

# Managing a Fleet of 1000 Connected Devices



balena

arm



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balena

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# Agenda

- **Discussion:** Introductions and Background
  - balena
  - Arm
- Account Creation
- Assemble Hardware
- Install CLI
- Push First Container
- **Discussion:** Scaling and Fleet Management
- Locate Additional Projects
- Additional Resources and Wrap up



# balena

“Platform built to develop, deploy, and manage fleets of connected devices at scale.”

- balenaCloud
  - Web-based control of IoT devices, broken down by Applications, Devices, Workloads, and more
  - Terminal access to device, logs, container build info, and more.
- balenaOS
  - Based on Yocto Linux
- balenaEngine
  - Container runtime



**balena**





balena**Cloud**



open**balena**



balena**OS**



balena**Engine**



balena**Etcher**



balena**Fin**



# Arm

Arm designs energy-efficient, advanced processor core designs that are used in billions of devices.

1. Arm designs Intellectual Property,
2. Many well known chip designers license Arm IP and manufacture their own processors.
3. Processor goes in to a device.

Used in phones, tablets, laptops, networking equipment, even servers!

The Arm logo, consisting of the lowercase letters 'arm' in a bold, white, sans-serif font.

# Deep Dive: Energy Efficiency

Arm excels in the mobile phone and tablet ecosystem, due to efficient compute.

x86 designs have historically focused on all-out performance.

Cell phones and tablets demand long battery-life, and have size constraints.

IoT devices typically have limited compute, power, memory, or physical dimensions, so Arm processors excel in this use case as well.

The Arm logo, consisting of the lowercase letters 'arm' in a bold, white, sans-serif font, positioned in the bottom right corner of the slide.

# Arm Developer Program

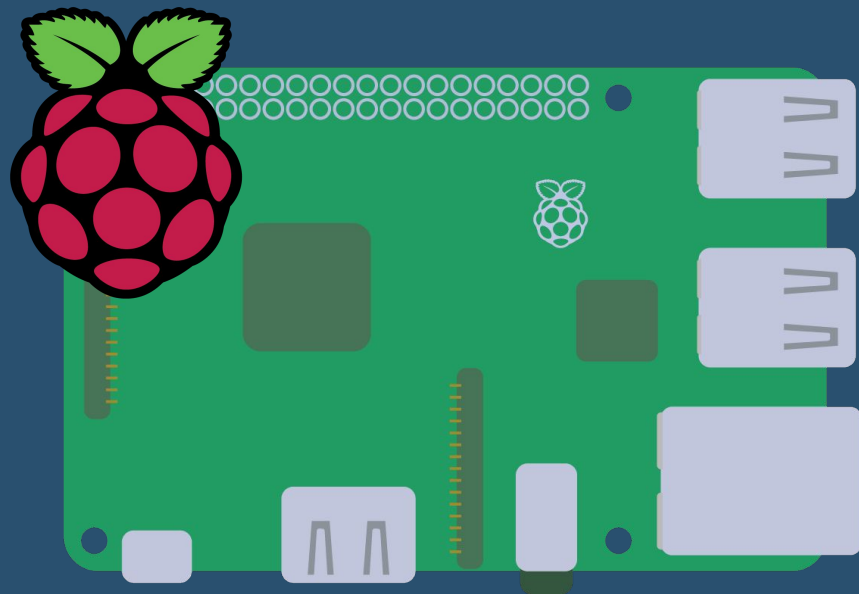
A new **Arm Developer Program** is coming...

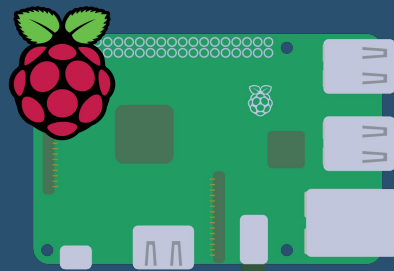
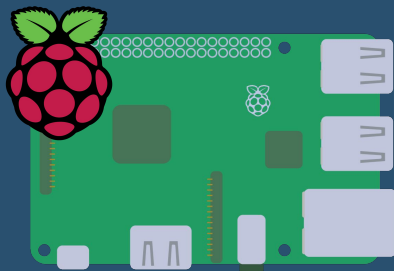
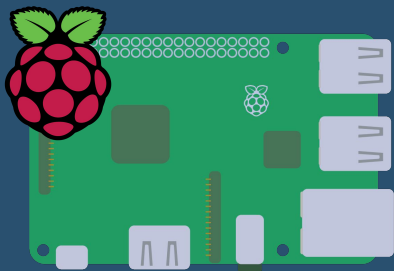
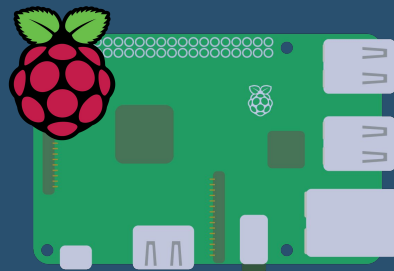
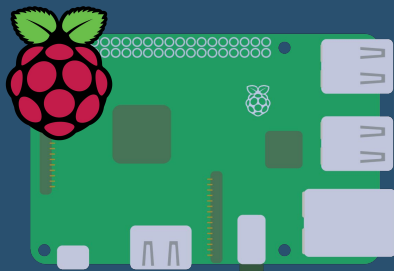
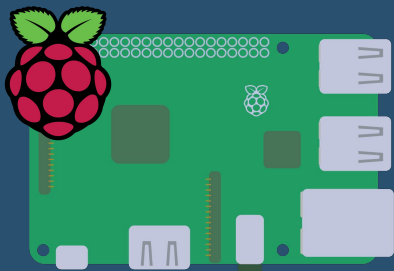
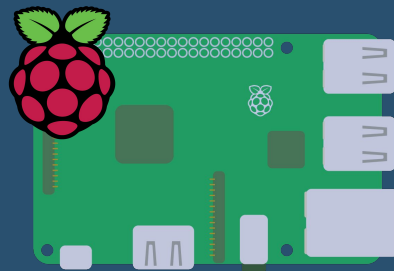
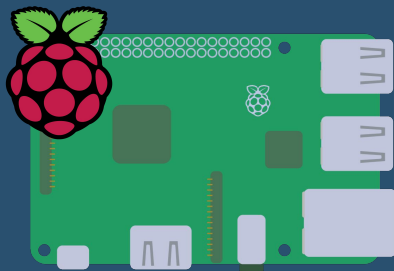
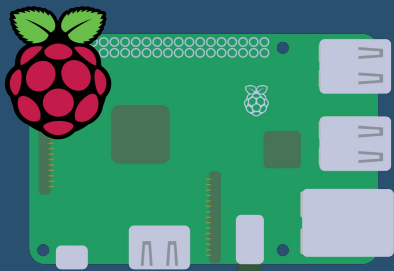
- Developer Network ([developer.arm.com](https://developer.arm.com)) refresh
- Major influx of content and resources
- Building and supporting communities across the Arm ecosystem
- Launch to happen in two phases
- First phase to launch in March, 2020
- Pay attention to [developer.arm.com](https://developer.arm.com)
- Developer feedback is welcome and appreciated

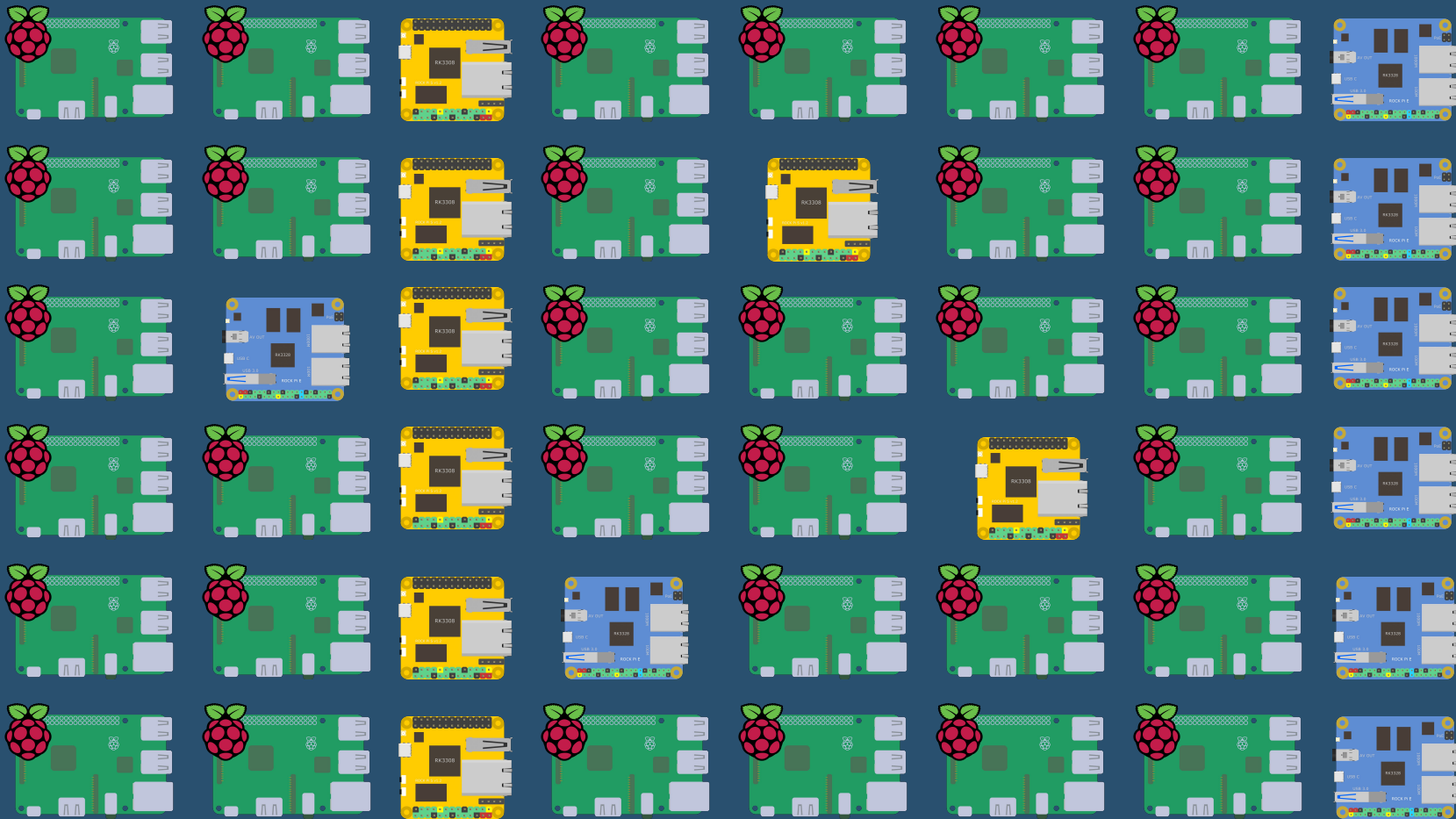
The Arm logo, consisting of the lowercase letters 'arm' in a bold, white, sans-serif font.

