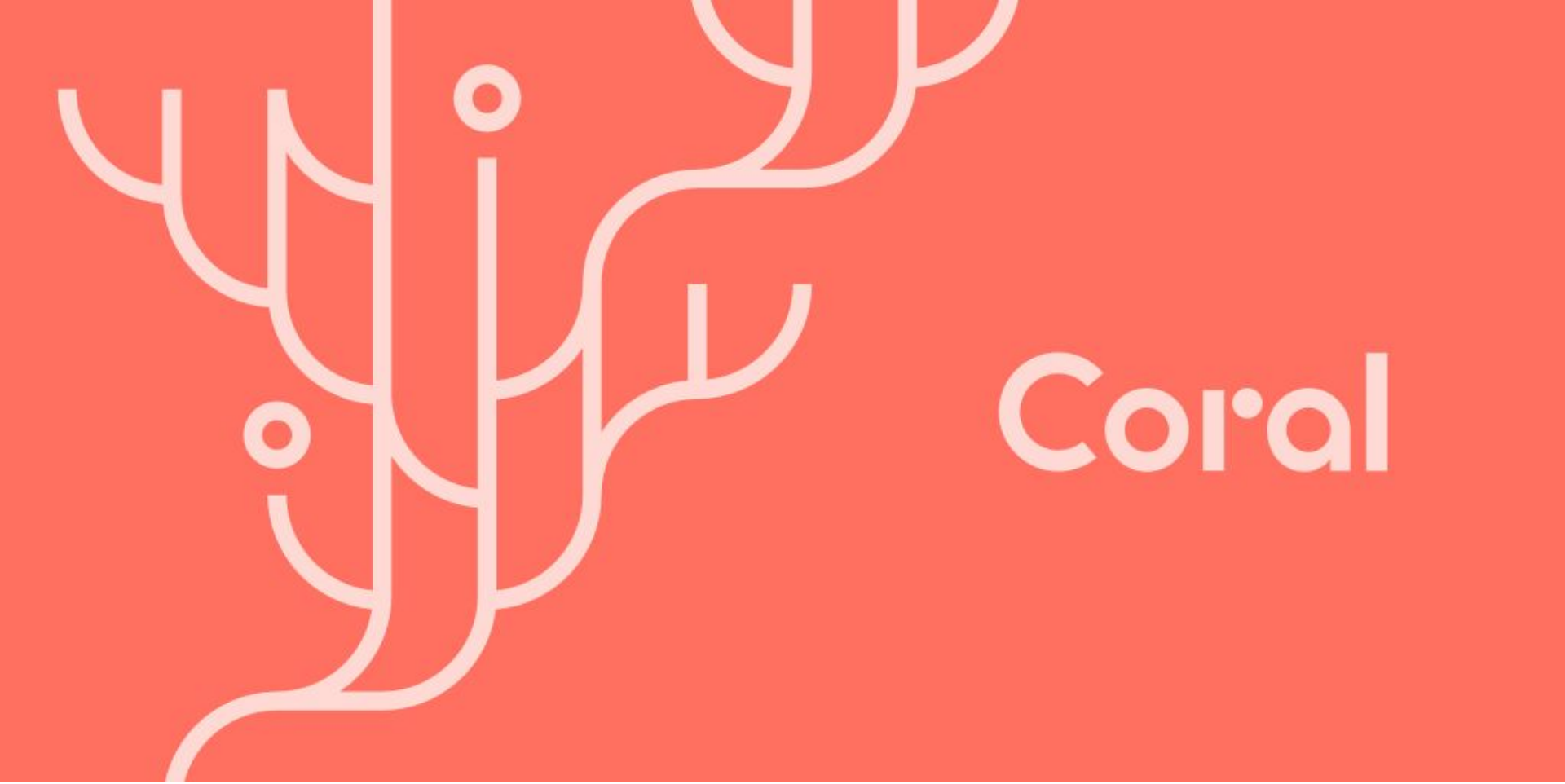
Goals

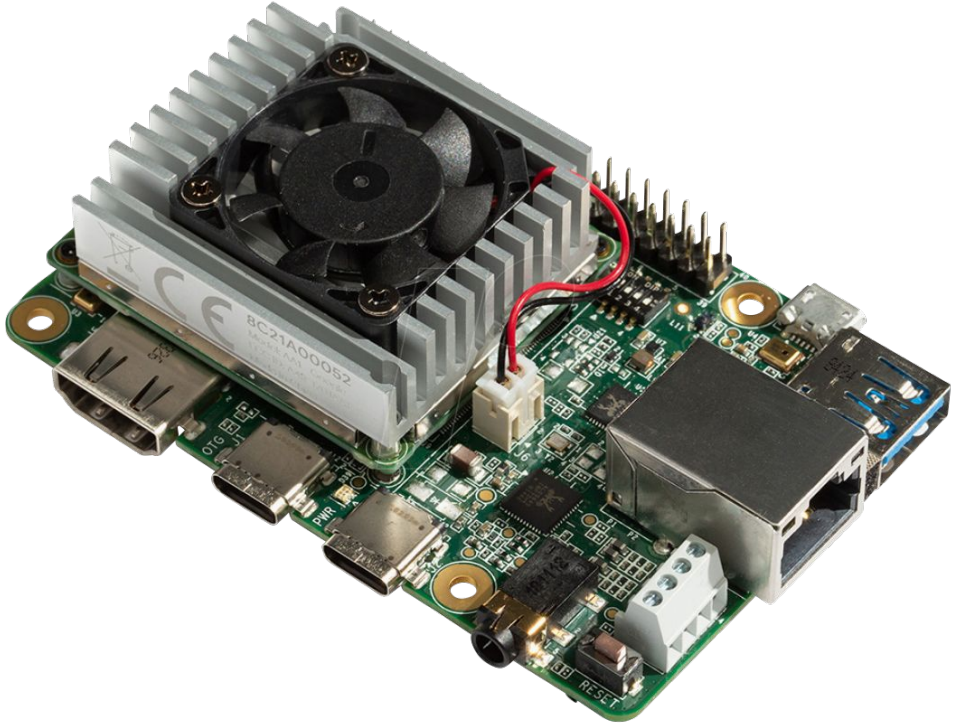
Introduce IoT and AI using Coral.

Show how you can do it at home.

Involve the community in the project.




Coral


8C21A000052
OTG
PWR
RESET


Coral

AI-equipped cameras will spot

https://www.theverge.com/2019/1/3/18166769/ai-cameras-conservation-africa-resolve-intel-elephants-serengeti

SCIENCE | TECH | ARTIFICIAL INTELLIGENCE

AI-equipped cameras will help spot wildlife poachers before they can kill

2

A new camera developed by nonprofit Resolve uses Intel technology to keep watch in the Serengeti

By James Vincent | Jan 3, 2019, 11:44am EST

SHARE

Photo by Wolfgang Kaehler / LightRocket via Getty Images

Gunshot Detection - ShotSpot

https://www.shotspotter.com/law-enforcement/gunshot-detection/

English

ShotSpotter

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SHOTSPOTTER RESPOND™

Reduce Gun Crime with Proven Gunshot Detection Technology

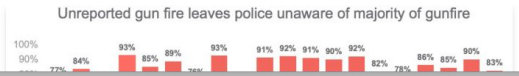
Identify and Accurately Locate Gunshots in Seconds

REQUEST A CONSULTATION

The Impact of ShotSpotter on Police Agencies

THE CHALLENGE FOR LAW ENFORCEMENT

Gun Violence is an Epidemic. Many Communities Aren't Resourced to Combat It.



Gun violence in America's cities is a devastating epidemic. It has killed more than 65,000 individuals and injured several hundred thousand in just the last five years. What's more devastating – **88%**

Noise Maps - ACTION Project

https://actionproject.eu/citizen-science-pilots/noise-maps/

ACTION

HOME ABOUT CITIZEN SCIENCE PILOTS NEWS ACCELERATOR MASTERCLASSES TOOLKIT RESOURCES CONTACTS

NOISE MAPS

ALL PILOTS

- AZOTEA
- CITICOMPLASTIC
- CITIZEN SCIENTISTS, DRAGONFLIES AND PESTICIDES
- IN MY BACKYARD
- LOSS OF THE NIGHT
- MAPPING MOBILITY
- NOISE MAPS
- OPEN SOIL ATLAS
- RESTART DATA WORKBENCH
- SONIC KAYAKS
- STREET SPECTRA

LOCATION
Barcelona (Spain)

