



MEDIATEK

Top IoT design challenges of Industry 5.0

and how to solve them with MediaTek Genio

Industry 5.0 empowers human-machine interaction with connected, resilient and sustainable IoT systems.

The goal: go beyond the process optimization of Industry 4.0 to enhance net benefits for humans and society with robots that empower workers, enable mass personalization and support environmental sustainability.

This revolution of human/machine interaction and machine-driven intelligence requires advanced capabilities, primarily at the edge. To achieve the society-shifting goals of Industry 5.0, IoT product developers are challenged to improve flexibility, strengthen connectivity and enhance interactivity with intelligent voice and vision systems. On top of these technical requirements, designs need to be both cost and energy efficient.

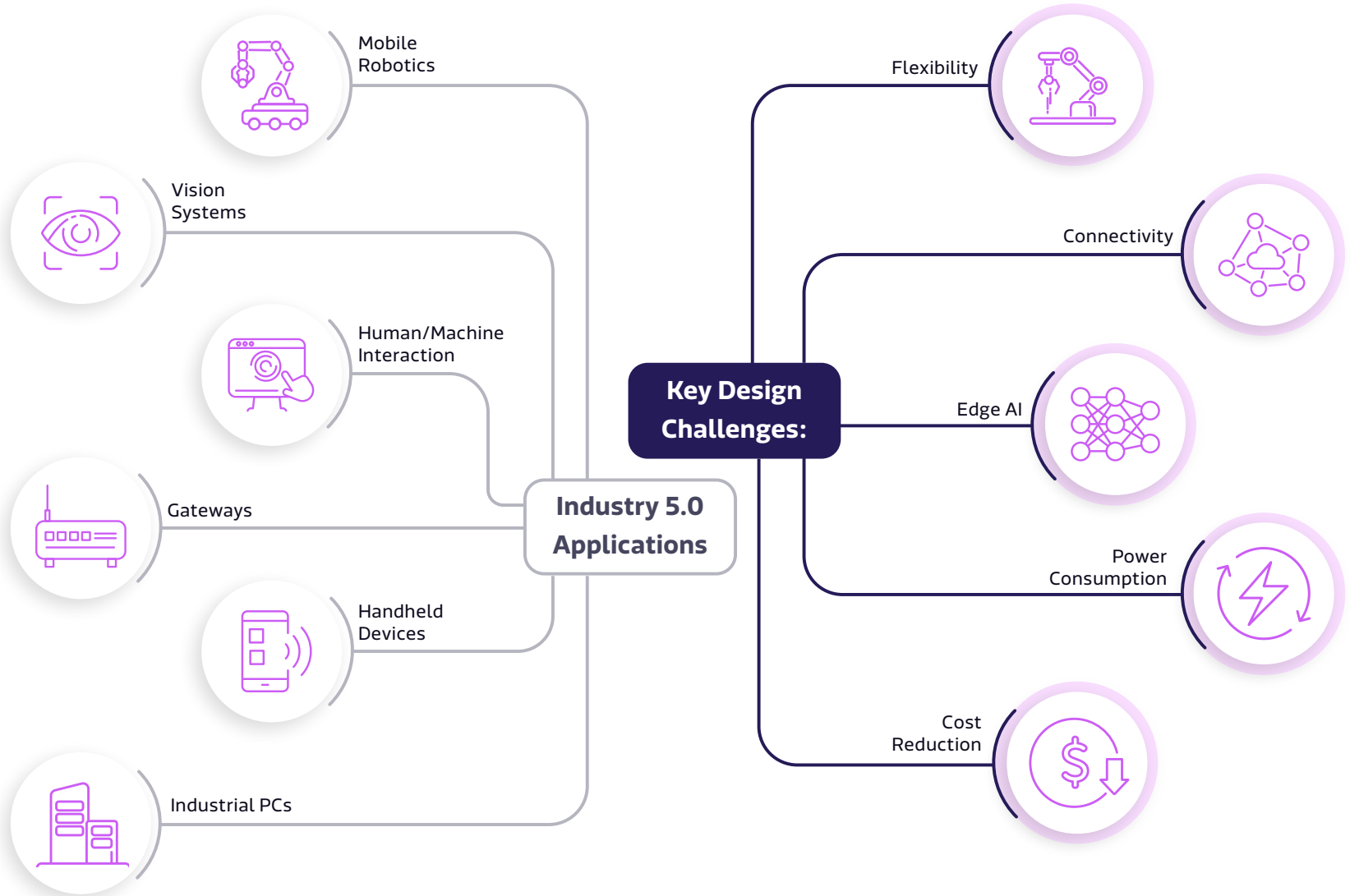
So then, how do you design energy efficient and cost-effective products for demanding use cases that require heavy IO and reliable embedded AI processing?

