Expert insights: Over-the-air updates
Ready for the future with the right IoT devices

Software updates are not just about fixing bugs and plugging security holes. More and more manufacturers are realizing that updates can also serve to add functions to their diverse assets in both mobile applications and industrial environments. This way, they can not only address their customers' needs; they can also come to appreciate software updates as a vehicle for implementing new business models to come.

This is already so much easier and more efficient today with over-the-air updates (OTA). Manufacturers no longer have to send out technicians to install updates manually; customers are no longer compelled to take their devices to the shop.

It's all about the device tech

Customers' needs are constantly changing. New business models take time to establish. Those realities give manufacturers of industrial assets cause to ponder a key question: What foundation can we build today to continue tapping the full potential of tomorrow's software updates?

Choosing the right IoT hardware is one answer, and perhaps the most important one at that. Manufacturers of agricultural, construction, and forestry machinery have to consider which devices they want to use to connect their assets. The distinctions between microprocessor and microcontroller architectures play a key role in that decision.

Take, for example, a connectivity control unit

How does this distinction affect the decision on hardware? To answer that, we need to look at a machine's control units (ECUs) – specifically the connectivity control unit (CCU). It provides a wireless link to connect the machine to the higher-level IT systems in the cloud. The CCU does this with the help of its hardware, operating system (OS), and various software modules. The CCU is the central connectivity hub for other control units and whatever sensors may be involved.

Selecting the right CCU is less a matter of considering the task at hand now and focusing more on which functions and applications could matter in the future. This is about seeing the big picture, building the foundation for flexibility, and future-proofing the entire IoT solution.

Compared to a microprocessor-based CCU, a CCU based on a microcontroller may be less expensive and cover all of the manufacturer's current requirements. However, things are sure to get complicated when customers' needs change or technology advances. Due to specialization and cost optimization, these devices typically draw on limited resources and do not allow for much in the way of adaptations and extensions. For example, implementing a 5G module would entail far-reaching changes on the software side.

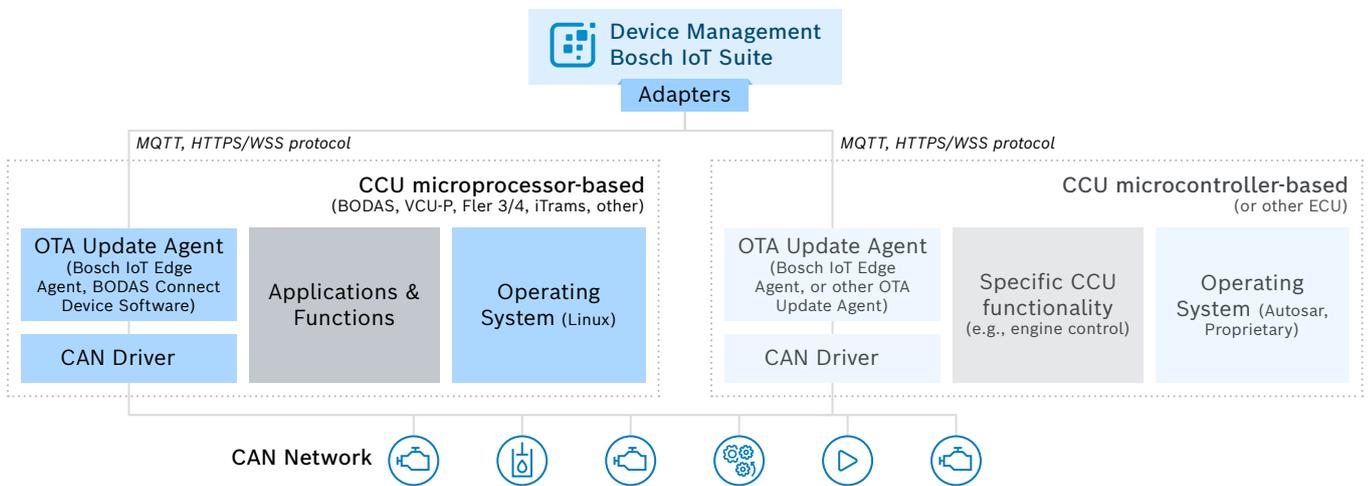|	Microprocessor-based devices	Microcontroller-based devices
Where they are used	Typically for processing data, its flexibility enables a wide range of use cases	Mainly for control tasks in systems, designed for clearly defined use cases
Computing power	High computing power and lots of memory for universal use	Computing power optimized for the given use case
Costs	More expensive, but greater flexibility and computing power means longer device service	Cheaper, but limited resources make them harder to extend
Runtime extensibility	Typically open operating system, open APIs, no vendor lock-in	Proprietary operating system, proprietary APIs, potential vendor lock-in

Microprocessor-based CCUs

CCUs based on microprocessors are open and modular systems. Their architecture is usually layered. A standardized Linux OS provides the foundation. The next layer up consists of hardware drivers. On top of that can be a a system layer with communication brokers and an application layer. Standard libraries and interfaces typically enable OEMs to use preprogrammed applications and program software modules of their own along the lines of smartphone apps.

Microcontroller-based CCUs*

CCUs based on a microcontroller are usually closed systems that combine hardware, an OS, and software in a single unit. They often run a proprietary operating system. OEMs' options for programming new applications for these devices are limited at best – and nonexistent at worst.

* can also be another type of ECU

A microprocessor-based CCU can be pricier, but with the help of software updates manufacturers can respond more flexibly to emerging developments. These systems offer open APIs and typically provide many libraries to draw on, thus enabling companies to easily and swiftly make software modifications. To revisit our example, being able to extend the software can make implementing a 5G module much easier. The microprocessor architecture also readily accommodates new applications. Rolling out new business models such as licensing schemes to the device will be an exercise in convenience.

A flexible approach to over-the-air updates

With the right device management and edge computing functions (e.g., of an IoT platform such as Bosch IoT Suite) companies can connect both microprocessor- and microcontroller-based devices and deliver over-the-air updates to their intended destinations. In both architectures, OTA update agents (such as Bosch IoT Edge Agent) are a pivotal component, linking diverse edge devices to the IoT to enable everything from cloud connectivity to software updates. Bosch IoT Edge Agent is applicable in both scenarios: It is compatible with a wide range of IoT devices, from small microcontrollers to powerful hardware platforms.

What's next?

Regardless of which variant you prefer, the comprehensive edge offering by Bosch gives you several options:

Option 1 – An integrated end-to-end solution:
We provide you with a pre-integrated solution ranging from sensors and the CCU to the cloud application. You can deploy the solution directly without any additional effort.

Option 2 – You bring your microprocessor:
The flexible Bosch Edge software is compatible with various microprocessor platforms.

Option 3 – You bring your microcontroller:
The lightweight Bosch Edge software is also compatible with resource-constrained microcontroller hardware.

Do you want to discuss your use case with us? Contact our OTA and edge experts