What do we mean by IoT  
“Fleet Management”?













# Architecture



OS



# balenaOS

Built on Yocto Linux, Optimized for  
Embedded Devices and IoT Usage

- Minimal by design (increased security)
- Less RAM / resource requirements
- Redundant RootFS partitions
- More tolerant of power loss
- Minimized SD Card writes



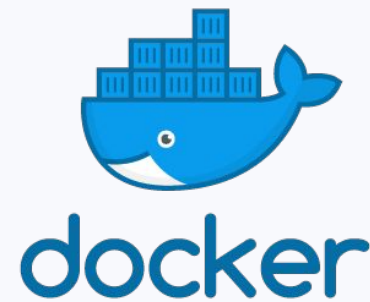
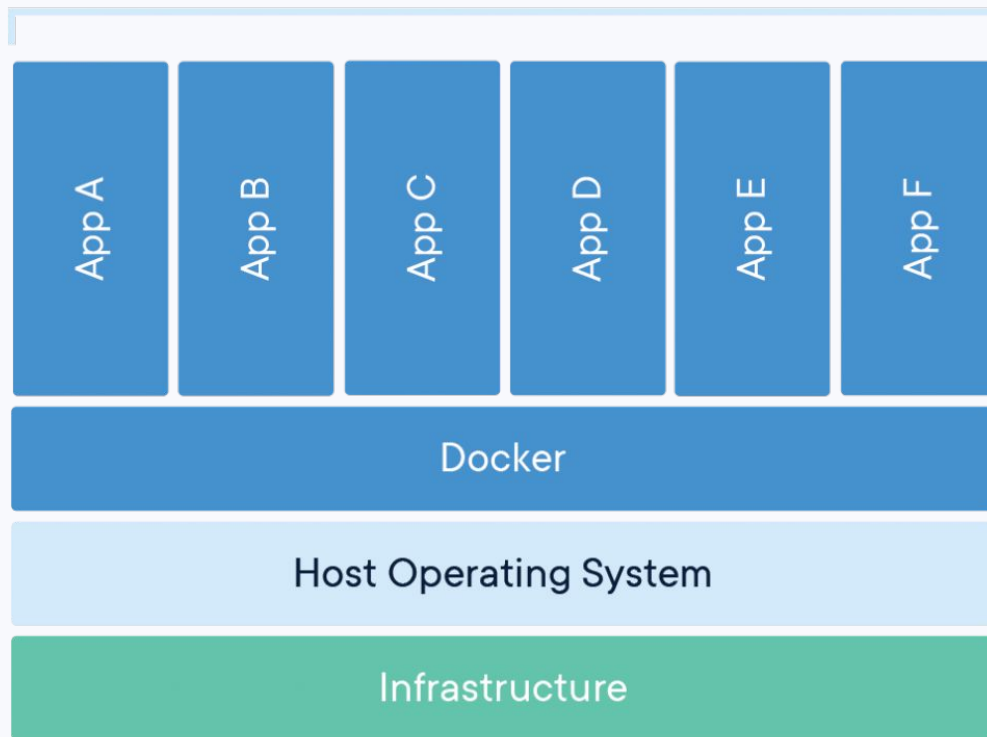
**balenaOS**



# Docker Containers



## Containerized Applications



# balenaEngine

Container engine built for Embedded and IoT use-cases, based on the Moby Project from Docker

- Minimal by design
- Less RAM / resource requirements
- Deltas pulls to save bandwidth
- Fault tolerance on container pulls



