

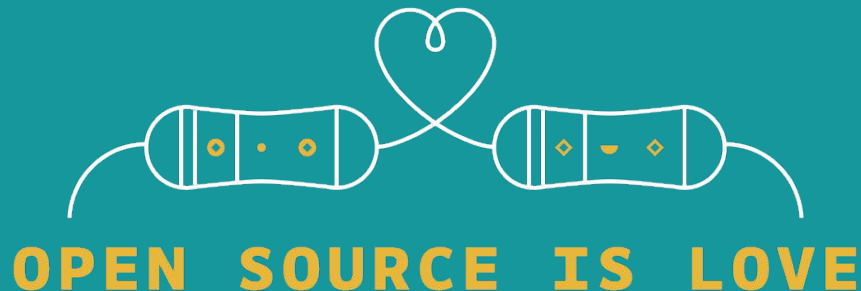


# Arduino

## Open Source Report 2024

Another busy year has passed in the Arduino world, and it's about time to publish our annual retrospective on the Arduino open source ecosystem. In this report you'll learn about the activities of the **Arduino team** from the past year, as well as the contributions from our passionate and vibrant **community**.

*This report is a snapshot of the ecosystem as of December 31st, 2024.*





# Introduction

# One more busy year

The Arduino name designates a company, an open source project, a community.

We're **tens of millions of people** sharing a passion for embedded electronics. But we're also thousands of **companies** manufacturing boards, shields and accessories, and developing software for them. We're educators, students, hackers, consultants, engineers, designers, entrepreneurs. In these 18 years we have all been collaborating every day to share knowledge and solutions, building an incredibly vast amount of resources around which an **entire industry** has grown.

As Arduino company, we believe in the values that make this community great: **openness, transparency, collaboration, sharing.**

This yearly report documents our **efforts and investments** to support the growth of the ecosystem. As you will see in the document, **2024** has been one more busy year in terms of open source development.

To comment on this report, join us in the [Arduino Forum](#).

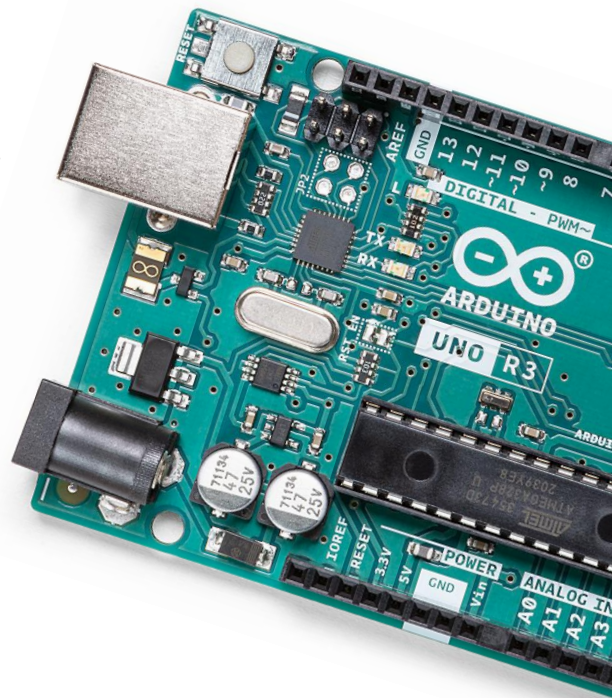


# How to support the Arduino project

There are several ways to support the Arduino team:

- **Buy original Arduino boards** (their cost funds our investment in open source development for the benefit of the entire ecosystem, including other hardware manufacturers)
- **Subscribe to an [Arduino Cloud](#) plan** (for a few \$/month you can fund our open source development and also get web dashboards, smartphone app as a remote control for your projects, remote firmware upload, variable synchronization across devices, mobile push notifications and more)
- **Make a [donation](#)**
- Join the development and **[become a contributor](#)!**

But in addition to the Arduino team, do not forget to **support the authors of your favorite libraries**. Many of them accept donations through GitHub or other means, and all of them appreciate your gratitude in any form.





# Activities carried out by the Arduino team

In this section we'll go through the main  
projects delivered directly by the Arduino team.

# The first Arduino core based on Zephyr®

NEW

In 2023 we joined the Zephyr® Project as Silver members. Zephyr is an open source project at the Linux Foundation that builds a secure, connected and flexible RTOS for future-proof and resource-constrained devices.

