

Customer story

WIZnet W55RP20 industrial SiP

Industrial-grade SiP powered by RP2040 enables seamless network acceleration and secure IoT connectivity

Combining its W5500 Ethernet controller with RP2040 to make a single system in package, WIZnet enhanced its device offering to provide a more comprehensive network offloading solution, enabling smoother and more efficient development for its customers.

Raspberry Pi solution	RP2040
Size of business	SME
Industry	IoT, automation, communications



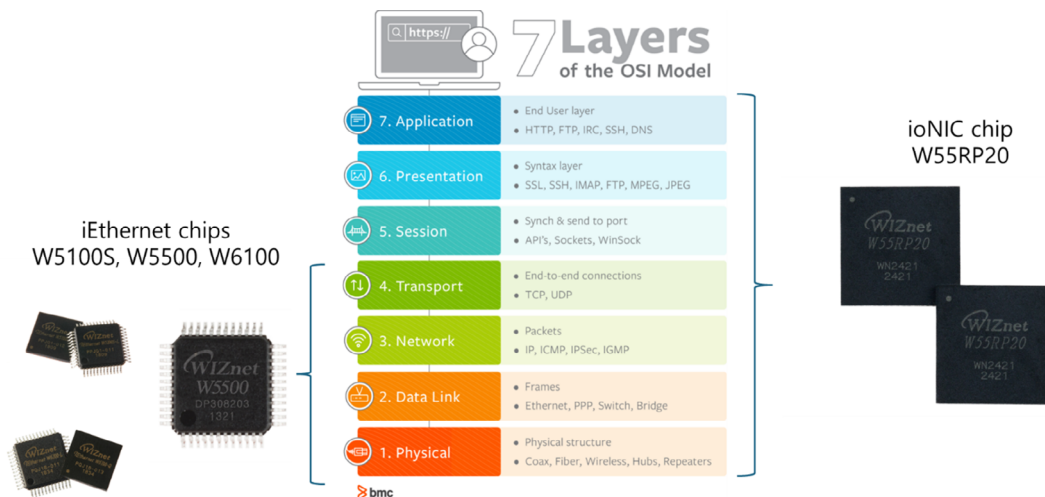
The “unmatched flexibility” of RP2040 sets it apart from the competition



WIZnet is a global leader in Ethernet connectivity solutions, renowned for its innovative approach to enabling seamless communication between devices. Founded in 1998, WIZnet specialises in developing hardware-based TCP/IP solutions that simplify networking for embedded systems, IoT devices, and industrial applications.

At the heart of WIZnet's success is its commitment to empowering developers with robust, reliable, and easy-to-integrate products. From its widely recognised Ethernet ICs like W5500 to cutting-edge system in package (SiP) solutions like W55RP20, WIZnet continues to push the boundaries of networking technology. The company serves a diverse range of industries, including smart home automation, healthcare, energy management, and manufacturing, delivering scalable solutions that cater to both large enterprises and small startups.

With a focus on innovation and customer-centric design, WIZnet combines technical expertise with a deep understanding of market needs. By simplifying complex networking challenges, WIZnet enables developers to focus on building impactful applications, accelerating time-to-market and driving industry transformation.



The challenge

As a leader in Ethernet IC solutions, WIZnet has continually pushed the boundaries of innovation. However, a critical challenge emerged with its existing Ethernet ICs, such as W5500, which function as TCP offload engines (TOEs). While these chips efficiently offloaded up to four layers of the OSI model from the host MCU, they still required the microcontroller to handle application-layer processes such as SSL, TLS, or other protocols.

For customers, this dependency often meant additional development complexity and resource utilisation on their MCU, especially when integrating features like secure communication or lightweight IoT protocols such as MQTT.

RP2040 offers a unique combination of availability, flexibility, and innovative features

The challenge was clear: how could WIZnet enhance its Ethernet ICs to provide a more comprehensive network offloading solution, enabling a smoother and more efficient development experience for its customers? The solution would need to extend beyond offloading just the TCP stack to also tackle application-level tasks, all while maintaining a compact form factor, cost efficiency, and compatibility with existing ecosystems.

