

WIZ WIZNET MAGAZINE **Mag**

ioMCU Special Edition 2024

ioMCU

internet offload MCU

Tandem surfing ioMCU combines
network accelerator TOE and Microcontroller

W55RP20



1

The Evolution of WIZnet TOE Chips : Leading the Future of Networking Innovation

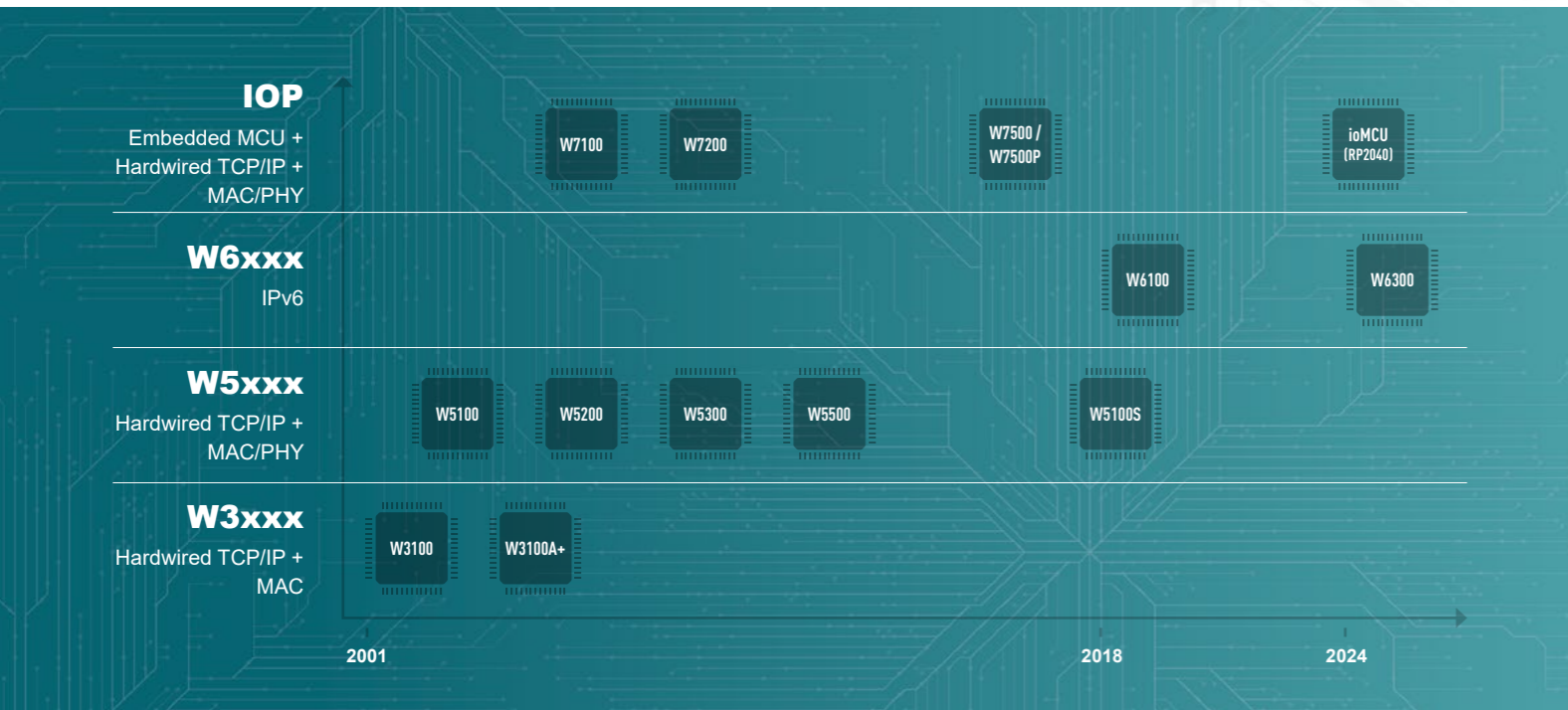


By Lawrence

2

W6300 WIZnet New TOE Ethernet Chip

By Lawrence



WIZnet TOE Chip Evolution: Pioneering Networking's Future
Since its inception, WIZnet has revolutionized networking with its TOE (TCP Offload Engine) series, elevating global IoT projects with its W5100 and W5500, chosen for Arduino's official Ethernet Shields. These chips also enhance Ethernet projects on platforms like Raspberry Pi Pico. WIZnet's journey began with the W3100 in 2001, unfolding to the IPv6-capable W6100 and soon, the ioMCU and W6300, each marking technological milestones. These controllers have evolved interfaces, with the W5300 accelerating to 16-bit BUS for faster communication. The W5500 and W6100 further broke ground by optimizing the SPI frame structure