Funding and supporting Zephyr is important for us because it helps keeping embedded development open, collaborative and accessible while increasing security and robustness.

- In 2024, we worked hard to contribute to Zephyr with **114 patches** submitted and merged to the upstream codebase. Most of them allowed to bring the new dynamic loader llex from experimental to a stable and widely used subsystem.
- In December 2024, we released the beta of [the first Arduino core based on Zephyr](#). This is a big milestone as it provides a solid foundation for the entire open source Arduino stack.

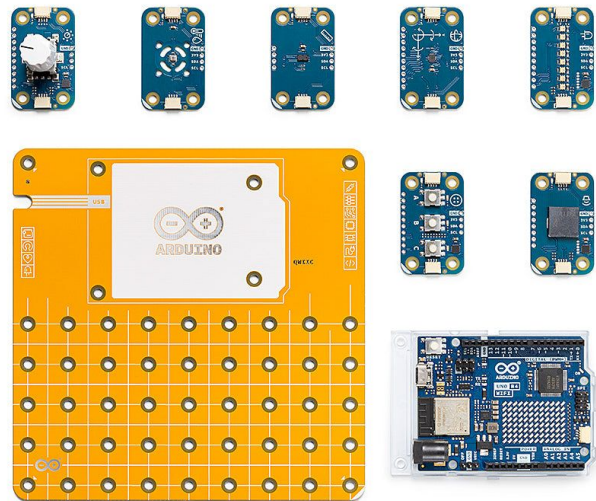


# Open-Source Hardware boards **NEW**

During this year we released **SEVEN** new open-source hardware boards, as part of the [Plug and Make Kit](#):

- **Modulino® Movement**
- **Modulino® Distance**
- **Modulino® Thermo**
- **Modulino® Knob**
- **Modulino® Buzzer**
- **Modulino® Pixels**
- **Modulino® Buttons**

For each of them, the full schematics and CAD files are available on the [docs.arduino.cc](https://docs.arduino.cc) website.



HOW TO GET INVOLVED:

- **Remix these boards, innovate and share your builds!**





# Arduino IDE 2

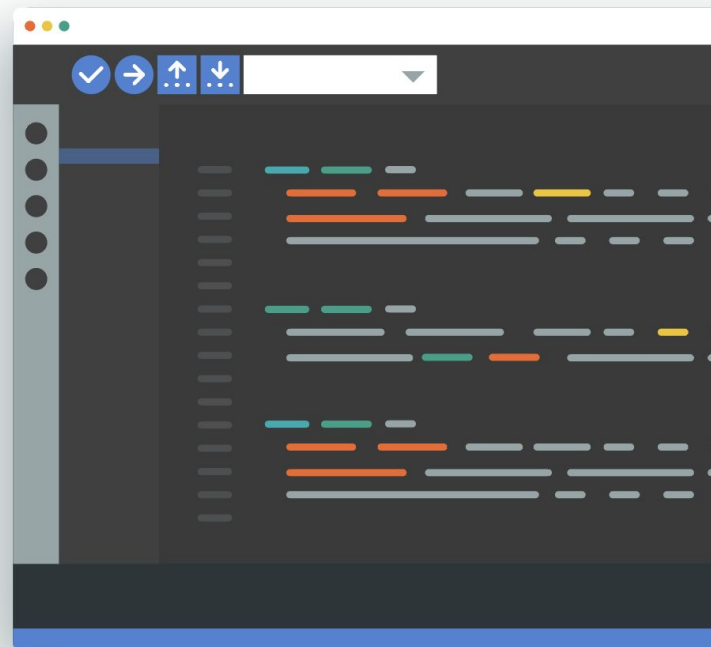
In 2022 we released the Arduino IDE 2, marking a big milestone in Arduino history. Since then, we never stopped working in it: the Arduino Tooling Team works on the IDE full time interacting with the community to make sure the IDE is robust, maintained, easy to use.

In 2024, [5 new versions](#) were released with many improvements to UX and reliability, as well as new features.