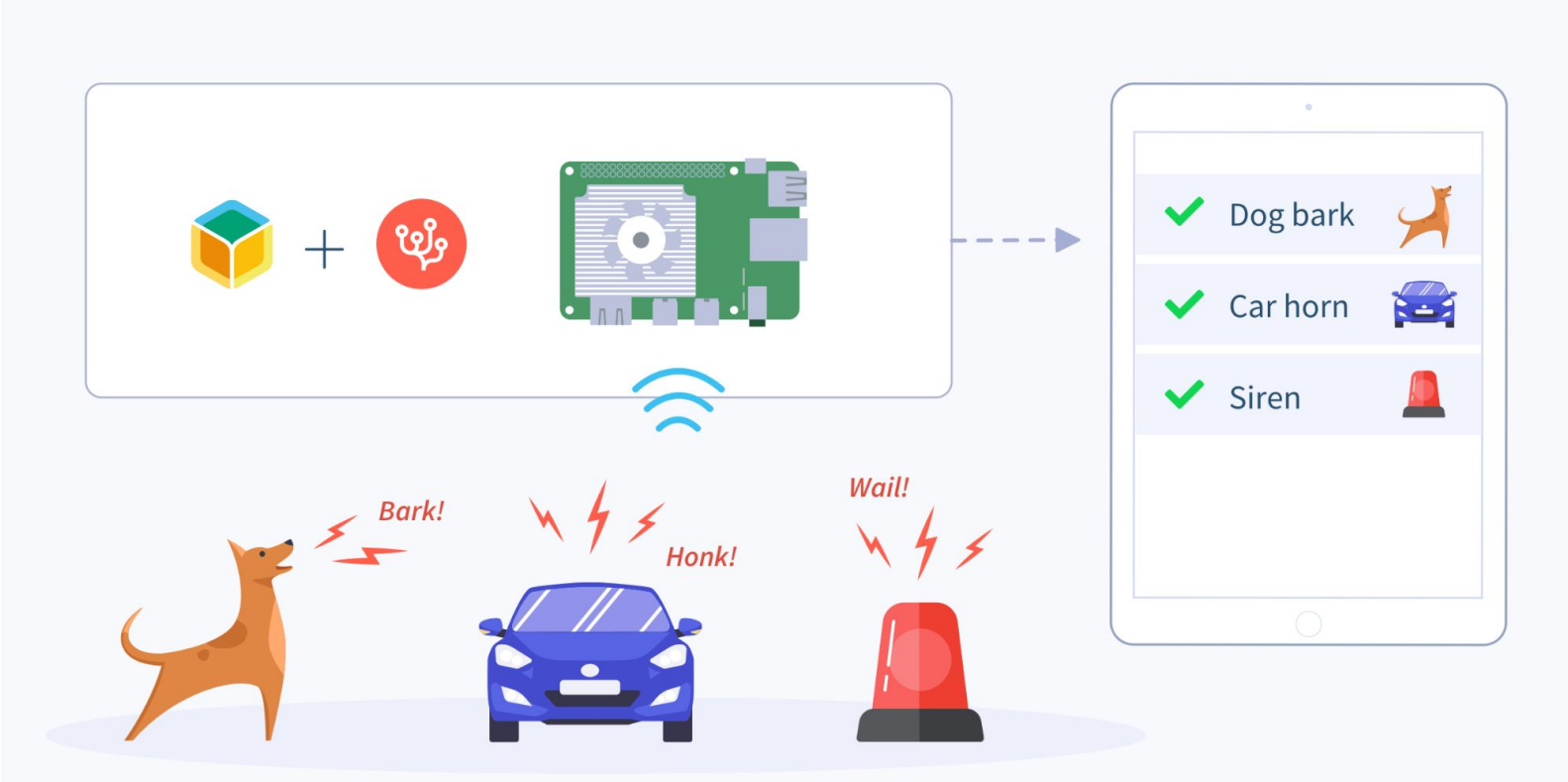
TYPE/S OF POLLUTION
Noise pollution

SUSTAINABLE DEVELOPMENT GOALS ADDRESSED?

NUMBER OF CITIZENS SCIENTISTS INVOLVED
20

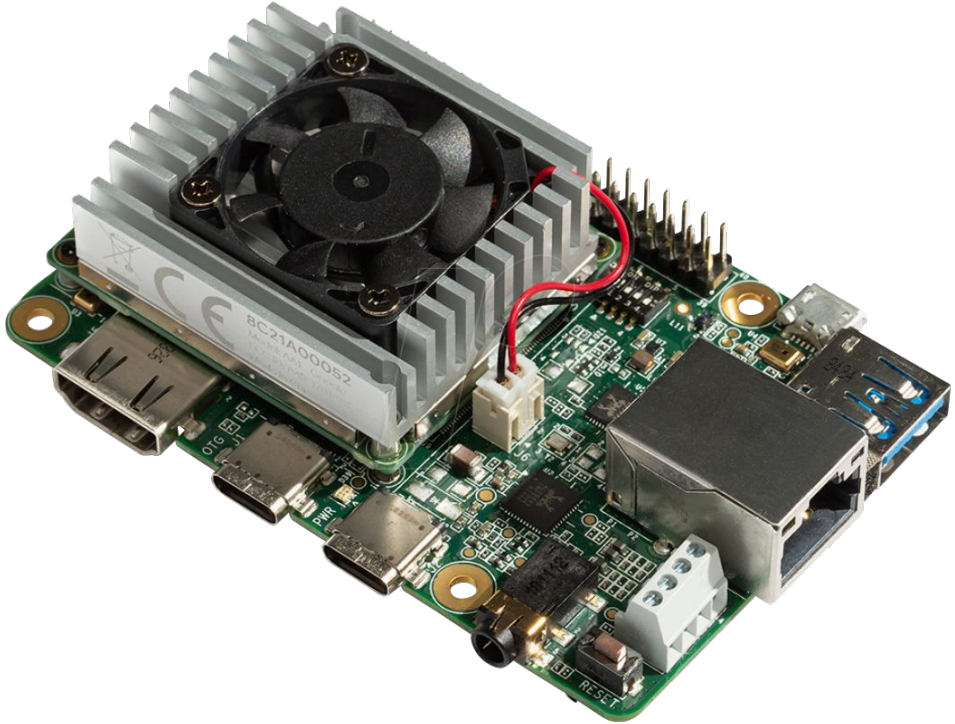
IS THE PILOT LOOKING FOR PARTICIPANTS?
No. The pilot was concluded in October 2020.