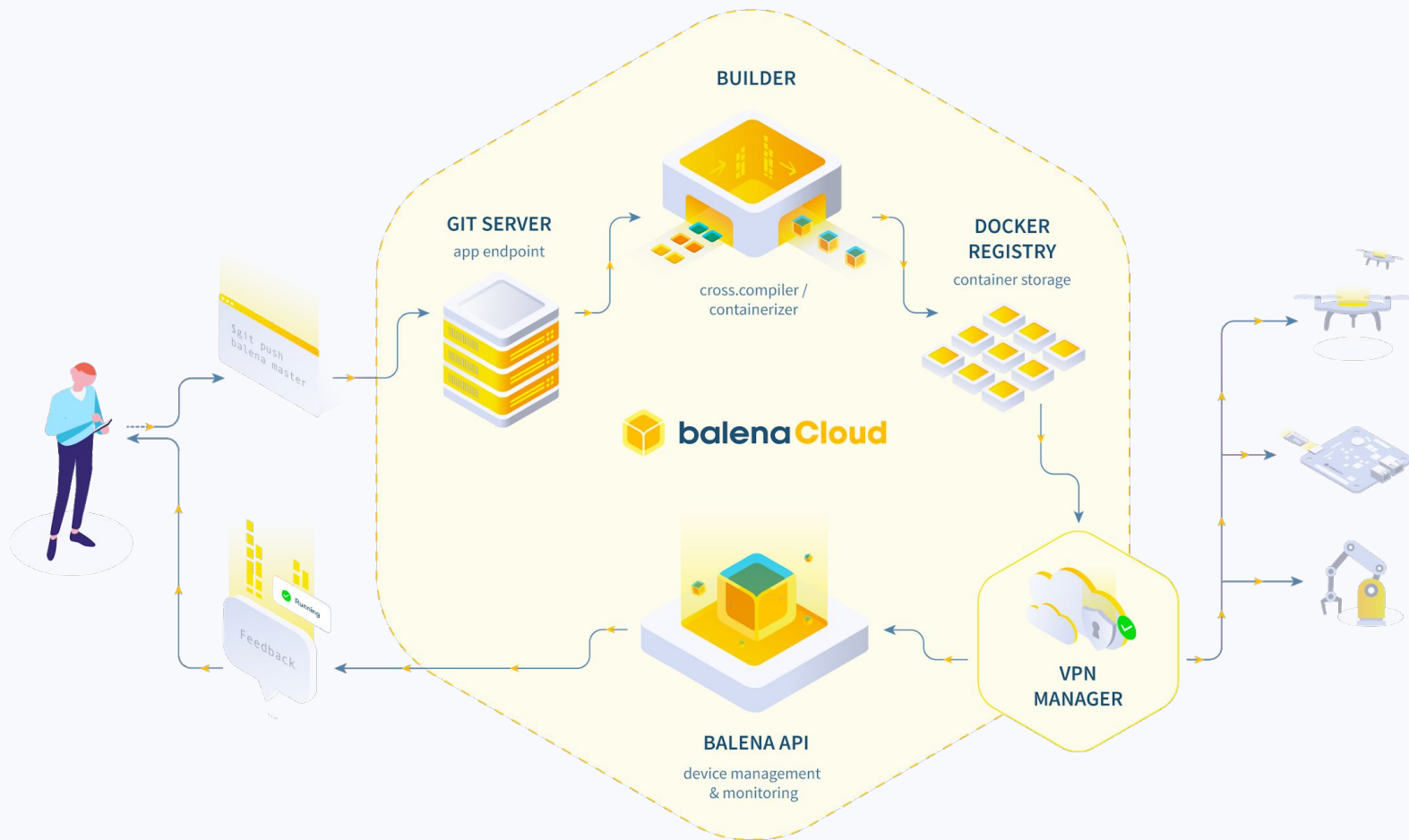
**balenaEngine**



# Build Workflow







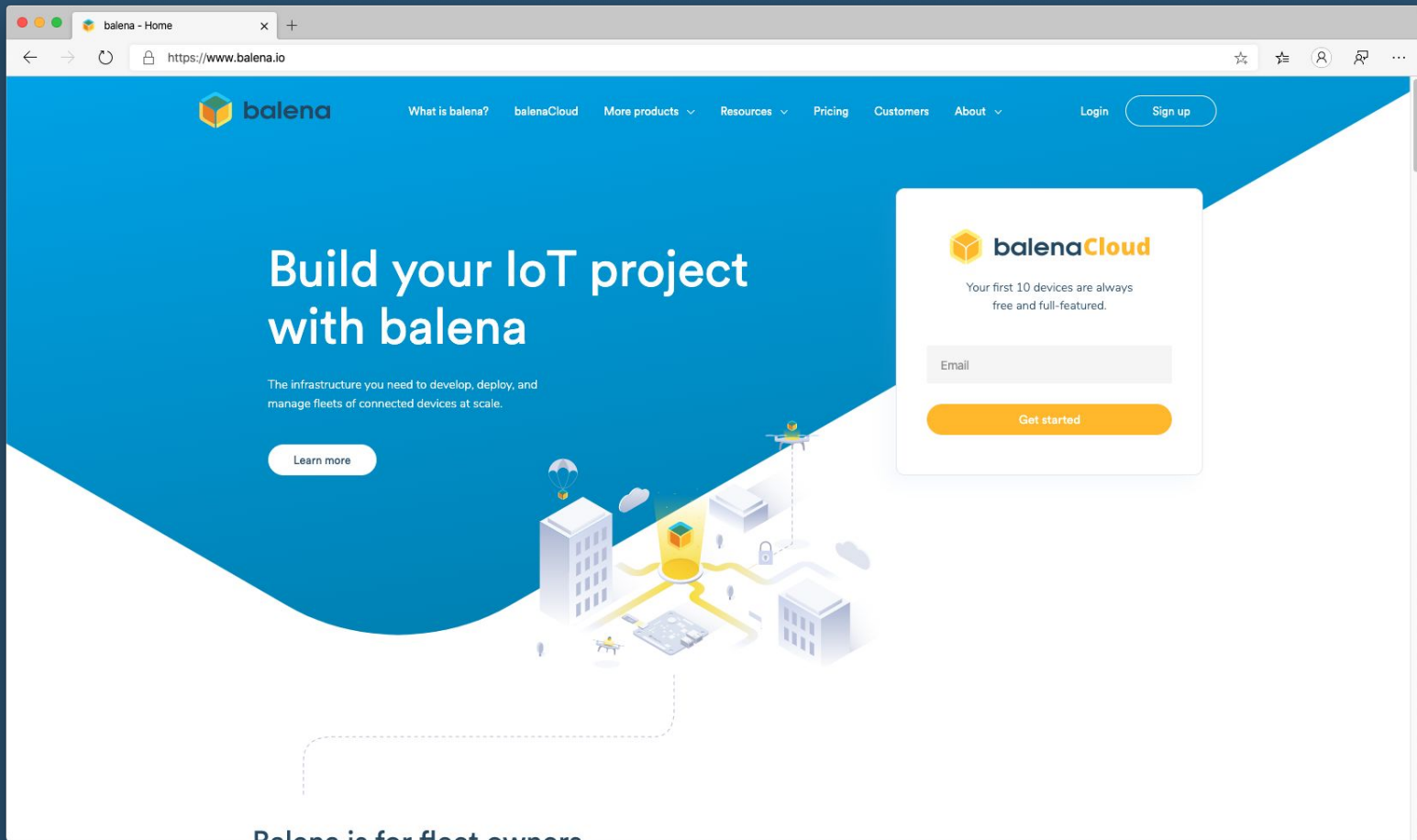
# Let's Begin!



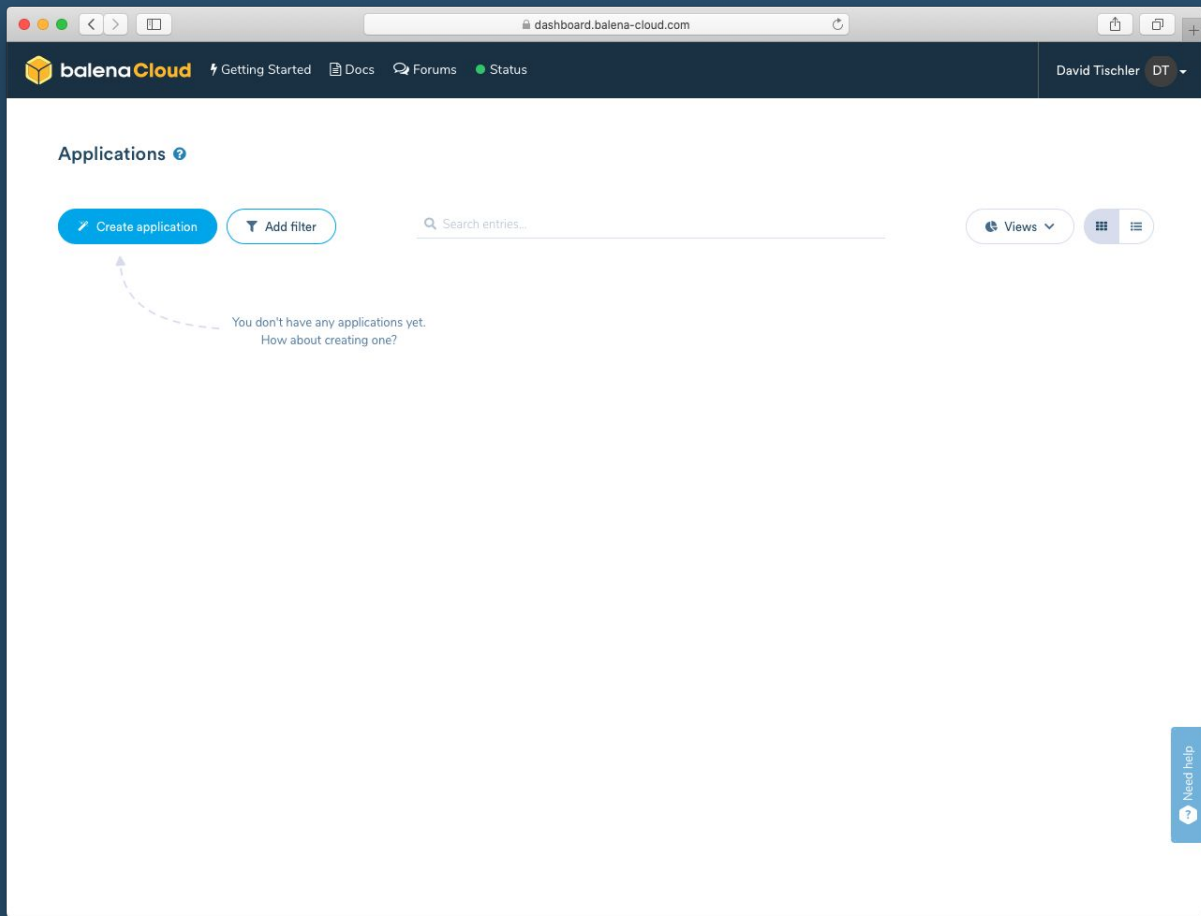
# Let's get started

- 1 Create an account
- 2 Create an application
- 3 Add your device
- 4 Push your code











# Wifi login

## SSID

## Password

balenaCloud Getting Started Docs Forums Status David Tischler DT

### Add new device

Select device type

Raspberry Pi 4

Select OS version

v2.46.1+rev3 (recommended)

Select edition

Development ☒ Production

**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.

**Network Connection**

Ethernet only ☐ Wifi + Ethernet ☒

Wifi SSID

Wifi Passphrase

+ Advanced

[Download balenaOS \(~146 MB\)](#)

#### Instructions

- 1 Use the form on the left above to configure and download balenaOS for your new device.
- 2 Write the OS file you downloaded to your SD card. We recommend using [Etcher](#).
- 3 Insert the freshly burnt SD card into the Raspberry Pi 4.
- 4 Connect your Raspberry Pi 4 to the internet, then power it up.
- 5 Your device should appear in your application dashboard within a few minutes. Have fun!

For more details please refer to our [getting started guide](#).






# Flash SD Card with Etcher





balena.io

An open source project by  balena | More products 



ForumsMailing listChangelogEtcher Pro

# Flash. Flawless.

Flash OS images to SD cards & USB drives, safely and easily.



→



→



Select imageSelect driveFlash!