for high-speed operation, reducing PCB costs with smaller chip sizes. Advancements in network stability are evident in the W5500 and W5300, featuring new MAC Address filters. The W6100 brought IPv6 into the fold, providing versatile network configurations with automatic address setting mechanisms. The WIZnet TOE series has shown continuous growth in connectivity and efficiency, shaping the trajectory of networking technology and its widespread applications, from IoT to data centers. WIZnet's innovation is a testament to the robust infrastructure being built for the future internet.

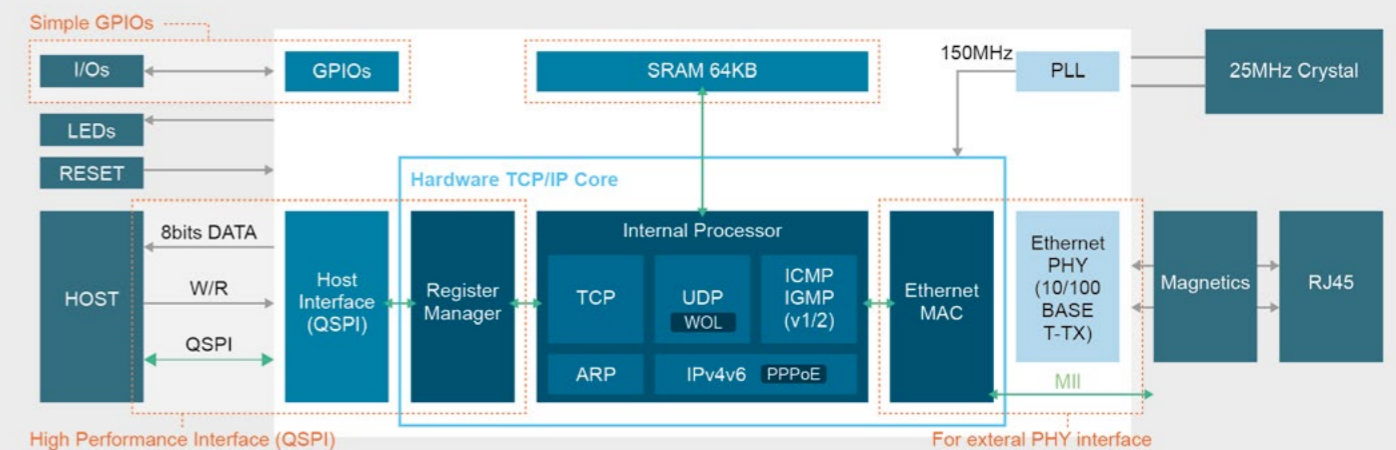
Introduction

W6300 is a WIZnet 10/100 TOE ethernet chip that combines the high-speed ethernet performance of W5300 with Dual IPv4/v6 Hardware stack of W6100.

To support ethernet performance **over 80Mbps** and above, it supports 150MHz system clock and QSPI interface(including 4 in-out Data lines). It supports a total SRAM size of 64KB and 8 sockets, each has 8KB TX/RX buffer by default. And it also provides **external MII** interface for user external PHYs.

Embedded Core	TCP/IPv4v6, MACPHY
System clock	150MHz
Host I/F	QSPI(SPI), 8bit BUS
Additional Interface	GPIOs, MII
SRAM	64KB
HW Socket #	8
Network performance	Over 80Mbps
Package	48LQFP/QFN
Size	7x7
Auto Negotiation	H/F Duplex, Auto MDIX
Checksum Filter	IPv4/IPv6

Block Diagram - W6300 (iEthernet)