3 Pillars of Industry 5.0



Source: [European Commission](#)

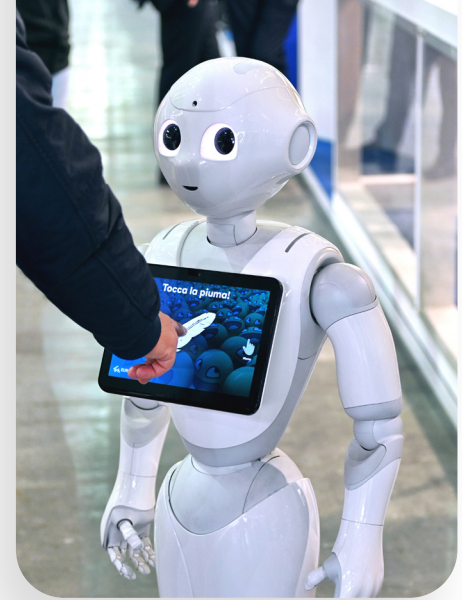
This eBook will examine how IoT product designers can use MediaTek Genio to solve key design challenges of Industry 5.0.



Challenge #1: Flexibility

To advance the human-robot co-working environment and smart societies, IoT products require the flexibility to function both as extensions of their human users or as independent robots in remote or off-grid areas. In this next evolution of industry, robots must understand the goals they need to achieve and how to help accomplish tasks, whether supporting a human worker or operating independently.

IoT product design should essentially help humans forget they are, in fact, working with a machine. A flexible design that supports seamless copresence and functions for long periods of time without maintenance, battery changes or support requires efficiency that impacts the size, shape and breadth of functionality that can fit in the product.





How to solve it

Use an integrated, highly efficient System on a Chip (SoC) to help decrease the footprint of an IoT product and support long-term power efficiency. With multifunctional components on one chip, they can be placed closer to each other, allowing the resulting chip size to fit in extremely tight spaces for more compact designs, fanless enclosures or it can provide new opportunities for devices.



Solve it with MediaTek

MediaTek Genio's System on Chip combines powerful features into one compact chip. Genio SoC's include: 8 CPU cores, a GPU to support 2D/3D graphics and multimedia applications, powerful APUs (AI Processing Units) for highly capable AI on the edge, multiple cameras, platform integrated PMIC (Power Management IC), support for rich interfaces for a wide range of sensors and peripherals, and much more.

With Genio, not only are key features all on one chip, but also provides high performance and low power consumption. Using leading TSMC 6nm (CLN6FF, N6) manufacturing technology, die sizes can be reduced by up to 15% when compared to using N7 design rules. The advanced 6nm manufacturing process also drives superior power efficiency, which in turn can support more efficient fanless designs.



Challenge #2: Connectivity

To facilitate human-machine interactions and sustainable systems, IoT designers must make connectivity choices based on factors such as data throughput, connectivity range and speed, power, scalability, robustness as well as protocol (i.e. Wi-Fi, Bluetooth, 5G or NTN), ensuring these choices will stand the test of time. The decision depends on the goal of the design, whether it involves private networks, virtual network slicing, URLLC 5G services for remote industrial control, remote health-care, or safety.