Download for macOS 

v1.5.71 [See what's new](#)

**Validated Flashing**

No more writing images on corrupted cards and wondering why your device

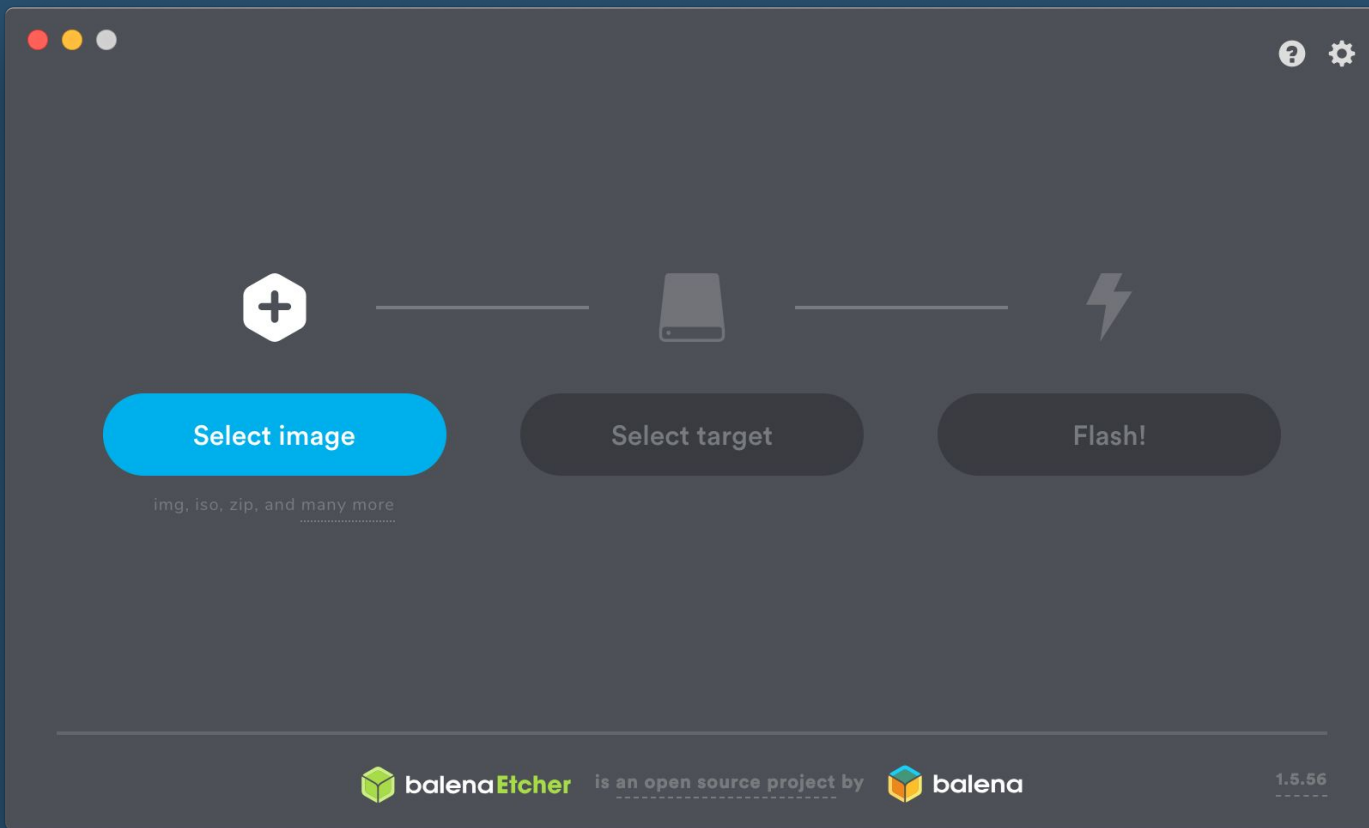
**Hard Drive Friendly**

Makes drive selection obvious to avoid wiping your entire hard-drive

**FEATURES**


## A better way to burn.





# Power Up!



Getting StartedDocsForumsStatus

David TischlerDT

Applications > DemoApplication

Release policytrack latest

git remote add balena david\_...

Devices

Fleet Configuration

Environment Variables

Service Variables


Releases

Location

Members

+ Add deviceAdd filterSearch entries...

ViewsActionsTags

<input type="checkbox"/>	Status	Name	Last Seen	UUID	OS Version	OS Variant	Supervisor Version	IP
<input type="checkbox"/>	 Online	bold-feather	Online (for a few seconds)	73ffa45	balenaOS 2.46.1+rev3	production	10.6.27	192.168.

1 - 1 of 1

Need help



🏠

Back

🏠

Applications > DemoApplication > bold-feather

Summary

Device Configuration

D(x)  
Device Variables

S(x)  
Device Service Variables

📍  
Location

⋮  
Actions

🩺  
Diagnostics Experimental

DEVICE

bold-feather

🔧

🔄 Reboot

🔄 Restart

💡

⌵

STATUS

Online

UUID

73ffa45

📄

TYPE

Raspberry Pi 4

LAST ONLINE

Online (for a few seconds)

HOST OS VERSION

balenaOS 2.46.1+rev3

production

SUPERVISOR VERSION

10.6.27

CURRENT RELEASE

Factory build

TARGET RELEASE

Factory build

IP ADDRESS

192.168.0.162

📄

TAGS (0)

🔧

No tags configured yet

PUBLIC DEVICE URL

🔌

NOTES

Add device notes...

Logs

UTC

🕒 Timestamps

👤

🗑️

🔗

Add filter

🔍 Search entries...

👁 Views

22.01.20 14:41:36 (-0700) Supervisor starting

22.01.20 14:42:06 (-0700) Applying configuration change {"SUPERVISOR\_POLL\_INTERVAL":"900000","SUPERVISOR\_DELTA\_VERSION":"3"}

22.01.20 14:42:06 (-0700) Applied configuration change {"SUPERVISOR\_POLL\_INTERVAL":"900000","SUPERVISOR\_DELTA\_VERSION":"3"}

22.01.20 14:42:07 (-0700) Creating network 'default'

Terminal

🔗

Select a target

> Start terminal session

Need help



# Quick Tour of GUI



# Let's Add a Container



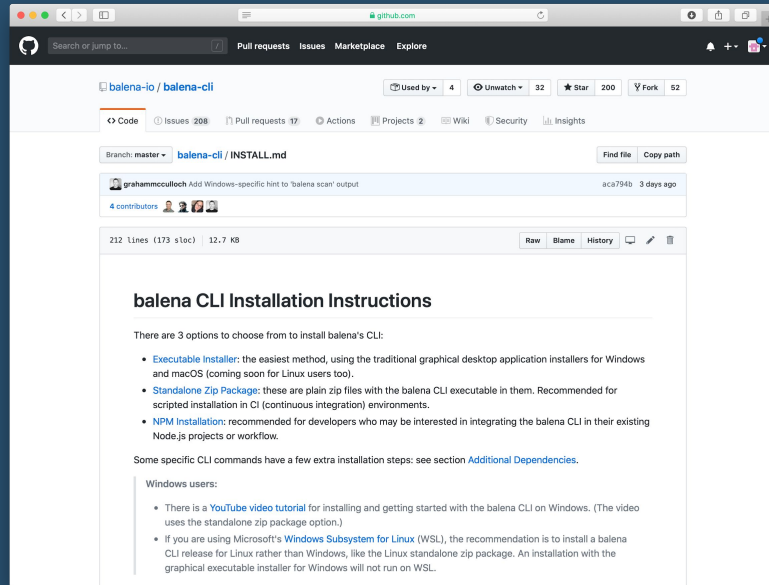
# 1 Install balena-CLI

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

Windows, Mac, or Linux

Provides native tooling for:

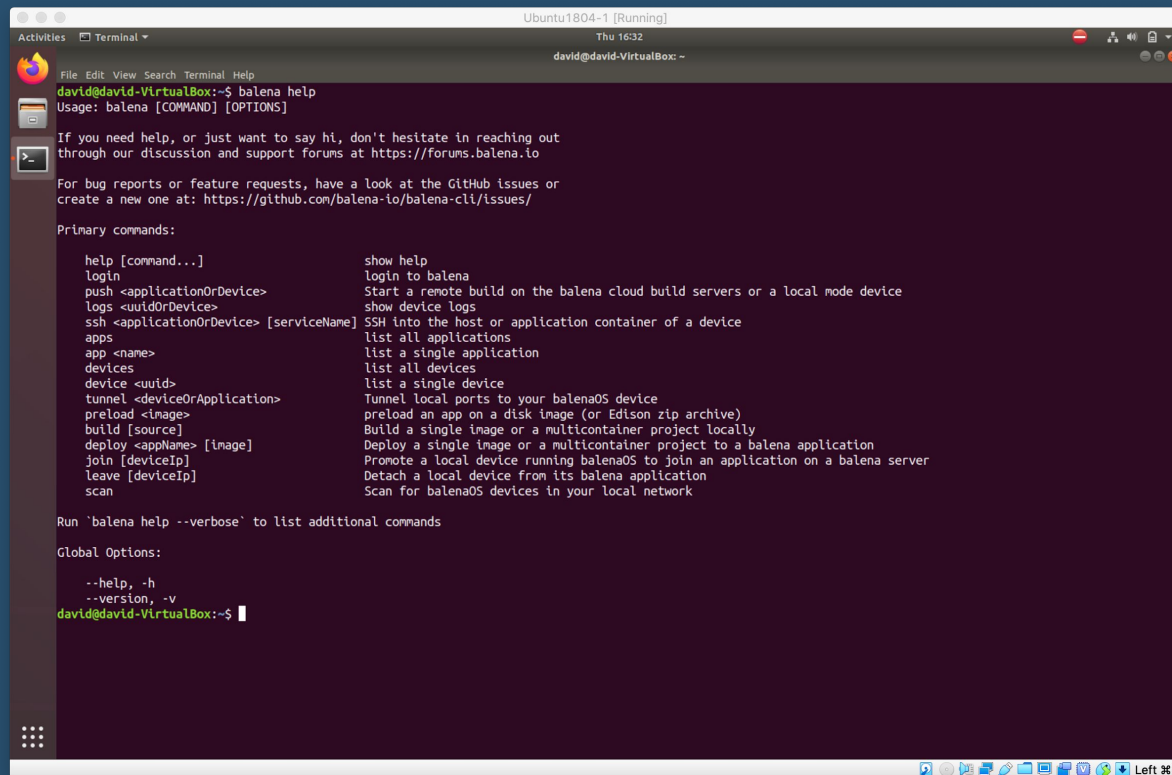
- Device and App Info
- Building, Pushing Code
- SSH to Devices





