WIZ Mag

WIZNET MAGAZINE

JAN. 2023

ARTICLES

NEWS

WizFi360
Design Contest

Award-winning Contents and Winner Interviews

maker.wiznet.io

WIZnet

NEWS

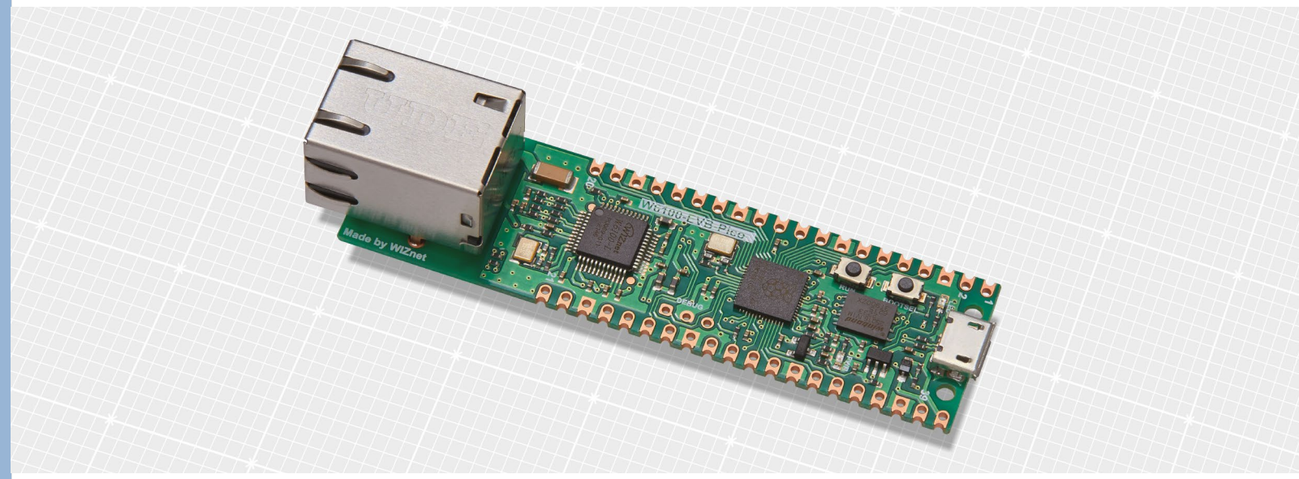
1

W6100-EVB-Pico

by Taylor, Scott

IPv6 Ready on RP2040 with W6100 (Raspberry Pi Pico)

W6100 is WIZnet's next series of hardwired Internet controller chip that supports IPv4/IPv6 dual stack.



The evaluation board for W6100, W6100-EVB-Pico is based on Raspberry Pi's RP2040 which works as the Raspberry Pi Pico board with secure Ethernet via hardwired TCP/IP.

W6100 has the following features.

- Supports TCP, UDP, IPv6, IPv4, ICMPv6, ICMPv4, IGMP, ARP and PPPoE protocols.
- 8 independent hardwired SOCKETs and supports various SOCKET-less commands for IPv6 auto-configuration, monitoring, and managing the network via ARP, PINGv4, and PINGv6.
- Supports two kinds of HOST interfaces; SPI and parallel system BUS.
- 32KB internal memory for sending and receiving data.
- Designed for low power and low heat and provides WOL (Wake On LAN), Ethernet PHY power down mode.

W6100 has two package types, 48 LQFP and 48 QFN lead-free.
(Both versions are Pin-to-Pin compatible with W5100S.)

