Arduino Pro

An unconventionally simple path to IoT success

May 2023

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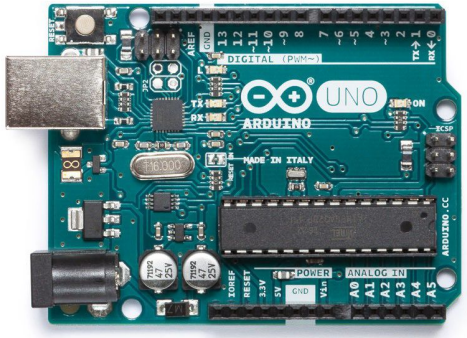
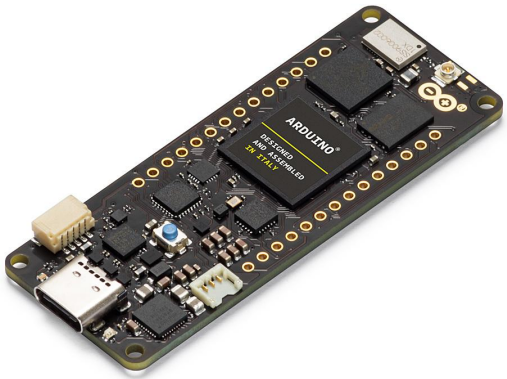
Arduino
at a Glance

Arduino* is a for-profit company incorporated in 2008 that designs, manufactures, distributes and supports Arduino products (HW, FW, SW/Cloud, knowledge and community).

** The name "Arduino" originates from the Arduino Bar in Ivrea, where the founders used to meet in the evening after class. The bar was named after Arduino, who was the King of Italy from 1002 to 1014.*

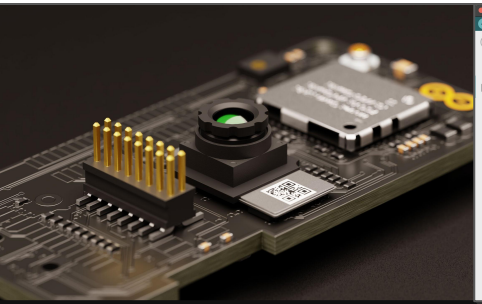




Mission

Enable anyone to innovate by making complex technologies **open & simple to use**

Arduino unique end-to-end offering



Hardware

Boards, kits and solutions from prototyping to production

Development Tools

Cloud and on-premises editors, code generators, compilers and debuggers

Cloud

Dashboards
Web & Mobile UI
Device MGMT
APIs

Knowledge

Community
Content
Support
Open source

Empower
students
to learn by doing

Provide
creative solutions
to everyday challenges

Enable grassroots
business
transformation

A loyal and passionate Arduino Community

76M+ Google

Search results for Arduino projects

(Source: Google Search - Dec '21)

1.35M+ YouTube

Arduino videos on YouTube

(Source: YouTube - Aug '21)

33k+ vimeo

Arduino videos on Vimeo

(Source: Vimeo - Dec '21)

160K+ LinkedIn

LinkedIn followers on Linkedin

(Source: LinkedIn - Feb '23)

1M+ facebook

Followers on Facebook

(Source: Facebook - Dec '21)

333M+ TikTok

Arduino video views

(Source: TikTok - Aug '21)

354k+ twitter

Followers

(Source: Twitter - Dec '21)

720k+ Instagram

Followers on Instagram

(Source: Instagram - Feb '23)

30M

Estimated Active Developers

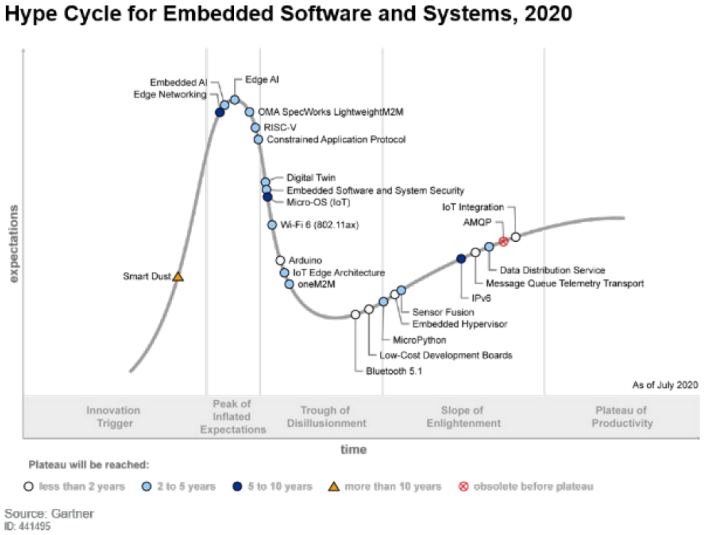
41M

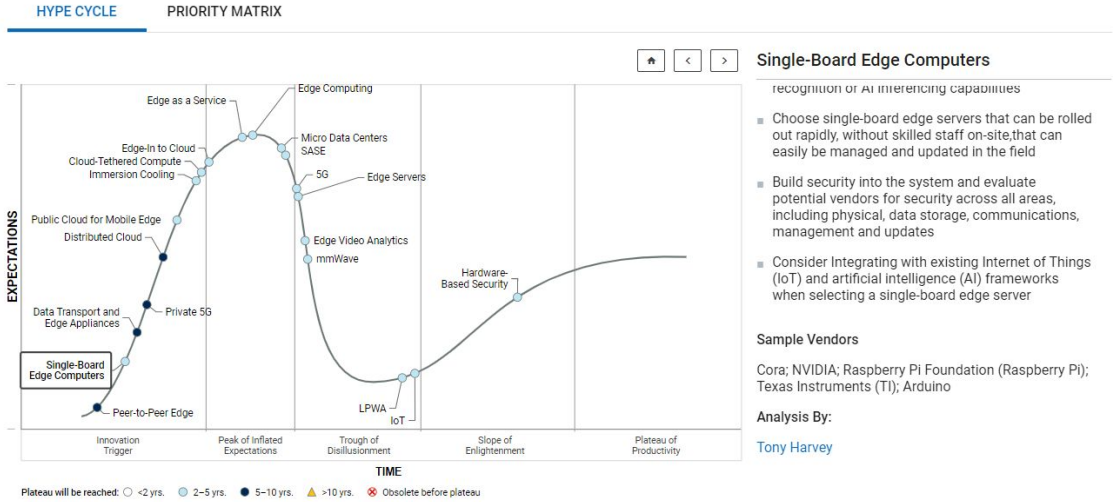
Arduino IDE Downloads per Year

417k

LinkedIn profiles mentioning Arduino skills

Gartner Hype Cycles





Gartner Hype Cycles provide a graphic representation of the maturity and adoption of technologies and applications, and how they are potentially relevant to solving real business problems and exploiting new opportunities.

Arduino raised 32M USD from world class investors in a funding round led by Robert Bosch VC and involving Arm, Renesas, and Anzu Partners (June 2022)

“Engineers in [Gen Z and Millennial] generations grew up using Arduino boards in STEM programs around the world, and they’ve become accustomed to the accessibility, simplicity and power of the company’s open-source hardware, software and cloud services. They’re now taking those demands into the enterprise as they enter the labor force.”

Massimo Banzi (co-founder, Chairman and CMO of Arduino)

“ The way corporations solve contemporary challenges and identify new business opportunities is quickly evolving as a new generation of engineers moves into the workforce in larger numbers. With this investment we’re developing and delivering a new range of dedicated enterprise solutions to ignite this transformation. ”

Fabio Violante (CEO of Arduino)


Venture Capital Journal

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News Briefs

Robert Bosch Venture Capital leads $32m second round for open-source company Arduino

Arduino plans to expand its portfolio of hardware, software, connectivity and developer tools.

By Nina Lindholm · 10 June 2022


Bloomberg

Europe Edition

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Business

Arduino Empowers Gen Z to Transform the Enterprise World

7 giugno 2022, 15:00 CEST

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Arduino Empowers Gen Z to Transform the Enterprise World

With $32 Million in New Capital from Robert Bosch Venture Capital, Renesas, Anzu Partners and Arm, Arduino's Vision for Universal Innovation Moves from the Garage and Classroom to the Enterprise with New Professional Offerings

Business Wire

LUGANO, Switzerland & BOSTON -- June 7, 2022


la Repubblica

Arduino raccoglie capitali per 32 milioni, investe anche Bosch

Massimo Banzi, cofondatore di Arduino

La società, nata nel 2005 a Ivrea, ottiene un round di investimento da partner industriali. Violante, ad dell'azienda: "Le imprese cercano nuove soluzioni, e una nuova generazione di


hackster.io

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Arduino Pulls in $32 Million in Funding to Push Its Vision for "Enterprise-Scale Applications"

Led by Robert Bosch Venture Capital (RBVC), and including Renesas, Anzu Partners, and Arm, the funds will go to pro-grade programs.


Tecnologia · Economia digitale

Servizio | L'investimento

Arduino raccoglie 30 milioni di euro per crescere nel mondo business

L'investimento è guidato da Bosch venture capital. Massimo Banzi: «Gli studenti che usano Arduino sono arrivati nelle fabbriche, ora realizziamo prodotti ad hoc»

di Luca Salvioli

7 giugno 2022


businesswire

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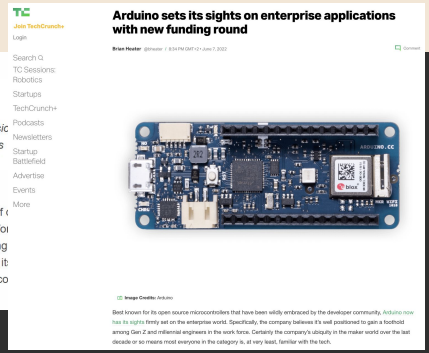
Arduino Empowers Gen Z to Transform the Enterprise World

With $32 Million in New Capital from Robert Bosch Venture Capital, Renesas, Anzu Partners and Arm, Arduino's Visic
Innovation Moves from the Garage and Classroom to the Enterprise with New Professional Offerings

June 07, 2022 09:00 AM Eastern Daylight Time

LUGANO, Switzerland & BOSTON--(BUSINESS WIRE)--Arduino, an open-source company used by tens of millions of
around the world, today unveiled plans to expand its portfolio of hardware, software, connectivity and developer tools fo
This move brings more of the speed, simplicity and power of the Arduino innovation platform to the enterprise, providing
generation of engineers with the flexibility and access they have come to expect in a work environment. By expanding it
scale offerings, Arduino is charting a new strategic course, focusing on larger organizations while also maintaining its co
deliver the industry's most innovative tools for makers and students.


Arduino sets its sights on enterprise applications with new funding round

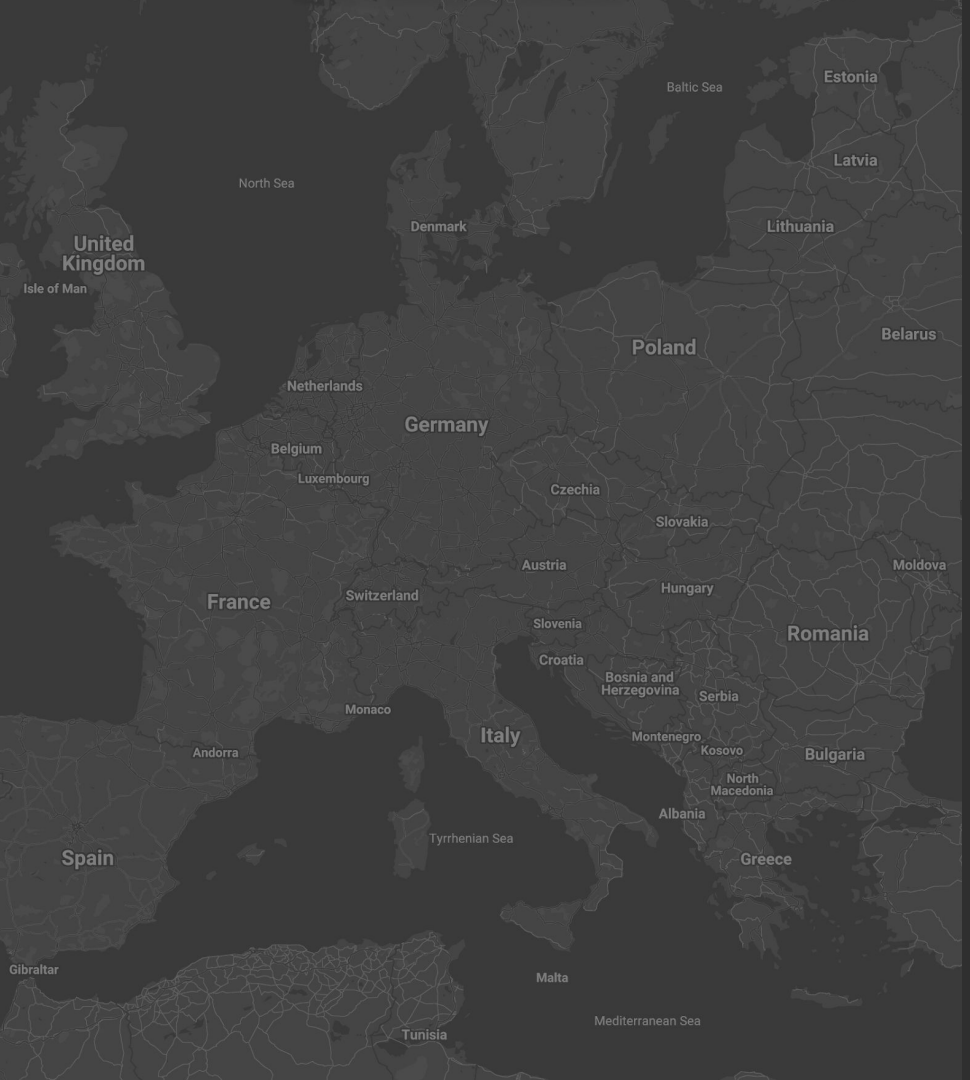
Brian Heater

Image Credits: Arduino

Best known for its open source microcontrollers that have been wildly embraced by the developer community, Arduino now has its sights firmly set on the enterprise world. Specifically, the company believes it's well positioned to gain a foothold among Gen Z and millennial engineers in the work force. Certainly the company's ubiquity in the maker world over the last decade or so means most everyone in the category is, at very least, familiar with the tech.

ARDUINO

Inside Arduino



Offices

Headquarters
Lugano, Switzerland

R&D and Sales
Turin & Rome, Italy

Education R&D & Customer Support
Malmo, Sweden

Sales US
Boston, United States

Sales APAC
Perth, Western Australia

Manufacturing

100% of products are assembled in **Italy**

Four EMS, 16+ SMT Lines

- High quality standard with individual product testing
- Dedicated suppliers for PRO product assembly

Logistics

Three distribution facilities:

Central Facility, Global Wholesale
Strambino (Italy)

US Retail
Lakewood, NJ (United States)

Europe & ROW Retail
Parma (Italy)

PRO Strategy
Overview

Arduino Pro Mission

Disrupting the way
IoT and AI at the edge
are adopted by enterprises

1) **Democratization and simplification of technology**
broaden the developers basis beyond specialized engineers, reducing friction

2) **End to end, human centric HW and Cloud platform**
reduce complexity for customers and drive adoption of AIoT by new user segments

3) **Open source**
leverage a large developer community and knowledge, foster adoption and reduce lock-in risks for customers

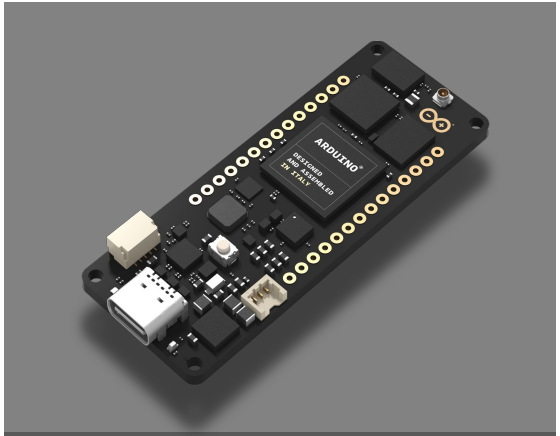
Why Pro

Transfer the productivity and creativity that makers have enjoyed with Arduino into the business world.

Help companies transform their business models with IoT, providing robust and understandable IoT HW and SaaS platforms.

Support the full development, production and operation lifecycle from Hardware and Firmware to Low Code, Clouds, and Mobile apps.