## 1

# Install balena-CLI



```
Ubuntu1804-1 [Running]
Thu 16:32
david@david-VirtualBox: ~

File Edit View Search Terminal Help
david@david-VirtualBox:~$ balena help
Usage: balena [COMMAND] [OPTIONS]

If you need help, or just want to say hi, don't hesitate in reaching out
through our discussion and support forums at https://forums.balena.io

For bug reports or feature requests, have a look at the GitHub issues or
create a new one at: https://github.com/balena-io/balena-cli/issues/

Primary commands:

help [command...]      show help
login                  login to balena
push <applicationOrDevice> Start a remote build on the balena cloud build servers or a local mode device
logs <uuidOrDevice>      show device logs
ssh <applicationOrDevice> [serviceName] SSH into the host or application container of a device
apps                   list all applications
app <name>              list a single application
devices                list all devices
device <uuid>           list a single device
tunnel <deviceOrApplication> Tunnel local ports to your balenaOS device
preload <image>          preload an app on a disk image (or Edison zip archive)
build [source]          Build a single image or a multicontainer project locally
deploy <appName> [image] Deploy a single image or a multicontainer project to a balena application
join [deviceIp]         Promote a local device running balenaOS to join an application on a balena server
leave [deviceIp]        Detach a local device from its balena application
scan                   Scan for balenaOS devices in your local network

Run 'balena help --verbose' to list additional commands

Global Options:

--help, -h
--version, -v
david@david-VirtualBox:~$
```



## 2

# Clone a Project

There are lots of sample projects to get started with, such as:

“It's a sign: build a remote controlled digital display with Screenly OSE and Raspberry Pi”

“Deploy a fleet of environmental sensors with balena & InfluxDB”

“Using Web Bluetooth to communicate with Bluetooth devices”

“Build a TTN LoRa Gateway with balenaFin and balenaCloud”

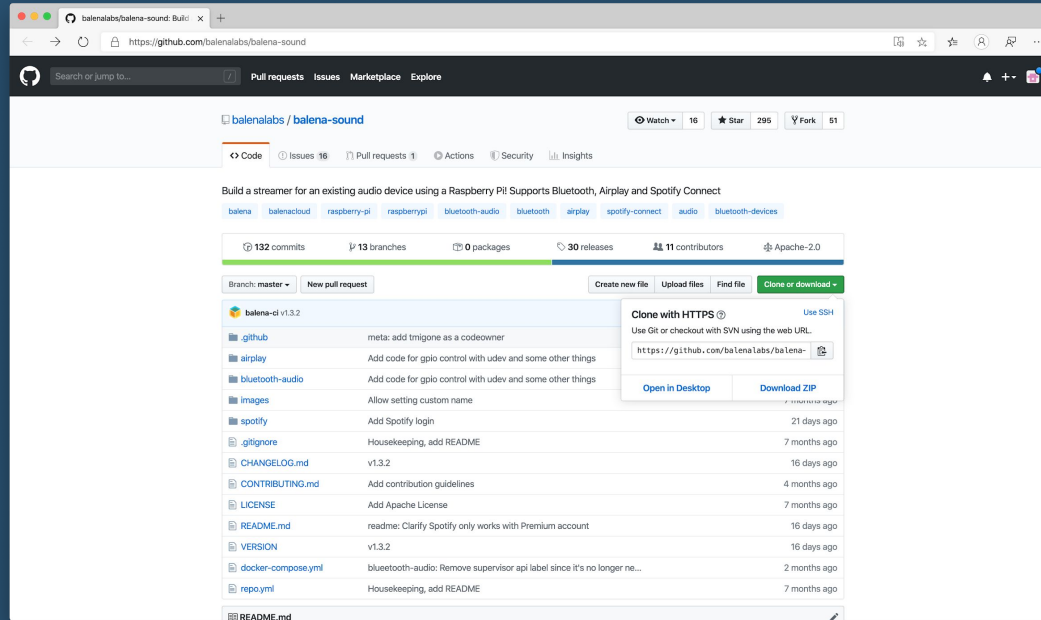
For now, let's go with **balenaSound**: “Turn your old speakers or Hi-Fi into Bluetooth, Airplay and Spotify receivers.”

<https://www.balena.io/blog/turn-your-old-speakers-or-hi-fi-into-bluetooth-receivers-using-only-a-raspberry-pi/>