C example URL : https://github.com/Wiznet/RP2040-v6-HAT-C

docs.wiznet.io : https://docs.wiznet.io/Product/iEthernet/W6100/w6100-evb-pico

Article

2

How WIZnet deals with IoT Security

by Viktor

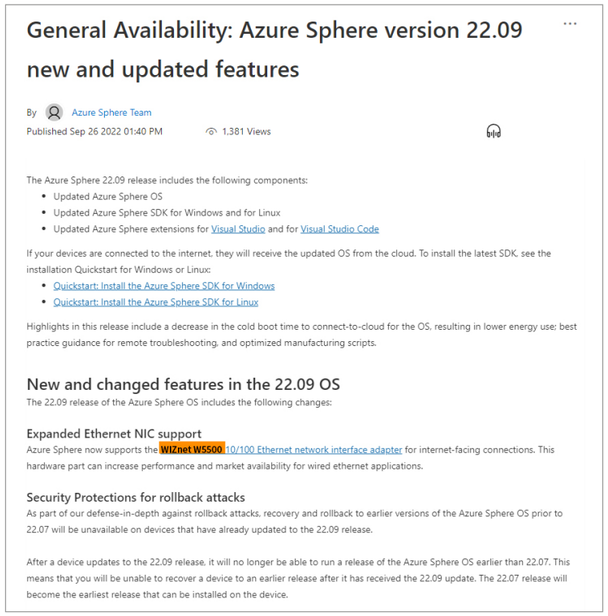
The Internet of Things is growing extremely fast! According to Statista(https://www.statista.com/statistics/1183457/iot-connected-devices-worldwide/) there will be 29.42 billion devices connected to the network by 2-25. With such rapid growth rate also come threats and security vulnerabilities. In this article we will highlight what various companies do to create more secure connected devices. Furthermore, we will also see what WIZnet does to ensure its customers have the most secured devices.

W5500 is now supported by Azure Sphere v 22.09

Microsoft's Azure Sphere, one of the trusted IoT Platforms, was released to satisfy the identified seven properties of highly secured devices. Since Azure Sphere's launch for general availability in 2020, the world has seen its many successful uses (for example Starbucks, OSO Hotwater and many others). At the same time, various manufacturers started producing Azure Sphere development kits and guardian devices.

WIZnet created one of the first guardian modules - ASG210 - that supports dual Ethernet by adding W5500 to MT3620. Released in 2021, the ASG210 module has drawn a lot of interest from customers worldwide seeking to add dual Ethernet module to their solution. As a result of a year-long collaboration between WIZnet and Microsoft, in September 2022 W5500 was added to expanded Ethernet NIC support by Azure Sphere ver 22.09.

Reference: Azure Sphere version 22.09 new and updated features



General Availability: Azure Sphere version 22.09 new and updated features

By Azure Sphere Team
Published Sep 26 2022 01:40 PM 1,381 Views

The Azure Sphere 22.09 release includes the following components:

- Updated Azure Sphere OS
- Updated Azure Sphere SDK for Windows and for Linux
- Updated Azure Sphere extensions for Visual Studio and for Visual Studio Code

If your devices are connected to the internet, they will receive the updated OS from the cloud. To install the latest SDK, see the installation Quickstart for Windows or Linux:

- Quickstart: Install the Azure Sphere SDK for Windows
- Quickstart: Install the Azure Sphere SDK for Linux

Highlights in this release include a decrease in the cold boot time to connect-to-cloud for the OS, resulting in lower energy use; best practice guidance for remote troubleshooting, and optimized manufacturing scripts.

New and changed features in the 22.09 OS

The 22.09 release of the Azure Sphere OS includes the following changes:

Expanded Ethernet NIC support

Azure Sphere now supports the WIZnet W5500 10/100 Ethernet network interface adapter for internet-facing connections. This hardware part can increase performance and market availability for wired ethernet applications.

Security Protections for rollback attacks

As part of our defense-in-depth against rollback attacks, recovery and rollback to earlier versions of the Azure Sphere OS prior to 22.07 will be unavailable on devices that have already updated to the 22.09 release.

After a device updates to the 22.09 release, it will no longer be able to run a release of the Azure Sphere OS earlier than 22.07. This means that you will be unable to recover a device to an earlier release after it has received the 22.09 update. The 22.07 release will become the earliest release that can be installed on the device.

PSA Certification announced by Arm and leading test laboratories

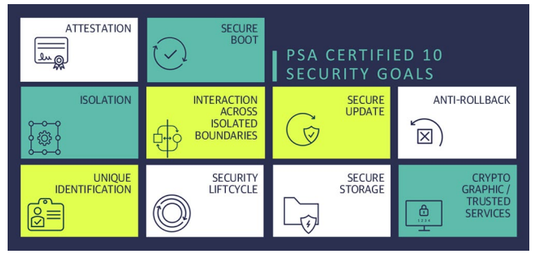
In 2019 Arm and its independent security testing labs announced PSA certified Security Framework. This framework provides various resources to help not only with developing and designing IoT devices but also validate whether product security is reliable.