Arduino PRO: Edge IoT technology

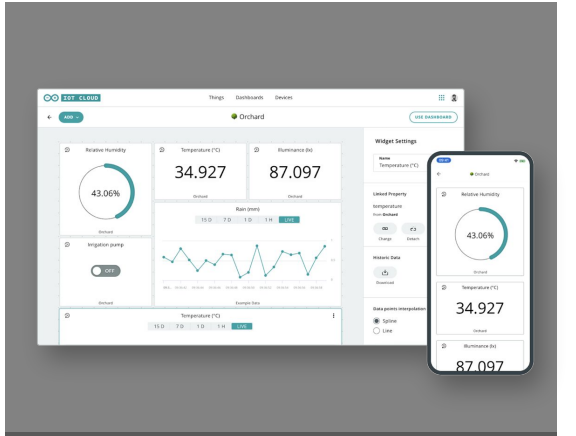


SOM

High-performance / low power / secure electronics building blocks

Solutions

Products tailored to vertical applications



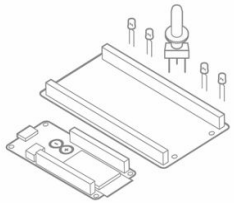
Arduino Cloud

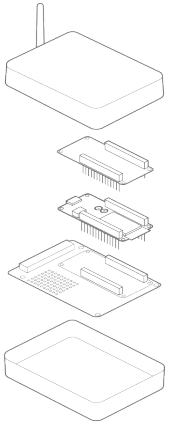
Device Management / OTA (Embedded and Linux) , Low Code Development framework, Device connectivity, data management APIs)

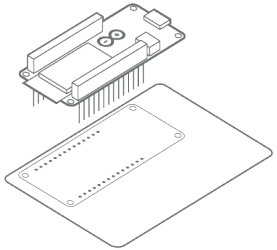
Arduino PRO customer journey

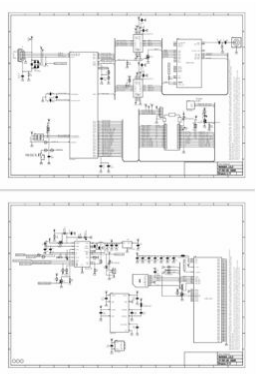
Prototype → **Small Volumes** → **Medium Volumes** → **Large Volumes**

Small Quantities | 1 to 1,000 units | 1,000 to 10K units | 10K+ units









Few Devices / Free

Arduino IoT Cloud

1000's of Devices / Pricing Scales

Arduino Pro
Technology

Your IoT node with Arduino PRO

Embedded sensing

Add industrial-grade intelligent and wireless sensing to your solution

Powerful processing

Exploit the full potential of low power 32-bit ARM® Cortex® processors

Multiple connectivity

Install your solution everywhere leveraging a wide range of connectivity options

Security in mind

Keep your solution encrypted and secured at the HW level through secure crypto elements

Battery powered

Make your solution standalone with the integrated Li-Po battery chargers and battery connectors

Certifications

Your solution compatible with the industry standards thanks to CE, FCC, RoHs certifications

Arduino PRO portfolio

Portenta

- Portenta H7
- Portenta X8
- Portenta C33
- Portenta Vision Shield
- Portenta CAT.M1 / NBIoT GNSS Shield
- Portenta Breakout
- Portenta Max Carrier

Nicla

- Nicla Sense ME
- Nicla Vision
- Nicla Voice

Solutions and Kits

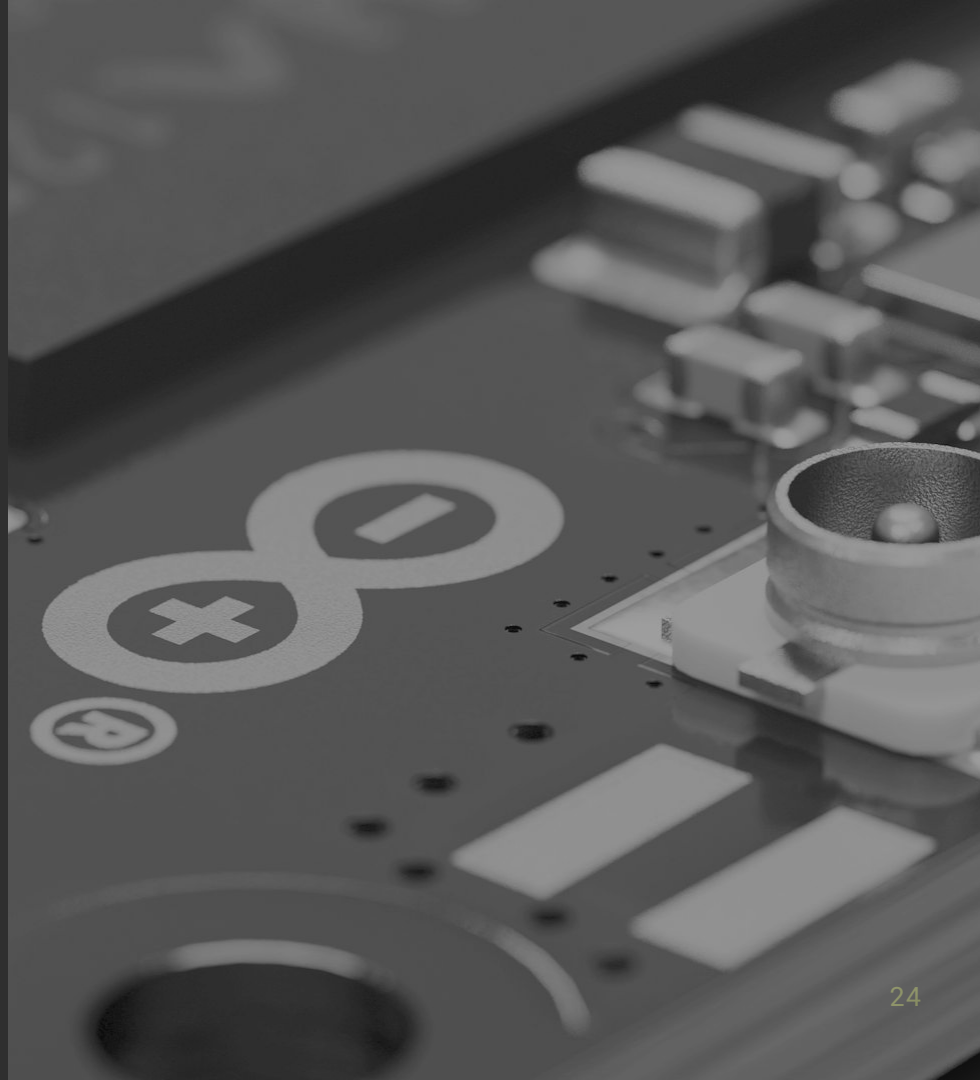
- Portenta Machine Control
- Edge Control
- WisGate Edge gateways
- Arduino Opta

Software and Cloud

- Arduino IDE
- Arduino PLC IDE
- Arduino CLI
- Arduino Cloud for Business

ARDUINO PRO

Portenta family



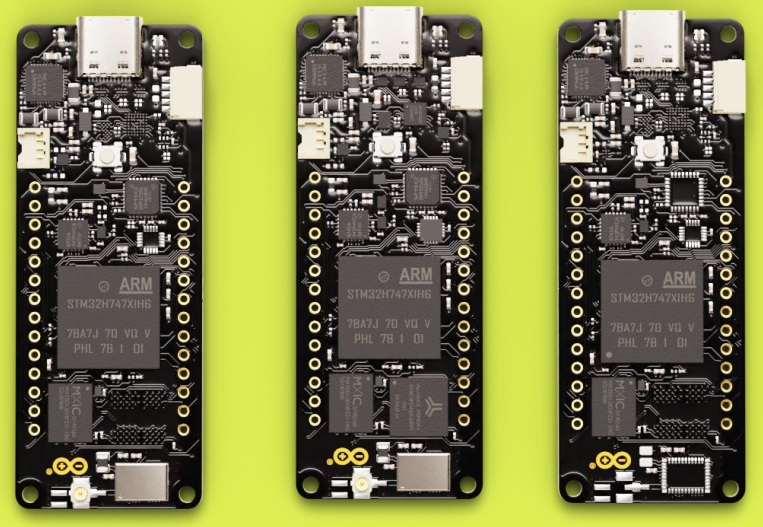
The Portenta Form Factor

- High performance processing
- AI and ML capabilities on the edge
- Industrial temperature range
- Secure crypto element
- Multiple connectivity options
- 80-pin high density connectors

Portenta H7

- **Two best-in-class microcontrollers in one**
  Run parallel tasks on the integrated STMicroelectronics Dual Core **STM32H747**:
  - Cortex® M7 running at 480 MHz
  - Cortex® M4 running at 240 MHz
- **Onboard Wireless modules**
  Simultaneously manage WiFi and Bluetooth® connectivity.
  The WiFi interface can operate as an Access Point, as a station or as a dual mode simultaneous AP/STA.
- **Support high-level programming languages**
  Run MicroPython / Javascript via an interpreter and TensorFlow™ Lite.
- **Security over time**
  Onboard secure element for certificates storage and management.

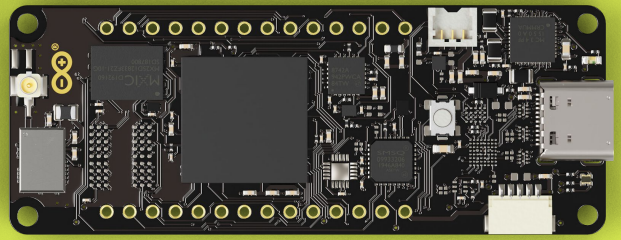
Three Portenta H7 versions available

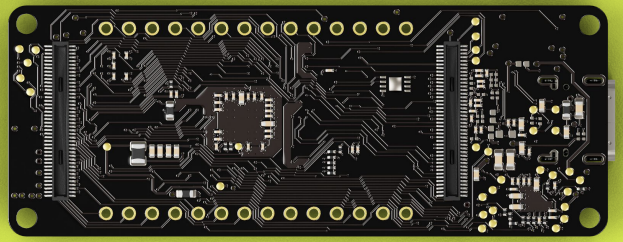


Portenta H7 Lite Connected

Portenta H7

Portenta H7 Lite

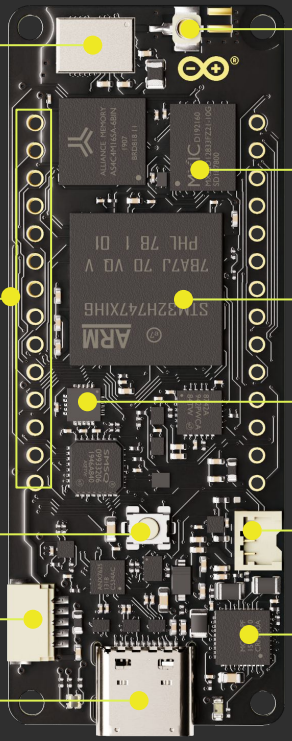




Portenta H7 - Use cases

- Industrial machinery
- Laboratory equipment
- Computer vision
- PLCs
- Robotics controller
- IoT gateway
- Dedicated stationary computer
- High-speed booting computation (ms)

Portenta H7 - Technical Specs



WiFi/BT Module

Antenna or U.FL Connector

16MB Flash Memory

MKR compatible headers

STM32H747, Main processor

NXP® Secure element

Pushbutton

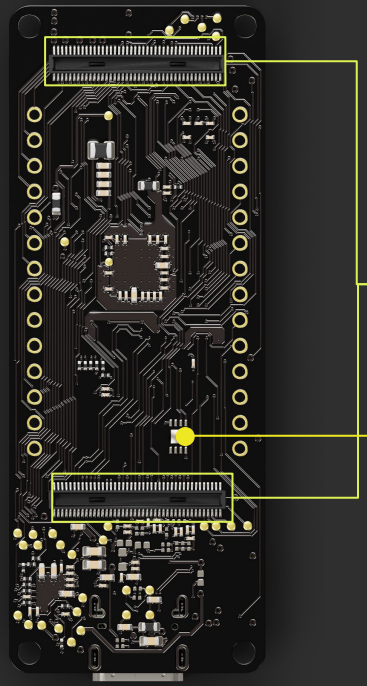
Battery connector

ESLOV connector

Power Manager

USB-C high-speed

Top View



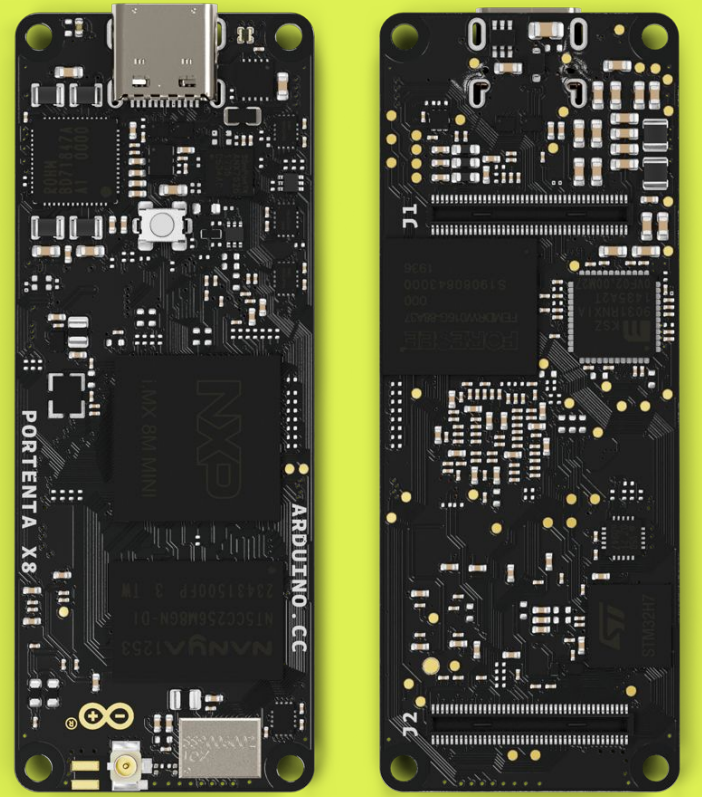
High Density Connectors

Microchip Secure element

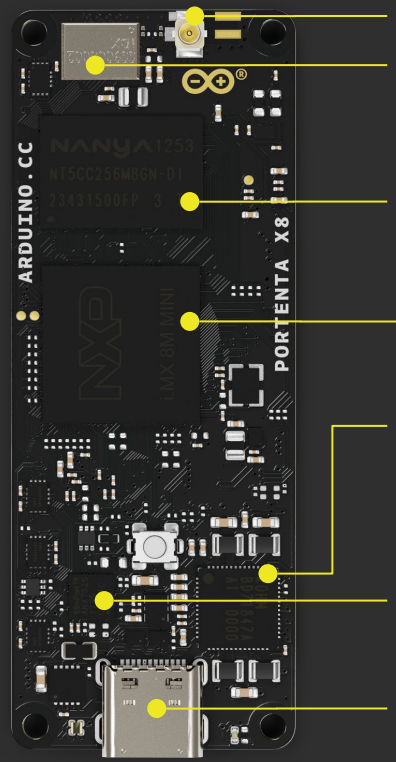
Bottom View

Portenta X8

- **Two industrial-grade products in one**
  Portenta X8 offers the best of two approaches: flexibility of usage of Linux combined with real-time applications through the Arduino environment, by featuring two microprocessors:
  1. ***NXP® i.MX 8M Mini*** Cortex®-A53 quad-core, up to 1.8GHz per core + 1x Cortex®-M4 up to 400MHz
  2. ***STM32H747XI*** dual-core Cortex®-M7 up to 480Mhz +M4 32 bit Arm® MCU up to 240Mhz
- **Plug-and-play**
  Linux OS (Yocto) distribution already preloaded onboard.
- **Containerized system**
  Deploy device-independent software thanks to the modular container architecture, allowing single packages of software to run within a controlled environment.
- **Security over time**
  Portenta X8 comes with a continuously maintained Linux kernel distribution, to keep security at first by OTA device updates and fleet management.
  Crypto element ensures a secure connection at the hardware level. PSA certified IoT security from ARM®.