For example, while it may be the expected behavior of a smart meter to connect and report on data once or twice a month, a cobot, like a robot surgeon, requires a trusted real-time connection to analyze data and make split-second decisions, where even a second or two of latency from sending data to the cloud and waiting for a decision could be too much to risk. To succeed, AI and voice and vision systems for Industry 5.0 interactivity require real-time connectivity with minimal latency.





How to solve it

Choose connected technologies that support the latest wireless protocols, including Wi-Fi /6E and upcoming Wi-Fi 7.



Solve it with MediaTek

MediaTek is one of the few global semiconductor companies that can supply the full breadth of wireless connectivity options: Wi-Fi, Bluetooth, 5G and NTN with verified operation in global markets.

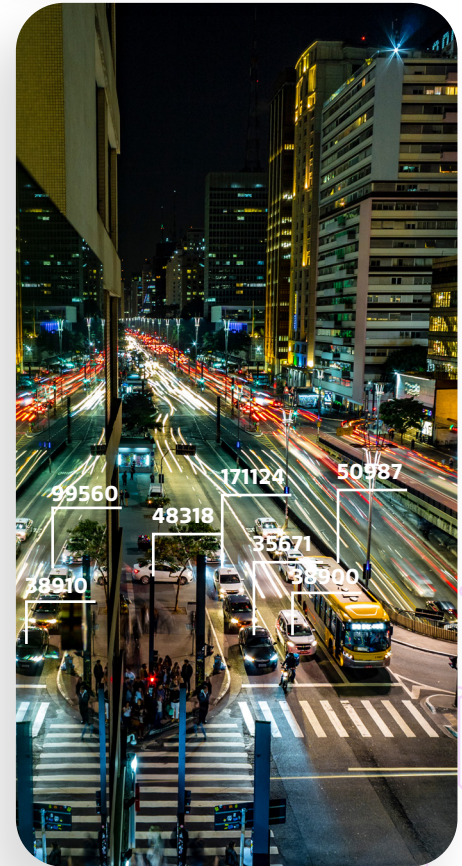
MediaTek Genio supports native Gigabit Ethernet, plus Wi-Fi 6E and sub-6 5G modules, and is prepared to support Wi-Fi- 7, to meet a wide range of connectivity needs. With Edge AI capabilities, Genio can further reduce latency by processing data close to the source, instead of sending it to the more distant cloud and then waiting for a response.

Challenge #3:

Supporting Voice & Vision Systems With Edge AI

Voice and vision systems are an important part of human-machine copresence, enhancing our own abilities and becoming the eyes and ears of our smart societies. To strengthen our senses, voice and vision systems can recognize real-time spaces and scenes, help us see in low-light conditions, or even understand what a voice is saying in another language. To support smart societies, vision systems can be used for people counting, car counting, toll and dynamic road infrastructure and other sensor fusion for hyper-local weather, AQI, noise monitoring or even scanning for emergency situations (like smoke detection).

In these situations, product design requires low latency but may not always need a network connection, which can be slow, costly and create data privacy concerns.





How to solve it

Enhanced processing at the edge creates new opportunities for advanced voice and vision systems, helping to process large data volumes closer to the source in order to reduce connection time and bandwidth to the cloud. With edge AI, processing happens at the edge of a network, often on the device where the data is created, instead of in the cloud or an offsite data center.

New IoT devices can integrate edge AI into the product design stage, or operate with a smart hub to connect and process data from multiple sensors that may not have built-in AI, adding an intelligent layer between basic IoT devices and the cloud.



