As part of a new wave of technology enablement, objects like door locks, wearable devices, and heavy machinery are all being hooked up to the internet and cloud services. According to ABI Research, 30 billion everyday physical objects will be part of the Internet of Things (IoT) by 2020.

Despite these promising figures, the IoT market is still considered to be in the early stages of growth. It’s a bit perplexing, what with the vast amount of chips and design solutions that have flooded the market in recent years, each promising to power up a variety of IoT applications.

A closer look at all of these options reveals that on one hand, what we have are power-hungry application processors that provide ample performance, but also negate the basic energy-efficiency premise for running battery-powered IoT devices.

On the other hand, there are standard microcontrollers that are cheap and low-power, but fail to provide the performance levels necessary for implementing IoT features like multiple sensor interfacing, security, and cloud communications.

This lack of technological consistency, if you will, takes us to the creation of PSoC 6, Cypress’ newest PSoC MCU that is aiming to bridge the gap between power-heavy application processors and performance-lite microcontrollers.

PSoC 6 is a single-chip solution targeted at a wide array of IoT applications, including wearables, smart home appliances and industrial automation. It offers longer battery life, more data processing, and built-in security features for protecting IoT devices against cyber-vulnerabilities and threats.

Ensuring high-performance while keeping power usage low is the first of three key tenets of the PSoC 6 architecture:

**1. Ultra-low-power without performance tradeoff**

IoT developers are increasingly demanding embedded solutions that extend battery life without sacrificing performance. Therefore, PSoC 6 has been purpose-built on a dual-core ARM® Cortex®-M4 and ARM Cortex-M0+ architecture.
The ARM Cortex-M4, running at 150-MHz speed is the primary application processor catering to the high-performance needs of IoT applications; the 100-MHz ARM Cortex-M0+ processor, meanwhile, supports low-power operations. The PSoC 6 MCU — built on an ultra-low-power 40-nm architecture — also employs dynamic voltage and frequency-scaling techniques to lower the power bar further.

As a result, PSoC 6 can accomplish 22-µA/MHz in an active mode for the Cortex-M4, and 15-µA/MHz for the Cortex-M0+, respectively. In fact, the new embedded chip has set another ultra-low-power benchmark.

2. A flexible architecture

The PSoC 6 MCU architecture offers best-in-class flexibility that enables the addition of new features and addresses the need for unique IoT products. With its multiple connectivity options, such as USB and BLE, and flexible dual-core architecture, IoT devices can be connected to the IoT, while optimizing system performance and power consumption.

Moreover, PSoC 6 provides software-defined peripherals that allow embedded system designers to add extra features on the fly without requiring a PCB re-spin. The programmable analog and digital peripherals, as shown in Figure 3, facilitate in-field tuning at the last minute and save cost as well as time. PSoC 6 also offers CapSense®, the industry’s best capacitive-sensing solution, to support sleek, next-generation user-interfaces.
3. Why hardware security?

Security is another stumbling block in the IoT world because connected devices also open the door to network vulnerabilities. And that calls for incorporating security at the lowest level in an IoT device. The PSoC 6 MCU architecture provides a hardware-based Trusted Execution Environment (TEE) with secure boot capability and secure data storage to protect firmware, applications and cryptographic keys.

What’s unique about the PSoC 6 architecture is that it supports multiple, simultaneous secure environments without the need for external memories or secure elements. PSoC 6 offers built-in security elements that other IoT chips don’t, primarily because of memories that are logically isolated. A close parallel to this methodology is the virtual machine (VM) model, except that isolated memories aren’t software-controlled. They are hardware-enabled.

Furthermore, PSoC 6 integrates cryptographic algorithms like Elliptical-Curve Cryptography (ECC), Advanced Encryption Standard (AES) and Secure Hash Algorithms (SHA 1,2,3) implemented in a CRYPTO hardware block, offloading these compute-intensive tasks from the main processor.

About PSoC 6 BLE Pioneer Kit

An important consideration in IoT environments is ecosystem support. Cypress’ new PSoC 63 Connectivity Family MCU allows developers to co-design application firmware and hardware in the PSoC Creator™ IDE or export design to a third-party IDE.

What’s new is the PSoC 6 BLE Pioneer kit (Figure 5) that enables IoT designers to evaluate and develop applications using the PSoC 63 Connectivity Family MCU. The kit allows...
low-cost development by prototyping design and facilitating changes without expensive and tedious hardware revisions.

The development kit comes with a PSoC 6 BLE baseboard, a BLE dongle, and Quick Start Guide. The baseboard features an onboard antenna and is compatible with Arduino Uno shield boards. And it supports operating voltages from 1.8 V to 3.3 V.

Then there is CY5677 CySmart BLE 4.2 USB Dongle, which is factory-programmed to emulate a BLE GAP Central device. In short, it allows you to emulate a BLE host on your computer.

The development kit also includes a 2.7-in. e-ink display shield board — CY8CKIT-028-EPD — with an onboard digital microphone and thermistor.

**Bridging the gap**

The PSoC 6 is an MCU solution unlike anything else on the market because it was designed to not only meet the expectations of the modern-day IoT developer, but address their needs as well — specifically when it comes to power consumption, design flexibility and security solutions.

Head to cypress.com/PSoc6 to learn more.