## 2

# Clone a Project

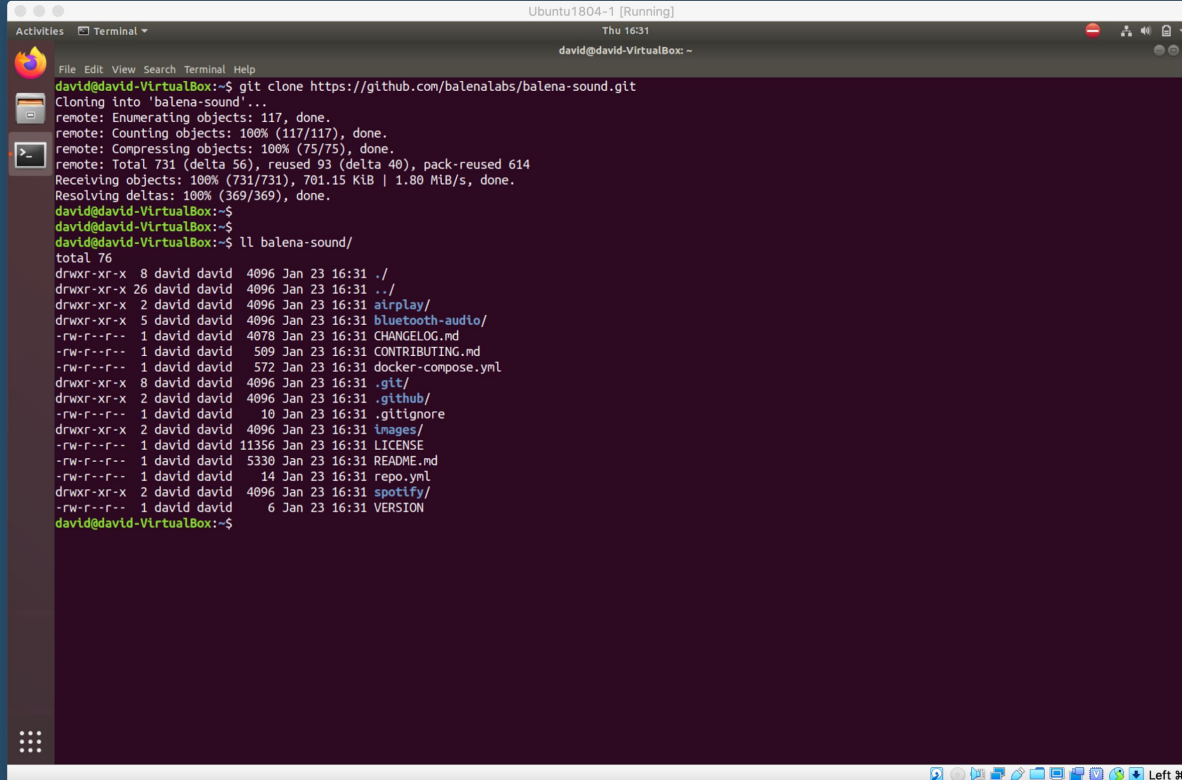


git clone https://github.com/balenalabs/balena-sound.git



## 2

# Clone a Project



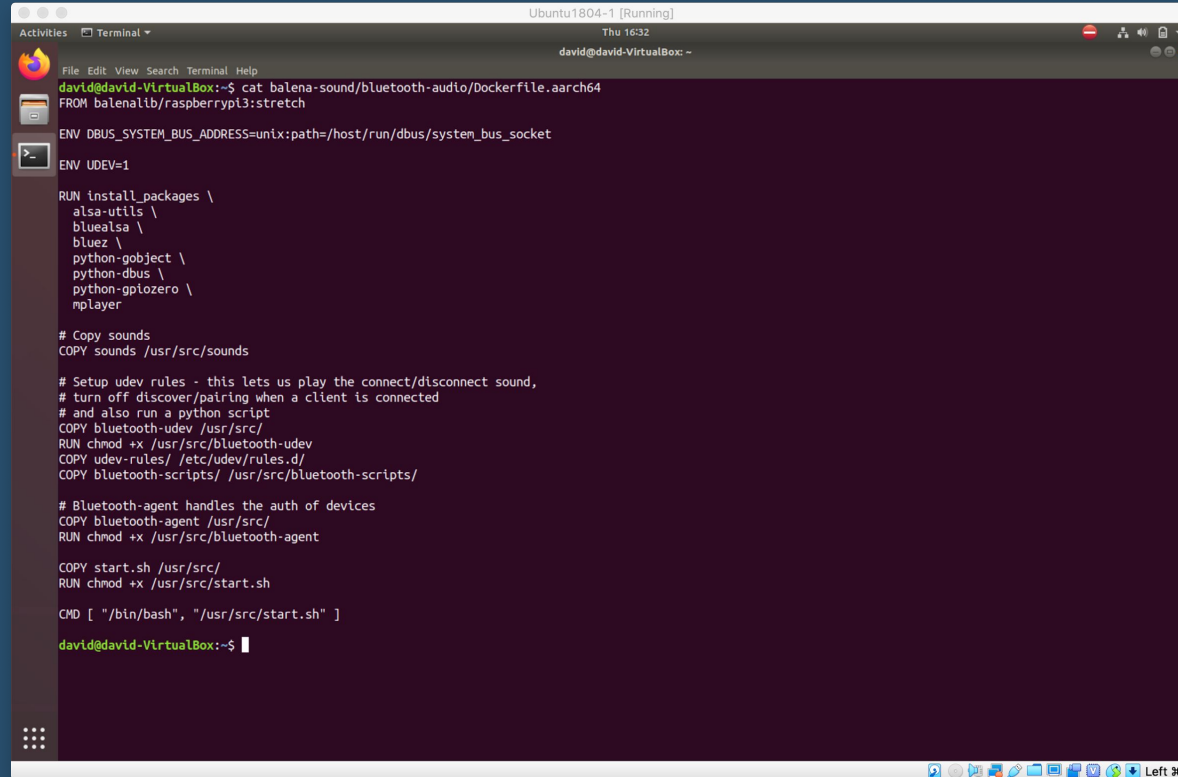
A terminal window titled 'Ubuntu1804-1 [Running]' showing the process of cloning a GitHub repository. The user runs the command `git clone https://github.com/balenalabs/balena-sound.git`. The output shows the cloning progress, including enumerating, counting, and compressing objects, and receiving and resolving deltas. After the cloning is complete, the user runs `ll balena-sound/` to list the contents of the cloned directory. The output shows a list of files and directories with their permissions, owner, size, date, and name.

```
David@David-VirtualBox:~$ git clone https://github.com/balenalabs/balena-sound.git
Cloning into 'balena-sound'...
remote: Enumerating objects: 117, done.
remote: Counting objects: 100% (117/117), done.
remote: Compressing objects: 100% (75/75), done.
remote: Total 731 (delta 56), reused 93 (delta 40), pack-reused 614
Receiving objects: 100% (731/731), 701.15 KiB | 1.80 MiB/s, done.
Resolving deltas: 100% (369/369), done.
David@David-VirtualBox:~$
David@David-VirtualBox:~$ ll balena-sound/
total 76
drwxr-xr-x  8 david david 4096 Jan 23 16:31 ./
drwxr-xr-x 26 david david 4096 Jan 23 16:31 ../
drwxr-xr-x  2 david david 4096 Jan 23 16:31 sirplay/
drwxr-xr-x  5 david david 4096 Jan 23 16:31 bluetooth-audio/
-rw-r--r--  1 david david 4078 Jan 23 16:31 CHANGELOG.md
-rw-r--r--  1 david david 589 Jan 23 16:31 CONTRIBUTING.md
-rw-r--r--  1 david david 572 Jan 23 16:31 docker-compose.yml
drwxr-xr-x  8 david david 4096 Jan 23 16:31 git/
drwxr-xr-x  2 david david 4096 Jan 23 16:31 github/
-rw-r--r--  1 david david 10 Jan 23 16:31 gitignore
drwxr-xr-x  2 david david 4096 Jan 23 16:31 images/
-rw-r--r--  1 david david 11356 Jan 23 16:31 LICENSE
-rw-r--r--  1 david david 5330 Jan 23 16:31 README.md
-rw-r--r--  1 david david 14 Jan 23 16:31 repo.yml
drwxr-xr-x  2 david david 4096 Jan 23 16:31 spotify/
-rw-r--r--  1 david david 6 Jan 23 16:31 VERSION
David@David-VirtualBox:~$
```



## 2

# Clone a Project

A terminal window titled 'Ubuntu1804-1 [Running]' showing the contents of a Dockerfile named 'balena-sound/bluetooth-audio/Dockerfile.aarch64'. The terminal output is as follows:

```
david@david-VirtualBox:~$ cat balena-sound/bluetooth-audio/Dockerfile.aarch64
FROM balenalib/raspberrypi3:stretch

ENV DBUS_SYSTEM_BUS_ADDRESS=unix:path=/host/run/dbus/system_bus_socket

ENV UDEV=1

RUN install_packages \
    alsa-utils \
    bluesalsa \
    bluez \
    python-gobject \
    python-dbus \
    python-gpiozero \
    mplayer

# Copy sounds
COPY sounds /usr/src/sounds

# Setup udev rules - this lets us play the connect/disconnect sound,
# turn off discover/pairing when a client is connected
# and also run a python script
COPY bluetooth-udev /usr/src/
RUN chmod +x /usr/src/bluetooth-udev
COPY udev-rules/ /etc/udev/rules.d/
COPY bluetooth-scripts/ /usr/src/bluetooth-scripts/

# Bluetooth-agent handles the auth of devices
COPY bluetooth-agent /usr/src/
RUN chmod +x /usr/src/bluetooth-agent

COPY start.sh /usr/src/
RUN chmod +x /usr/src/start.sh

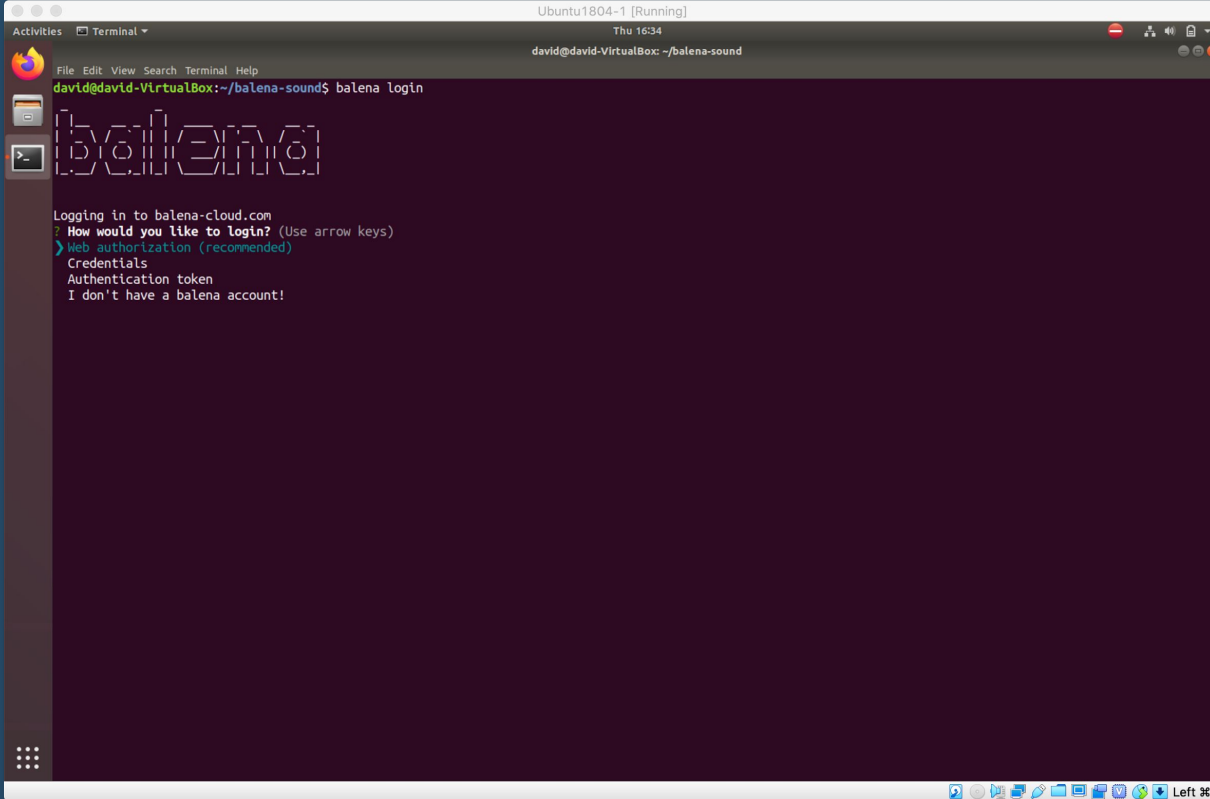
CMD [ "/bin/bash", "/usr/src/start.sh" ]

david@david-VirtualBox:~$
```