Privacy & Cookies Policy

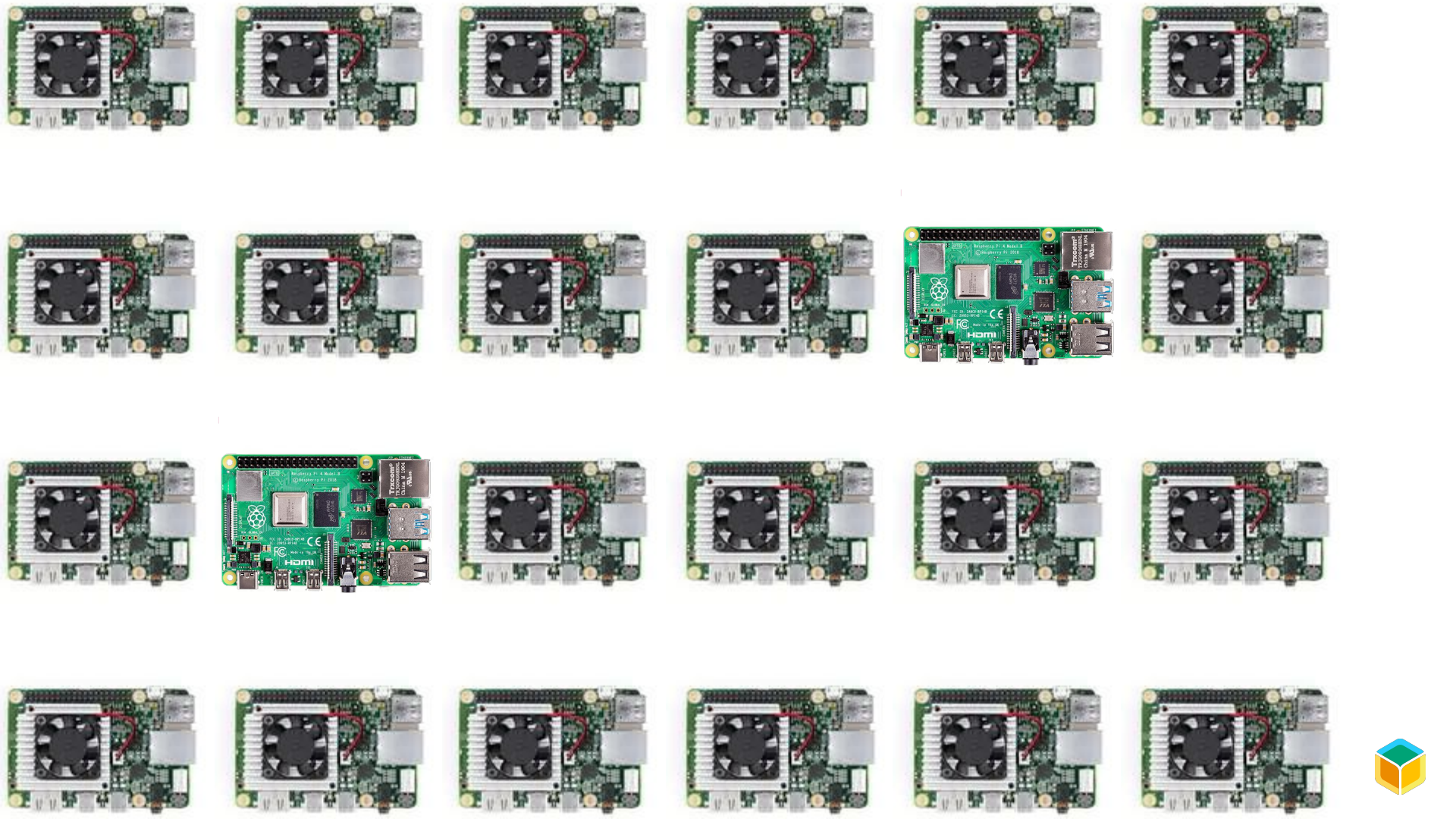


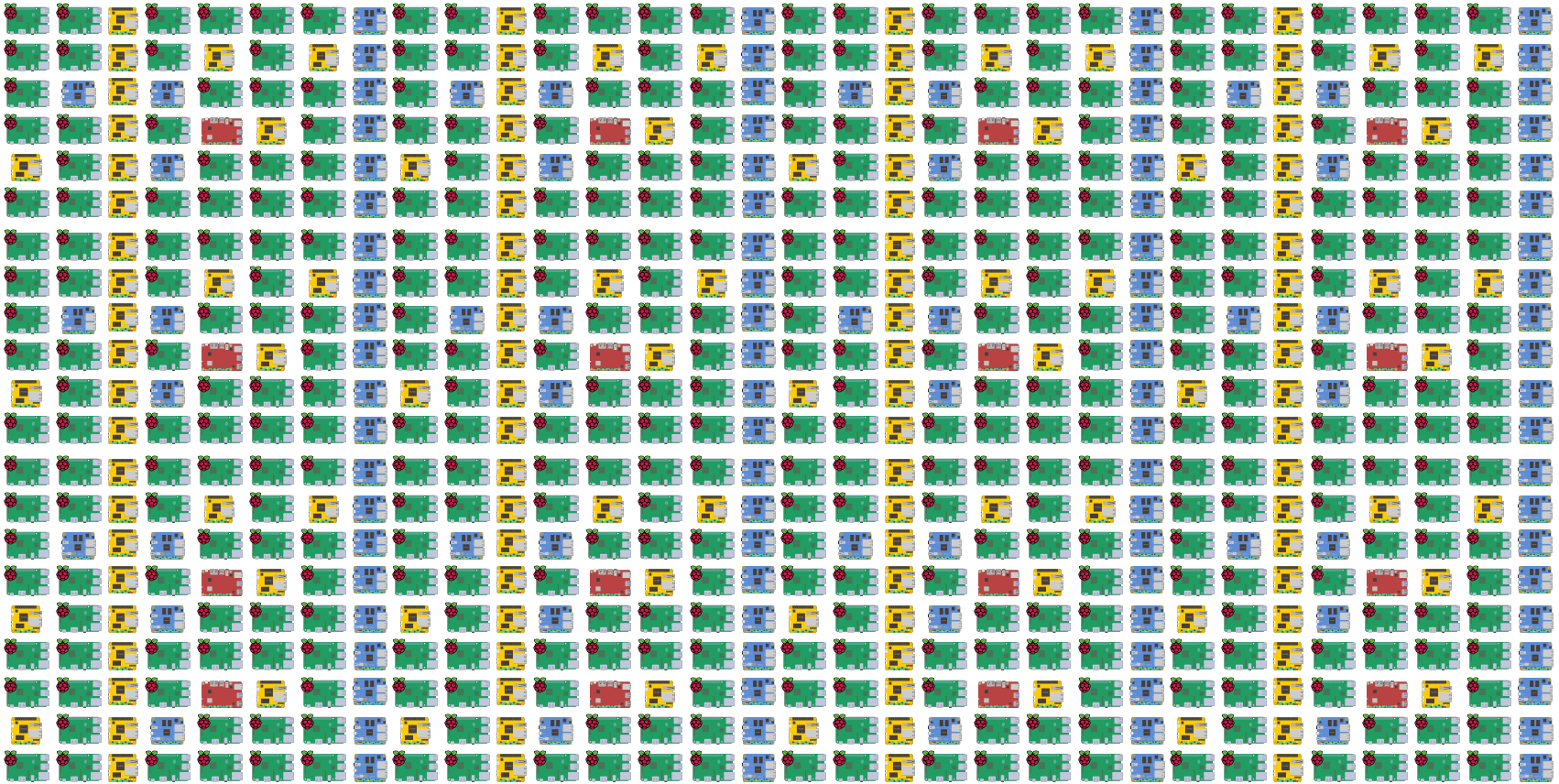
https://www.balena.io/blog/analyze-sounds-using-ai-on-the-edge-and-fleet-intelligence-part-1/

What is a fleet?

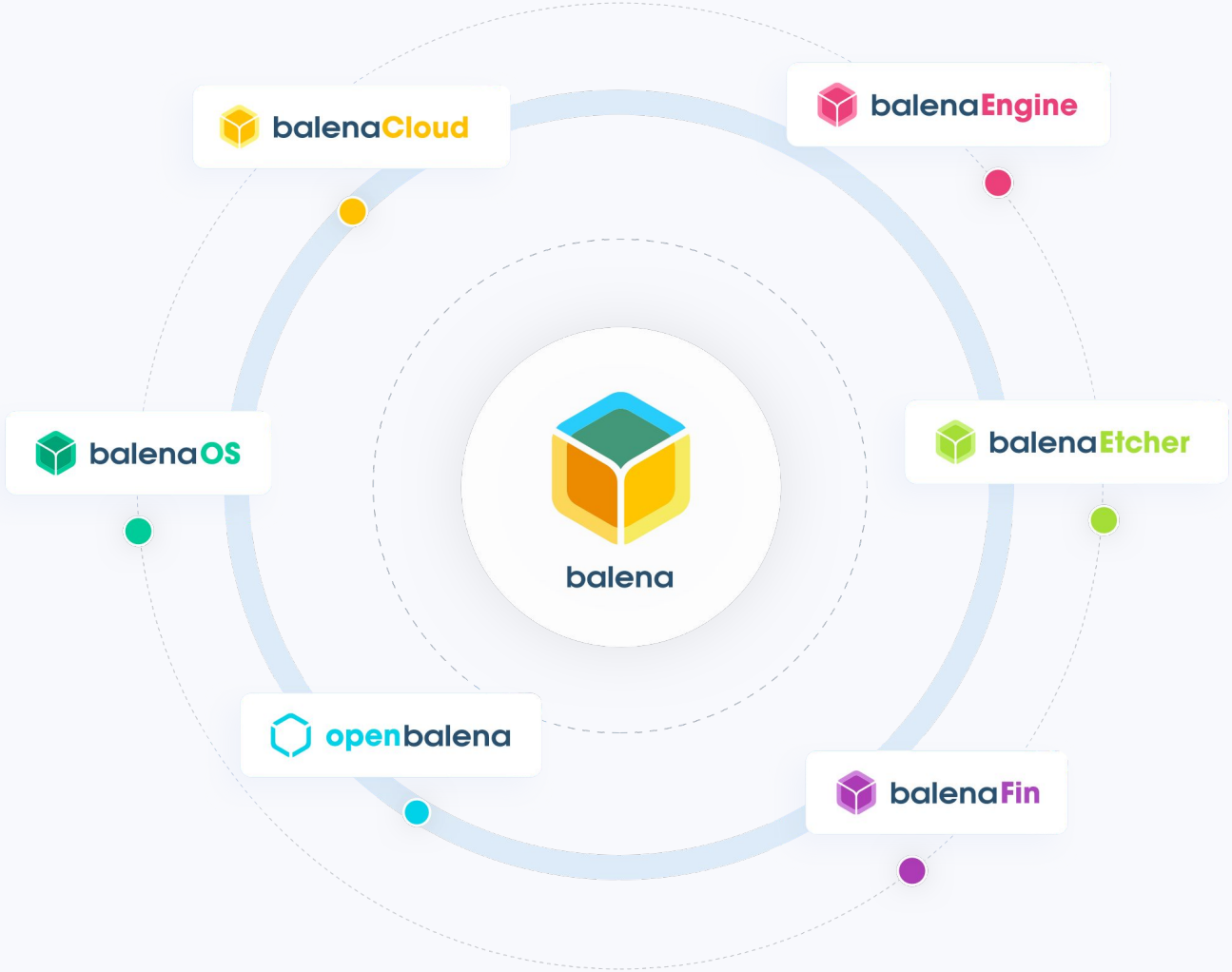


Prototypes are easy™





balena


balenaCloud
balenaEngine
balenaOS
balena
balenaEtcher
openbalena
balenaFin

balena

Device Supervisor Container

User Containers

From 1 to N

balenaOS

balenaEngine

Docker-compatible, edge optimised container engine

Userspace

Systemd, NetworkManager, etc.

Linux Kernel

Customised for CPU architecture & device hardware

How it works


1
Setup your app
app created
balena Cloud
2
Flash your device
OS
Running
balena Cloud
3
Push code
$git push
balena master

How to build it?


The DIE HARD method

or KEEP CALM AND USE balena method

Build it with me :-)

1. Prepare Coral Dev Board or Raspberry Pi + Coral USB
2. Deploy the balena Fleet
3. Share it, contribute and inspire others.