## HOW TO GET INVOLVED:

- **Test the [IDE 2](#) to spot issues and bugs**
- **Contribute the [translation](#) in your language**
- **Join the [development](#) and help testing bugs, fixing them and developing new features!**



# Arduino CLI

The open-source [Arduino CLI command line tool](#) provides access to all the features of the IDE, including compilation, upload to boards, library management and more. This tool allows you to manage your Arduino sketches without leaving your editor of choice, as well as integrate it in your scripts and custom applications.

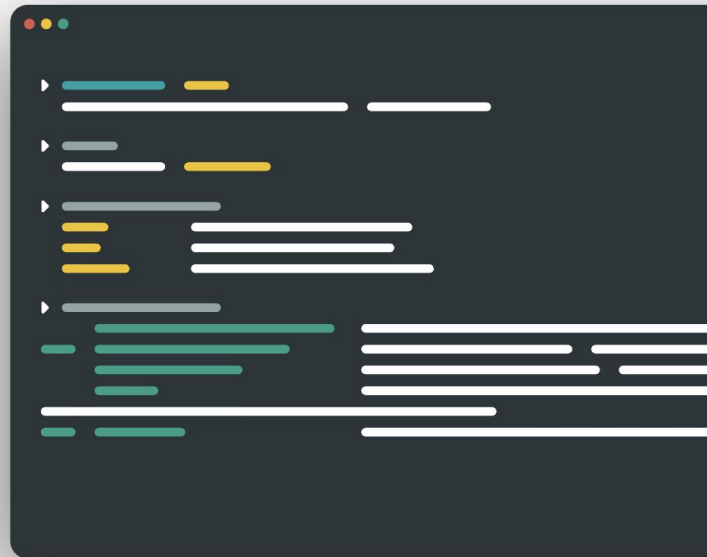
We have been working on this tool on a daily basis to add new features, and during this year we released [18 new versions](#)!

And even more importantly, we released the **1.0.0 stable** version which is a huge milestone!



## HOW TO GET INVOLVED:

- **Contribute the [translation](#) in your language**
- **Jump into the [development](#) and help testing bugs, fixing them and developing new features!**



# Arduino Lab for MicroPython

In 2022 we had released a new [IDE for MicroPython](#) was released as an experimental project. Since then we have received very good feedback from the community so we have been improving it to add new features and improve reliability.

In 2024 we have released [3 new versions](#) of the Arduino Lab for MicroPython!

In addition, we also released an update to the [Arduino Runtime for Micropython](#).



## HOW TO GET INVOLVED:

- **Test the application in real-world situations and report feedback**
- **Join the development and roadmap discussion on [GitHub](#)**



Data source: GitHub

```
* maize_llama.py

1  from machine import Pin
2  from time import sleep
3
4  led = Pin("LED_BUILTIN", Pin.OUT)
5  print("Hello world!")
6
7  while True:
8      led.on()
9      sleep(0.5)
10     led.off()
11     sleep(0.5)
12
```

```
raw REPL; CTRL-B to exit
>OKHello world!
>
MicroPython v1.24.1 on 2024-11-29; Generic ESP32S3 module with ESP
Type "help()" for more information.
>>>
```

# Arduino Cloud CLI & Create Agent

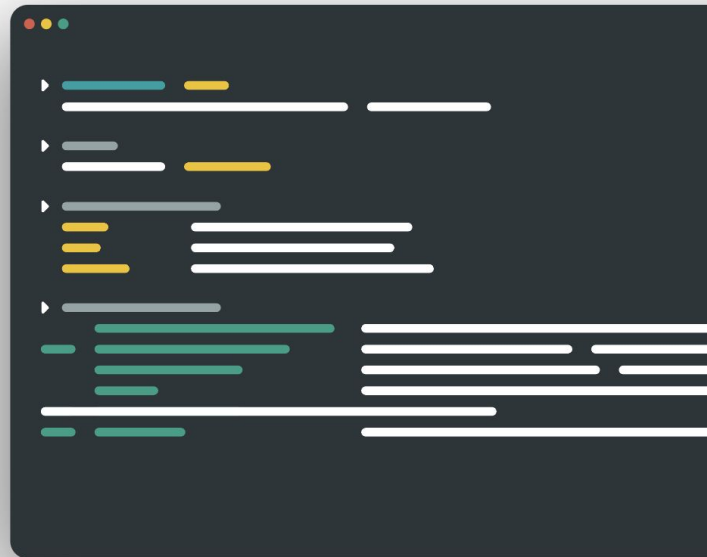
The **Arduino Cloud CLI** supports, among other things, mass device provisioning and **Over-the-Air updates**: this allows anyone to **upload sketches on remote devices** without leaving the command line. During 2024, we have been improving this tool and we released [11 new versions](#).