Portenta X8 - Technical Specs



Antenna/UFL

Wi-Fi / Bluetooth® Low Energy

2GB Low Power DRAM

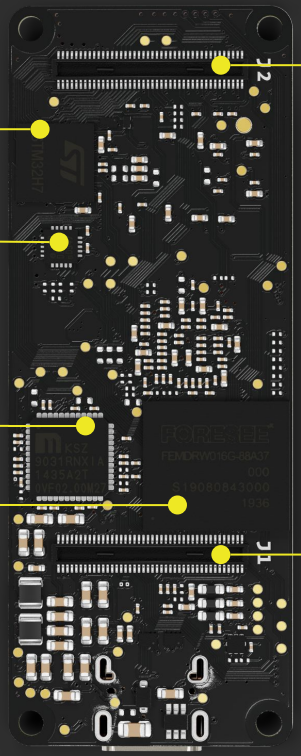
NXP® i.MX 8M Mini

Power Manager

MIPI to USB-C/DisplayPort

High-speed USB-C

Top View



STMicroelectronics STM32H747AII6

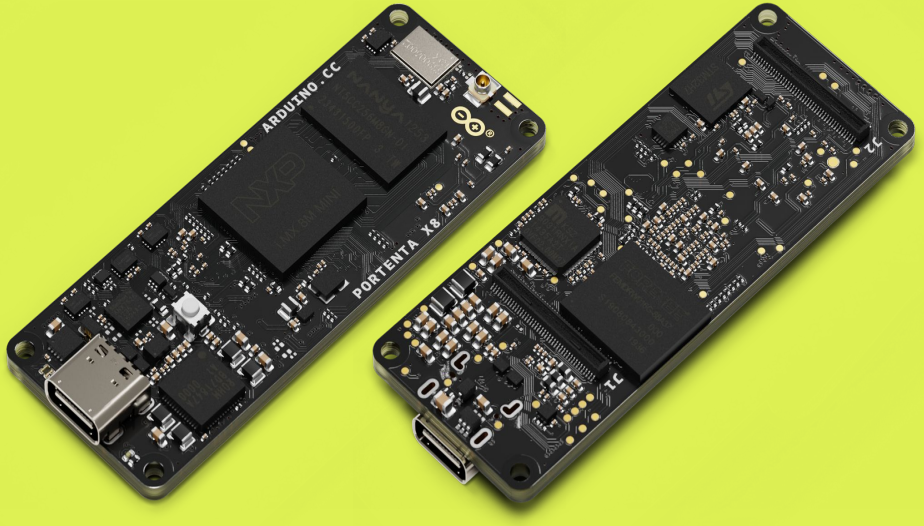
Secure element

GBit Ethernet Phy

16 GB Flash memory

High Density Connectors

Bottom View



Portenta X8 - Use cases

- Connected Edge Computer
- Industrial IoT Gateway
- HMI
- Automated optical inspection
- AGV, autonomous guided systems
- Office/house control system
- Smart kiosks
- Digital signage
- Interactive vending machines

Portenta X8 Board Manager

Subscribe to **Arduino Cloud for business** to:

- Securely maintain Linux distribution
- Deploy and update applications packaged into containers:
  - Pre-installed Python container
  - Other Arduino customised containers (coming soon)
  - Custom containers
- Get individual provisioning keys for each device
- Secure OTA update to target Portenta X8 devices/fleets

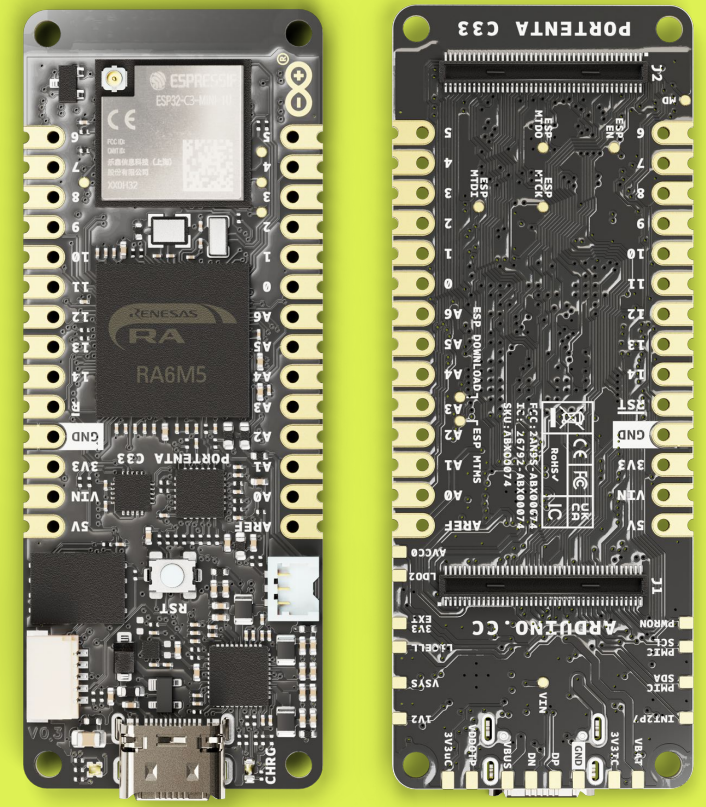
Portenta C33

- **Flexible, high performance microcontroller**
  From motion control to process tracking, the Portenta C33 gives you the power to automate countless industrial, building and prototyping applications.

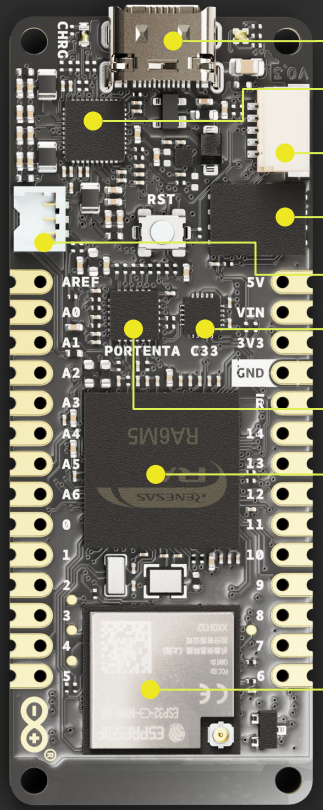
- **Cost effective, but always connected**
  Build your ultimate low cost IoT gateway with Portenta C33. It features **Wi-Fi and Bluetooth® Low Energy connectivity**, as well as a full range of flexible and programmable **I/Os** for custom peripheral support.

- **Get the most out of it**
  Get started now. Program your Portenta C33 with the **Arduino IDE** or **MicroPython**. Not enough? **Arduino Cloud** is looking forward to monitor and update all your devices from remote.

- **Endless possibilities**
  Deploy a wide range of **shields** and **carriers** compatible out-of-the-box. Otherwise, develop your own custom hardware and leverage Portenta C33 **castellated pins** to simplify your assembly.



Technical Specs



High-speed USB-C

Battery Charger

ESLOV Connector

16MB Flash

Battery Connector

Secure Element

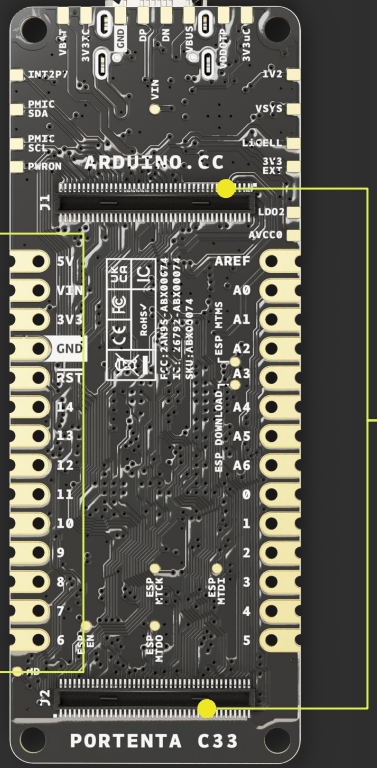
100Mbit Ethernet Phy

Renesas
R7FA6M5BH2CBG

Wi-Fi / Bluetooth®
Low Energy

Top View

Castellated Pins +
MKR Connectors



High Density
Connectors

Bottom View

Portenta C33 - Use cases

- Industrial IoT Gateway
- Machine monitoring to track OEE/OPE
- Inline quality assurance
- Ready-to-use IoT prototyping solution
- Energy consumption monitoring
- Appliances control system

Portenta Vision Shield

The **Portenta Vision Shield** provides machine vision capabilities and additional connectivity to the Portenta family boards.

The shield integrates an ultra low-power 320 x 320 pixel **camera module** and a **digital microphone**, enabling **Always-On computer vision applications**, such as gestures, intelligent ambient light and proximity sensing, tracking and object identification.

The **Portenta Vision Shield** is available in two versions:

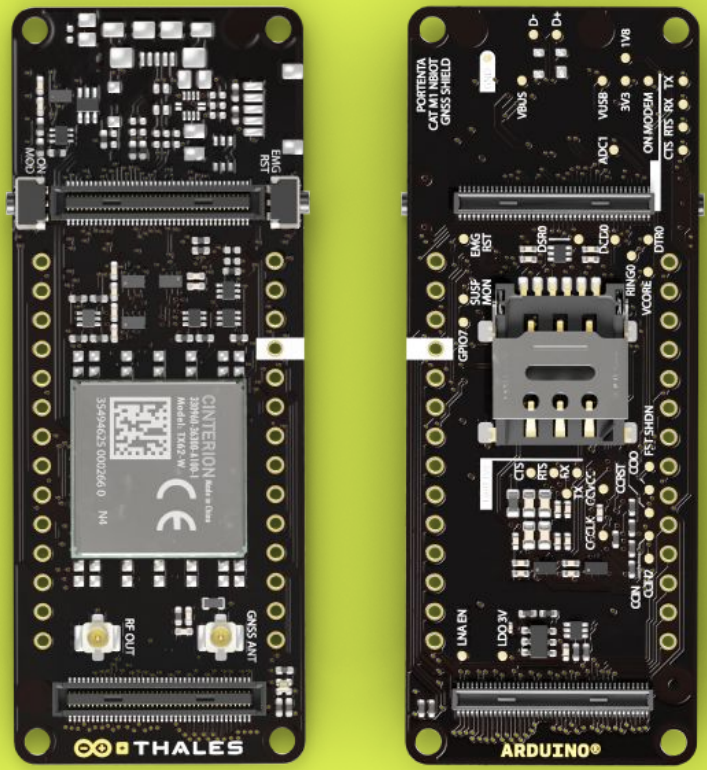
- **Portenta Vision Shield LoRa®**, equipped with a LoRa modem
- **Portenta Vision Shield Ethernet**, featuring a RJ45 connector onboard

Cat.M1/NB IoT GNSS Shield

The **Portenta Cat. M1/NB IoT GNSS Shield** brings cellular communication and positioning on the Portenta H7 boards. The shield leverages a Cinterion TX62 wireless module designed for **highly efficient, low-power IoT applications** to deliver optimized bandwidth and performance. The shield can also be used with MKR boards.

The **Portenta Cat. M1/NB IoT GNSS Shield** allows the development of **asset tracking and remote monitoring** applications (agriculture, smart cities, utilities) in combination with the strong edge computing power of Portenta H7.

This is a Works with Arduino Product, designed by Arduino and Thales.



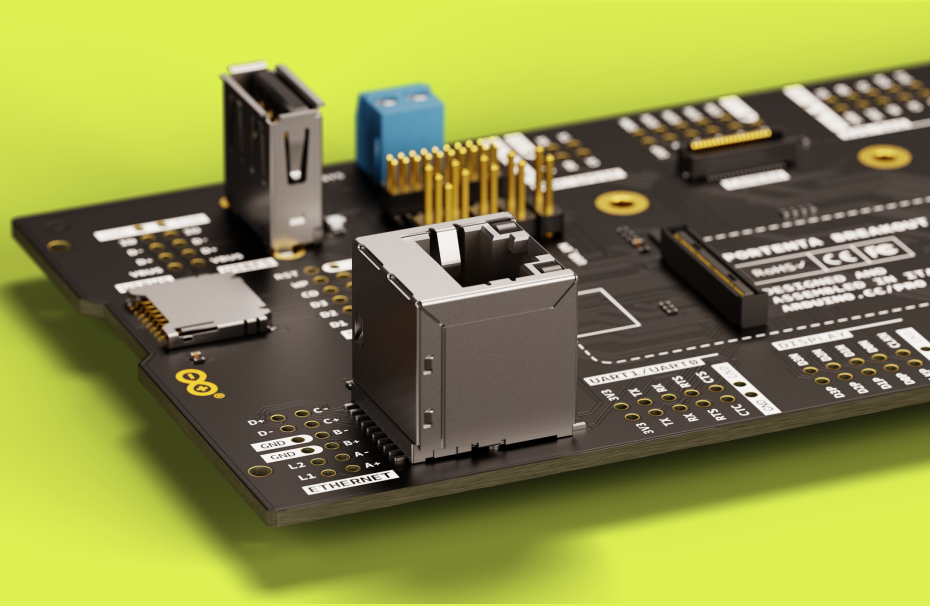
Portenta Breakout

Start prototyping and **reduce development time** for your industrial grade solutions based on the Portenta family.

The Arduino Portenta Breakout is designed to assist developers with their prototypes by **exposing all the pins** of the high density connectors of the Portenta family boards.
It allows for **easy debugging** through the JTAG connector and for **inspection of the bus lines** through the breakout pins.

In addition to the breakout pins, the Portenta Breakout features Ethernet, USB and SD sockets, coin cell, power button, external power supply and configurable boot selection modes.

Easily **connect additional Portenta shields** via the high density connectors on the bottom of the carrier.



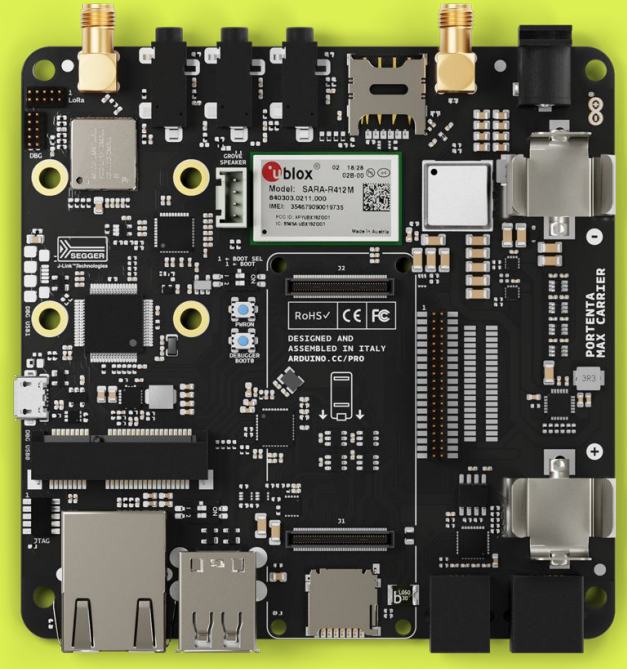
Portenta Max Carrier

Enable **edge AI** for **high performance industrial**, **building automation** and **robotics** applications with the Portenta Max Carrier.

The Portenta Max Carrier transforms the Portenta family products into a **standardized industrial platform***, ready for use as a single board computer or as a reference design.

The Portenta Max Carrier provides easy access to the Portenta X8 peripherals including **audio/video output**, as well as **Ethernet**, **microSD** and **mPCIe** connectors. This carrier further augments the capabilities of the Portenta platforms with **Fieldbus**, **LoRa®**, **Cat.M1** and **NB-IoT** connectivity, providing a platform for Industry 4.0. Thanks to its thermal design, the Portenta Max Carrier provides support for **Li-ion batteries**.
The carrier is also compatible with Portenta H7.