TOE Iperf performance test in each 100M network bandwidth

W6300 : 95.9Mbps

SW TCP/IP : 32Mbps

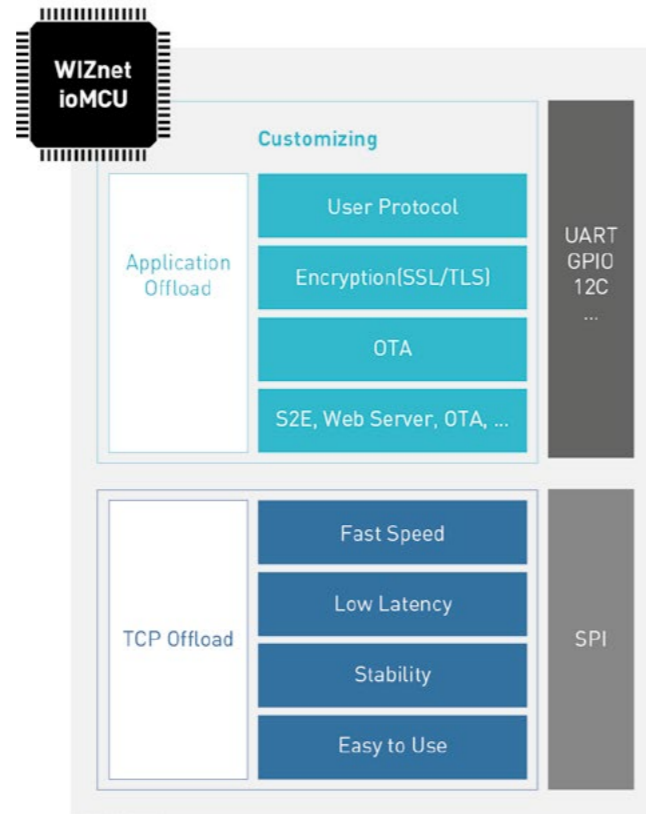
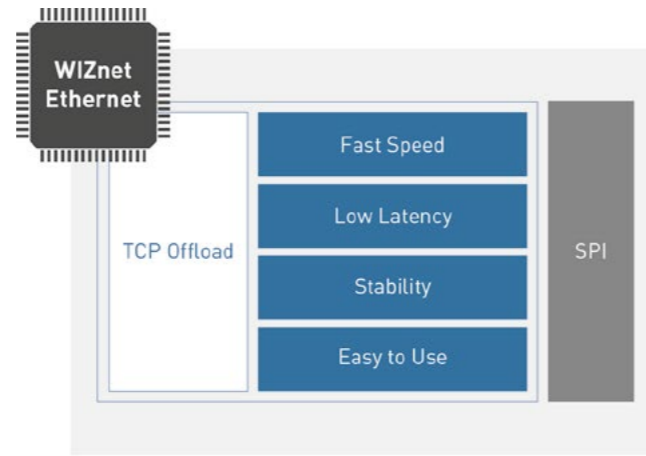
* Iperf network throughput test in 100Mbps bandwidth

* Target hardware is used STM32F4(including ethernet MAC) series microcontroller, LwIP as SW TCP/IP and W6300 as TOE

3

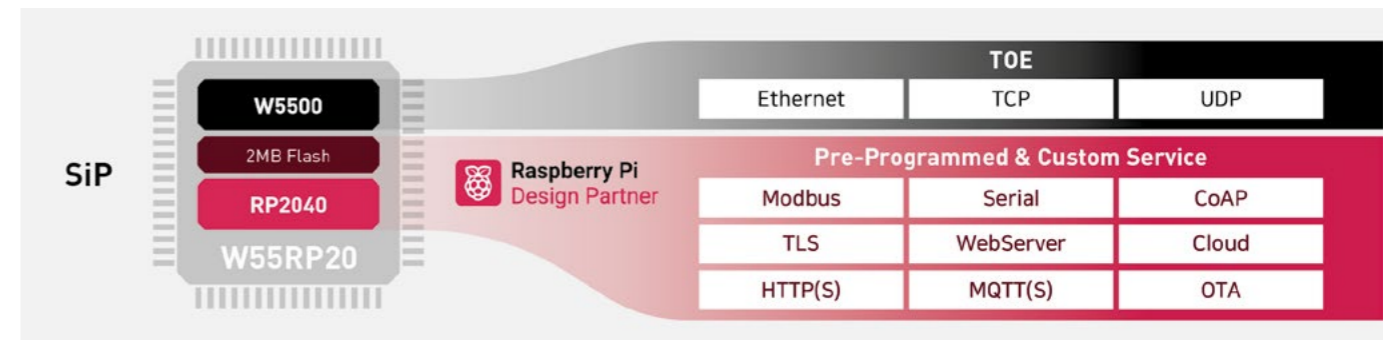
What is ioMCU? (Ethernet + MCU)