1 Prepare Coral board

or Raspberry Pi with microphone

Hardware

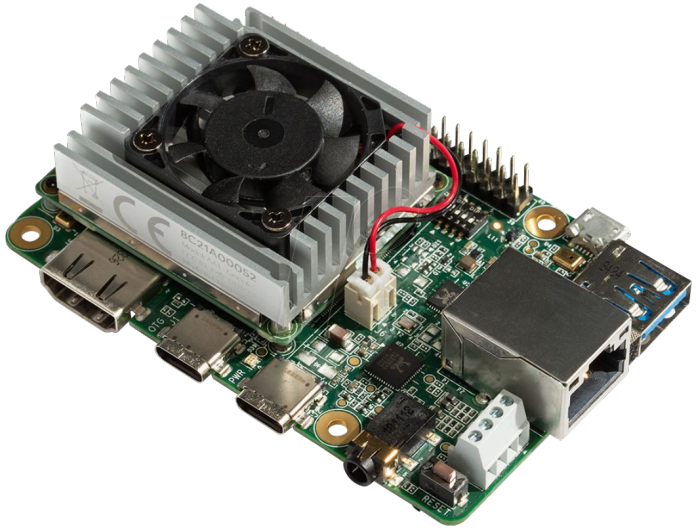
Coral Dev Board

or

Raspberry Pi 4 + Coral USB + Microphone

SD Card

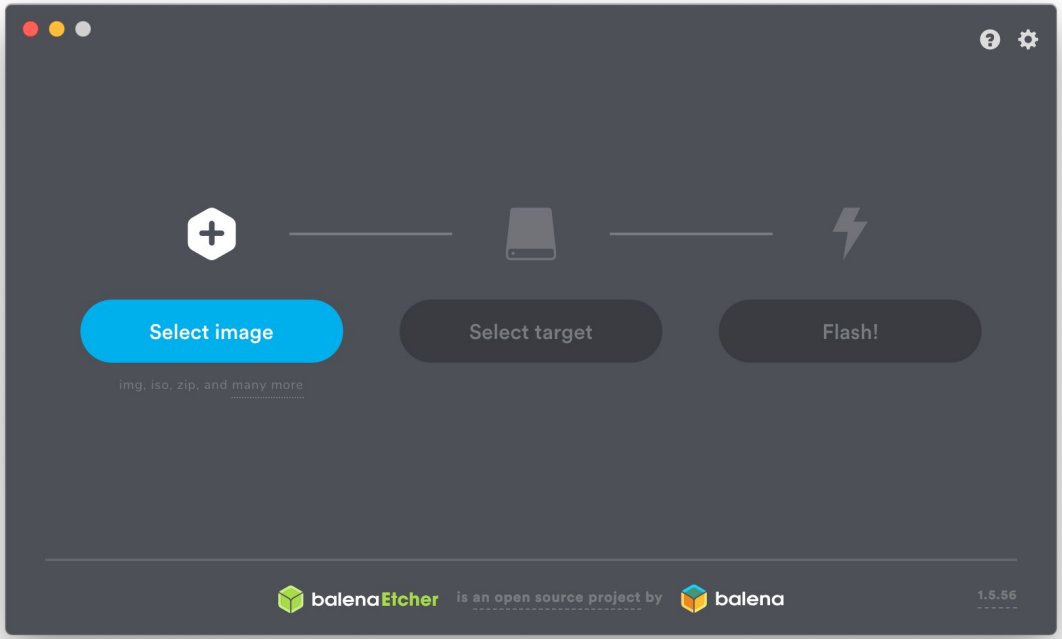
Power Adapter



Software

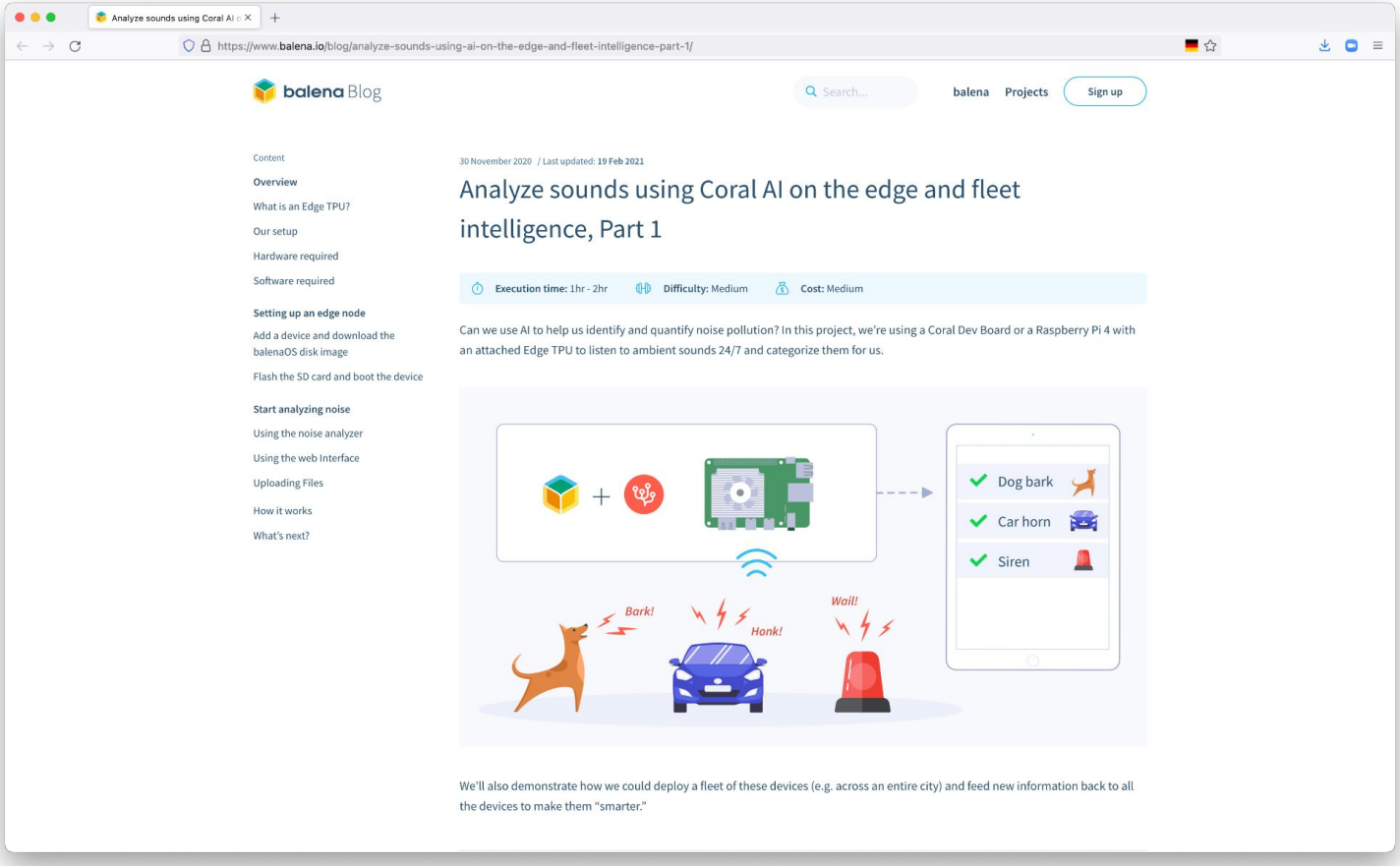
balenaCloud

balenaEtcher



2 Deploy the balena fleet

in just one click



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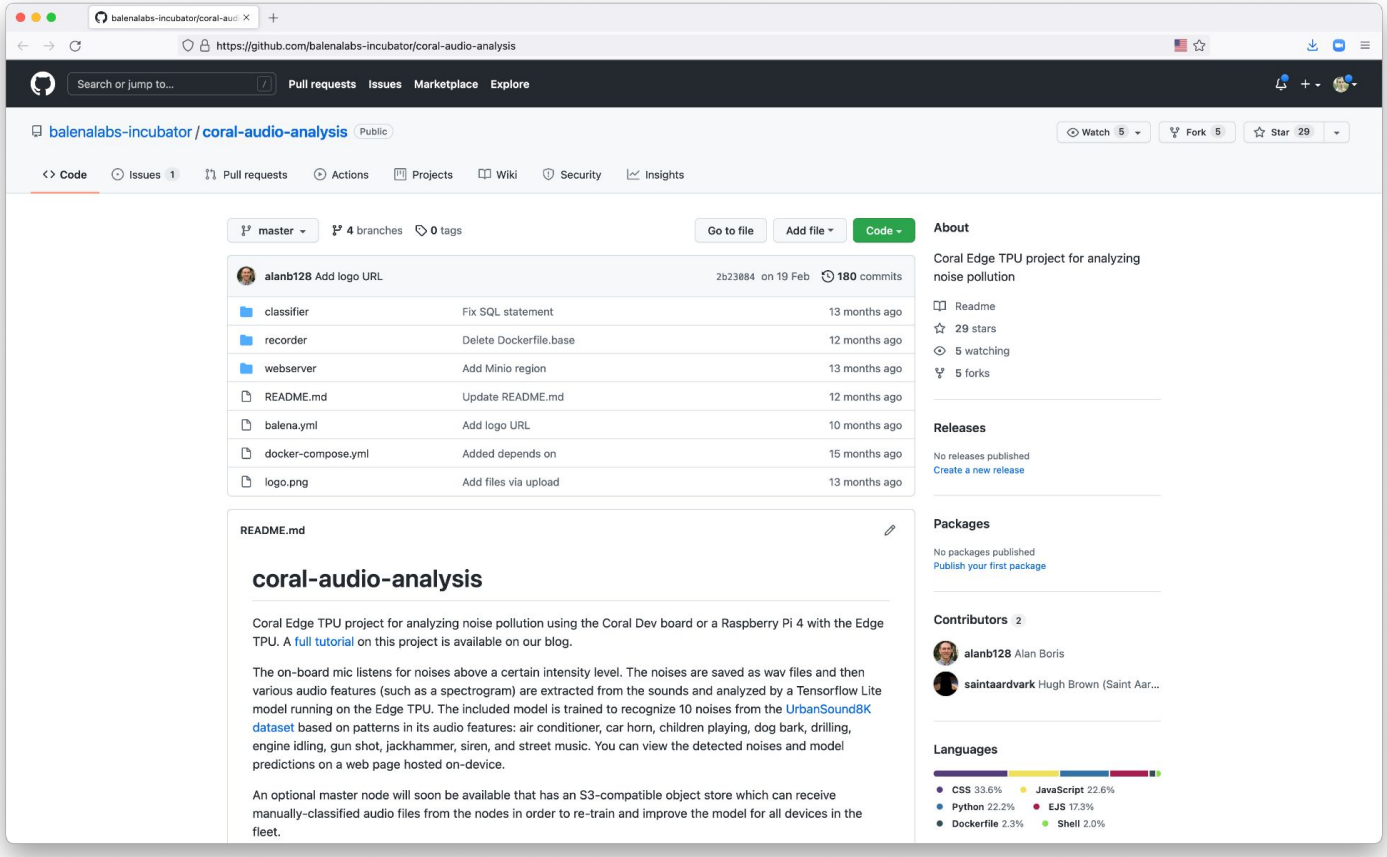
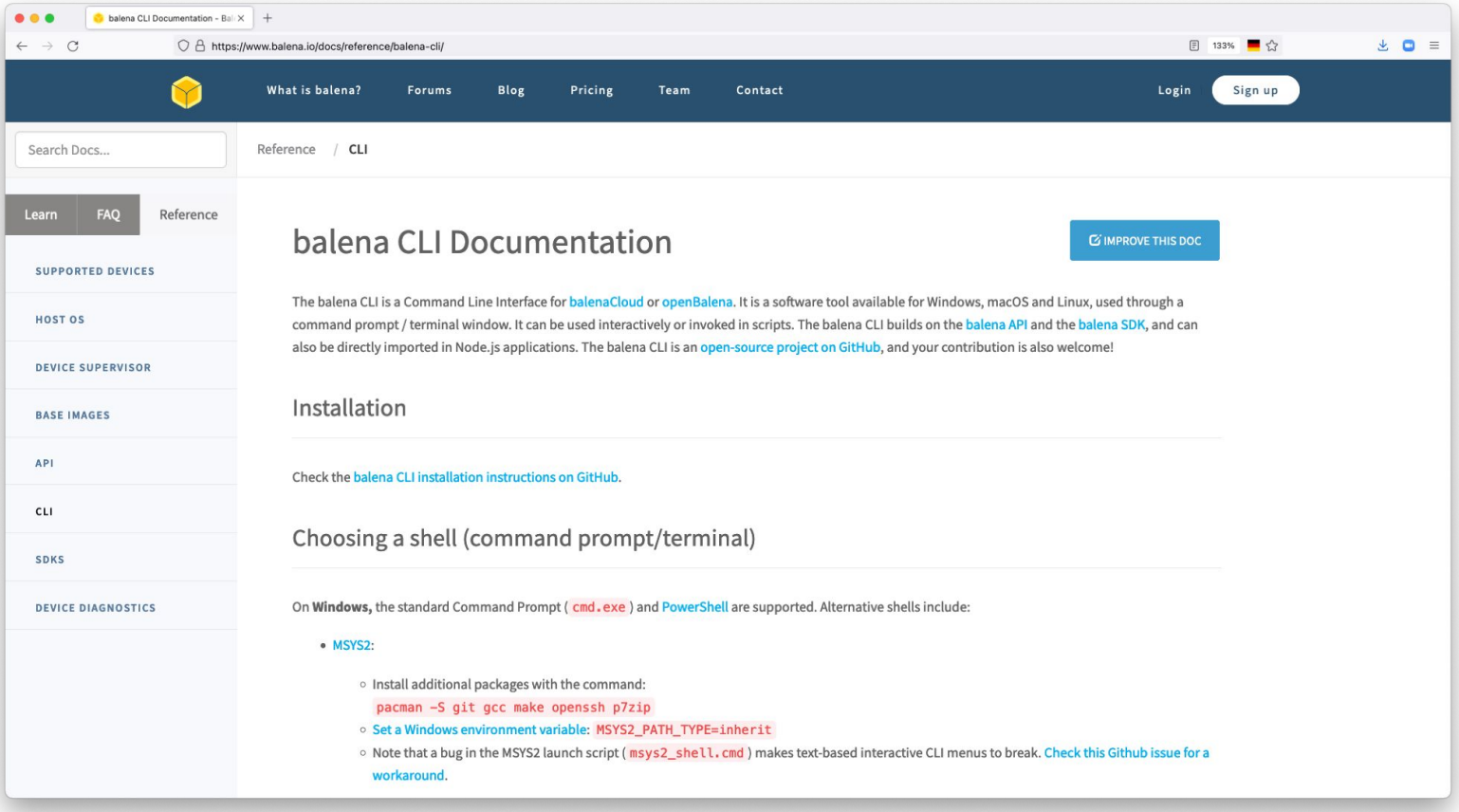