In the same way, as Microsoft defined seven properties of highly secured devices, PSA Certified outlined high-level IoT security principles in the ten security goals.

Reference: The PSA Certified 10 Security Goals Explained

To allow the IoT ecosystem to realize the benefits of PSA more rapidly, ARM also delivers Trusted Firmware - an open-source reference implementation of secure software for various processors.

As of the publication date, Trust Firmware is available for A- Profile and M-Profile Arm processors.

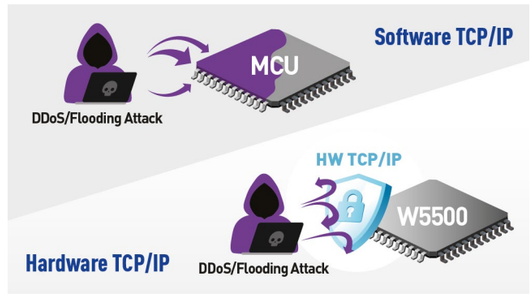


How to enhance IoT Security with WIZnet?

WIZnet Ethernet solutions are famous not only for their reliable Hardware TCP/IP technology, but also for preventing network attacks such as flooding, spoofing and injection.

The hardware TCP/IP Offload Engine (TOE) technology, implemented as hardwired logic from the Ethernet MAC Layer to the TCP/IP Layer, can protect the IoT system against network attack under an excessive number of flooding packets by discarding flooding packets detected. Additionally, the hardware TOE shows superior performance compared to the software TCP/IP stack solutions, and supports up to eight independent hardware sockets concurrently.

To help customers with development and to ensure security is no longer a barrier to product development, WIZnet continues with new Software Development Kits (SDK) based on various security frameworks.



Article

3 Introducing RTOS supporting WIZnet's W5500

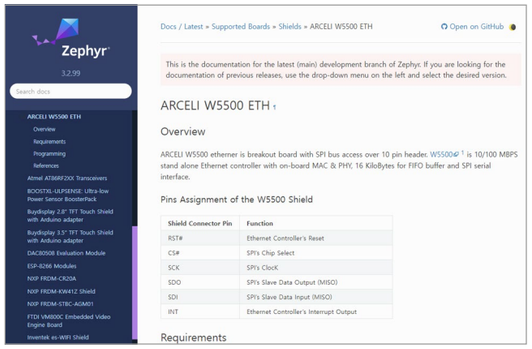
by Sophia, Mason

WIZnet W5500 proved to be one of the most popular Ethernet ICs in the market. We have seen various boards and products connected to networks using W5500. Today, we want to introduce how our chip is supported in various RTOS and its use cases.

Link Maker site : RTOS support W5500

1. Zephyr RTOS

Zephyr by Linux Foundation supports many microcontroller boards. WIZnet's W5500 has been applied to ARCELI W5500 ETH. Zephyr provides its own network stack, and W5500 works with this network stack in MACRAW mode.

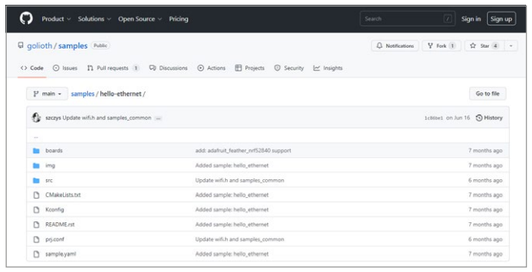


https://docs.zephyrproject.org/latest/boards/shields/arceli_eth_w5500/doc/index.html

One of the best examples of the W5500 in Zephyr is the Ethernet Solution provided by Golioth, a Silver Member of Zephyr.