* Compatible with embedded Next Unit of Computing (eNUC) form factor

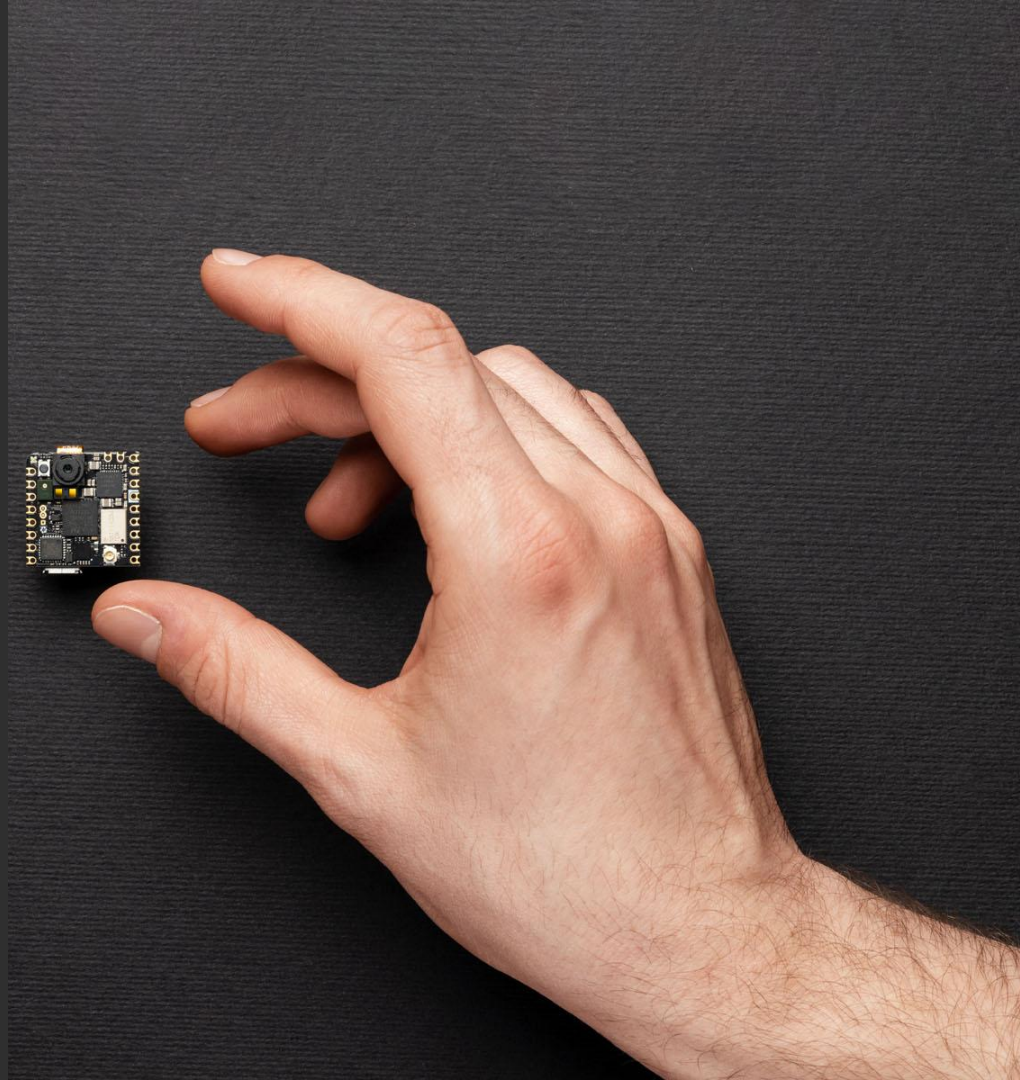


ARDUINO PRO

Nicla family

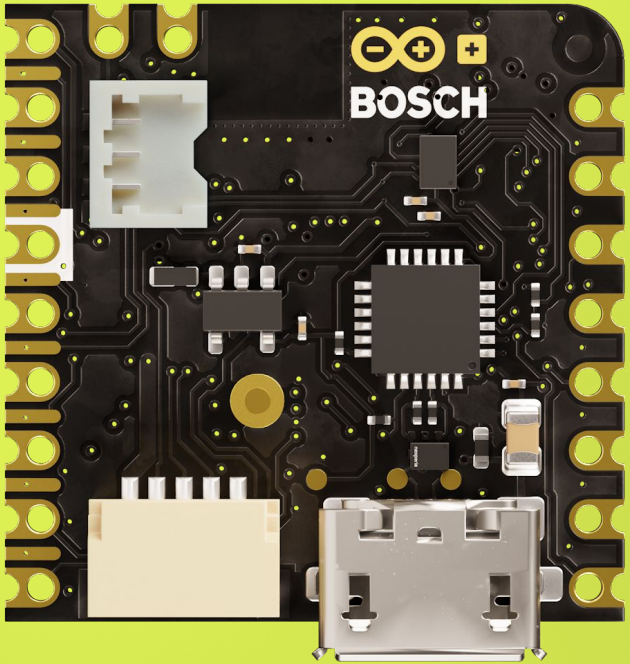
The Nicla Form Factor

- Low power microcontroller
- Embedded sensing with AI capabilities
- Small in size: 22.86 x 22.86 mm
- Wireless communication
- Standalone when battery powered
- Castellated pins

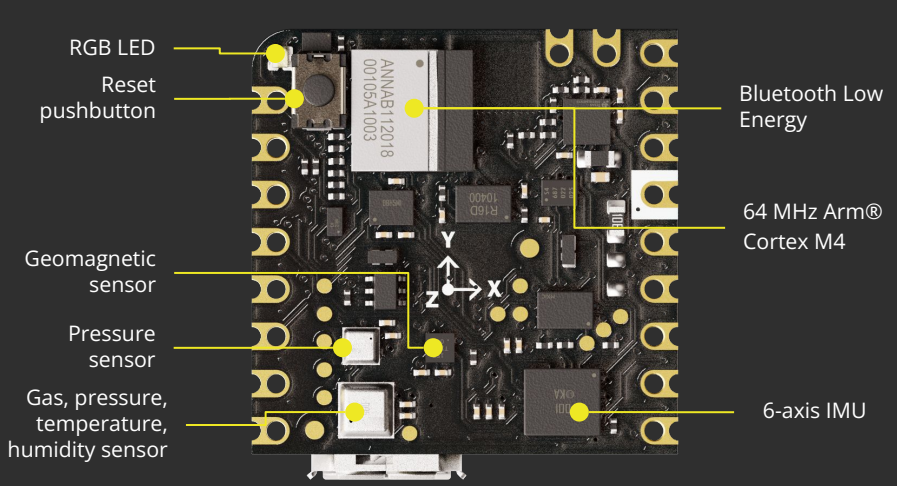


Nicla Sense ME

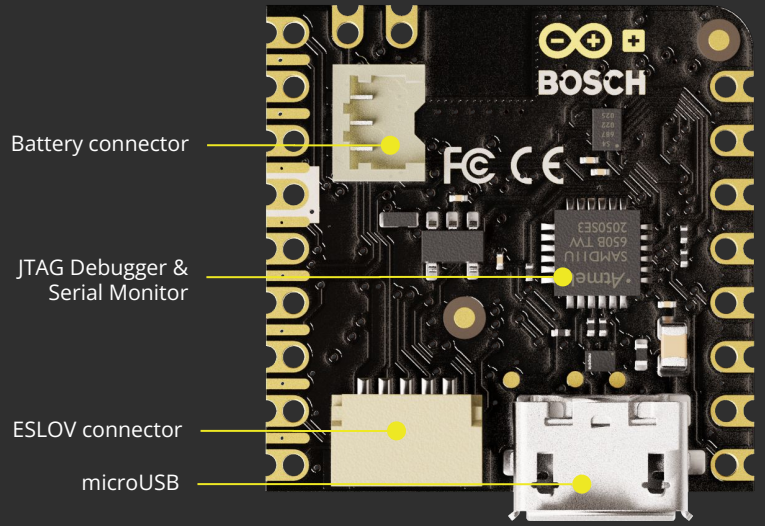
- **Tiny size packed with features**
  Thanks to its tiny size (22.86 x 22.86 mm) and a robust design, Nicla Sense ME is suitable for projects that need to combine sensor fusion and AI capabilities on the edge.
- **Intelligent industrial grade sensing**
  The board combines four state-of-the-art sensors from Bosch Sensortec. Easily analyse Motion and Environment by measuring rotation, acceleration, pressure, humidity, temperature, air quality and CO2 levels.
- **Low power consumption**
  Implement 24/7 always-on sensor data processing at ultra-low power consumption with Nicla Sense ME, also when battery powered.



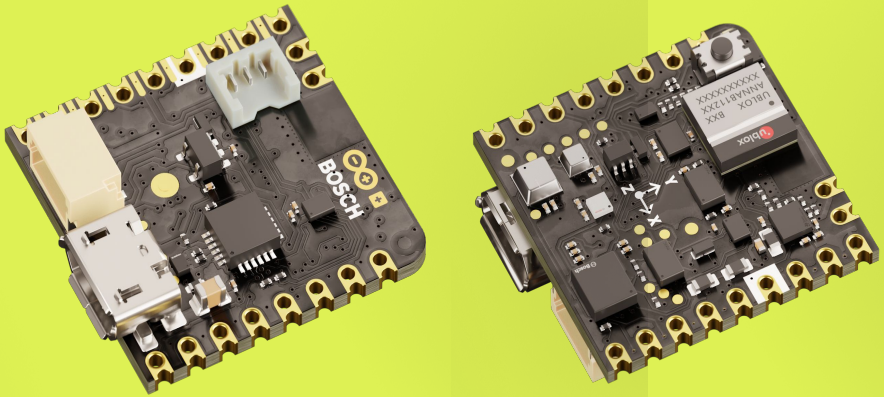
Nicla Sense ME - Technical Specs



Top View



Back View

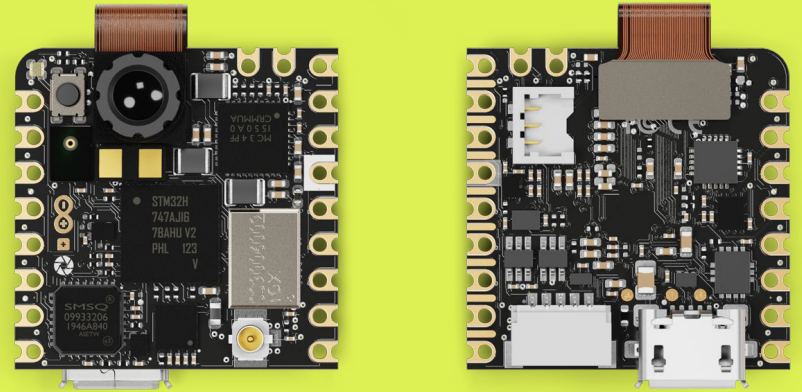


Nicla Sense ME - Use cases

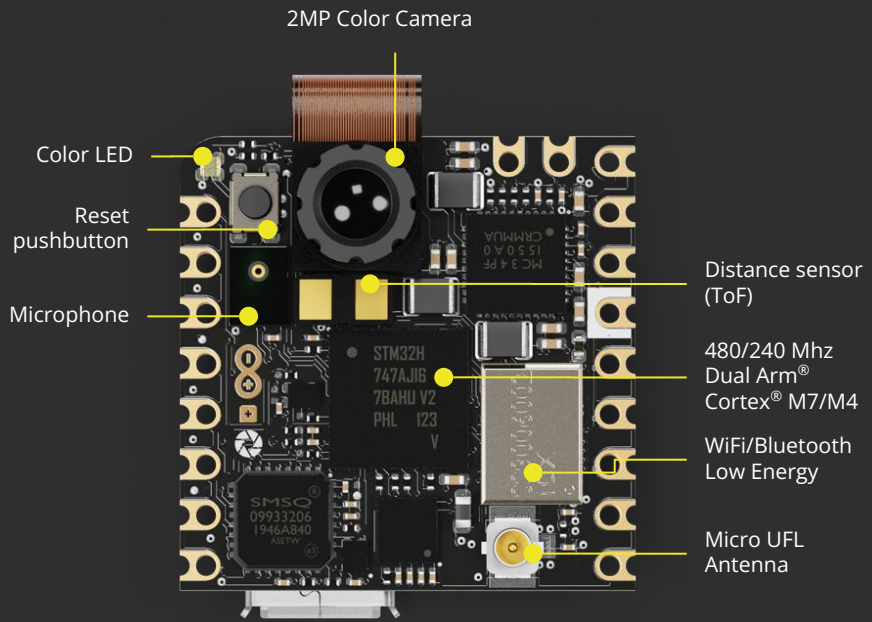
- Vibration and environmental sensing for preventive maintenance
- Robots/rovers stabilization
- Manufacturing process monitoring and optimization
- Man down detection
- Environmental parameters monitoring
- Gas detection
- Fire detection

Nicla Vision

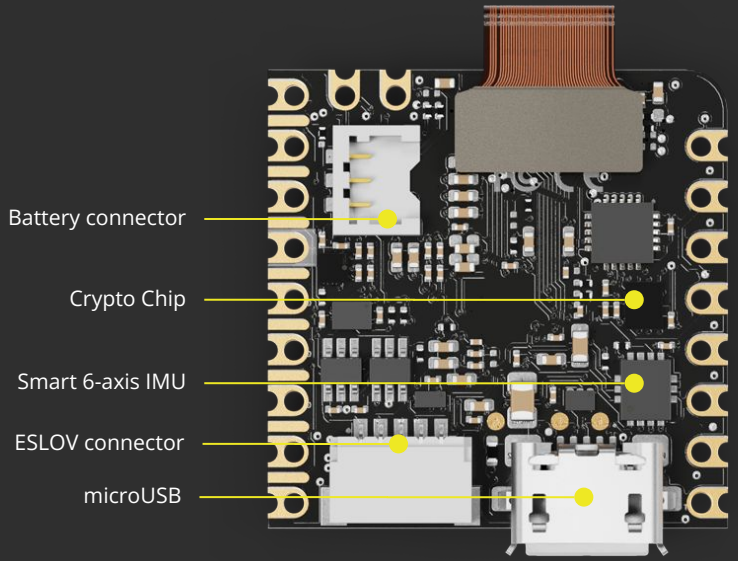
- **Image processing with 2MP color camera**
  Ready-to-use, standalone camera for analyzing and processing images on the edge.
- **Tiny size packed with features**
  Small in size (22.86 x 22.86 mm) but big in performance, Nicla Vision features the STM32H747AII6 Dual ARM® Cortex® - M7 core up to 480 Mhz + M4 core up to 240 Mhz (same as Portenta H7).
- **Industrial grade sensing**
  Develop asset tracking, object recognition and predictive maintenance applications. Other than 2MP color camera, Nicla vision features 6-axis motion sensor, microphone and distance sensor.
- **Connected sensor node**
  Quickly implement sensor nodes to send collected data to the Arduino Cloud (or third-party vendor services) via integrated WiFi/Bluetooth Low Energy connectivity.



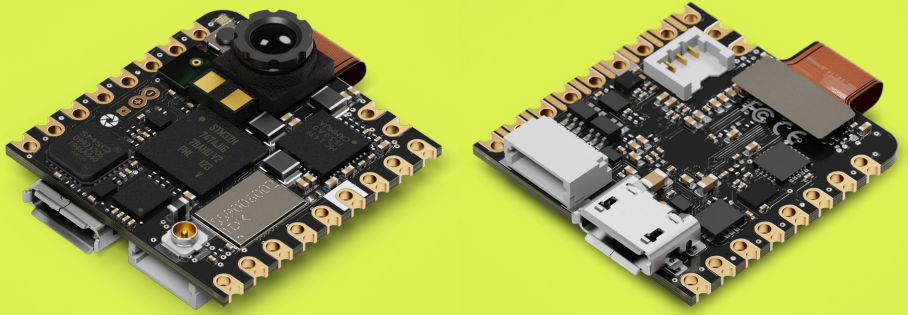
Nicla Vision - Technical Specs



Top View



Back View

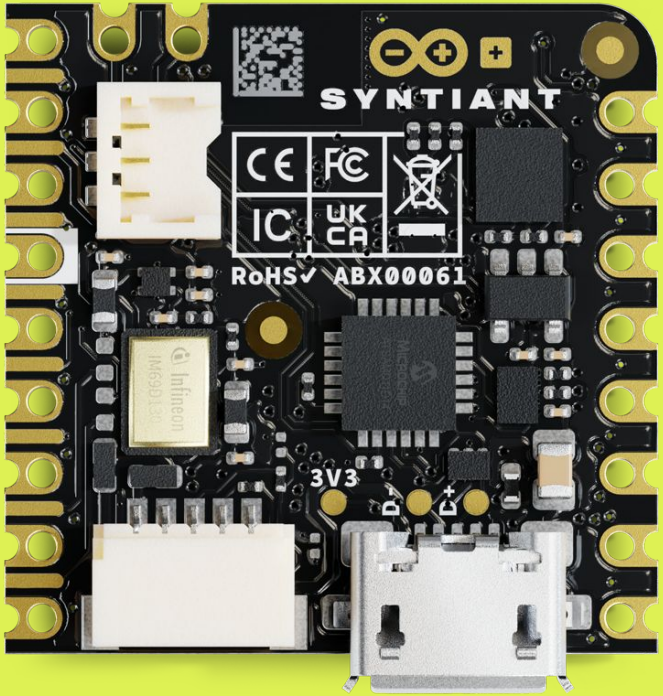


Nicla Vision - Use cases

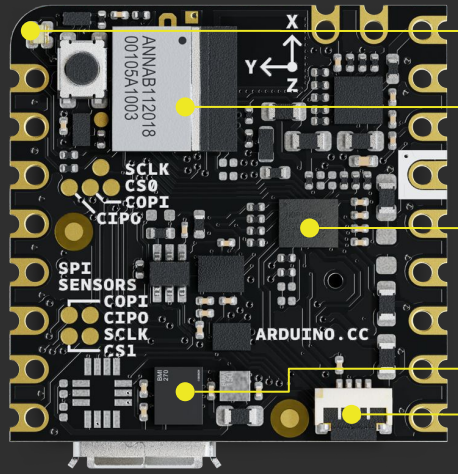
- Automated inventory management system
- Automated quality checks
- Multi-sensor preventive maintenance
- Autonomous harvester
- Detection of health and safety devices (PPE)
- Ready-to use machine vision prototyping solution

Nicla Voice

- **Always-on speech recognition on the edge**
  The board integrates a Neural Decision Processor™ from Syntiant (NDP120), allowing to run multiple AI algorithms.
- **Tiny size packed with sensors**
  In addition to its microphone, the tiny Nicla Voice (22.86 x 22.86 mm) features a smart 6-axis motion sensor and a magnetometer, making it the ideal solution for ultra-low power predictive maintenance, gesture/voice recognition and contactless applications.
- **Low power consumption**
  Implement 24/7 always-on sensor data processing at ultra-low power consumption with Nicla Voice, also when battery powered.