The **Arduino Cloud Agent** is the core of the Arduino Cloud services and it's fully open source. During 2024, we released [17 new versions](#) of it, improving its security and compatibility with the latest OS versions.



## HOW TO GET INVOLVED:

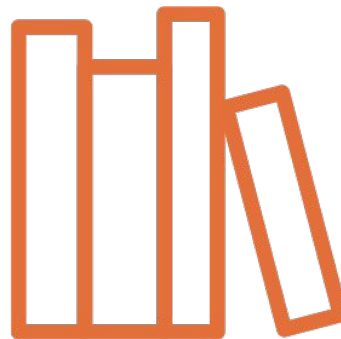
- **Help testing bugs, fixing them and developing new features!**



# Official libraries

We released **19 new official libraries**:

- [Arduino SecureElement](#)
- [Arduino PowerManagement](#)
- [Arduino 10BASE T1S](#)
- [Arduino Opta Blueprint](#)
- [Arduino OPC UA](#)
- [Arduino PortentaMachineControl](#)
- [Arduino LowPowerPortentaH7](#)
- [Arduino LowPowerPortentaC33](#)
- [Arduino Cellular](#)
- [Arduino NiclaSenseEnv](#)
- [Arduino Alvik](#)
- [Arduino AlvikCarrier](#)
- [Arduino CloudConnectionFeedback](#)
- [Modulino](#)
- [arduino-modulino-mpy](#)
- [arduino-nicla-sense-env-mpy](#)
- [Arduino MAX17332](#)
- [arduino-alvik-mpy](#)
- [ucPack-mpy](#)



Also, during 2024 we performed **69 new releases** of the official libraries with bug fixes and new features.



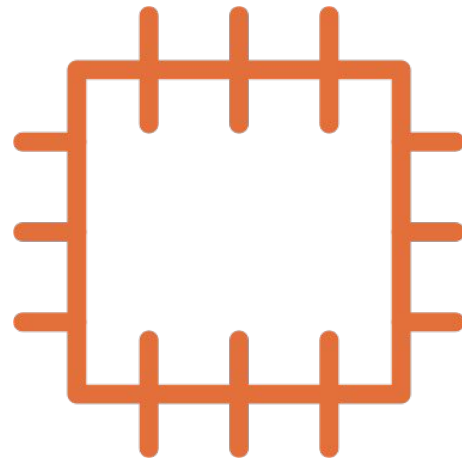
## HOW TO GET INVOLVED:

- Please help us fix bugs, review pull requests and improve the examples shipped with libraries to better document their functionality!



# Official cores

During 2024 we performed **10 new releases** of the [official cores](#) for RP2040, STM32, nRF52, Renesas with bug fixes, new features and support for more boards.



## HOW TO GET INVOLVED:

- **There are still many pending issues and feature requests, so you're really more than welcome to help us in GitHub.**



# Security

Last but not least, a lot of work has been carried out by our dedicated security team that works full-time to inspect code, handle reports, and secure the infrastructure including the way assets are developed, compiled and distributed.

During 2024, we have been improving security of our open source code thanks to proactive audits as well as prompt reaction to reports we received directly and in the form of CVEs.



## HOW TO GET INVOLVED:

- **Help us inspect repositories to find vulnerabilities, and get in touch with our security team according to the [security policy](#).**



# Contributions to external projects

Open source is about sharing and giving back, so we care a lot about contributing to upstream projects. During 2024, we have been dedicating significant development time to contribute to the following excellent projects:

- [Zephyr](#)
- [MicroPython](#)
- [Arduino core for ESP32 boards](#)
- [Arduino core for Silicon Labs boards](#)
- [microROS](#)







# Highlights from the community

We're now going through the main  
contributions from the community in 2024.



## Community contribution matters

**1,198** new contributed libraries have been added to the Library Manager (once more, this growth is higher than the previous year!), bringing the total number to **7,669**. The Arduino library ecosystem is having an impressive growth.