https://blog.golioth.io/zephyr-does-ethernet-too/

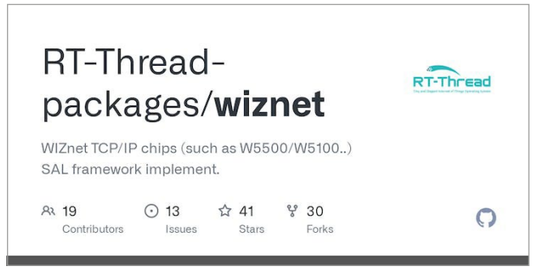
Zephyr Ethernet Sample Code by Golioth.



https://github.com/golioth/samples/tree/main/hello-ethernet

2. RT-Thread

RT-Thread is an RTOS developed by an RT-Thread Development Team based in China. Their Ethernet solution based on WIZnet's product can be found in the following GitHub repository.



https://github.com/RT-Thread-packages/wiznet

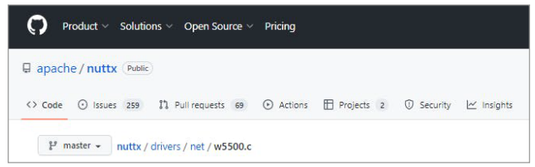
RT-Thread uses WIZnet's original technology, Hardwired TCP/IP, not MACRAW mode. Therefore, although the number of sockets is limited, the memory usage and load on the MCU can be reduced.
To learn more about how to use W5500 in RT-Thread, refer to the link below.

https://juejin.cn/post/7074821127830257700

3. NuttX

NuttX is an RTOS provided by The Apache Software Foundation.

The W5500 driver for NuttX can be checked from the link below. NuttX supports BSD-compatible sockets and W5500 is compatible with this library in MACRAW mode.



https://github.com/apache/nuttx/blob/master/drivers/net/w5500.c

The global IoT Real-Time Operating Systems (RTOS) Market is growing every year, with new players constantly appearing in the industry. Connectivity is one of key points to consider when choosing an RTOS. In this article we presented only three examples how our W5500 is used to provide network connectivity. We at WIZnet are committed to providing the best Ethernet solutions for IoT and giving manufacturers of embedded devices a competitive edge in the world of IoT by enabling them to bring industry-leading devices to market faster, while reducing risks and developments costs.

WIZnet's W5500

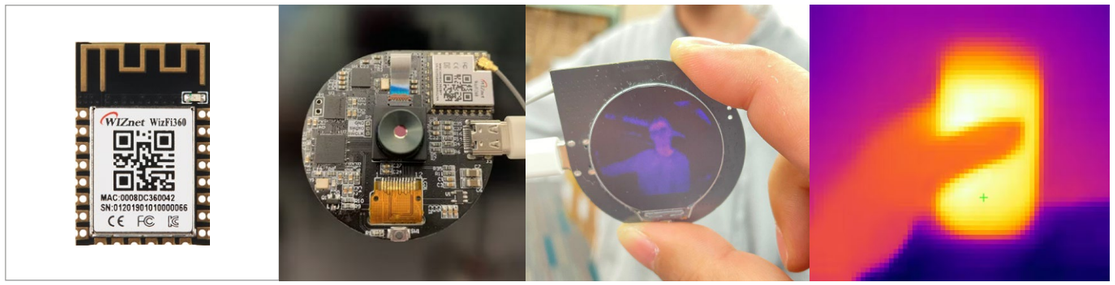
Article

4 IP IR Camera Application Kit

by Haifeng, Eric

Depending on project needs, WIZnet can provide a customized Application kit and board. This IR Camera ADK uses WIZnet Wi-Fi and Ethernet chip; in this article, we will see and explain several possible use cases. By using WIZnet's Hardwired TCP/IP, W5X and W6X, the memory usage and the load on the MCU can be reduced.