Technical Specs



RGB LED

64 MHz Arm® Cortex M4
Bluetooth® Low Energy

Neural decision
Processor™ (NDP120)

Smart 6-axis IMU

External mic connector

Top View

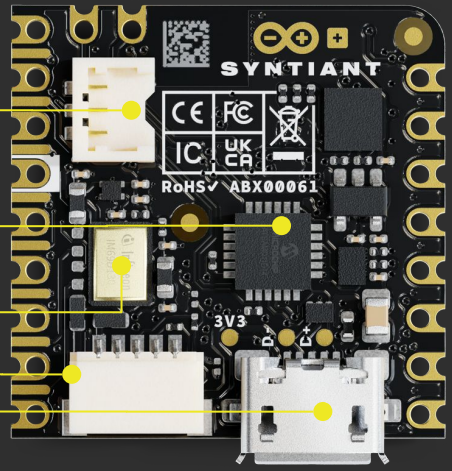
Battery connector

JTAG Debugger &
Serial Monitor

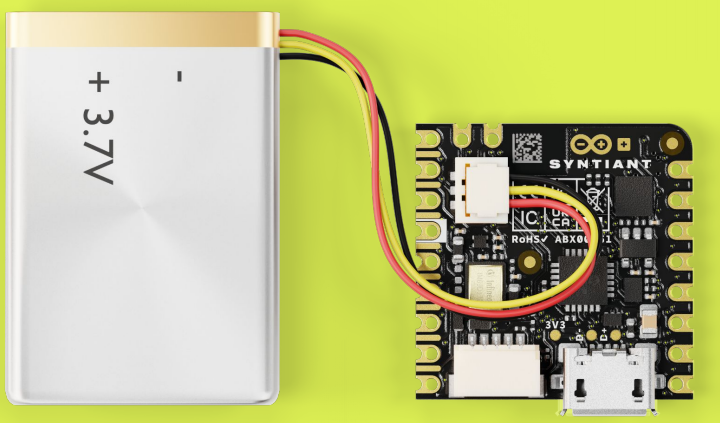
High-performance
Microphone

ESLOV connector

microUSB



Back View

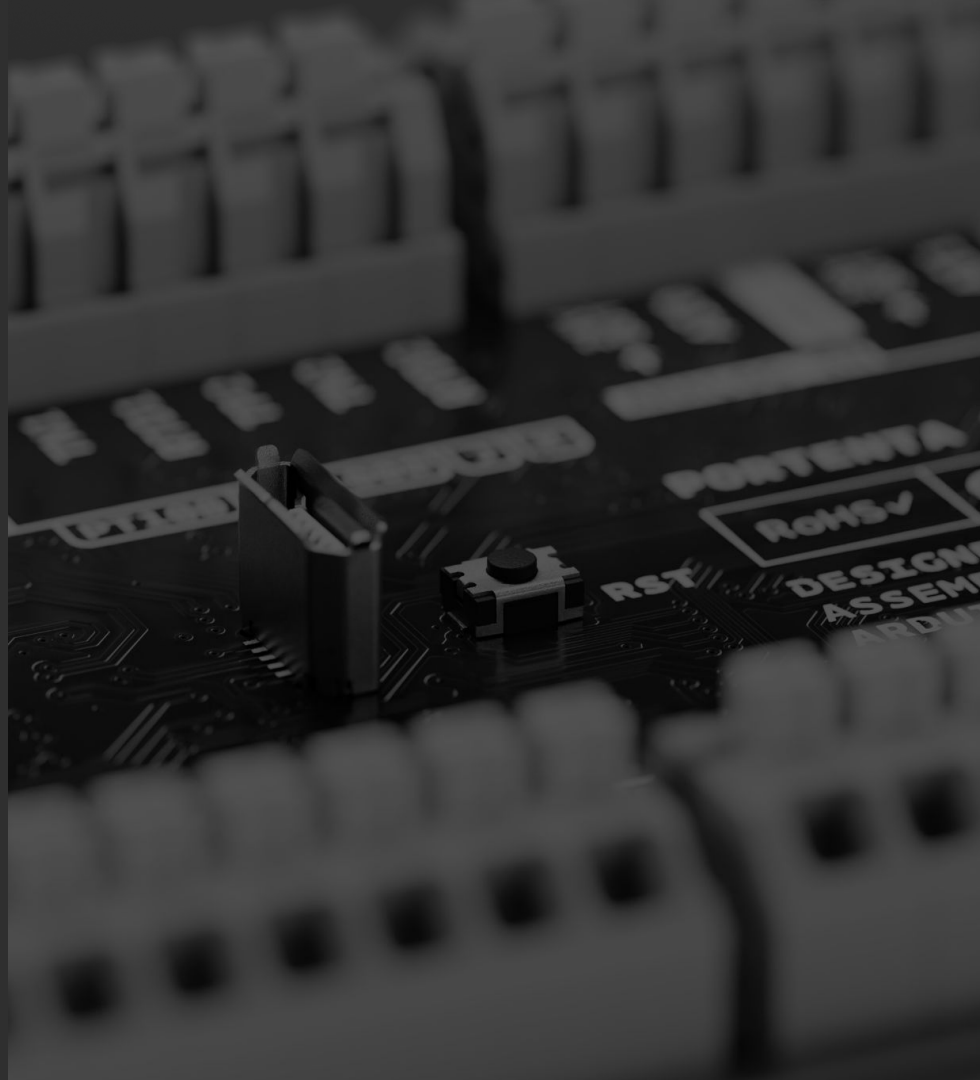


Nicla Voice - Use cases

- Vibrations detection in robotic arms
- Voice-enabled commands for industrial refrigerators
- Automated intruder detection system
- Ready-to-use speech recognition prototyping solution

ARDUINO PRO

Solutions and Kits



Arduino Opta

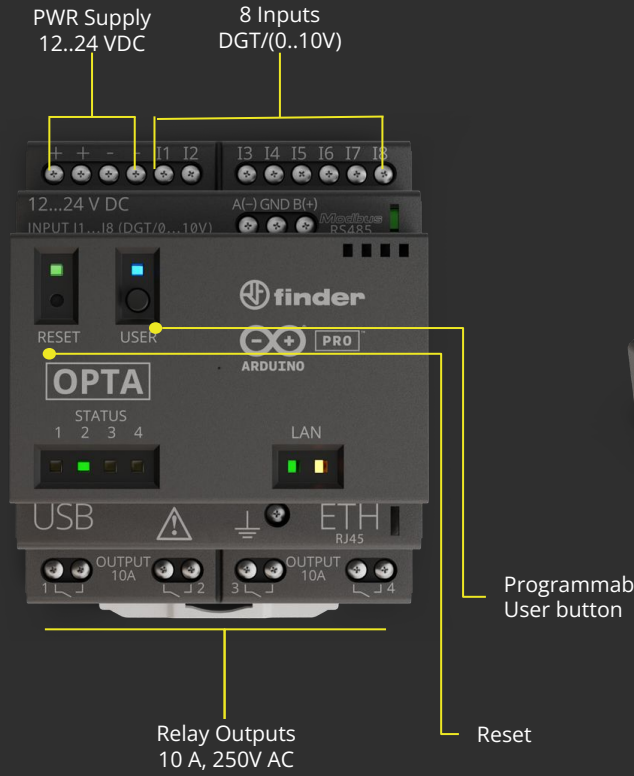
- **An easy-to-use micro PLC with Industrial IoT capabilities**
  Scale up automation projects while taking advantage of the open and widely known Arduino ecosystem and enable a wide range of real-time control, monitoring and predictive maintenance applications

- **Choose your connectivity option:**

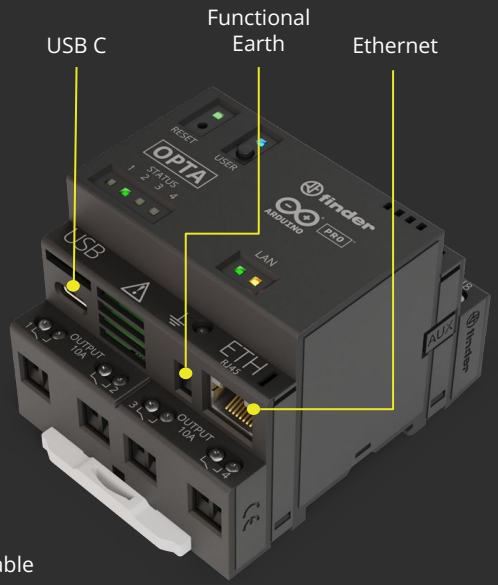
  - Opta Lite: onboard Ethernet or Modbus TCP/IP
  - Opta RS485: adding RS485 connectivity
  - Opta WiFi: the most complete solution, adding Wi-Fi/Bluetooth® Low Energy

- **Security as a cornerstone**
  Onboard secure element for certificates storage and management, device identity and encrypted communication.

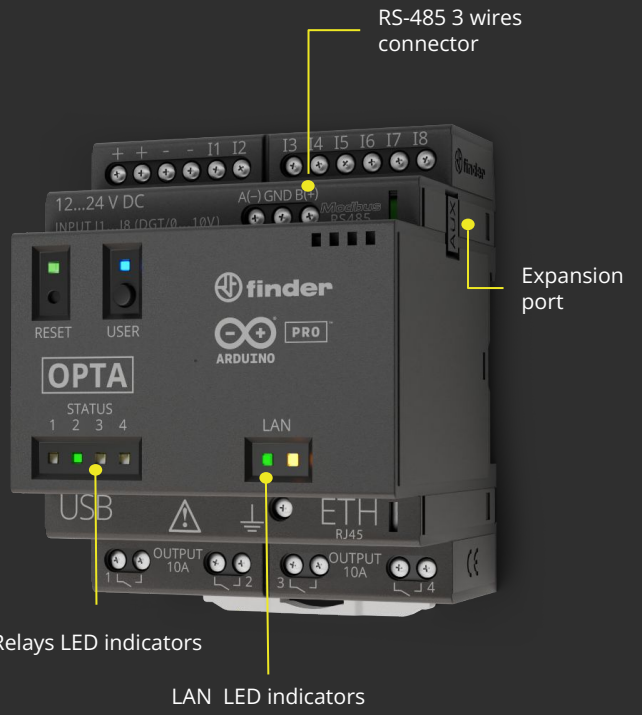
Technical Specs



Top View



Side Down view



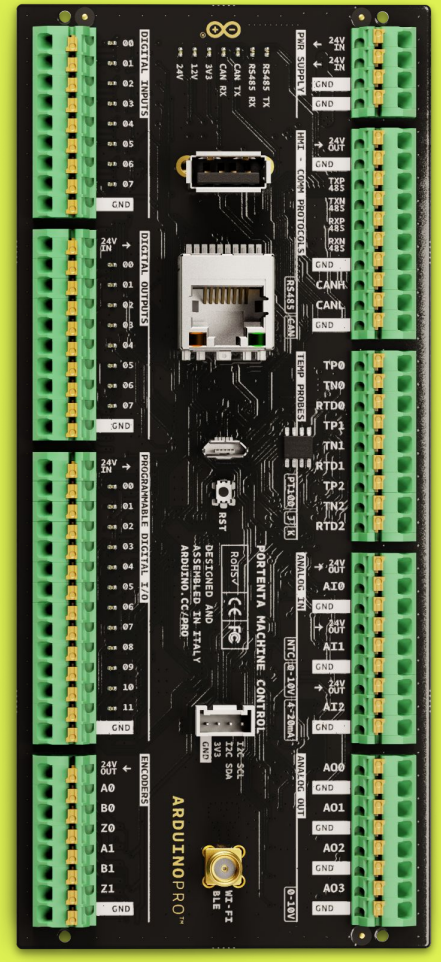
Perspective View

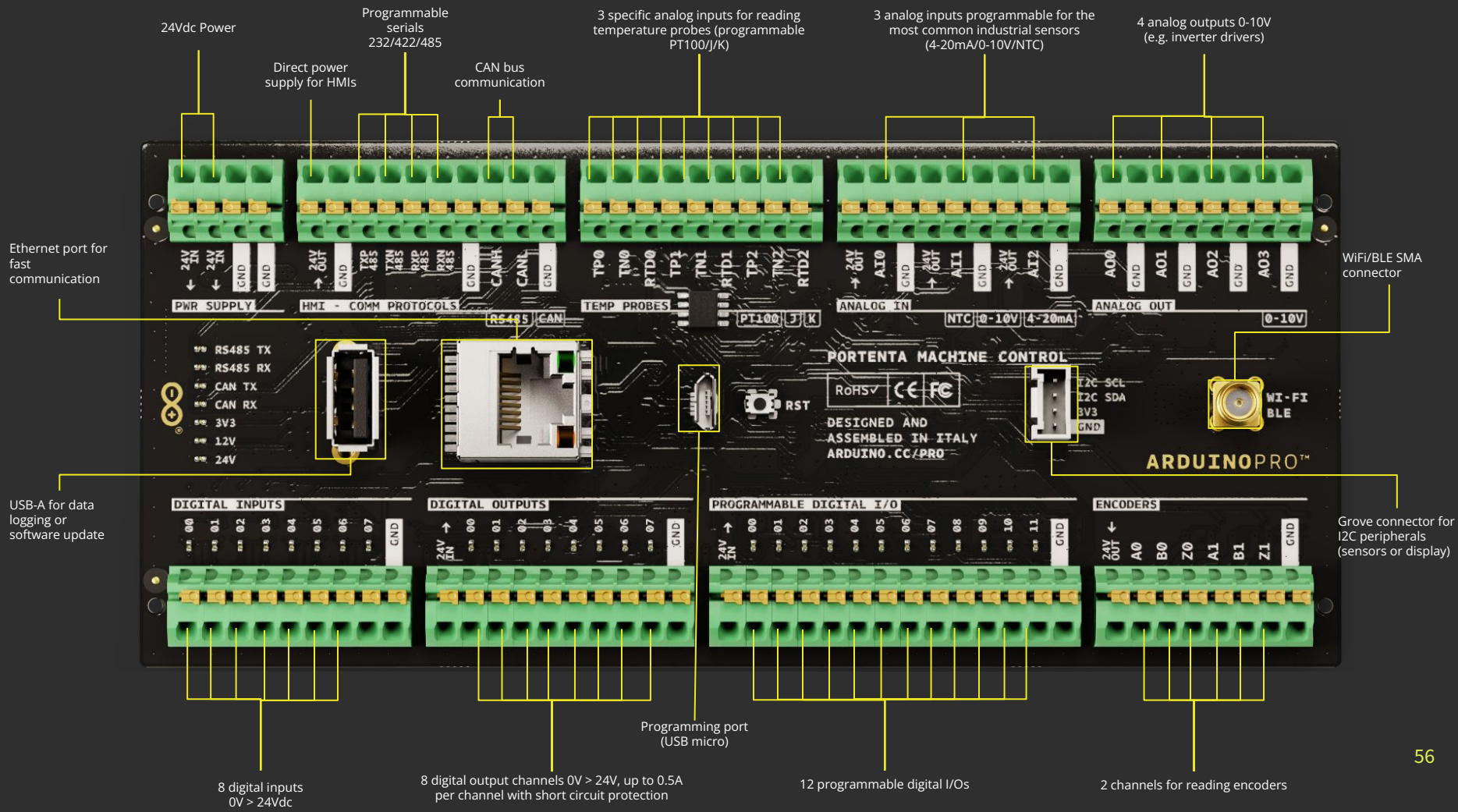
Opta - Use cases

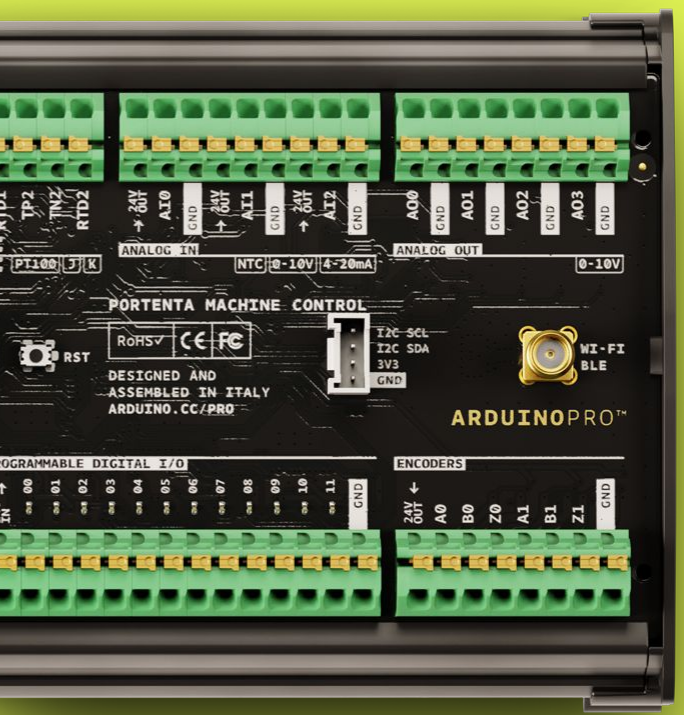
- Industrial IoT integration in manufacturing
- Production process optimization
- Sensors-PLCs gateway
- Remote control and monitoring
- Building automation
- Energy monitoring and optimization
- Anomaly detection
- Data logging

Portenta Machine Control

- **A Portenta H7 PLC**
  Portenta Machine Control leverages the integrated Portenta H7 module to implement a fully-centralized, low power, industrial control unit able to drive equipment and machinery. It can be programmed using the Arduino framework or other embedded development platforms.
- **Add IoT capabilities to industrial machines**
  Integrated WiFi and Ethernet connectivity, enabling the collection of real-time data from the factory floor and the remote control of equipment, even from the Cloud when desired.
- **Tailor it to your need**
  35 fully configurable I/Os, 2 encoder channels and 3 temperature probes input available for the user.
- **Security over time**
  Onboard secure element for certificates storage and management.