By Steve



Innovating Embedded Device Communication with Smart Ethernet Chips

The ioMCU is an innovative chip that not only provides the stability and reliability of Ethernet but also features customizable options to meet the diverse needs of users. It evolves from the traditional TCP Offload Ethernet chips, incorporating a stable TCP Offload capability along with various additional functionalities. This chip empowers you to bring your creative ideas to life, enabling a multitude of functions within a single chip.



Enhanced performance, tailored scalability! ioMCU transcends the boundaries of TCP Offload.

ioMCU focuses on enhancing customer MCU performance and efficiency, supporting not just standard TCP Offload functions but also enabling a variety of applications, security measures, and encryption processing.

TCP Offload

Like previous WIZnet Ethernet products, it uses an integrated TCP/IP to ensure stable, efficient communications with low latency, unaffected by external conditions.

Multiple Network Protocols

ioMCU can handle various network protocols. For example, it can manage protocols like HTTP, FTP, and MQTT, reducing the load for applications such as web servers, file transfers, and sensor data transmission.

Security and Encryption

ioMCU can handle SSL/TLS and encryption tasks, bolstering secure communications. This ensures data safety and meets stringent security requirements.

Application Processing

It can manage tasks specific to certain network applications, supporting operations like video and audio streaming, online gaming, and real-time data analysis.

Data Caching and Acceleration

By caching and accelerating data, ioMCU can enhance application performance. This reduces the memory and time burden on MCUs while maintaining stable communication with servers.

ioMCU propels your business forward! Realize the implementations you desire now.

With the customizable ioMCU and its hardware-based TCP/IP stack, you can implement functions such as

Cloud Connectivity

ioMCU connects to a secure cloud, encrypting and safely transmitting data collected by the MCU. The MCU simply needs to transmit data using the desired pins (UART, SPI, I2C, GPIO).

OTA Updates

ioMCU can update not only its internal firmware but also that of the MCU.

MCU-less Application Implementation: ioMCU can perform MCU functions, providing an all-in-one solution for application development with integrated Ethernet TCP/IP, PHY chip, Flash, and MCU.

Low Latency/Stable Protocol Implementation

It can implement applications requiring stable communication with low latency, such as audio, video, and industrial applications.

Custom Protocol Implementation

Custom protocols can be tailored for specific domains or use cases, providing optimized solutions that meet unique requirements and offer added value to customers.

Embedded Web Server

With an embedded web server in the device, users can access, monitor, and control the device status through a web browser.

4

NEW WIZPoE Boards

By Alan, Viktor

Introduction

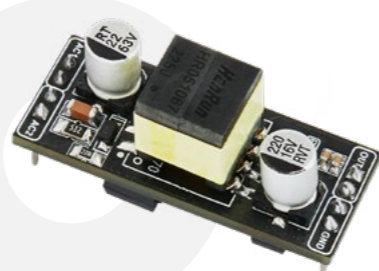
WIZnet has recently expanded its portfolio with the introduction of new PoE (Power over Ethernet) modules, namely the WIZ-PoE-S1 and WIZPoE-P1. These two models underscore the company's commitment to advancing Ethernet technology by offering enhanced power delivery solutions for various applications. Marked by their adherence to IEEE standards, these versatile devices support both Mode A (Endspan) and Mode B (Midspan) configurations. They boast a broad input voltage range and high DC/DC conversion efficiency. Additionally, the WIZPoE-S1 and WIZPoE-P1 are engineered with internal, built-in 2-channel bridge rectifiers, showcasing advanced designs tailored for robust and efficient power delivery in diverse operational environments.