1. Wi-Fi

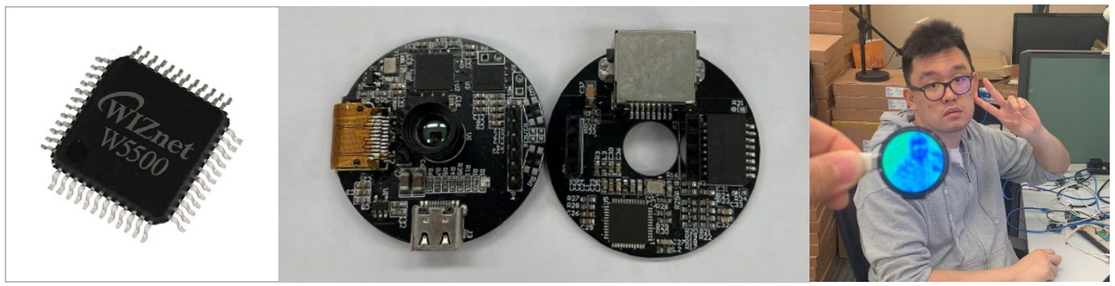


This IR Cam Application used RP2040, WizFi360 for Wi-Fi, and Bobcat's CMOS sensor for thermal images. Also, we used Arduino IDE for RP2040 and WizFi360 from Earle Philhower's library. For round screen GC9A01, we used the GFX library for Arduino.

Reference: Raspberry Pi Pico & WizFi360 Wireless Thermography

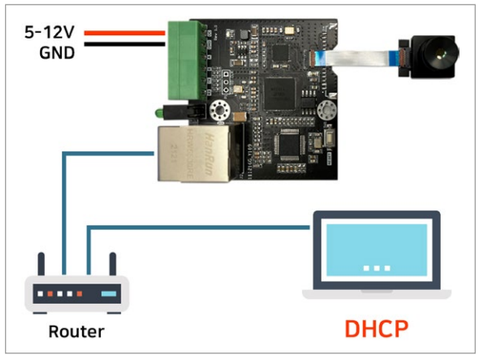
This Application Kit supports TCP Client and Server through a Wi-Fi connection to monitor IR CAM online.

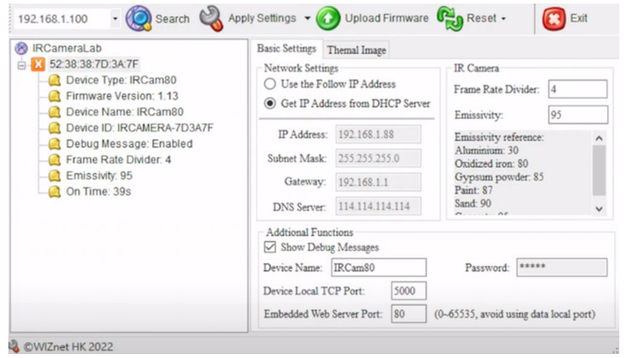
2. Ethernet



The Ethernet IR Cam using W5500 has similar hardware specifications as the Wi-Fi version using RP2040 + WizFi360.

The above two solutions (RP2040 applications) provide a 4FPS network infrared image.





For higher resolution, we upgrade the MCU to Cortex M4. This IR CAM application board meets the industrial temperature(-40~85° C). It provides network infrared image 20FPS. A full hardwired TCP/IP protocol stack chip(W5500/W6100) ensures stable data communication and MCU performance.

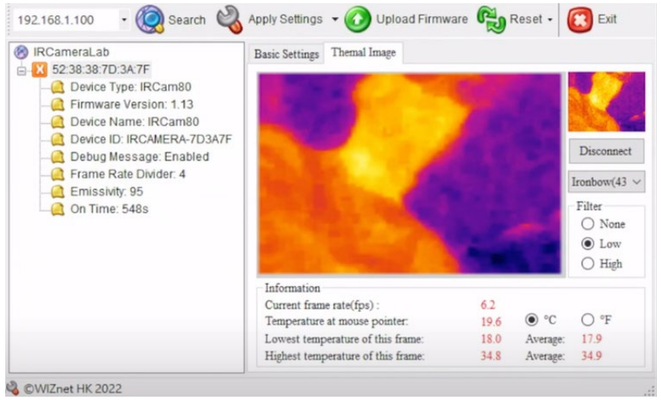
The configuration test tool is provided to configure and view device information through the network and view thermal images.