24Vdc Power
Programmable serials 232/422/485
Direct power supply for HMIs
CAN bus communication
3 specific analog inputs for reading temperature probes (programmable PT100/J/K)
3 analog inputs programmable for the most common industrial sensors (4-20mA/0-10V/NTC)
4 analog outputs 0-10V (e.g. inverter drivers)
Ethernet port for fast communication
WiFi/BLE SMA connector
USB-A for data logging or software update
Grove connector for I2C peripherals (sensors or display)
Programming port (USB micro)
8 digital inputs 0V > 24Vdc
8 digital output channels 0V > 24V, up to 0.5A per channel with short circuit protection
12 programmable digital I/Os
2 channels for reading encoders
PWR SUPPLY
HMI - COMM PROTOCOLS
RS485
CAN
TEMP PROBES
PT100
J
K
ANALOG IN
NTC
0-10V
4-20mA
ANALOG OUT
0-10V
RS485 TX
RS485 RX
CAN TX
CAN RX
3V3
12V
24V
PORTENTA MACHINE CONTROL
RST
I2C SCL
I2C SDA
3V3
GND
WI-FI
BLE
DESIGNED AND ASSEMBLED IN ITALY
ARDUINO.CC/PRO
ARDUINOPRO™
DIGITAL INPUTS
DIGITAL OUTPUTS
PROGRAMMABLE DIGITAL I/O
ENCODERS



Portenta Machine Control - Use cases

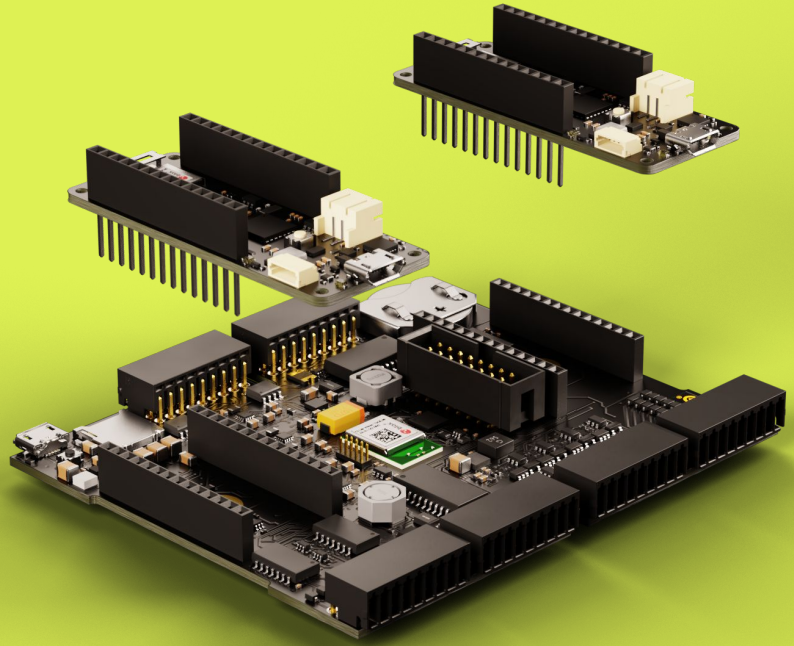
- Sensors-PLCs gateway
- Remote control and monitoring
- Asset manageability and diagnostics
- Preventive maintenance
- Data logging
- Production processes optimization

Edge Control

- **Crop health control**
  Real-time collect data from smart agriculture sensors, such as weather conditions, soil quality, crop's growth. Drive actuators like latching valves (common in agriculture) to fertilize/irrigate when needed.

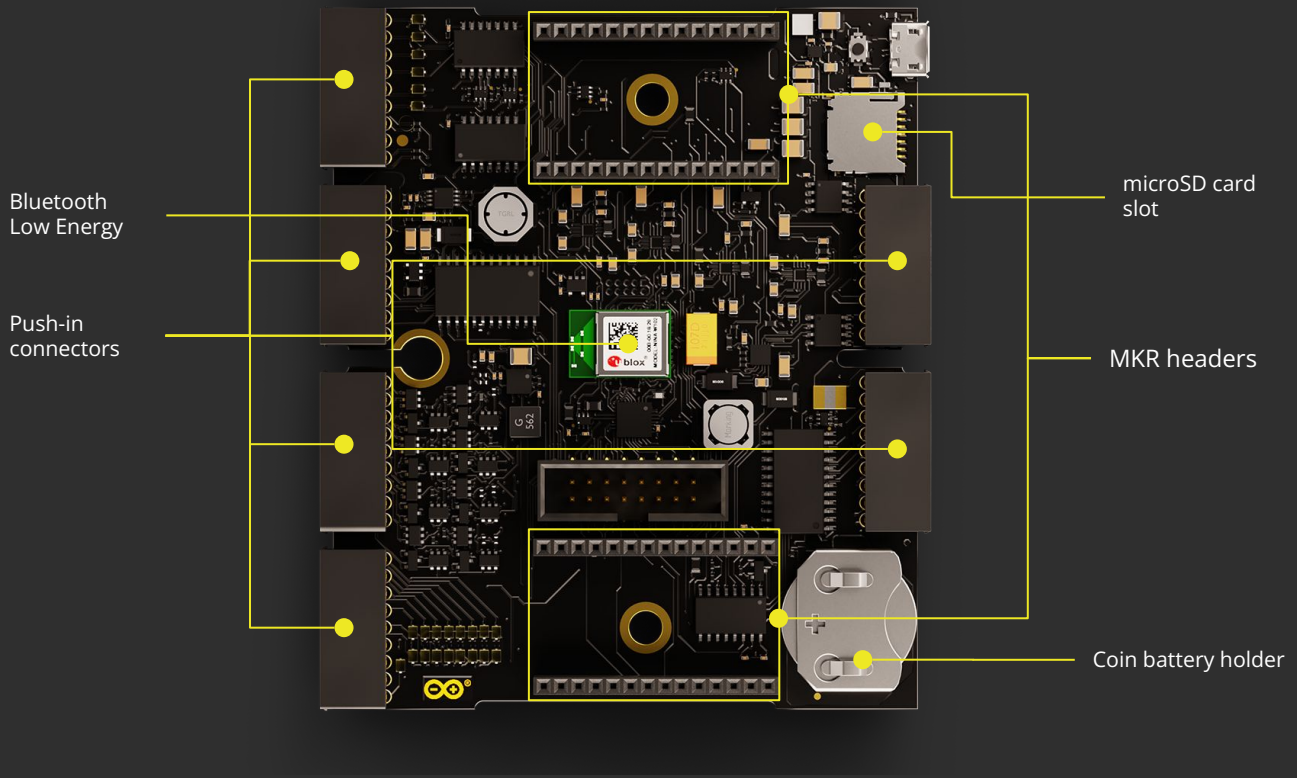
- **Multiple connectivity options**
  Integrated MKR headers to expand connectivity options, including 2G/3G/CatM1/NB-IoT modems, LoRa, Sigfox, and WiFi/Bluetooth.

- **Remote areas installation**
  Edge Control can fit in any cabinet thanks to its Din Rail mounting Enclosure Kit. It is provided with 2-row display and user button that can be highly customized to visualize sensor data real-time. Power it either via solar panel or DC input.

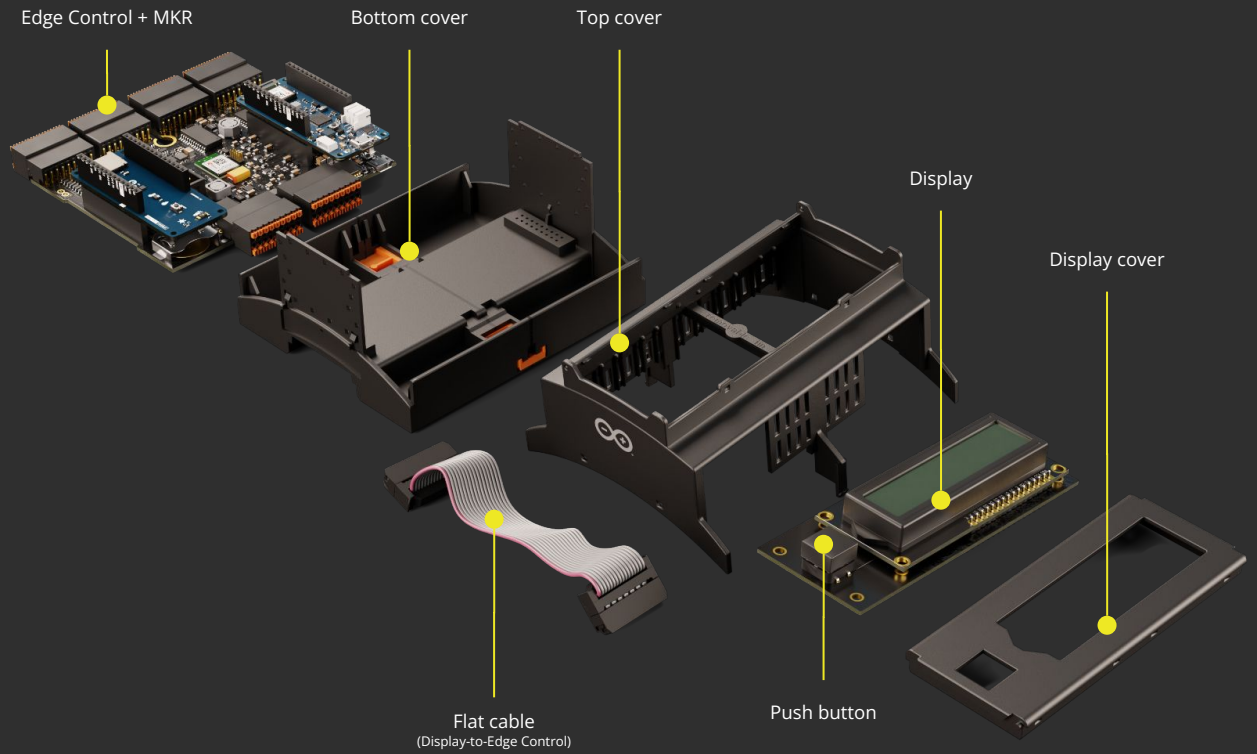


Example of a typical application for a solution including two Arduino MKR boards.

Edge Control - Technical Specs



Edge Control Enclosure Kit - Technical Specs



Edge Control - Use cases

- Automated Greenhouses
- Hydroponics/Aquaponics
- Mushroom Cultivation
- Fertilization/Irrigation
- Real-time weather monitoring
- Energy consumption monitoring

WisGate Edge gateways

- **LoRaWAN® connectivity**
  Connect your LoRa® devices better than ever. Leverage Arduino gateways for LoRaWAN® connectivity to ensure secure and reliable connectivity for a wide rage of professional applications.

- **Indoor and outdoor solutions**
  Two solutions to satisfy both indoor and outdoor environment requirements:
  - **WisGate Edge Lite 2** for industrial indoor LoRaWAN® applications with high execution efficiency. It supports up to 8 LoRa channels, multi backhaul with Ethernet, Wi-Fi, and Cellular connectivity. The gateway is powered by OpenWRT which allows to develop custom applications.
  - **WisGate Edge PRO** for IoT commercial outdoor deployment. It supports 16 LoRaWAN® channels thanks to a Dual LoRaWAN® Concentrator, and multi backhaul connectivity via Ethernet, Wi-Fi, and Cellular LTE. The design of its enclosure allows internal antennas for LTE, Wi-Fi, and GPS. It is powered by OpenWRT which allows to develop custom applications.