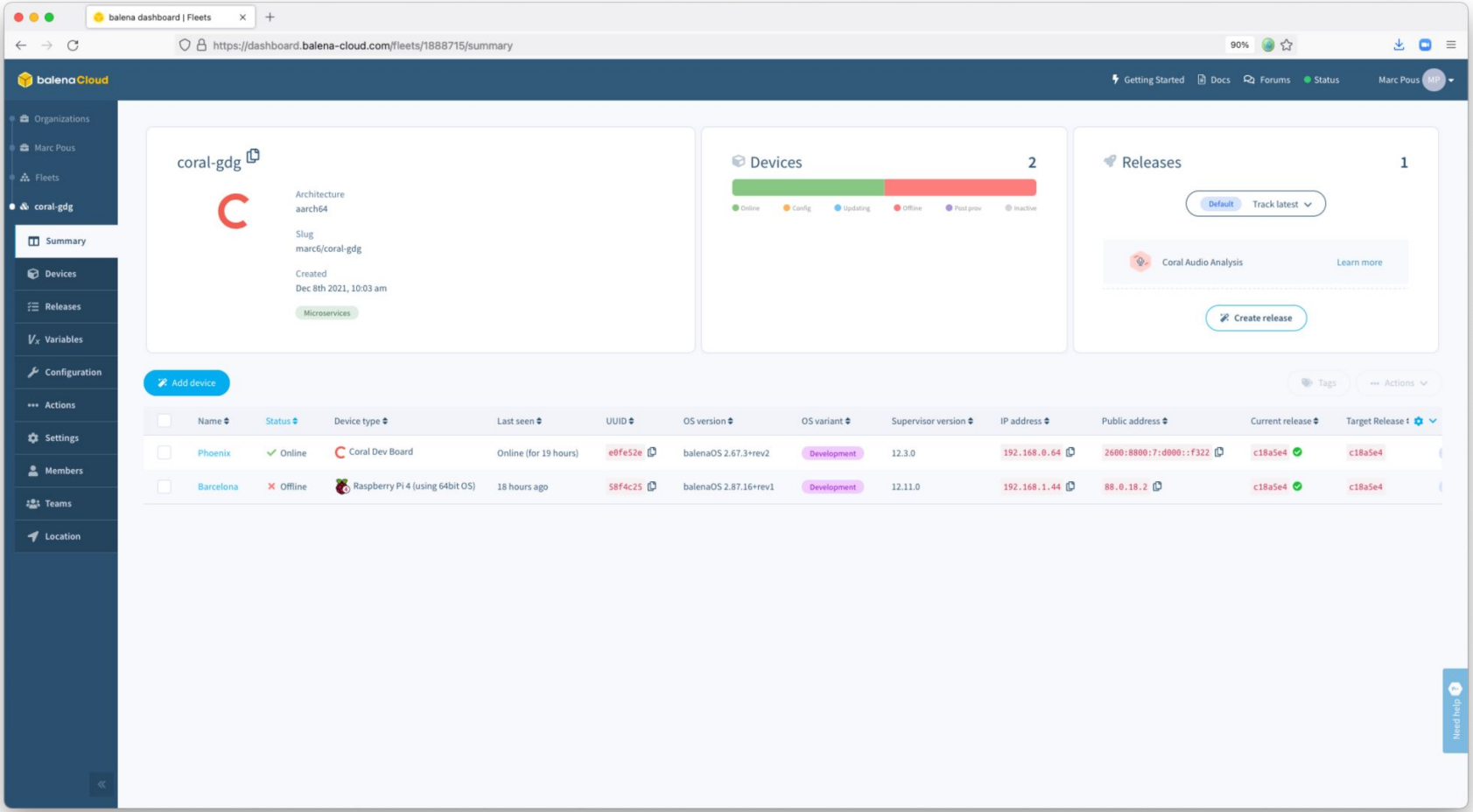
https://github.com/balenalabs-incubator/coral-audio-analysis

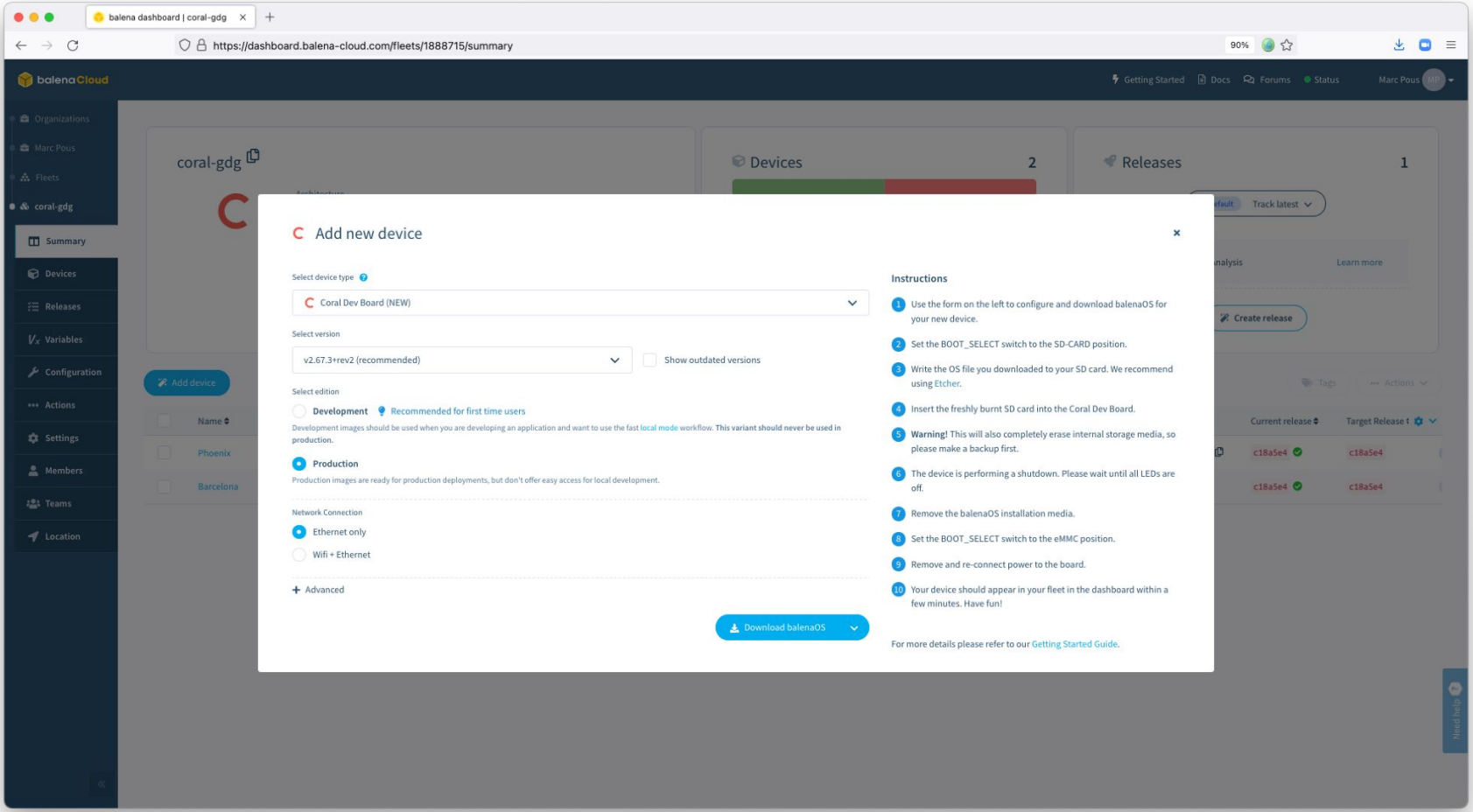

Deploy with balena

```
$ git clone https://github.com/balenalabs-incubator/coral-audio-analysis.git
$ cd coral-audio-analysis
$ balena login
$ balena push coral-audio-analysis
```