## 3

# Push a Container



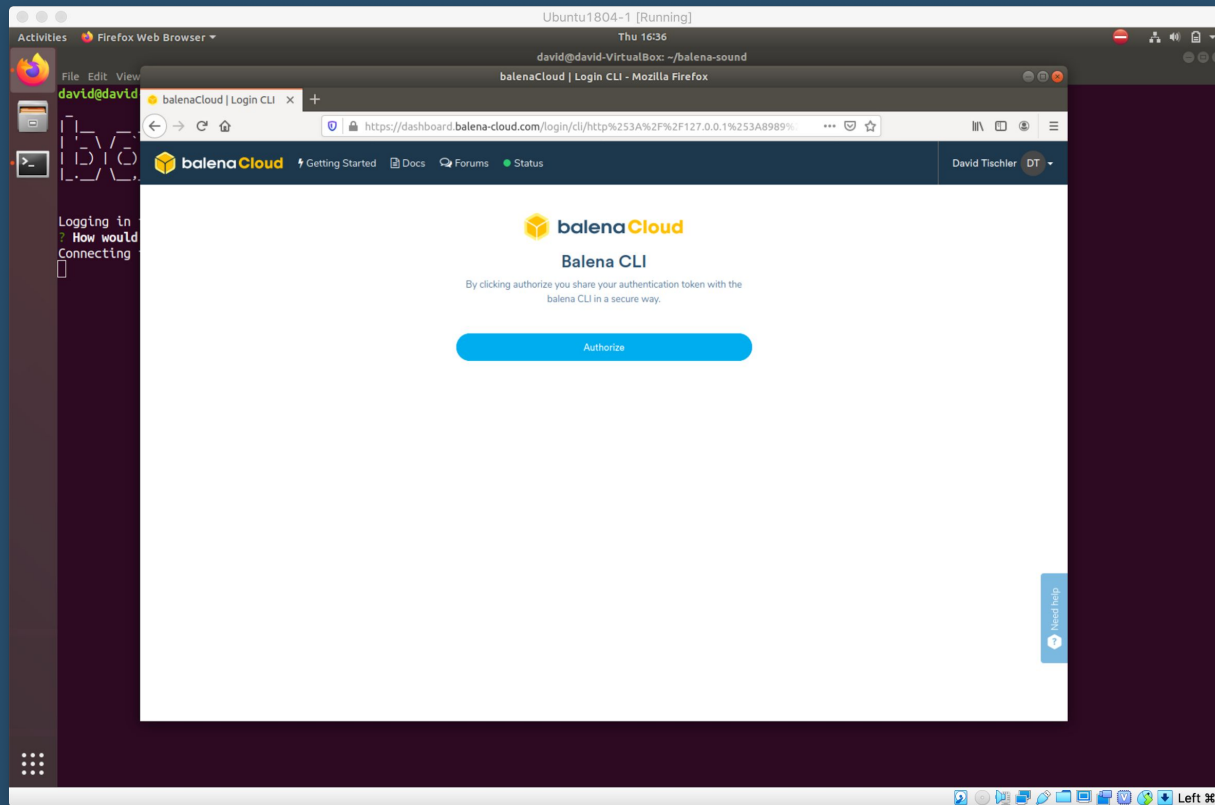
A terminal window titled "Ubuntu1804-1 [Running]" showing the execution of the `balena login` command. The terminal output includes the Balena logo, a login prompt, and a list of login options. The user has not yet selected an option.

```
david@david-VirtualBox: ~/balena-sound
balena login

Logging in to balena-cloud.com
? How would you like to login? (Use arrow keys)
> Web authorization (recommended)
  Credentials
  Authentication token
  I don't have a balena account!
```



# 3 Push a Container



# 3 Push a Container

The screenshot shows a desktop environment with a terminal window and a web browser. The terminal window is titled "david@david-VirtualBox: ~/balena-sound" and displays the command `balena push DemoApplication` being entered. The web browser is displaying the BalenaCloud dashboard, which shows the "DemoApplication" card with a "1 DEVICES" status. The dashboard also includes a "Create application" button and a search bar.

balenaCloud | Application: x

https://dashboard.balena-cloud.com/apps

balenaCloud | Getting Started | Docs | Forums | Status

David Tischler DT

Want more devices, private support and more? You can upgrade your plan from the dashboard.

Applications

Create application Add filter Search entries...

DemoApplication

Starter

1 DEVICES

Online Config Updating Offline Post prov Inactive

RELEASE ARCHITECTURE APP ID

No commit aarch64 1572539

david@david-VirtualBox: ~/balena-sound

File Edit View Search Terminal Help

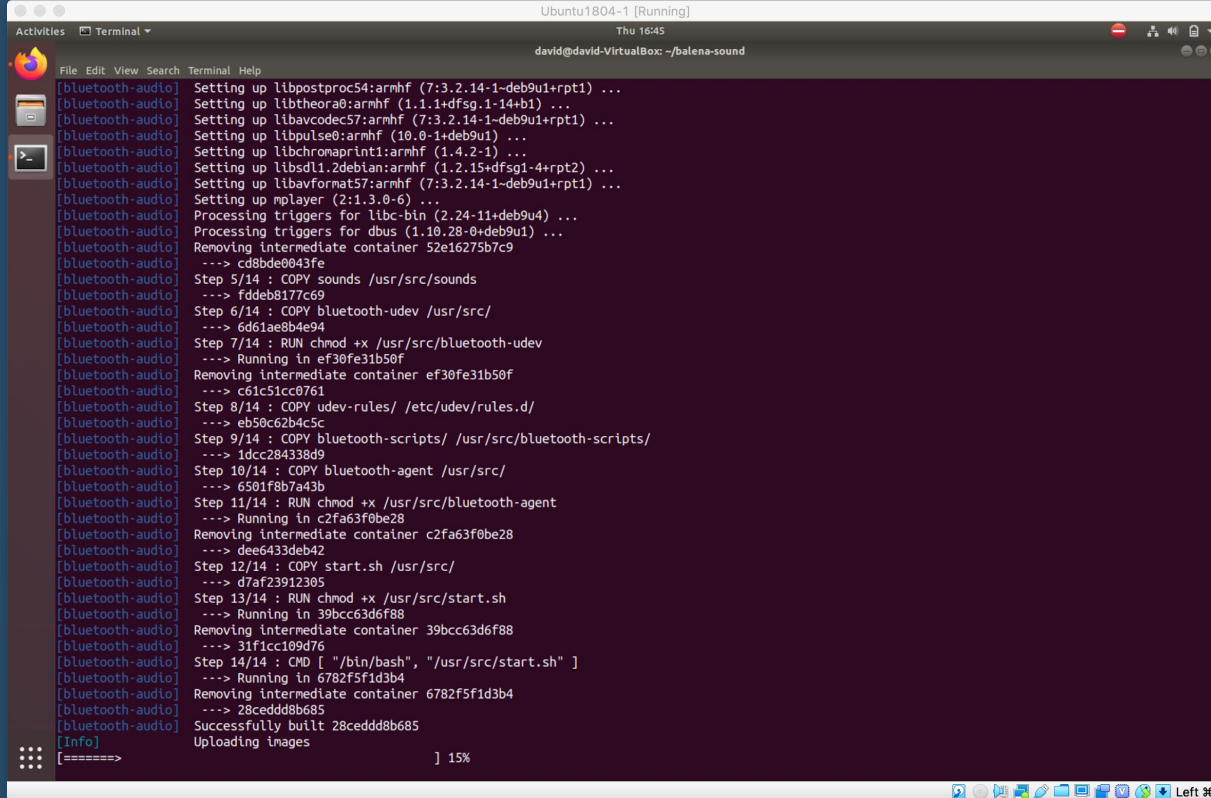
david@david-VirtualBox:~/balena-sound\$ balena push DemoApplication





## 3

# Push a Container



The screenshot shows a terminal window titled 'Ubuntu1804-1 [Running]' with the date 'Thu 16:45' and the user 'david@david-VirtualBox: ~/balena-sound'. The terminal displays the output of a container installation process. The process starts with setting up various dependencies like libpostproc54, libtheora0, libavcodec57, libpulse0, libchromaprint1, libsnd1, libavformat57, and mplayer. It then proceeds to copy files to the container's filesystem, including sounds, udev rules, scripts, and the start.sh script. The container is then built and images are uploaded. The process is monitored by a progress bar at the bottom.

```
[bluetooth-audio] Setting up libpostproc54:armhf (7:3.2.14-1-deb9u1+rpt1) ...
[bluetooth-audio] Setting up libtheora0:armhf (1.1.1+dfsg.1-14+b1) ...
[bluetooth-audio] Setting up libavcodec57:armhf (7:3.2.14-1-deb9u1+rpt1) ...
[bluetooth-audio] Setting up libpulse0:armhf (10.0-1+deb9u1) ...
[bluetooth-audio] Setting up libchromaprint1:armhf (1.4.2-1) ...
[bluetooth-audio] Setting up libsnd1.2debian:armhf (1.2.15+dfsg1-4+rpt2) ...
[bluetooth-audio] Setting up libavformat57:armhf (7:3.2.14-1-deb9u1+rpt1) ...
[bluetooth-audio] Setting up mplayer (2:1.3.0-6) ...
[bluetooth-audio] Processing triggers for libc-bin (2.24-11+deb9u4) ...
[bluetooth-audio] Processing triggers for dbus (1.10.28-0+deb9u1) ...
[bluetooth-audio] Removing intermediate container 52e16275b7c9
[bluetooth-audio] --> cd8bde0043fe
[bluetooth-audio] Step 5/14 : COPY sounds /usr/src/sounds
[bluetooth-audio] --> fddeb8177c69
[bluetooth-audio] Step 6/14 : COPY bluetooth-udev /usr/src/
[bluetooth-audio] --> 6d61ae8b4e94
[bluetooth-audio] Step 7/14 : RUN chmod +x /usr/src/bluetooth-udev
[bluetooth-audio] --> Running in ef30fe31b50f
[bluetooth-audio] Removing intermediate container ef30fe31b50f
[bluetooth-audio] --> c61c51cc0761
[bluetooth-audio] Step 8/14 : COPY udev-rules/ /etc/udev/rules.d/
[bluetooth-audio] --> eb50c62b4c5c
[bluetooth-audio] Step 9/14 : COPY bluetooth-scripts/ /usr/src/bluetooth-scripts/
[bluetooth-audio] --> 1dc284338d9
[bluetooth-audio] Step 10/14 : COPY bluetooth-agent /usr/src/
[bluetooth-audio] --> 6501f8b7a43b
[bluetooth-audio] Step 11/14 : RUN chmod +x /usr/src/bluetooth-agent
[bluetooth-audio] --> Running in c2fa63f0be28
[bluetooth-audio] Removing intermediate container c2fa63f0be28
[bluetooth-audio] --> dee6433deb42
[bluetooth-audio] Step 12/14 : COPY start.sh /usr/src/
[bluetooth-audio] --> d7af23912305
[bluetooth-audio] Step 13/14 : RUN chmod +x /usr/src/start.sh
[bluetooth-audio] --> Running in 39bcc63d6f88
[bluetooth-audio] Removing intermediate container 39bcc63d6f88
[bluetooth-audio] --> 31f1cc109d76
[bluetooth-audio] Step 14/14 : CMD [ "/bin/bash", "/usr/src/start.sh" ]
[bluetooth-audio] --> Running in 6782f5f1d3b4
[bluetooth-audio] Removing intermediate container 6782f5f1d3b4
[bluetooth-audio] --> 28ceddd8b685
[bluetooth-audio] Successfully built 28ceddd8b685
[Info] Uploading images
[=====] 15%
```