WisGate Edge PRO on the left and WisGate Edge Lite 2 on the right

Interfaces

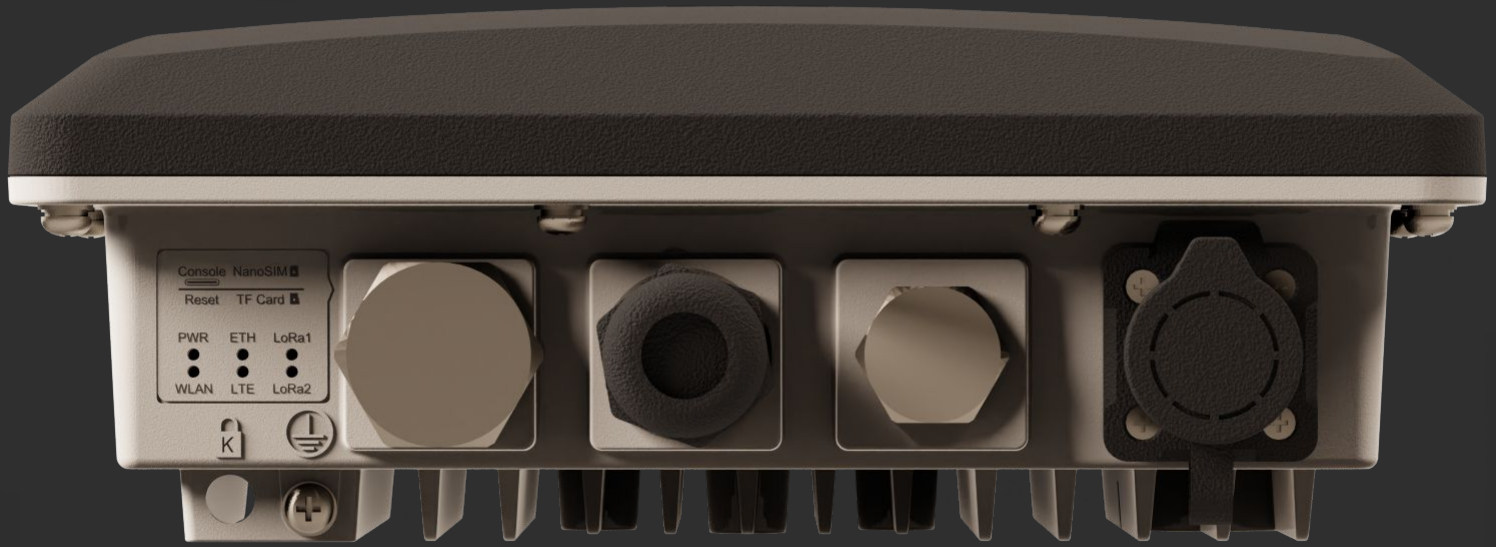
WisGate Edge Lite 2

LoRaWAN® indoor gateway

Interfaces

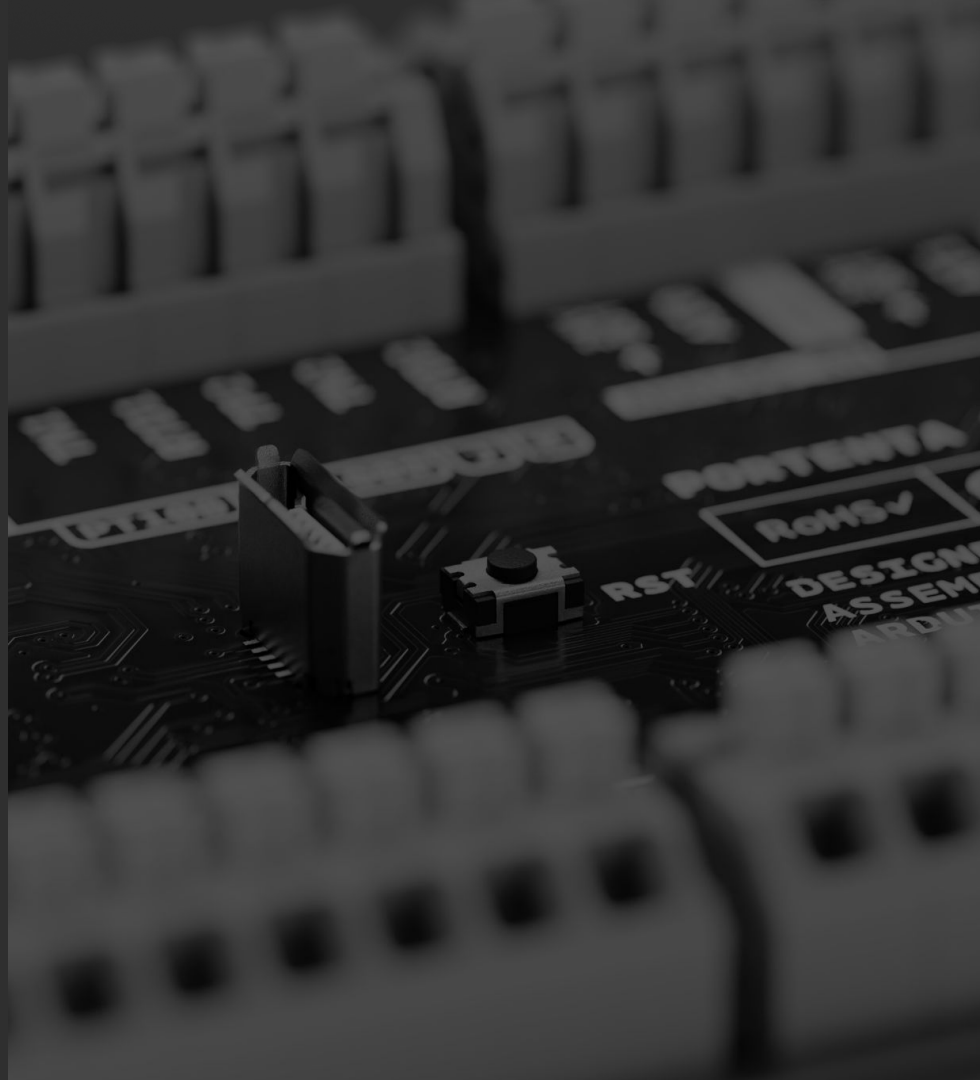
WisGate Edge Pro

LoRaWAN® outdoor gateway

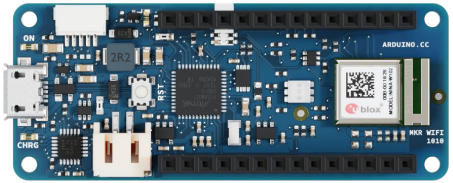


ARDUINO PRO

MKR and Nano ecosystem

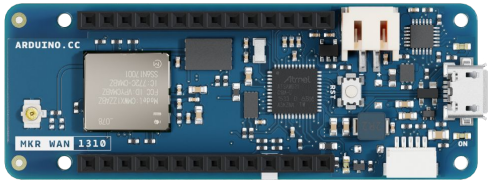


MKR and Nano families



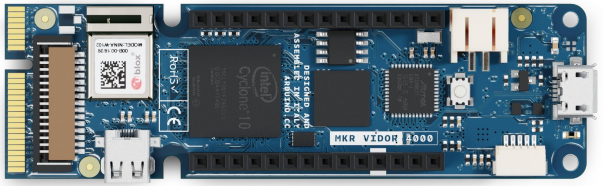
Arduino MKR WiFi 1010

The basics to build secure WiFi and Bluetooth applications



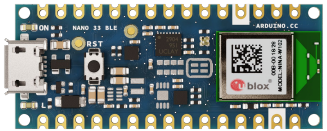
Arduino MKR WAN 1310

Send data securely with LoRaWAN with minimal power consumption



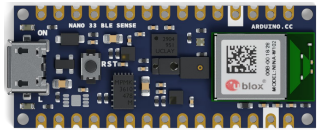
Arduino MKR Vidor 4000

The most powerful re-programmable chip on an Arduino device: FPGAs.



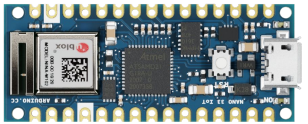
Arduino Nano 33 BLE

Tiny and powerful board that incorporates 9-axis motion sensor



Arduino Nano 33 BLE Sense

Sense the environment, detect movement or capture sound

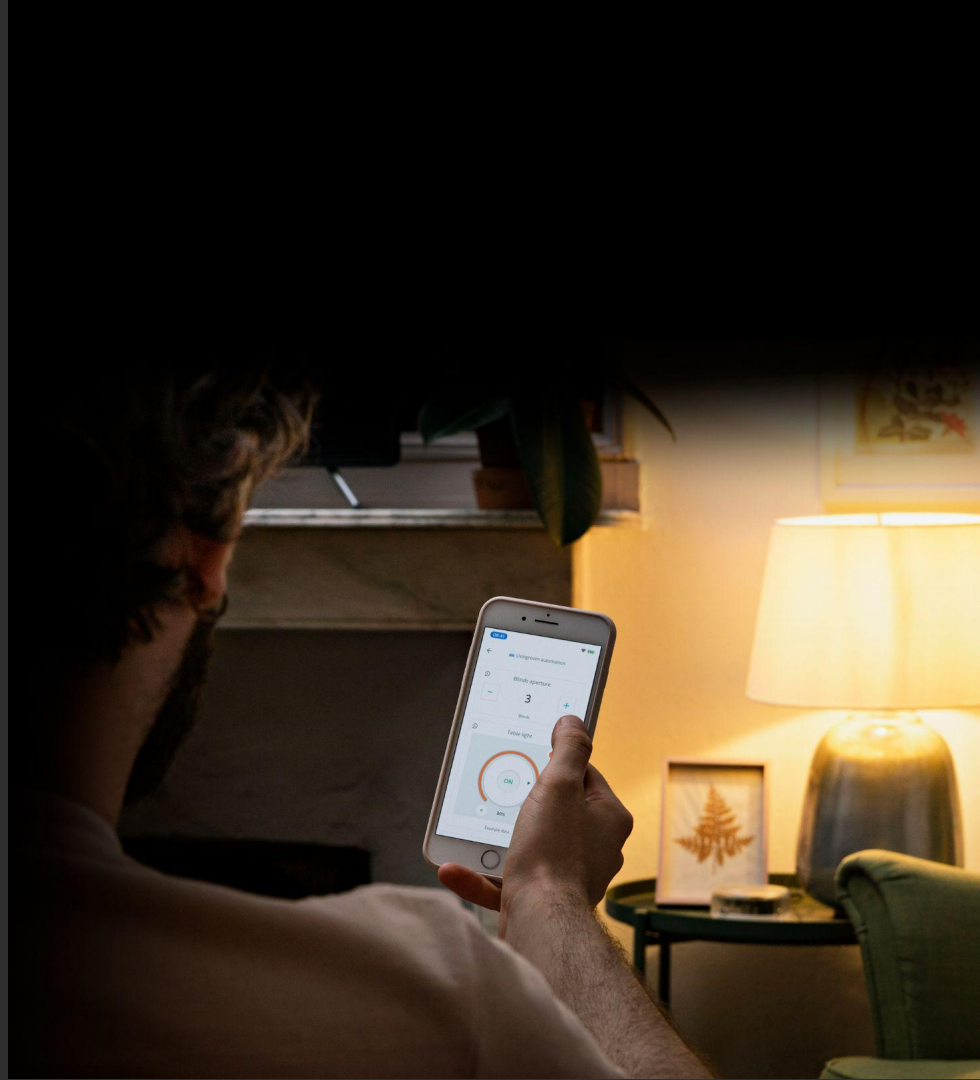


Arduino Nano 33 IoT

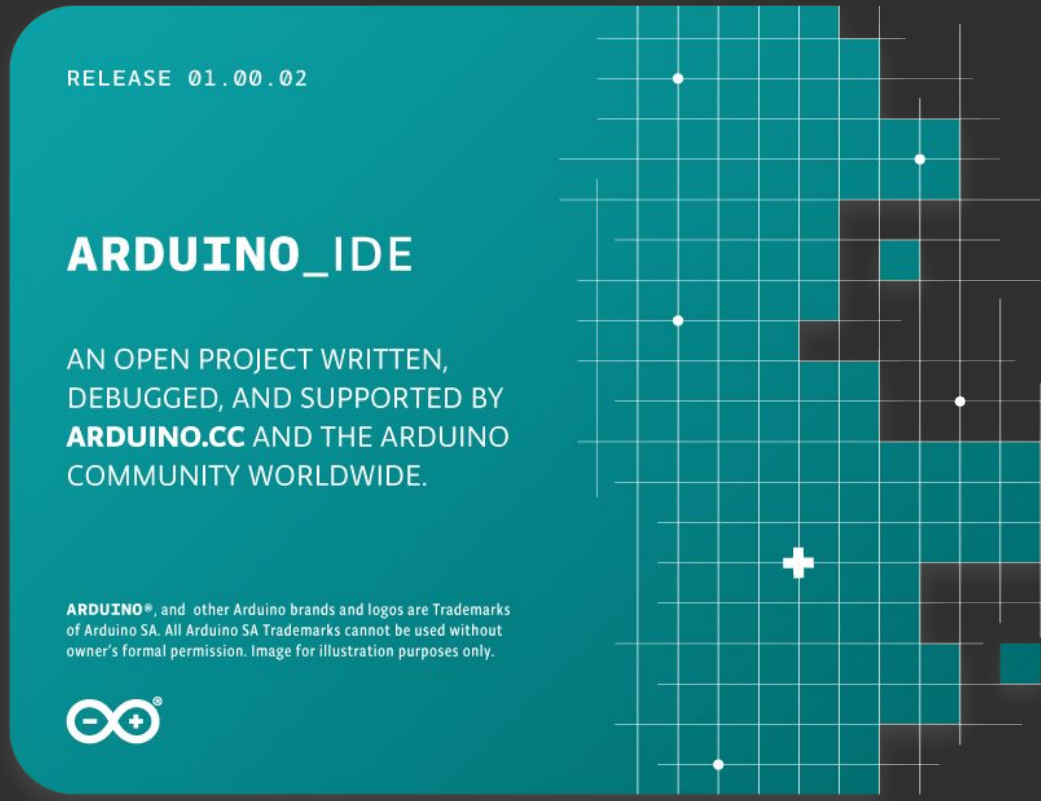
Enhance existing devices to be part of the IoT and design pico-network applications

ARDUINO PRO

Software and Cloud



Arduino IDE


RELEASE 01.00.02
ARDUINO_IDE
AN OPEN PROJECT WRITTEN, DEBUGGED, AND SUPPORTED BY ARDUINO.CC AND THE ARDUINO COMMUNITY WORLDWIDE.
ARDUINO®, and other Arduino brands and logos are Trademarks of Arduino SA. All Arduino SA Trademarks cannot be used without owner's formal permission. Image for illustration purposes only.

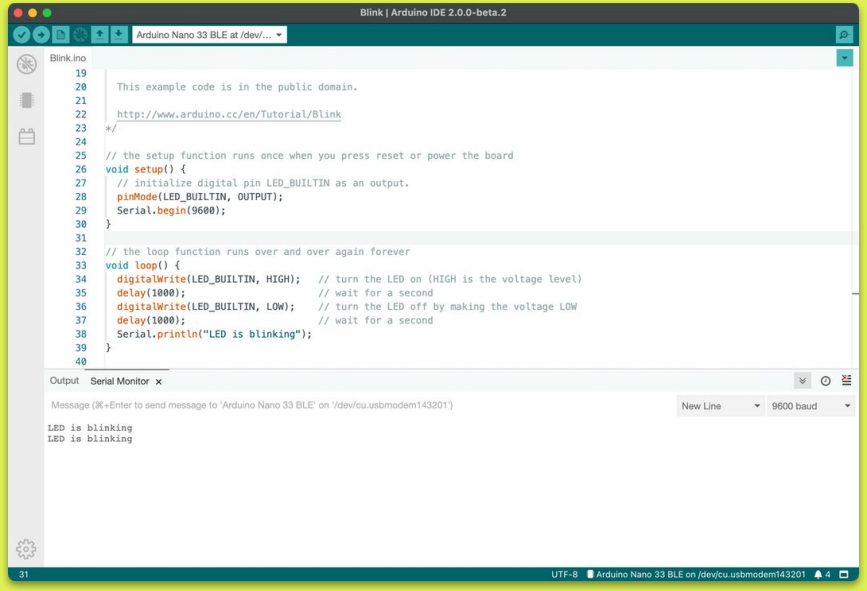
Arduino IDE 2.0

- **Program your Arduino devices**
  Upload the latest core, write a sketch and start using your Arduino devices. Program with no friction leveraging many IDE features, including code identification and autocompletion, auto-closing brackets, live debugging.

- **All the libraries you need in one click**
  Provide extra functionalities to your devices by including libraries to your sketches. Select the right library from a variety of open-source projects or through the integrated Library Manager. If you cannot find what you need, write your own library and contribute to the Arduino community.

- **Visualize your data real-time**
  Make use of the integrated serial monitor to print your data into “terminal style” or graphically track them through the serial plotter.

- **Access all your sketches everywhere**
  Write your Arduino sketches on one computer and access them on another with a single click. Do not worry about synchronisation and backup, the IDE provides a Remote Sketches feature to allow you to store your sketches securely in the Arduino Cloud and retrieve them easily on any other workstation.



ARDUINO PRO

Arduino CLI

Arduino CLI

- **Use your terminal for your Arduino projects**
  Code, compile and uploads your Arduino devices through command prompt (Windows) and Terminal (Linux and Mac). Leverage third parties tools such as Visual Studio to program your Arduino devices.

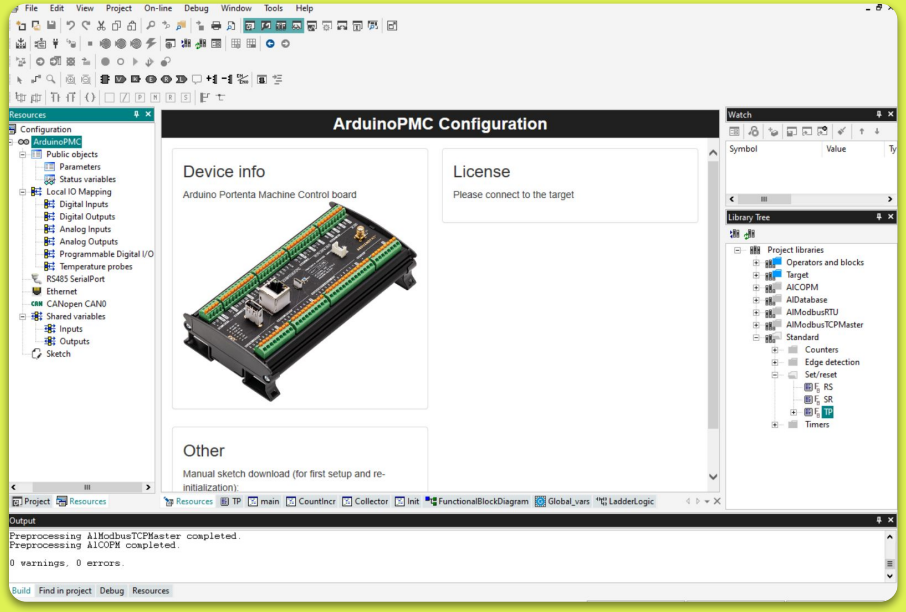
- **Replicate IDE UX in the shell**
  Install the cores and libraries you need, create sketches using your favorite editor and compile/upload it to your Arduino devices. All through the Arduino CLI.

- **Multiple supported platforms**
  Run Arduino CLI on both ARM® and Intel® (x86, x86_64) architectures. Install Arduino CLI on a Portenta X8 or on your servers, and use it to compile Sketches targeting the board of your choice.
  Arduino CLI is open source but companies wishing incorporate it in end products can also contact us for a commercial license.