https://github.com/balena-io/balena-cli/blob/master/INSTALL.md


balena dashboard | Fleets
https://dashboard.balena-cloud.com/fleets/1888715/summary
90%
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
coral-gdg
Summary
Devices
Releases
Variables
Configuration
Actions
Settings
Members
Teams
Location
coral-gdg
Architecture
aarch64
Slug
marc6/coral-gdg
Created
Dec 8th 2021, 10:03 am
Microservices
Devices
2
Online
Config
Updating
Offline
Post prov
Inactive
Releases
1
Default
Track latest
Coral Audio Analysis
Learn more
Create release
Add device
Tags
Actions
Name
Status
Device type
Last seen
UUID
OS version
OS variant
Supervisor version
IP address
Public address
Current release
Target Release
Phoenix
Online
Coral Dev Board
Online (for 19 hours)
e0fe52e
balenaOS 2.67.3+rev2
Development
12.3.0
192.168.0.64
2600:8800:7:d000::f322
c18a5e4
c18a5e4
Barcelona
Offline
Raspberry Pi 4 (using 64bit OS)
18 hours ago
58f4c25
balenaOS 2.87.16+rev1
Development
12.11.0
192.168.1.44
88.0.18.2
c18a5e4
c18a5e4
Need help


balena dashboard | coral-gdg
https://dashboard.balena-cloud.com/fleets/1888715/summary
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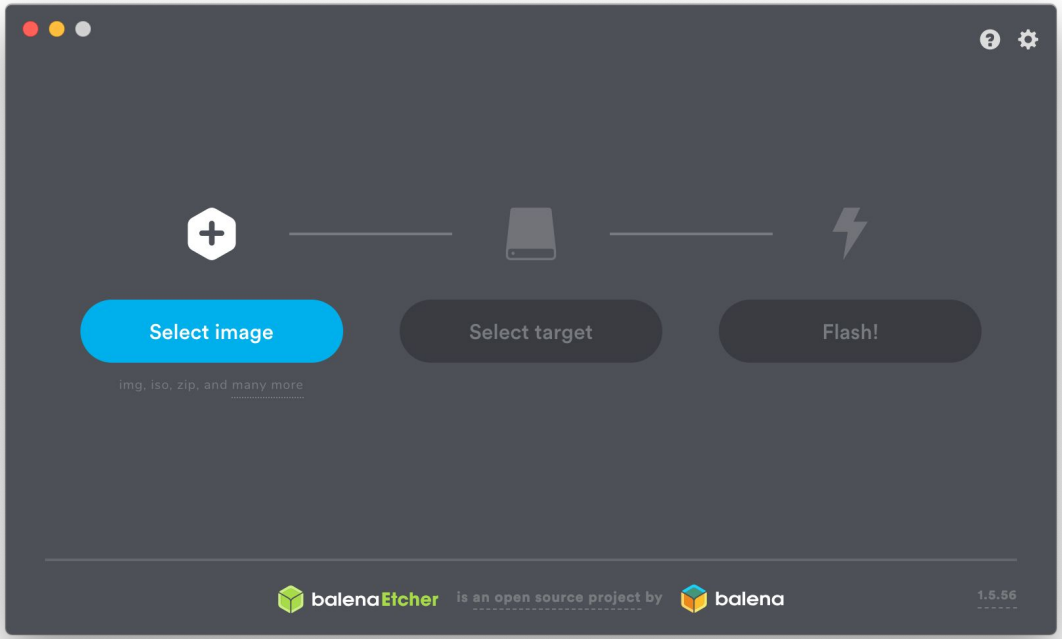
Summary
Devices
Releases
Variables
Configuration
Actions
Settings
Members
Teams
Location
coral-gdg
Devices
2
Releases
1
Track latest
Learn more
Create release
Add device
Name
Phoenix
Barcelona
Current release
Target Release
c18a5e4
c18a5e4
c18a5e4
c18a5e4
Add new device
Select device type
Coral Dev Board (NEW)
Select version
v2.67.3+rev2 (recommended)
Show outdated versions
Select edition
Development
Recommended for first time users
Development images should be used when you are developing an application and want to use the fast local mode workflow. This variant should never be used in production.
Production
Production images are ready for production deployments, but don't offer easy access for local development.
Network Connection
Ethernet only
Wifi + Ethernet
Advanced
Download balenaOS
Instructions
1 Use the form on the left to configure and download balenaOS for your new device.
2 Set the BOOT_SELECT switch to the SD-CARD position.
3 Write the OS file you downloaded to your SD card. We recommend using Etcher.
4 Insert the freshly burnt SD card into the Coral Dev Board.
5 Warning! This will also completely erase internal storage media, so please make a backup first.
6 The device is performing a shutdown. Please wait until all LEDs are off.
7 Remove the balenaOS installation media.
8 Set the BOOT_SELECT switch to the eMMC position.
9 Remove and re-connect power to the board.
10 Your device should appear in your fleet in the dashboard within a few minutes. Have fun!
For more details please refer to our Getting Started Guide.
Need help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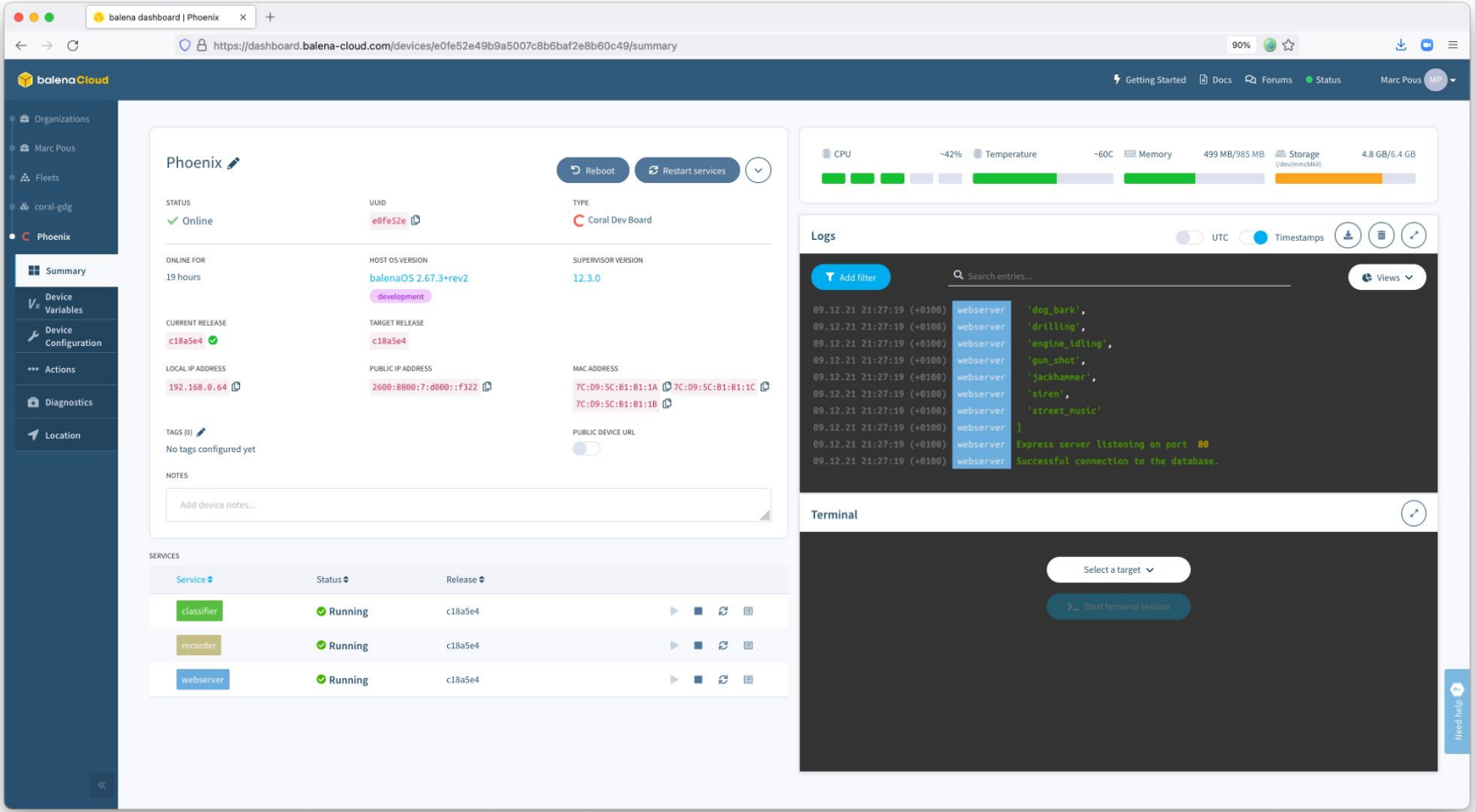
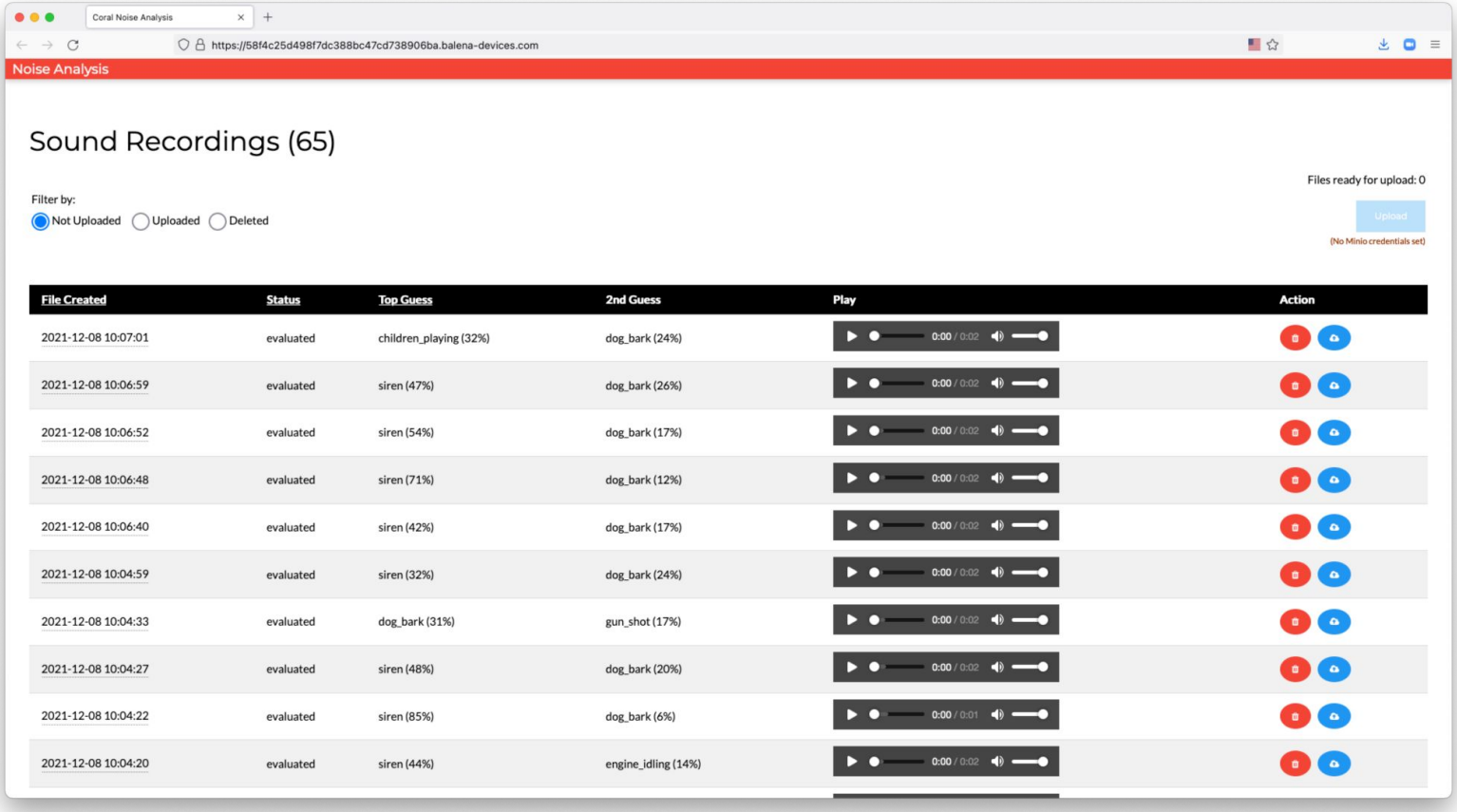
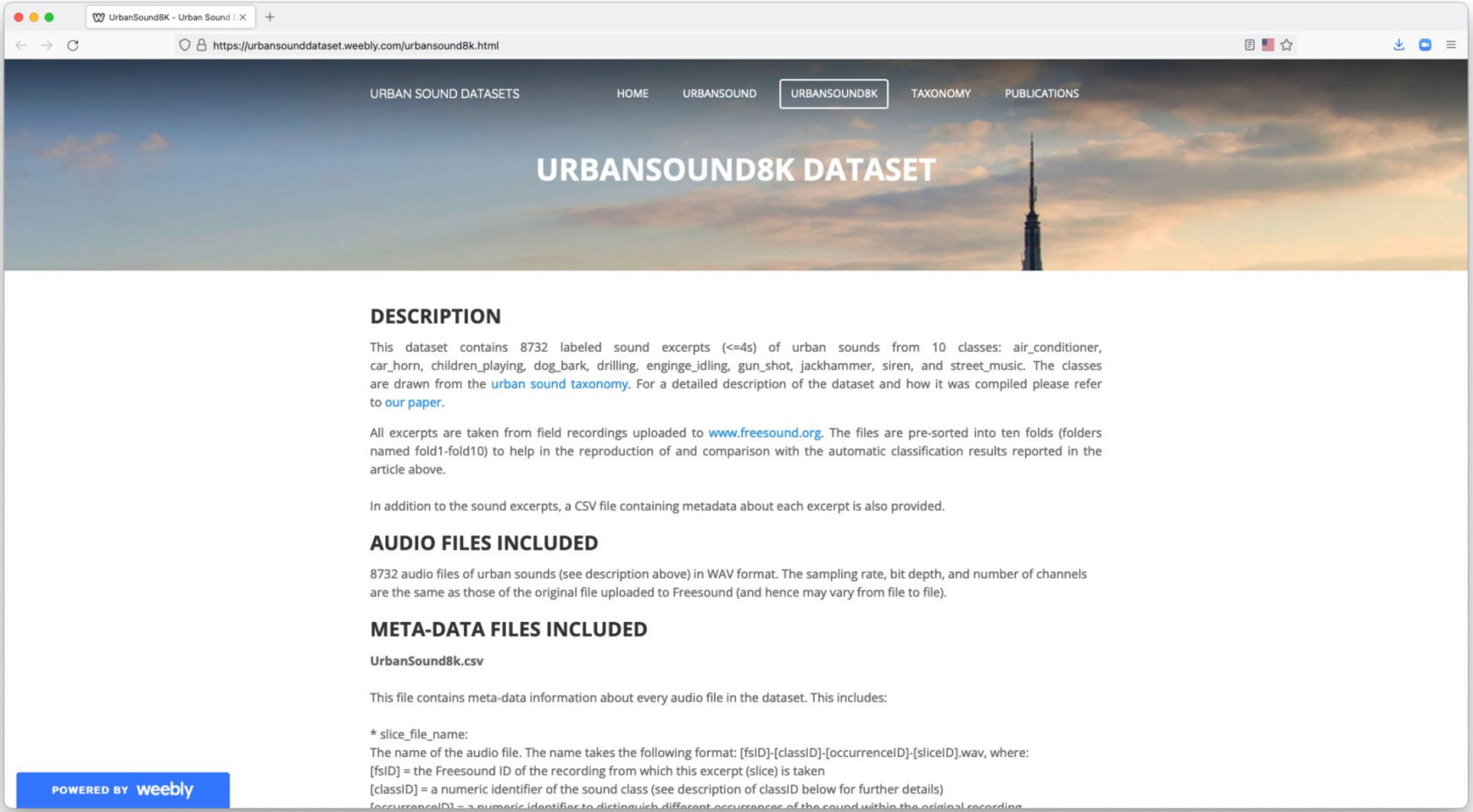
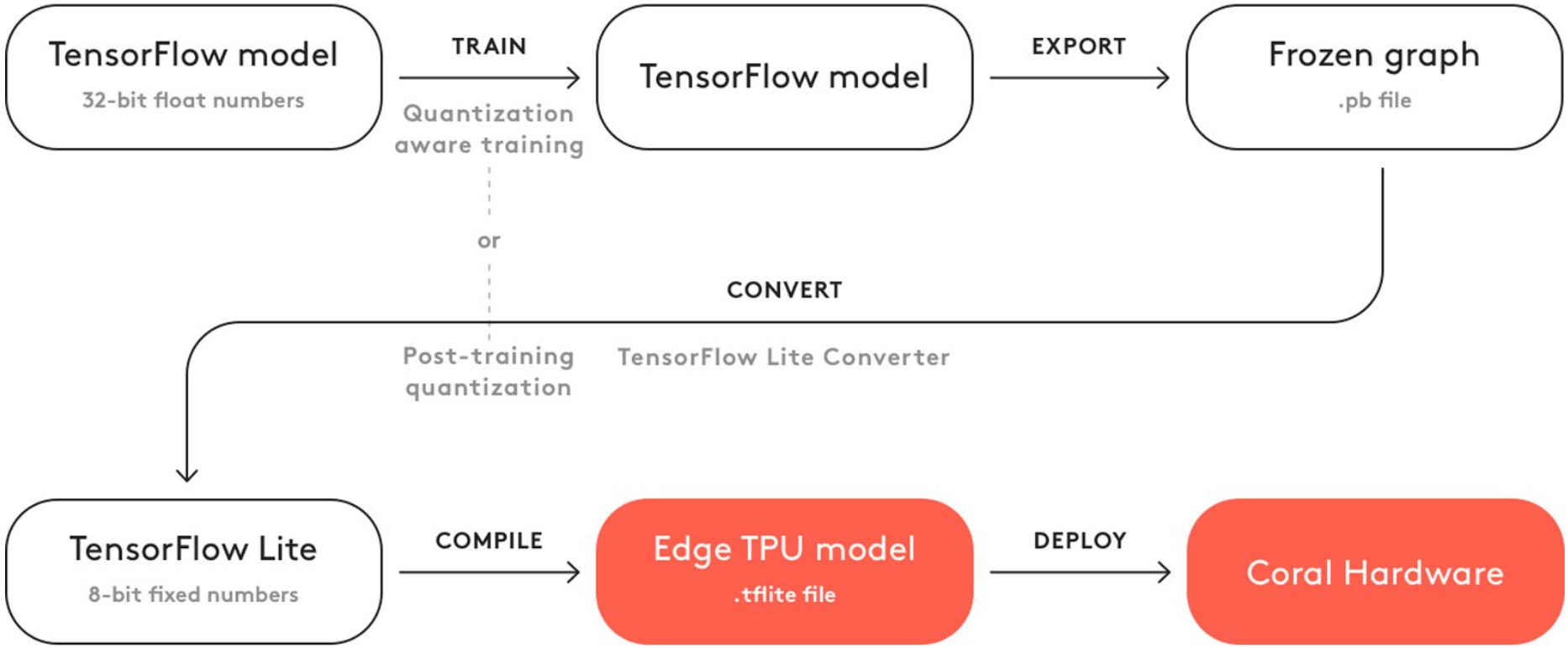