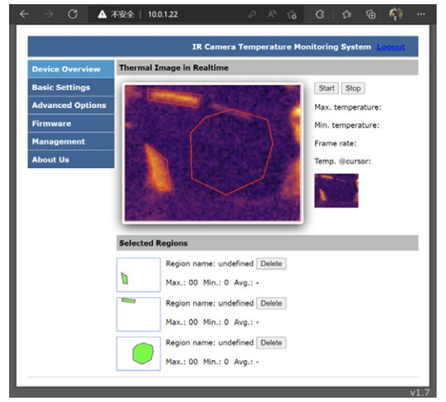
This application supports the DHCP function, remote firmware upgrade, and web page.

3. Application

After "Connect", the Server application simultaneously shows the IR image. Users can regulate the size, and color filter of the display image. The application provides various measurement tools, like local temperature measurement by pointing the mouse or by setting a polygon. Various transitions and statistics are available too.

YouTube : IRCam80 Quick Start Guide





NEWS

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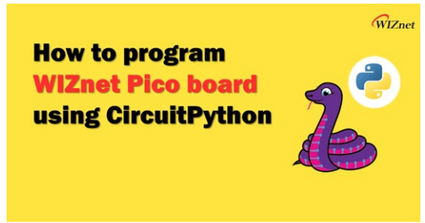
New SDK and Examples

WIZnet Pico board (RaspberryPi Pico + WIZnet)

by Matthew, Austin, Scarlet

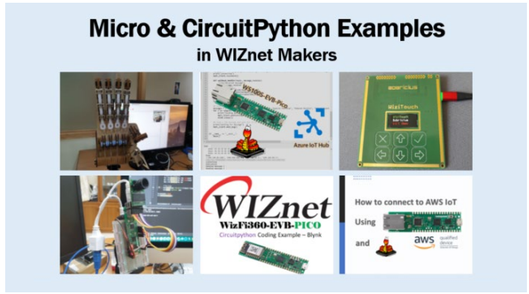
Looking to add connectivity to Raspberry Pi Pico or RP2040? Check WIZnet's SDKs and examples to start development using Ethernet products - W5100S-EVB-Pico and W5500-EVB-Pico; or Wi-Fi products - WizFi360-EVB-Pico.
These products are Pin-to-Pin compatible with Raspberry Pi Pico.
The new SDKs and examples are more accessible and supportive in developing Ethernet and Wi-Fi solutions.

MicroPython and CircuitPython SDK, Examples



We previously provided Ethernet MicroPython & CircuitPython examples for the Raspberry Pi Pico(RP2040). Recently we updated the MicroPython & CircuitPython's SDKs with Wi-Fi examples.

These SDKs provide various libraries and examples starting from basic blink & loopback to check TCP communication, to advanced MQTT and HTTP.



WIZnet Maker Site has various MicroPython and CircuitPython projects for the WIZnet Pico board. Users and makers can also easily post cool projects using WIZnet Pico board and WIZnet Ethernet chip and WizFi360.
Check the below links to maker.wiznet.io and our YouTube channel for more information.

maker.wiznet.io :

How to program WizFi360-EVB-Pico using CircuitPython
RP2040 Wi-Fi HTTP client (use wizfi360+micropython)
RP2040 Wi-Fi Loopback server (use wizfi360+micropython)
RP2040 Wi-Fi TCP client (use wizfi360+micropython)

Arduino IDE

WIZnet Pico boards can be programmed using ARDUINO IDE. We modified the Arduino Raspberry Pi Pico library made by Earle Philhower; now this library supports all three WIZnet EVB-Pico boards. Furthermore, various sample codes (Blink, TCP, HTTP, MQTT, Client, Server) were added to ease user's development process.
Please note that this library can be also used even if Raspberry Pi Pico is used along with standalone WIZnet Ethernet or Wi-Fi Module. Please check the below links for more details.

maker.wiznet.io :

The Arduino Raspberry Pi Pico/RP2040-Ethernet V2.1.1
How to program wizfi360-evb-pico using Circuitpython

YouTube :

How to use the W5100S-EVB-Pico Arduino Official Ethernet Library
WizFi360-EVB-Pico based on Arduino IDE

C/C++ Development Environment

WIZnet C/C++ SDK is provided for development using C/C++ on the WIZnet Pico board. There are many developers who are comfortable developing in C/C++. Unlike other language development environments, the method of building a C/C++ SDK development environment is complicated.