Arduino PLC IDE

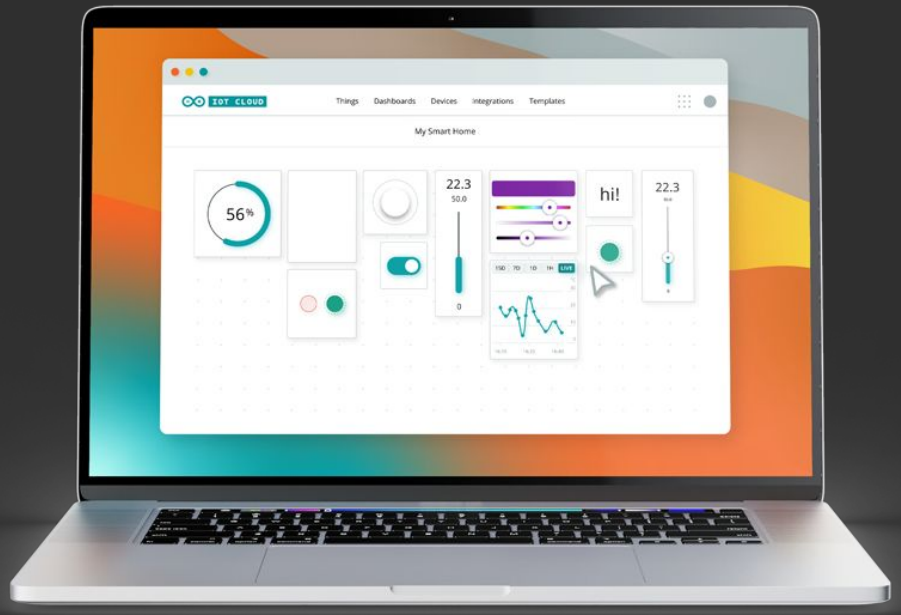
Arduino PLC IDE

- **Bring deterministic cyclic tasks and multitasking** to your software application.
- **Enable your Portenta Machine Control to IEC 61131-3 programming languages** and Combine PLC programming and Arduino sketch programming to seamlessly share variables between the two environments.
- **Get comfortable with the highly configurable UI** offering unified programming environment while a complete set of monitoring and debugging tools provides a powerful workbench for professionals.
- **Manage fieldbus communication** with the integrated no-code CanOpen, Modbus RTU and Modbus TCP configurators.

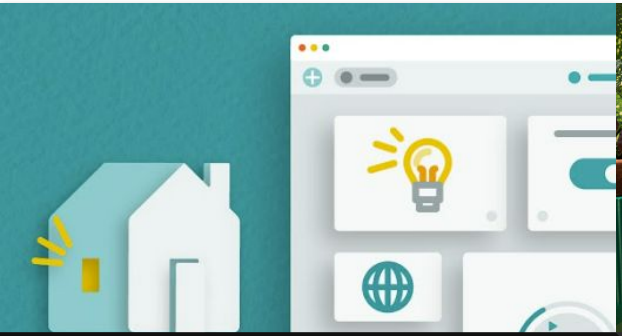


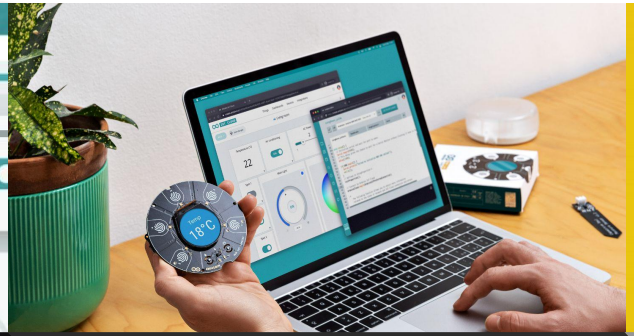
ARDUINO PRO

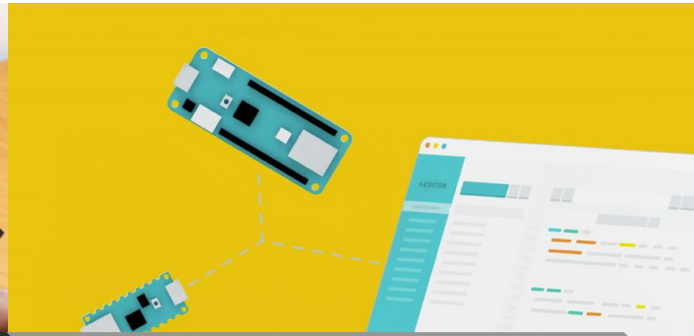
Arduino Cloud for business



Arduino PRO Cloud: Endless possibilities







Data Plane

Gather real-time and historical **data** in one place and **display** them on widget-based **dashboards**

Sketching and Coding

Program your devices and **access** all your **sketches** online in the integrated **Web Editor**

PRO Features

Manage and **monitor** your **fleet of devices** from anywhere together with all your **team**

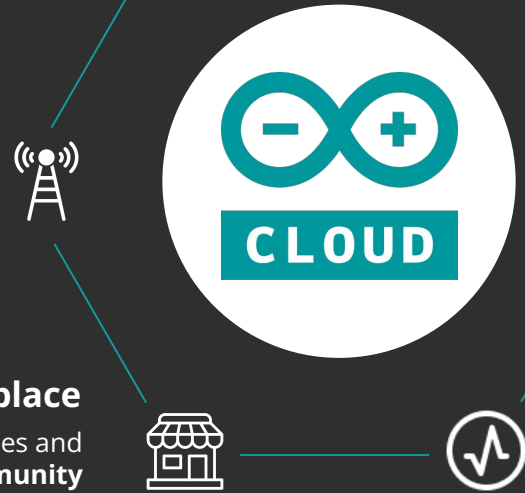
Arduino Cloud - Common Value Propositions

Code or no code. You choose

Choose a device you want to connect, and Arduino Cloud will take care of all the needed **code to set it up**. Use the Web Editor to modify or write your **own code**.

Over-the-air updates

Need to make updates? Upload **new code over-the-air** from anywhere in the world!



Multiple connectivity options

Multiple connectivity supported out of the box, e.g. **WiFi, LoRa, Cellular, Ethernet**.

Access from anywhere

Access all your Cloud projects and sketches from **any device**, from PCs to smartphones. **Export** your Cloud data locally when needed.

Solutions and IP Marketplace

A place where users, companies and members of the Arduino **community** can share and **monetize** their own Project **Templates** and Resources for others to use.

Integrated Machine Learning Tools

Build and train predictive models with just few lines of code. Deploy **premade models** to quickly implement your project, from object detection to audio segmentation.

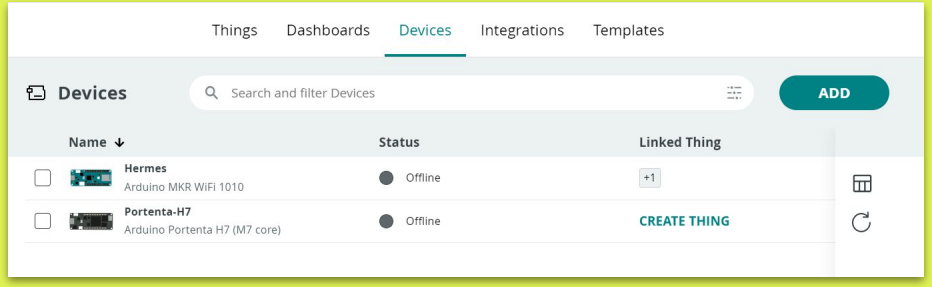
Arduino Cloud for business

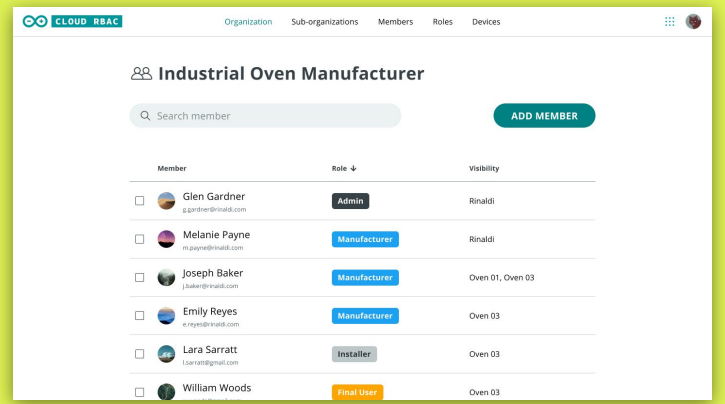
Device management
- Secure provision your devices
- Check online/offline device status
- Perform over-the-air updates

Fleet management
- Filter and search devices
- Create groups/tags update campaigns
- List and order multiple boards

Role-Based-Access-Control (RBAC)
- Multiple organizations
- Assign roles within organizations
- Share your dashboards with multiple users

Optional add-ons
- Portenta X8 Manager
- LoRaWAN Device Manager
- Enterprise Machine Learning Tool

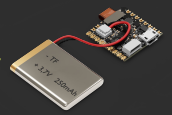




Use case - Connected Predictive Maintenance

Industrial machine
Cartoning machine

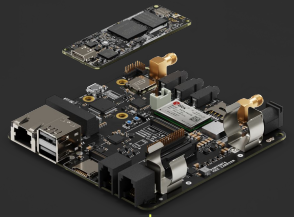
Smart sensing
Nicla Vision
Nicla Voice
Nicla Sense ME



VIBRATION
NOISE
VISION
TEMP.

WiFi/BLE

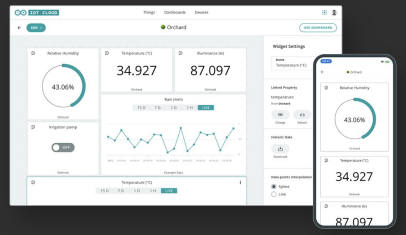
IoT Node
Portenta Board
+ Carrier/Shield



DATABASE
DATA PROCESSING

WiFi

Arduino PRO Cloud
Dashboards
+ Mobile App



CHARTS
ALARMS
NOTIFICATIONS

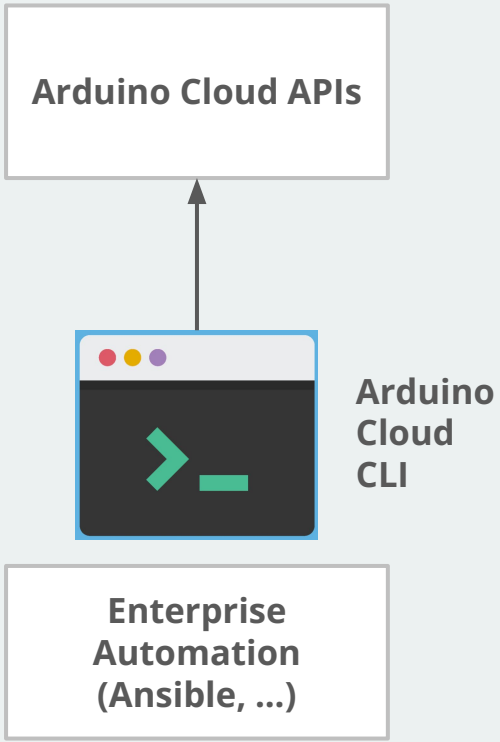
Cloud Command Line Interface

Benefits

- Perform **massive device provisioning** and configuration via command-line
- Enables integration with Arduino Cloud during manufacturing flows / device testing (deploy pre-built device firmware and configure Cloud integration)

Features

- Cloud CLI enables execution of Cloud operations such as device provisioning, OTA updates, ... with a command-line interface
- Can be integrated with enterprise automation systems such as Ansible



Arduino Pro
Customer Success Stories

Success story: *Fluid Intelligence*
Realtime oil performance monitoring

Customer
Fluid Intelligence, based in Finland, helps heavy industry companies eliminate unexpected operational downtimes. The Fluid Eye® solution sees inside of oil in real-time, generates failure mode analysis and actionable recommendations automatically. It makes maintenance intelligent.

Challenge
Digitalizing the currently dominant oil analysis process; transforming the industry from decades old process. Fluid Intelligence had been working with Scandinavian heavy industries for over a decade; witnessing huge amounts of waste in terms of oil, maintenance work and spare parts. The team set out to find a better way to save resources and the environment, utilizing the latest available digital technologies, connected to their oil excellence and industry expertise.

What Arduino solution was selected?
MKR GSM 1400, MKR NB 1500, MKR 485 Shield with an objective to transition the customer to a more powerful Portenta H7 solution in the future.

Why Arduino won
It's ready-to-use, "easy" solution, Arduino user experience and modular solutions with alternative communication technologies.

Defining Success
The goals of the Fluid Eye® solution are to minimize unplanned downtimes, reduce costs and cut waste oil streams in half.

"On average Fluid Eye® early alert has saved 100K€ per failure event for our customers"

"On average Fluid Eye® has alerted 150 days before next oil sampling time"

"Over 60% of our customers managed alerted failure mode event without downtime"

Read more here

Success story: *Rinaldi Super Forni*
Connected Industrial ovens

Customer
Rinaldi Super Forni is a manufacturer active in the industrial oven market, focusing in bakery shops, pizza restaurants and pastry segments.

Challenge
Ovens market is crowded by many competitors, in this context Rinaldi Super Forni wanted to distinguish its products by adding advanced capabilities, not only for smart operations like remote management, intelligent cooking, smart recipes, but also improve the efficiency by using predictive maintenance.
Within the latest industry 4.0 opportunity, the Arduino technology enables the Rinaldi's ovens ready to be used also in complex scenarios. Connected ovens talk to external systems, like ERP and business intelligence tools.
Another big step achievable by integrating the Arduino technology is to change the business model, enabling the usage-rental model.

What Arduino solution was selected?
Arduino Portenta Machine control with HMI, Arduino Cloud, Arduino CLI for massive deployment and Cloud CLI for interacting via API.

Why Arduino won
It's a complete suite of hardware and software, tools for managing the products lifecycle, easy to integrate and make it working with minimal effort. Using one Arduino product, Rinaldi was able to drive all the products, from single ovens to complex tunnels, managing all the needs of each single system.

Defining Success
Create a new product line and Improve the actual manufactured ovens without rebuild it from scratch.

Read more and Watch video here

Success story: *Imecon sanitizer system*

Fast innovation in difficult conditions

Customer

Imecon Engineering, is an Italian company leader in the production of turnkey technological solutions in the field of Digital Signage and Outdoor Advertising.

Challenge

During the Covid-19 first wave, Arduino developed for Imecon the hardware and software needed for an automatic hand sanitizer dispenser.
The main challenge was to help Imecon to develop the product in difficult circumstances, within a strict lockdown, with hard limitation on the way of work and with a short term goal of having the product manufactured in thousands of units ready to be deployed.
The product was designed to be as smartest as possible, with a real time monitoring of the liquids level in order to have the highest optimization for refilling and maintenance operations.

What Arduino solution was selected?

Arduino **MKR GSM 1400** to ensure stable connectivity , **MKR Motor carrier** to drive the motors for the dispenser, a custom shield used to adapt the mechanical design of the sanitizer.

Why Arduino won

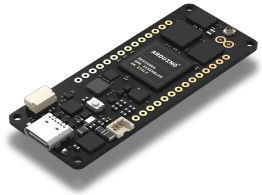
Imecon has a deep knowledge of mechanical and electrical design, but was quite new to small IoT devices. The opportunity that Arduino gave to Imecon was to have a ready to be integrated and off the shelf products was the key to success.

Defining Success

Imecon was able to create from scratch a smart connected device, diversifying the offer, creating a consistent source of revenue in a hard situation and in a really short time to market.

Success story: *Mercedes Benz*

Automatic Guided Vehicle (AGV) Controller - IIoT



Customer
Mercedes-Benz subsidiary Montajes y Estampaciones Metálicas (MEM), which manufactures the leading carmaker's V-Class and Vito frames near Barcelona. Arduino partnered with Engapplic, a Spanish IIoT solutions provider.

Challenge
Mercedes needed a new AGV (automated guided vehicle) controller with IIoT connectivity - required to better monitor production in the factory – and integrated a list of specific features that would make the new solution powerful, reliable, and durable.

Project Requirements
IIoT-ready, easy to program, 24/7 uptime, modular, durable, fast power-on and power-off

What Arduino solution was selected?
IIoT-ready Arduino Portenta H7

Other Solutions Considered
Standard AGV control solutions from automation companies like Elmo, Kollmorgen, Nidec, Balyo

Why Arduino won
The compact Portenta H7 is easy to use, can be quickly replaced, and most importantly features a dual-core processor to run real-time/control tasks and cloud connectivity at the same time. Power-on time is reduced to milliseconds to save battery life, while the AGV's movements and other data are monitored via Wi-Fi. Finally, the Portenta H7 costs a fraction of the price of competitors.

Defining Success
50%+ cost savings vs competition (for controller unit)
10-20% average battery saving from fast power on time (milliseconds instead of several seconds)

Read more here

Watch the YouTube video here

ARDUINO

That’s a wrap,

Thank you!