balena dashboard | Phoenix
https://dashboard.balena-cloud.com/devices/e0fe52e49b9a5007c8b6baf2e8b60c49/summary
90%
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
coral-gdg
Phoenix
Summary
Device Variables
Device Configuration
Actions
Diagnostics
Location
Phoenix
Reboot
Restart services
STATUS
Online
UUID
e0fe52e
TYPE
Coral Dev Board
ONLINE FOR
19 hours
HOST OS VERSION
balenaOS 2.67.3+rev2
development
SUPERVISOR VERSION
12.3.0
CURRENT RELEASE
c18a5e4
TARGET RELEASE
c18a5e4
LOCAL IP ADDRESS
192.168.0.64
PUBLIC IP ADDRESS
2600:8800:7:d000::f322
MAC ADDRESS
7C:D9:5C:B1:B1:1A
7C:D9:5C:B1:B1:1C
7C:D9:5C:B1:B1:1B
TAGS (0)
No tags configured yet
PUBLIC DEVICE URL
NOTES
Add device notes...
SERVICES
Service
Status
Release
classifier
Running
c18a5e4
recorder
Running
c18a5e4
webserver
Running
c18a5e4
CPU
~42%
Temperature
~60C
Memory
499 MB/985 MB
Storage
4.8 GB/6.4 GB
Logs
UTC
Timestamps
Add filter
Search entries...
Views
09.12.21 21:27:19 (+0100) webserver 'dog_bark',
09.12.21 21:27:19 (+0100) webserver 'drilling',
09.12.21 21:27:19 (+0100) webserver 'engine_idling',
09.12.21 21:27:19 (+0100) webserver 'gun_shot',
09.12.21 21:27:19 (+0100) webserver 'jackhammer',
09.12.21 21:27:19 (+0100) webserver 'siren',
09.12.21 21:27:19 (+0100) webserver 'street_music'
09.12.21 21:27:19 (+0100) webserver]
09.12.21 21:27:19 (+0100) webserver Express server listening on port 80
09.12.21 21:27:19 (+0100) webserver Successful connection to the database.
Terminal
Select a target
Start terminal session
Need help