The WIZnet Maker site or the WIZnet YouTube channel easily explains how to build a complex development environment step-by-step Also, such as DUINO-COIN Mining, examples of various WIZnet Pico Boards in the C/C++ environment can be found on the WIZnet Maker Site or the WIZnet YouTube Channel.

NEWS

6 WizFi360 Design Contest

Contest Results

by Sophia

WizFi360 Design Contest

WIZnet has had another successful contest, thanks to one of the most creative contestant groups we've worked with so far!

Thirty winners were each awarded the latest Apple iPad Pro model ($1,099 value).

WizFi360 is registered as Arm's official shield for Open-CMSIS-Pack and is officially registered and used on various platforms such as Azure Certified.

WizFi360 supports AWS AT Command as well as AWS SDK and is used in various development environments, such as Arduino, C/C++, Python, and FreeRTOS.

Overall, there were 398 participants from 46 countries - and 30% were from India. 74 projects were submitted for final evaluation. Of those submissions, 48 projects were built using Arduino, while 10 finalists had built their own hardware boards.

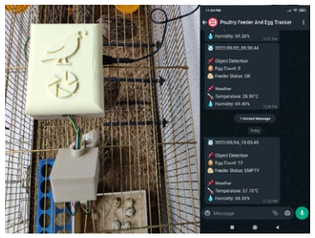
We'll be back with another cool contest in early 2023 and are looking forward to collaborating with the maker community again!
Please stay tuned!

Contest Award Winners

For more details on all projects please check following link

URL: https://maker.wiznet.io/contest/wizfi360/submission/

IoT AI-driven Poultry Feeder and Egg Tracker w/ WhatsApp



This project was developed by Kutluhan Aktar from Turkey.

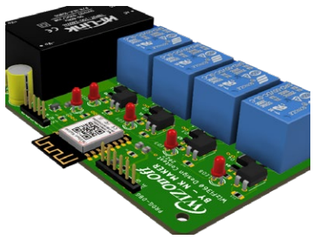
Detect when the poultry feeder needs to be refilled and track unhatched eggs in the coop w/ object detection to get informed via WhatsApp.

COMPONENTS

Hardware components	WIZnet - WizFi360-EVB-Pico	X 1
Software Apps and online services	Arduino - Arduino IDE	X 1

https://maker.wiznet.io/kutluhan_aktar/contest/iot-ai-driven-poultry-feeder-and-egg-tracker-w-whatsapp-1/

WizOnOff



This project was developed by Nisarg K Bhatt from India.

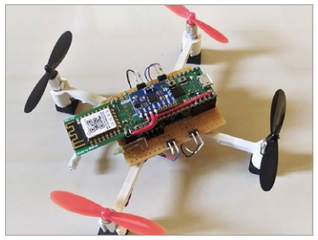
WizOnOff is WizFi360-PA module based on Open-source standalone multi-cloud supported device for automation with 4 relays and 1 temperature sensor

COMPONENTS

Hardware components	WIZnet - WizFi360 WizFi360-PA (as standalone IoT controller)	X 1
Software Apps and online services	Arduino - Arduino IDE With Arduino IDE Support for WizFi360-PA standalone controller (W600 Winner Micro)	X 1

https://maker.wiznet.io/nk_maker/contest/wizonoff/

WizFi360-EVB-PICO based Smart phone controlled Micro Drone for STEM Education



This project was developed by Ravi Chandulal Butani from India.

In the proposed project WizFi360-EVB-PICO is used as a flight controller for the drone which is controlled over WiFi via Android App.