Solve it with MediaTek

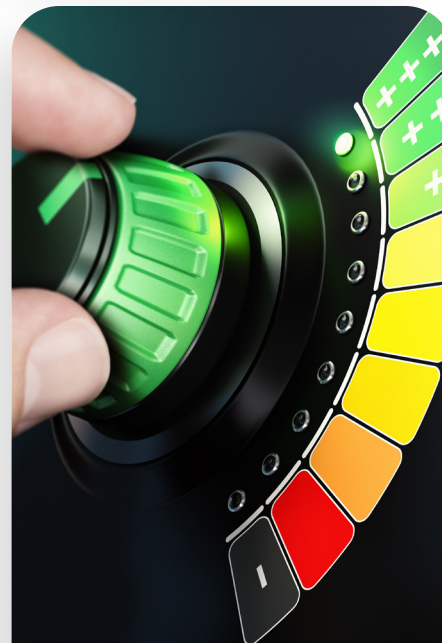
MediaTek Genio incorporates edge AI to intelligently process data locally rather than having to depend on an external cloud. The CPU, GPU and AI Processing Unit (APU) in each Genio chipset work together to enhance intelligent autonomous capabilities at the edge and support high quality displays, cameras and more.

Challenge #4:

Power Consumption

Efficient power consumption not only supports our planet but also the edge systems that make unified human-machine interaction possible and cost effective. Traditionally, in complex functions like facial recognition, the CPU can account for more than 40% of power consumption, contributing to the 1% of all global GHG emissions caused by end-user computing. In smart systems that require vision or voice recognition, sensors (like microphones) need to be always-on, requiring power-saving strategies, especially for battery-powered devices.

Industry 5.0's demand for performance at the edge and powerful AI processing, combined with always-on sensors and the need for wireless connectivity requires a system with optimal power and thermal advantages.





How to solve it

Improving power consumption requires system optimization and innate power efficiency innovations to key technologies in both hardware and software.



Solve it with MediaTek

MediaTek Genio significantly reduces power consumption for Industry 5.0 devices while providing the necessary compute power and performance. The advanced TSMC N6 (6nm-class) chip production process allows the Genio 700 to be exceptionally power efficient, enabling product designers to use fanless enclosures or even off-grid power solutions for more application opportunity. In 2021 alone, MediaTek's chipsets reduced power consumption by an average of 23% in comparison to the year prior, a reduction of 334 tons of carbon dioxide emissions.

To reduce power consumption, MediaTek engineers have pioneered a number of system optimizations.

- » MediaTek's hardware cuts power consumption to the CPU when it is not being used, and even brief pauses can be targets of power optimization. By design, related circuits and components will automatically switch off when inactive to reduce power consumption.
- » For software, the research and development team has developed algorithms to detect processor loading so that when loading on the processor is low, technology automatically allows the second, third, or fourth processor to be shut off.



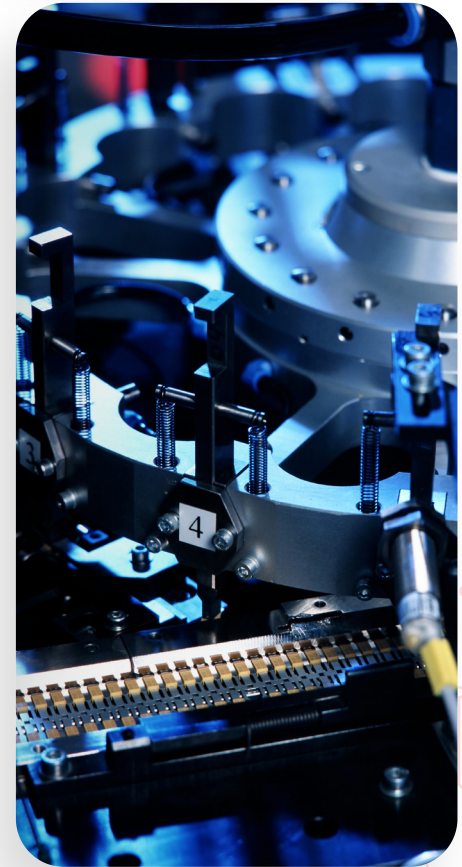
**Did you know?
MediaTek has
committed to
the goal of net
zero emissions
by 2050.**

Challenge #5:

Cost Reduction

With Industry 5.0 redefining how we work and build a sustainable world, the incremental value of IoT could be as exponential as saving our planet. However, optimizing hardware and connectivity for cost is also critical to ensure these society-shifting products can be funded to get off the ground. Often the business case for an IoT product hinges on the total system cost as it relates to incremental revenue or cost savings generated by the system.