WIZPoE - S1

Spec

- IEEE802.3af compliant
- Mode A(Endspan), Mode B(Midspan)
- Wide input voltage range 40Vdc ~ 60Vdc
- High DC/DC conversion efficiency
- Non-Isolation
- Internal build in 2 channel bridge rectifiers
- 5V/8W Output

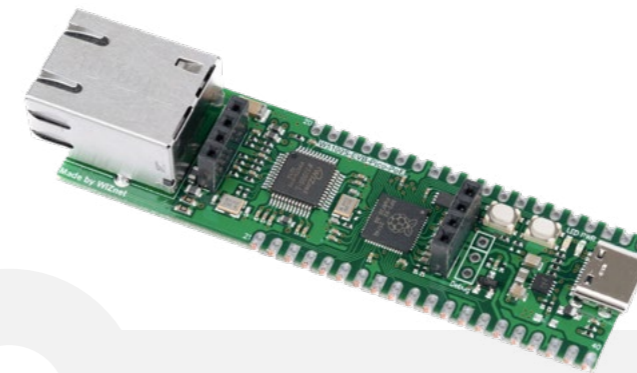


WIZPoE - P1

Spec

- IEEE802.3af compliant
- Mode A(Endspan), Mode B(Midspan)
- Wide input voltage range 40Vdc ~ 60Vdc
- High DC/DC conversion efficiency
- Isolation
- Internal build in 2 channel bridge rectifiers
- 5V/8W Output

Compatible WIZnet Boards

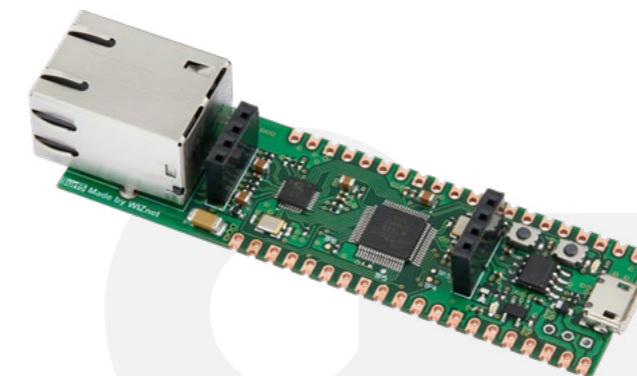


New EVB-Pico boards

Series Features:

- Identical pinout with Raspberry Pi Pico / Pico W
- Available in W5500 or W5100S versions
- USB Type C
- Run button available
- PoE enabled via add-on module

EVB-Pico boards are built around the Raspberry Pi RP2040 and the WIZnet Ethernet chips, providing a platform similar to the Raspberry Pi Pico but with added Ethernet capabilities. The boards are designed for applications that require embedded internet, offering a blend of microcontroller versatility and networked communication.



Surf 5

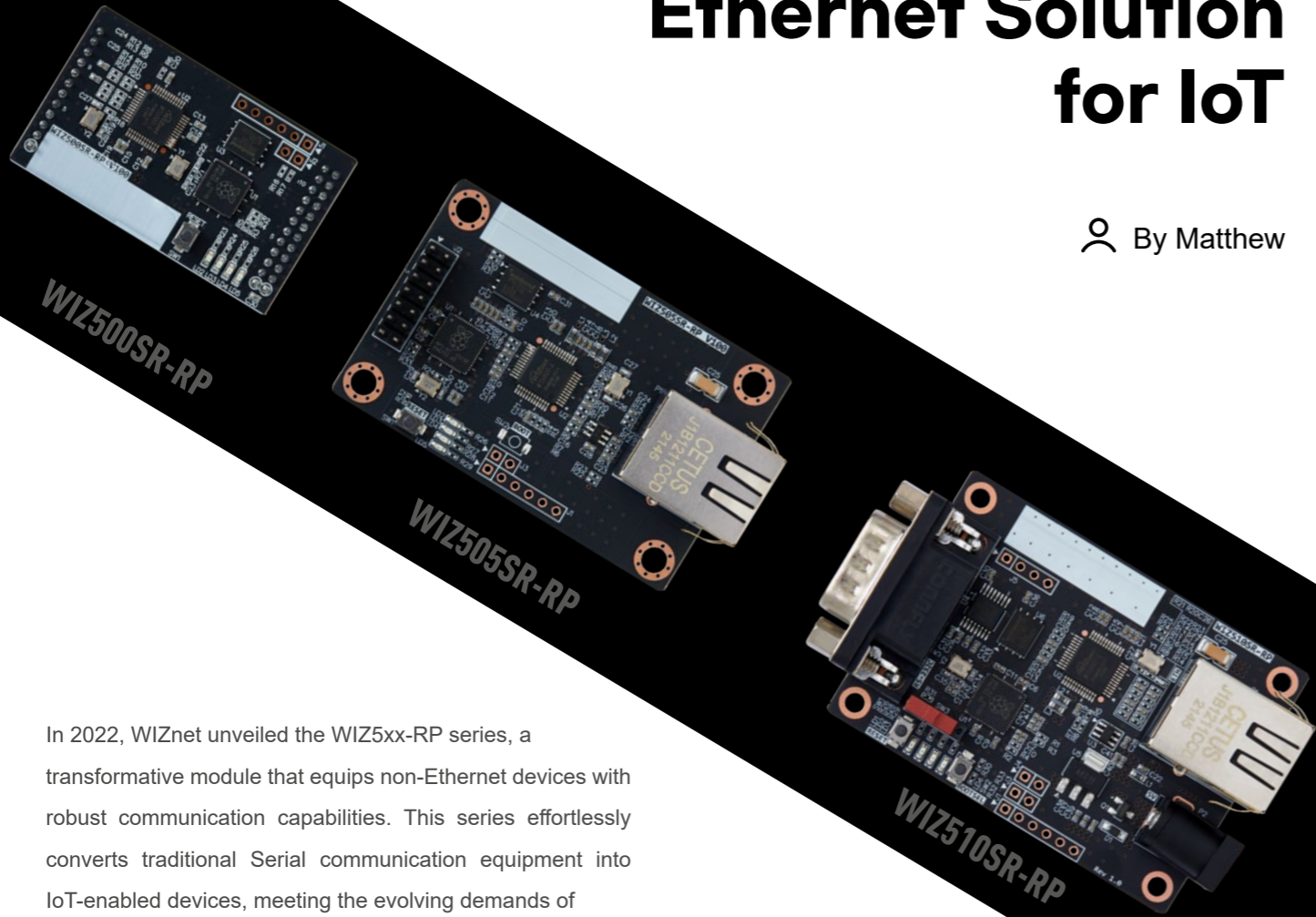
Features:

- Serial-to-Ethernet functionality supported
- Raspberry Pi Pico board form factor
- PoE enabled via add-on module
- All features of W7500 chip
- Built-in RJ45 port

The Surf5 board is a microcontroller evaluation platform that integrates the W7500 chip, offering a compact solution for projects requiring embedded internet connectivity. It is designed to work seamlessly with PoE modules for versatile power and networking options

WIZnet WIZ5xx-RP Series : A Robust Serial to Ethernet Solution for IoT

By Matthew



In 2022, WIZnet unveiled the WIZ5xx-RP series, a transformative module that equips non-Ethernet devices with robust communication capabilities. This series effortlessly converts traditional Serial communication equipment into IoT-enabled devices, meeting the evolving demands of network connectivity.

The WIZ5xx-RP series stands out for integrating the high-performance Raspberry Pi - RP2040 MCU, enhancing processing power and stability. It supports the increasingly crucial MQTT protocol in IoT and offers SSL/TLS 1.2 for secure application deployment. Its customizable firmware allows users to tailor functionalities to their specific needs.

Designed with compatibility in mind, existing Serial to Ethernet module users can easily migrate to the WIZ5xx-RP series, thanks to its compatible configuration tool. The series comes in various forms: fully modular, partial modular, and all-in-one solutions, ensuring the right fit for any networking environment. For instance, the WIZ500SR-RP is a full module perfect for setups requiring Ethernet and serial ports. The WIZ505SR-RP

includes an RJ45 connector, ideal for environments where Serial ports connect via pins, while the WIZ510SR-RP is an all-in-one solution with built-in RJ45 to Serial ports, operational without additional hardware setup.

The WIZ5xx-RP series by WIZnet breaks through communication barriers, turning the potential of IoT into a practical reality. For more details or inquiries, visit the WIZnet website. With WIZnet, every device can become a part of the IoT landscape.