COMPONENTS

Hardware components	WIZnet - WizFi360-EVB-Pico WizFi360 as WiFi Controller and telemetry and RP2040 for Flight Stabilization	X 1
	dfrobot - 6 DOF Sensor - MPU6050 6 Axis IMU for flight stabilization	X 1
Software Apps and online services	Arduino - Arduino IDE https://github.com/earlephilhower/arduino-pico	X 1

https://maker.wiznet.io/ravi_maker/contest/wizfi360-evb-pico-based-smart-phone-controlled-micro-drone-for-stem-education/

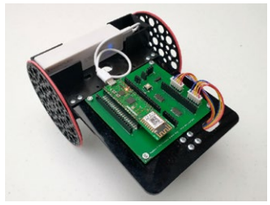
NEWS

7

WizFi360 Design Contest

Contest Winner Interview

by Sophia



Name : Alistair MacDonald

Project Name : WizFi Trundlebot - The Teaching Robot

URL : https://maker.wiznet.io/alistair/contest/wizfi-trundlebot-the-teaching-robot/

Q Tell us a bit about yourself. (Name, age, location, job/profession, etc.)

A I am Alistair from the North East of the UK. I have a science degree in computing and was a software engineer, but today I run a FabLab. We give small businesses and students access to facilities like 3D printing and laser cutting.

Q How did you find out about our contest?

A I have been using WIZnet modules on projects for several years and keep an eye out for any exciting new products.

Q What did you think about the product sampled in the contest?

A I think it is great. I have been hoping WIZnet would produce a Wi-Fi device for a while. Until now the option for Wi-Fi connectivity has either been low quality or high cost. WIZnet tends to produce a good quality product but at an affordable price.

Q What were some difficulties you faced using our product in the contest?

A My main challenge was that there were no WizFi abstraction libraries for Python at the time. Any use of the Wi-Fi module needed to be done through the classic AT command. This is something I have done in the past for GPRS modules so I decided to start a library and make it available on GitHub for others to use and improve. This library, along with a web server library, for the base of my project.

Q What inspired you to use the product the way you did?

A When I was at school the Logo programming language and AUCBE's Dart software was used to teach basic programming and geometry. With this software, you move an arrow around the screen using basic commands. MIT's Scratch is a modern-day equivalent. Many schools also had a hardware "turtle" that copied what happened on the screen on the floor. Sadly these were expensive so most schools did not use them "just in case it got broken". Our school was like this and I never got to use it. Ever since I have wanted to make own my version, but one that was low-cost and accessible to everyone.

Q Would you recommend our products to anyone?

A Yes. They offer good value if you need a good quality product. Adding Wi-Fi to the Pi Pico solves many problems and can add Wi-Fi capability by simply changing the module and some coding.

Name : Ankur Verma

Project Name : Florabot: Giving voice to Plants

URL: https://maker.wiznet.io/ankur608/contest/florabot%3A-giving-voice-to-plants/

Q Tell us a bit about yourself. (name, age, location, job/profession, etc…)

A Ankur Verma, 28, India, Design Engineer

Q What did you think about the product sampled in the contest?

A WizFi360 provides great functionality for IoT products leveraging Wi-Fi. The hardware and software support is great to get started with product development.

Q What were some difficulties you faced using our product in the contest?

A While most of the provided functionalities are great & the majority of the library and sensor support works out of the box. I encountered an issue with interfacing One-Wire Protocol Sensor (DS18b20) to the WizFi360-EVB-Pico, and from my experience, it is due to software (library) support.

Q What inspired you to use the product the way you did?

A The form factor of WizFi360-EVB-Pico lured me into developing a smart probe for soil and plant health monitoring. The single-side (hardware) component placement is great for prototyping ideas into PoC.

Q Would you recommend our products to anyone?

A Yes, I would definitely recommend WIZnet products to companies and customers associated with me, and have posted & will post my projects and know-how about the product, to various hardware community platforms.

Q Are there any other products you wish to see in our next upcoming contests?

A Probably, I think the next product line will be around Bluetooth Low Energy or NB-IoT, or for the current product line, I will definitely go with WIZ550web.

Q Have you used other WIZnet products? How would you rate your overall experience working with WIZnet products?

A WIZnet Maker Community & Official support, provide enough reference for working with WIZnet products. I will rate it 5/5 for WizFi360.

Q Anything else you would like to say?

A Thanks for providing an opportunity for getting hands on a new Wi-Fi Chip, maker community has been bored by ESP8266 for a long time, due to a lack of compatible products, plus their security was weak for developing a commercial product out of it. WizFi360 has now emerged with better functionality and security (the most essential) than its counterparts and hope to see more products leveraging WizFi360.