3

Charlie!

```
Ubuntu1804-1 [Running]
Thu 16:45
david@david-VirtualBox: ~/balena-sound

[bluetooth-audio] ---> Running in 6782f5fd3b4
[bluetooth-audio] Removing intermediate container 6782f5fd3b4
[bluetooth-audio] ---> 28ceddd8b685
[bluetooth-audio] Successfully built 28ceddd8b685
[Info] Uploading images
[Success] Successfully uploaded images
[Info] Built on arm01
[Success] Release successfully created!
[Info] Release: 717c66f18517b4592017ccae6702c4f9 (id: 1228066)



| Service         | Image Size | Build Time           |
|-----------------|------------|----------------------|
| bluetooth-audio | 262.08 MB  | 1 minute, 31 seconds |
| airplay         | 203.90 MB  | 28 seconds           |
| spotify         | 165.81 MB  | 24 seconds           |



Build finished in 1 minute, 58 seconds

david@david-VirtualBox:~/balena-sound$
```



## 3

# Push a Container

The screenshot displays the BalenaCloud dashboard for a device named 'bold-feather'. The device is a Raspberry Pi 4 running balenaOS 2.46.1+rev3. The dashboard shows the device's status as 'Updating' with a progress bar at 18%. It also displays a list of services: 'airplay', 'bluetooth-audio', and 'spotify', all in a 'Downloading' state. The 'Logs' section on the right shows a list of system events, including network creation, volume creation, and image downloads. The 'Terminal' section at the bottom right has a 'Start terminal session' button.

**Device Summary:**

- NAME: bold-feather
- STATUS: Updating (18% progress)
- UUID: 73ffa45
- TYPE: Raspberry Pi 4
- LAST ONLINE: Online (for 17 hours)
- HOST OS VERSION: balenaOS 2.46.1+rev3 (production)
- SUPERVISOR VERSION: 10.6.27
- CURRENT RELEASE: Factory build
- TARGET RELEASE: 717c66f
- IP ADDRESS: 192.168.0.162
- PUBLIC DEVICE URL: [Toggle]

**Services:**

Service	Status	Release
airplay	Downloading 19%	717c66f
bluetooth-audio	Downloading 13%	717c66f
spotify	Downloading 21%	717c66f

**Logs:**

- 22.01.20 14:42:07 (-0700) Creating network 'default'
- 23.01.20 16:45:43 (-0700) Creating volume 'spotifycache'
- 23.01.20 16:45:43 (-0700) Creating volume 'bluetoothcache'
- 23.01.20 16:45:43 (-0700) Downloading image 'registry.balena-cloud.com/v2/112334d0f425604fbc304b1a3de1a861gsha256:b01a6c30aba58da61a685774b648ec54459dd1b72ff61434becc552a867e3c11b'
- 23.01.20 16:45:43 (-0700) Downloading image 'registry.balena-cloud.com/v2/582805bf627e0b3242347756e7f7507a8sha256:b87e03519f92f4e773a54864165b9e4bd99b1e0e15e85dc7f89f42223051644'
- 23.01.20 16:45:43 (-0700) Downloading image 'registry.balena-cloud.com/v2/0c9746dab36315fab5d2e017a47861efgsha256:b691ebba8d5e27fec2d7d824b3f9a0d3f6495efeb9fce5a10fc6c874b3108d2'

**Terminal:**

Select a target

Start terminal session




Discussion Item (and Demo):

# Scaling and a Global Fleet






dashboard.balena-cloud.com


 **balenaCloud**


[Getting Started](#) [Docs](#) [Forums](#) [Status](#)


David Tischler **DT**


 Applications >  DemoApplication


 Devices


 Fleet Configuration

 *E(x)* Environment Variables


 *S(x)* Service Variables

 Releases

 Location

 Members

### Fleet Location



+

-

Google

Map data ©2020 Terms of Use

Need help?

?



balenaCloud

Getting Started

Docs

Forums

Status

David Tischler

DT

Applications > DemoApplication

Release policy track latest

git remote add balena david\_

+ Add device

Add filter

Search entries

Views

Actions

Tags

	Status	Device Type	Name	Last Seen	UUID	OS Version	OS Variant	Supervisor Version	IP Address	Current Release	Target Release	Release Policy	Latitude	Longitude	All Tags
	Online	Raspberry Pi 4	chrisys	Online (for 3 hours)	c90f6eb	balenaOS 2.46.1+rev3	development	10.6.27	10.19.0.56	717c66f	717c66f	Default	50.8243	-4.5413	
	Online	Raspberry Pi 4	garethdavis	Online (for a day)	3a628fc	balenaOS 2.44.0+rev3	development	10.3.7	192.168.86.43	717c66f	717c66f	Default	48.4808	-123.3165	development
	Online	Raspberry Pi 4	dame-time	Online (for 3 hours)	4cef398	balenaOS 2.44.0+rev3	development	10.3.7	192.168.30.197	717c66f	717c66f	Default	-12.0464	-77.0428	
	Online	Raspberry Pi 4	iamsolankiamit	Online (for an hour)	38627e9	balenaOS 2.46.1+rev3	production	10.6.27	192.168.1.185	717c66f	717c66f	Default	19.0748	72.8856	
	Online	Raspberry Pi 4	nghiant2710	Online (for 14 minutes)	8b42d1e	balenaOS 2.46.1+rev3	production	10.6.27	192.168.100.18	717c66f	717c66f	Default	21.0313	105.8516	
	Online	Raspberry Pi 3 (using 64bit OS) (BETA)	afitzek	Online (for 2 hours)	e3361ee	balenaOS 2.46.1+rev1	development	10.6.27	192.168.1.85	717c66f	717c66f	Default	48.2006	16.3672	
	Offline	Raspberry Pi 3 (using 64bit OS) (BETA)	tmigone	15 minutes ago	a8eb979	balenaOS 2.46.1+rev1	development	10.6.27	192.168.88.194	717c66f	717c66f	Default	-34.5106	-58.4964	
	Online	Nvidia Jetson Nano (BETA)	dtischler	Online (for an hour)	6a8f8f8	balenaOS 2.45.1+rev3	development	10.3.7	192.168.0.186	717c66f	717c66f	Default	33.6613	-112.0398	
	Online	Nvidia Jetson Nano (BETA)	go-blazers-pdx	Online (for 40 minutes)	aad4641	balenaOS 2.45.1+rev3	development	10.3.7	192.168.1.121	717c66f	717c66f	Default	45.3894	-122.586	
	Online	Nvidia Jetson Nano (BETA)	steamed-hams	Online (for an hour)	a2819a9	balenaOS 2.45.1+rev3	production	10.3.7	10.19.0.198	717c66f	717c66f	Default	50.8243	-4.5413	

1 - 10 of 10

Need help

# Additional Resources



# Additional Resources

balena Blog: <https://www.balena.io/blog/>

balena Forums: <https://forums.balena.io/>

balena Labs GitHub: <https://github.com/balenalabs>

Arm Developer Portal: <https://developer.arm.com/>

Arm Community Blog: <https://community.arm.com/developer/>

Community Discord Server for Developers\*: <https://discord.gg/H5ETM7C>

\*Note: Not an official, endorsed platform, just a fun place to hang out and chat / learn. :-)





# Review / Q&A





balena

arm

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inst: :-)



balena

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Developer Evangelist  
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inst: block.chained

arm