## **Libraries are a vibrant big thing**

This number represents the incredibly active and continuous efforts of the Arduino library developers, growing each year.

This number is higher than 2023, which means the Arduino community is more active than ever.



# 6775

**New versions of  
libraries in 2024**



# You will never walk alone

**368** new open-source tutorials were added to [Arduino Project Hub](#) during the year (+80% compared to 2023!).

Note that we perform quality review and moderation to avoid duplicates, so this number does not include all the submissions but only represents the projects that were approved and published by the Project Hub maintainers.



Data source: Arduino Project Hub



# Many cores contributions

**+69** new versions of contributed Arduino cores were released during the year (more than previous year).

Note that since there's no official platform registry, this number may not include platforms that we don't know about.



Data source: GitHub



# Top contributors of new libraries

Author	Number of libraries added in 2024
<a href="#">iarduino</a>	67
<a href="#">Rob Tillaart</a>	46
<a href="#">Turkish Technnology Team Foundation (T3)</a>	42
<a href="#">BEST MODULES CORP.</a>	26
<a href="#">M5Stack</a>	24
<a href="#">Digital Codesign</a>	23
<a href="#">AlexGyver</a>	19
<a href="#">Mathieu Carbou</a>	18

Author	Number of libraries added in 2024
<a href="#">DashIO Connect</a>	14
<a href="#">Soldered</a>	14
<a href="#">Dejwk</a>	11
<a href="#">Bonezegei (Jofel Batutay)</a>	10
<a href="#">Brayden Anderson</a>	9
<a href="#">Maker Zone Australia</a>	9
<a href="#">Xose Pérez</a>	9
<a href="#">Johan Böhlín</a>	8
<a href="#">Pokerobo Team</a>	8

Author	Number of libraries added in 2024
<a href="#">ams-OSRAM</a>	8
<a href="#">Makerlab.vn</a>	7
<a href="#">Narwhalsss360</a>	7
<a href="#">TDK/Invensense</a>	7
<a href="#">Adafruit</a>	6
<a href="#">Frank Häfele</a>	6
<a href="#">Rop Gonggrijp</a>	6
<a href="#">Sensirion</a>	6
<a href="#">vovagorodok</a>	6



# Most active library maintainers

Maintainer	Number of releases in 2024
<a href="#">Mathieu Carbou</a>	393
<a href="#">AlexGyver</a>	372
<a href="#">Rob Tillaart</a>	344
<a href="#">iarduino</a>	145
<a href="#">Adafruit</a>	122
<a href="#">Mobizt</a>	102
<a href="#">Maker Zone Australia</a>	90
<a href="#">Hung.Pham</a>	79
<a href="#">M5Stack</a>	67

Maintainer	Number of releases in 2024
<a href="#">SparkFun Electronics</a>	67
<a href="#">Johan Böhlín</a>	62
<a href="#">J. Camilo Gomez C.</a>	59
<a href="#">hideakitai</a>	59
<a href="#">ams-OSRAM</a>	54
<a href="#">momizi</a>	44
<a href="#">Jofel Batutay</a>	41
<a href="#">Larry Bank</a>	41
<a href="#">Xose Pérez</a>	41

Maintainer	Number of releases in 2024
<a href="#">Lee Leahy</a>	38
<a href="#">Ricardo Lima Caratti</a>	36
<a href="#">stm32duino</a>	35
<a href="#">Joshua Phelps</a>	34
<a href="#">Abhijit Bose (aka. Boseji)</a>	33
<a href="#">Ayush Sharma</a>	33
<a href="#">Dejwk</a>	33
<a href="#">Digital Codesign</a>	32
<a href="#">Rei Vilo</a>	32



# More contributions

The Arduino community is much more than this, and given its size it is nearly impossible to track all the contributions that are shared daily in **unofficial community platforms** and **independent websites**. This includes **software contributions** such as code examples and full open-source sketches, but also **knowledge contributions** such as documentation and tutorials, and last but not least **hardware design contributions** such as derivative or complementary products (shields, accessories, derived boards).

Tracking and representing such a variety in a future edition of this report, both in quantitative and in qualitative form, would be a valuable addition to recognize the tremendous efforts of thousands of people and companies contributing to the success of the Arduino ecosystem.







# That's a wrap Thank you!

The Arduino Team