The solution

To address the limitations of traditional Ethernet ICs, WIZnet devised an innovative approach: integrating the RP2040 microcontroller with its proven W5500 Ethernet controller into a single SiP. This new chip, W55RP20, leverages the power of RP2040's dual-core Arm Cortex-M0+ architecture and combines it with the robust networking capabilities of W5500.

The integration enables W55RP20 to act as a full-stack network accelerator, going beyond just TCP offloading. With the processing resources of RP2040, the chip can handle application-level protocols such as TLS and MQTT directly, significantly reducing the workload on the host MCU. This means that developers can now offload not just the TCP/IP stack but also security features like TLS encryption or IoT-specific libraries, streamlining the implementation of secure and scalable networked applications.

From a hardware perspective, the SiP design combines the internal dies of RP2040 and W5500 with optimised wiring to ensure efficient communication between the two components. The result is a compact, power-efficient solution that offers enhanced functionality without increasing complexity or cost. This breakthrough allows customers to achieve faster time-to-market with their products while maintaining robust network performance and security.



Why Raspberry Pi?

When selecting the ideal microcontroller to pair with its W5500 Ethernet IC, WIZnet evaluated several options from leading MCU vendors. RP2040 stood out as the clear choice, offering a unique combination of availability, design flexibility, and innovative features.

One of the critical factors during WIZnet's decision-making process was the global semiconductor shortage during the COVID-19 pandemic. While many microcontrollers faced severe supply chain constraints, RP2040 remained accessible, allowing WIZnet to maintain its development timeline and bring W55RP20 to market without delays.

Beyond availability, RP2040 impressed WIZnet with its thoughtful design. Its dual-core Arm Cortex-M0+ architecture provided ample processing power while maintaining low power consumption. What truly set RP2040 apart was its programmable I/O (PIO) subsystem, which offered unmatched flexibility for handling custom protocols and peripherals. This feature enabled seamless communication between RP2040 and W5500, optimising the performance of WIZnet's SiP design.

RP2040's robust development ecosystem, which includes excellent documentation and community support, further reinforced WIZnet's decision. By choosing RP2040, WIZnet was able to build a solution that not only solved its technical challenges but also aligned with its commitment to delivering reliable, developer-friendly products.

The results

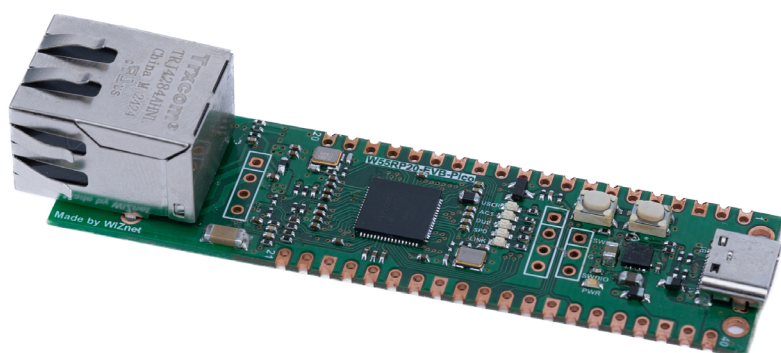
W55RP20 has redefined Ethernet IC functionality. The innovative chip offloads not only the TCP stack and application-layer protocols like TLS and MQTT but also computation-intensive tasks. It can process raw data, prepare it for transmission, and handle packet delivery to the network, significantly reducing the workload on customer MCUs.

To support rapid adoption and ease of development, WIZnet has introduced W55RP20-EVB-Pico, an evaluation board in the familiar Raspberry Pi Pico format. This board simplifies prototyping and testing, allowing developers to explore the chip's capabilities quickly and integrate it into their designs. By leveraging the Pico-like pinout and form factor, W55RP20-EVB-Pico ensures compatibility with existing Raspberry Pi Pico accessories, further lowering the barrier for development.

With its robust performance, compact footprint, and ease of integration, W55RP20 has gained traction across various industries, including IoT, industrial automation, and secure communications. Customers report improved system reliability, reduced development time, and enhanced application performance.

By combining networking and data-processing capabilities with accessible evaluation tools, W55RP20 has set a new benchmark in network accelerators, driving innovation in embedded systems and connectivity solutions.

RP2040's robust development ecosystem includes excellent documentation and support



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