Coral Noise Analysis
https://58f4c25d498f7dc388bc47cd738906ba.balena-devices.com
Noise Analysis
Sound Recordings (65)
Filter by:
Not Uploaded
Uploaded
Deleted
Files ready for upload: 0
Upload
(No Minio credentials set)
File Created
Status
Top Guess
2nd Guess
Play
Action
2021-12-08 10:07:01 evaluated children_playing (32%) dog_bark (24%)
2021-12-08 10:06:59 evaluated siren (47%) dog_bark (26%)
2021-12-08 10:06:52 evaluated siren (54%) dog_bark (17%)
2021-12-08 10:06:48 evaluated siren (71%) dog_bark (12%)
2021-12-08 10:06:40 evaluated siren (42%) dog_bark (17%)
2021-12-08 10:04:59 evaluated siren (32%) dog_bark (24%)
2021-12-08 10:04:33 evaluated dog_bark (31%) gun_shot (17%)
2021-12-08 10:04:27 evaluated siren (48%) dog_bark (20%)
2021-12-08 10:04:22 evaluated siren (85%) dog_bark (6%)
2021-12-08 10:04:20 evaluated siren (44%) engine_idling (14%)



https://urbansounddataset.weebly.com/urbansound8k.html



https://coral.ai/docs/edgetpu/inference/

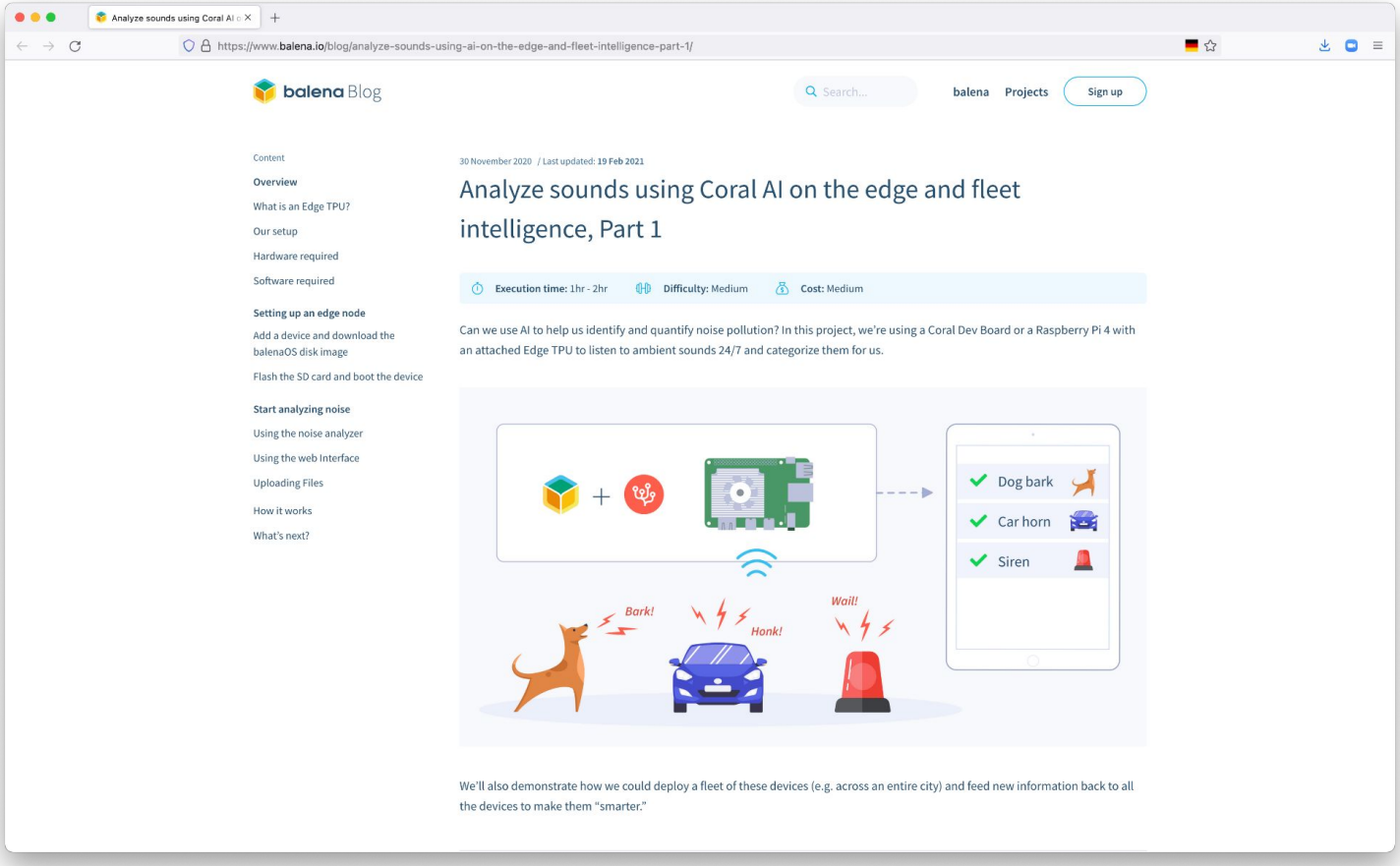
3

Share it, contribute

and inspire others

Time to install it :-)

Please send feedback



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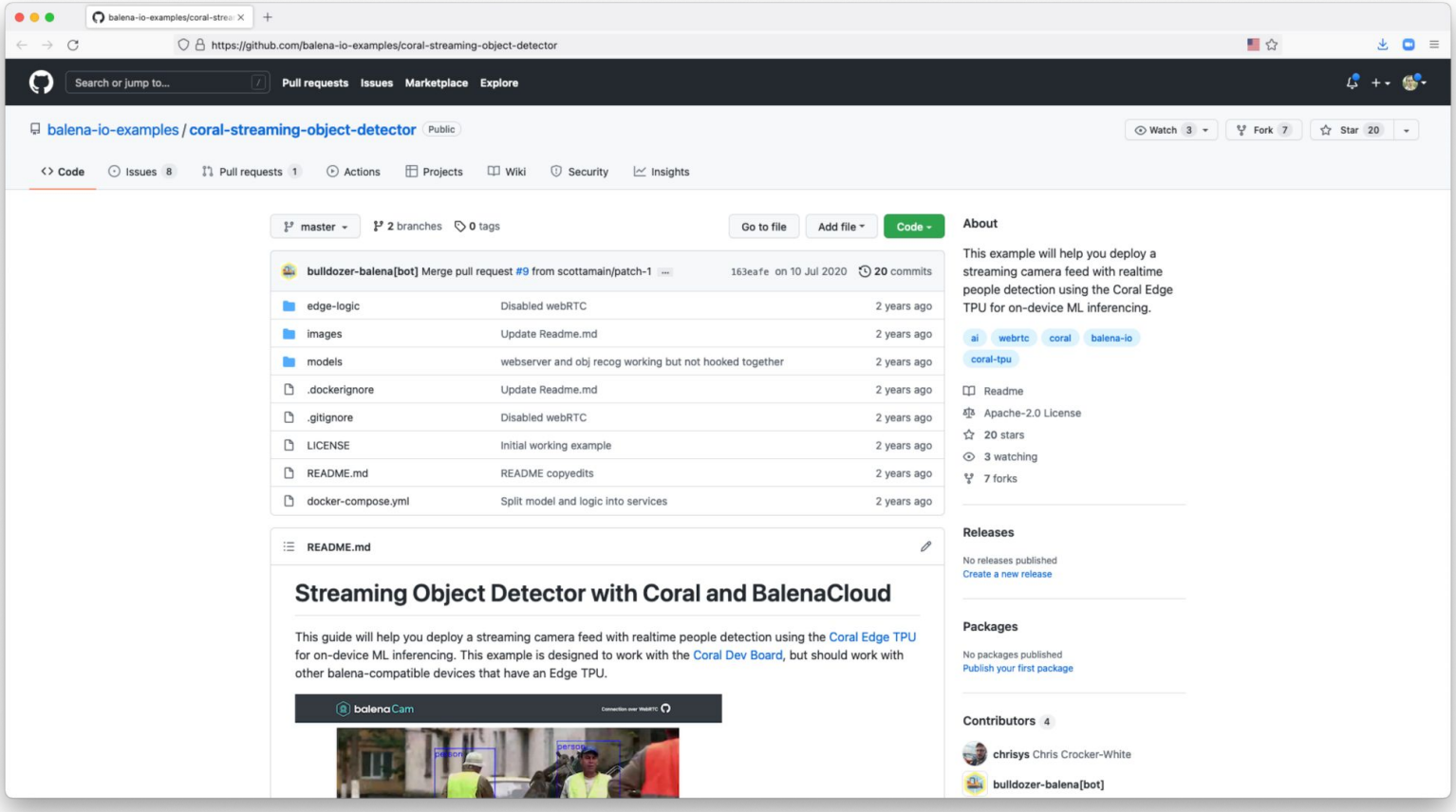

https://github.com/balena-io-examples/coral-streaming-object-detector

Contribute to the project!
(It’s open source)

https://github.com/balenalabs-incubator/coral-audio-analysis

Ok! Let’s wrap-up!

Takeaways

- Learn about Machine Learning and sound classification.
- Create your IoT / Edge AI fleet, the easy way.
- Contribute and inspire others.

Questions?

Learn how to use Google Coral for your Edge ML projects with balena

DevFest UK + Ireland - 29th January 2022