WIZnet TOE

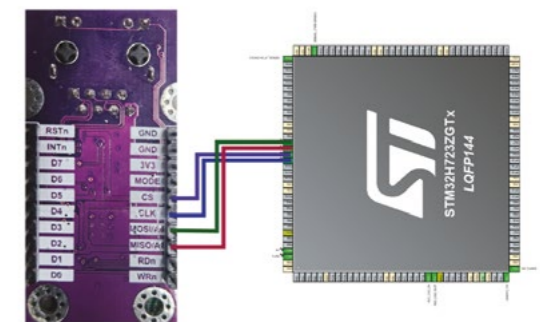
By Matthew



Real-world Performance of 80 MHz SPI Clock Implemented with STM32H723 and W6100 : Performance Measurement and Analysis through iPerf

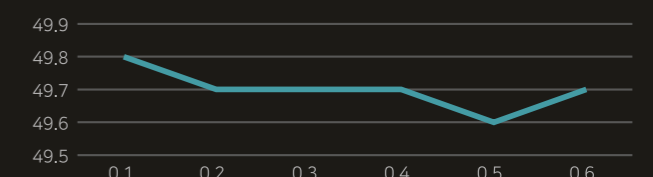
Innovating networking technology, the W6100 Ethernet controller stands out for its groundbreaking design. Utilizing the Serial Peripheral Interface (SPI), it boasts speeds of up to 80MHz thanks to WIZnet's TCP Offload Engine (TOE) technology. This offloads TCP/IP stack processing, saving MCU resources and enhancing network communication.

Despite theoretical limits, modern MCUs like the STM32H723 support these speeds, bridging the gap between theory and practice. We delve into the W6100, showcasing TOE technology's full potential




```
[ 4] local 192.168.15.7 port 5002 connected with 192.168.15.111 port 50000
[ 4] 0.0- 0.1 sec 713 KBytes 49.8 Mbits/sec
[ 4] local 192.168.15.7 port 5002 connected with 192.168.15.111 port 50001
[ 4] 0.0- 0.1 sec 713 KBytes 49.7 Mbits/sec
[ 4] local 192.168.15.7 port 5002 connected with 192.168.15.111 port 50002
[ 4] 0.0- 0.1 sec 713 KBytes 49.7 Mbits/sec
[ 4] local 192.168.15.7 port 5002 connected with 192.168.15.111 port 50003
[ 4] 0.0- 0.1 sec 713 KBytes 49.7 Mbits/sec
[ 4] local 192.168.15.7 port 5002 connected with 192.168.15.111 port 50004
[ 4] 0.0- 0.1 sec 713 KBytes 49.6 Mbits/sec
[ 4] local 192.168.15.7 port 5002 connected with 192.168.15.111 port 50005
[ 4] 0.0- 0.1 sec 713 KBytes 49.7 Mbits/sec
```

W6100 iperf send test



7 TOP Community Projects

[AIoT] LLM Steak Classifier AIOT Bot

 Louis_m




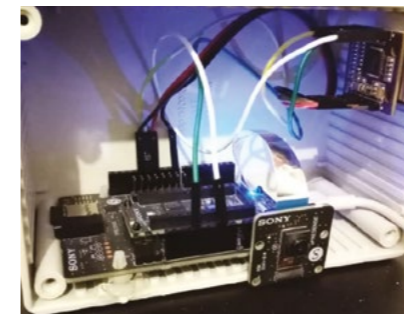
This project develops an AIoT bot that recognizes and classifies meat images using the GPT-4-Vision model. It utilizes a W6100-EVB-Pico and a Raspberry Pi 4, and determines the doneness of the meat from a user's photo on the Streamlit web server. This project was featured in the Raspberry Pi Main News.

https://maker.wiznet.io/louis_m/projects/aiot-llm-steak-classifier-aiot-bot-1/



IPv6 Web Camera Powered by WIZ610io

 Manuel Alejandro Iglesias Abbatemarco



Discover the cutting-edge IPv6 Web Camera powered by WIZ610io module, a state-of-the-art device that integrates seamlessly into IPv4 or IPv6 networks. This camera transmits clear QVGA images directly to your browser, utilizing WIZnet's innovative technology for a superior, secure, and swift connection.

<https://maker.wiznet.io/WIZnet/projects/ipv6-web-camera-powered-by-wiz610io/>



Creating a Mystery API with Raspberry Pi Pico and WIZnet Ethernet

 Akki

This project uses a Raspberry Pi Pico and a WIZnet Ethernet module to create a web server, and CircuitPython to remotely manipulate a PC mouse cursor via a web API. It is described using adafruit_wiznet5k and adafruit_httpserver, the purpose is mouse cursor control via a web page, and the code is publicly available on GitHub.