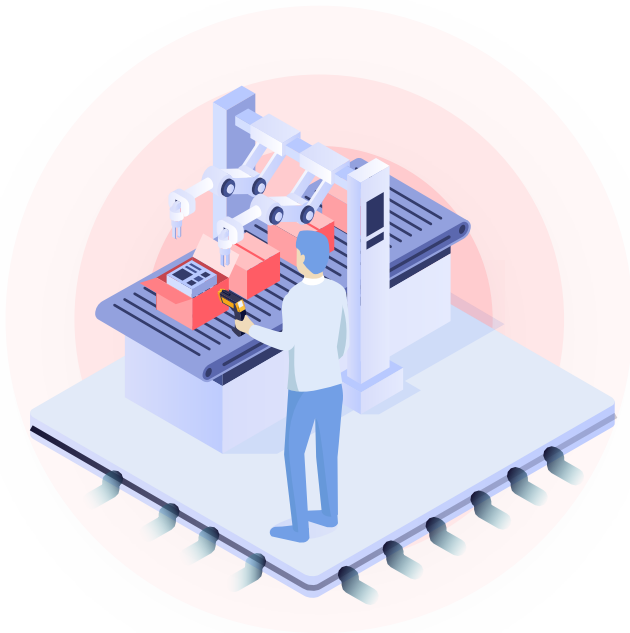
With the right support for human workers, intelligent IoT products can significantly reduce manufacturing costs. Case in point: a joint study by Vanson Bourne and GE found that 23% of all manufacturing downtime was caused by human error, which if corrected by machine support, could generate substantial savings. With long-term smart city installations and independent remote robots, maintenance or connectivity issues could be costly. Cost savings should consider unit costs, process savings as well as long-term support and maintenance issues.





How to solve it

There are various strategies for reducing costs, including assessing the cost of parts, local vs cloud storage, reduction of engineering complexity, and minimizing the time to bring a product to market.



Solve it with MediaTek

MediaTek Genio delivers cost savings through its complete System on a Chip (SoC), including powerful CPU, GPU, APU, support for multiple cameras, platform integrated PMIC, and more; support for several familiar operating systems, allowing designers to customize products using Yocto Linux, Ubuntu, and Android; ecosystem support, including long-term support and upgrades to ensure a 7-to-10-year lifespan for IIoT-capable devices; and potential reduction of cloud storage and bandwidth costs depending on the application.

Genio's SoC and extensive platform integration helps reduce the bill of materials and save development time, accelerating time to market. Network and systems cost reductions can be further reduced with high-performance edge processing maintenance analytics.

Implement MediaTek Genio in your next IoT product design

MediaTek provides a suite of advanced intelligent IoT chips and an ecosystem of partners whose smart modules enable companies to develop intelligent devices for advanced industrial applications and other highly demanding, edge-weighted applications that need heavy IO, reliable connectivity, and the immediacy of embedded processing.

Designed for demanding AI and performance-centric IoT applications, MediaTek Genio is a premium IoT SoC that empowers the edge with multiple in-chip processors and extremely capable multitasking performance in the latest Open OS.

- » Best-in-class CPU
- » Graphics and AI performance
- » Support for the latest multimedia standards
- » Multiple 4K displays
- » Exceptional power efficiency

[Discover MediaTek Genio](#)



About MediaTek

MediaTek Incorporated (TWSE: 2454) is a global fabless semiconductor company that enables nearly 2 billion connected devices a year. We are a market leader in developing innovative systems-on-chip (SoC) for mobile, home entertainment, connectivity, and IoT products.

- » World's 4th largest fabless semiconductor company.
- » Partnering with global brands for more than 20 years.

MediaTek empowers and inspires people to expand their horizons and achieve their goals through smart technology, more easily and efficiently than ever before. We work with the brands you love to make great technology accessible to everyone, and it drives everything we do.

Visit www.mediatek.com for more information

MEDIATEK