<https://maker.wiznet.io/viktor/projects/wiznet-web-mouse-api/>



FTP Server with W6100 and SD card

 Teddy

Unleash the power of network storage with the STM32 Nucleo-64 and WIZnet's W6100 Ethernet shield. This beginner-friendly FTP server project integrates an SD card for easy file management, offering both IPv4 and IPv6 support for versatile connectivity.



<https://maker.wiznet.io/teddy/projects/ftp-server-with-w6100-and-sd-card/>



How to use Ethernet in Fuzix OS with W5500 and Raspberry Pi Pico

 Mason




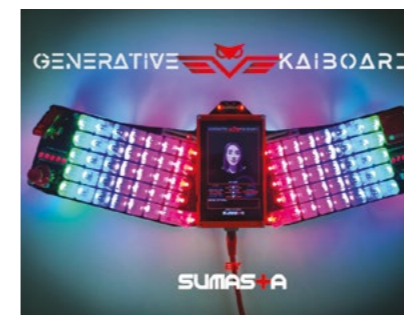
Implement Ethernet connectivity using the W5500 and Raspberry Pi Pico in Fuzix OS. This brings a UNIX-like environment to small devices and allows users to experience Ethernet communication in Fuzix OS via IP settings.

<https://maker.wiznet.io/mason/projects/how-to-use-ethernet-in-fuzix-os-with-w5500-and-raspberry-pi-pico/>



Generative kAiboard - Beyond Typing with Generative AI

 Pamungkas Sumasta



The Generative kAiboard is an internet-connected keyboard powered by ChatGPT, integrating a virtual assistant and more. It's inspired by the transformative potential of generative AI and aims to merge keyboard input with AI capabilities. The project is a culmination of technical prowess and artistic inspiration, serving as a testament to human creativity and innovation.

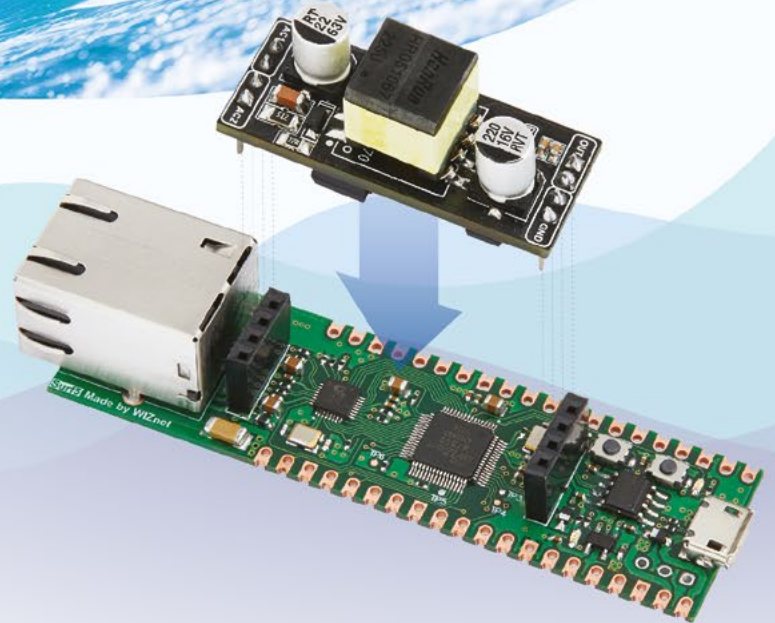
<https://maker.wiznet.io/sumasta/contest/generative-kai-board-beyond-typing-with-generative-ai/>



Innovate with Surf5 & PoE Modules

Surf5

Design Contest



Free Giveaway!

Submit your project idea
Get FREE Surf5 & PoE module,
worth 15\$

- **Surf5** : W7500 iMCU with ARM Cortex-M0, TCP/IP core in one!
- **WIZPoE-P1** : IEEE802.3af, Mode A/B, 8W power, isolation



Contest begins

Apr 02



Sample distribution

Apr 02 ~ May 20



Project submission

May 20 ~ Jun 30



Winners announcement

Jul 10

COMPETE FOR
\$ 6,000 IN PRIZES

1st PRIZE \$ 1,000 X 2

2nd PRIZE \$ 500 X 4

3rd PRIZE \$ 200 X 10



HOW TO GET A FREE SAMPLE

1. Sign up to maker.wiznet.io
2. Submit any project idea for a contest
3. Show your submission