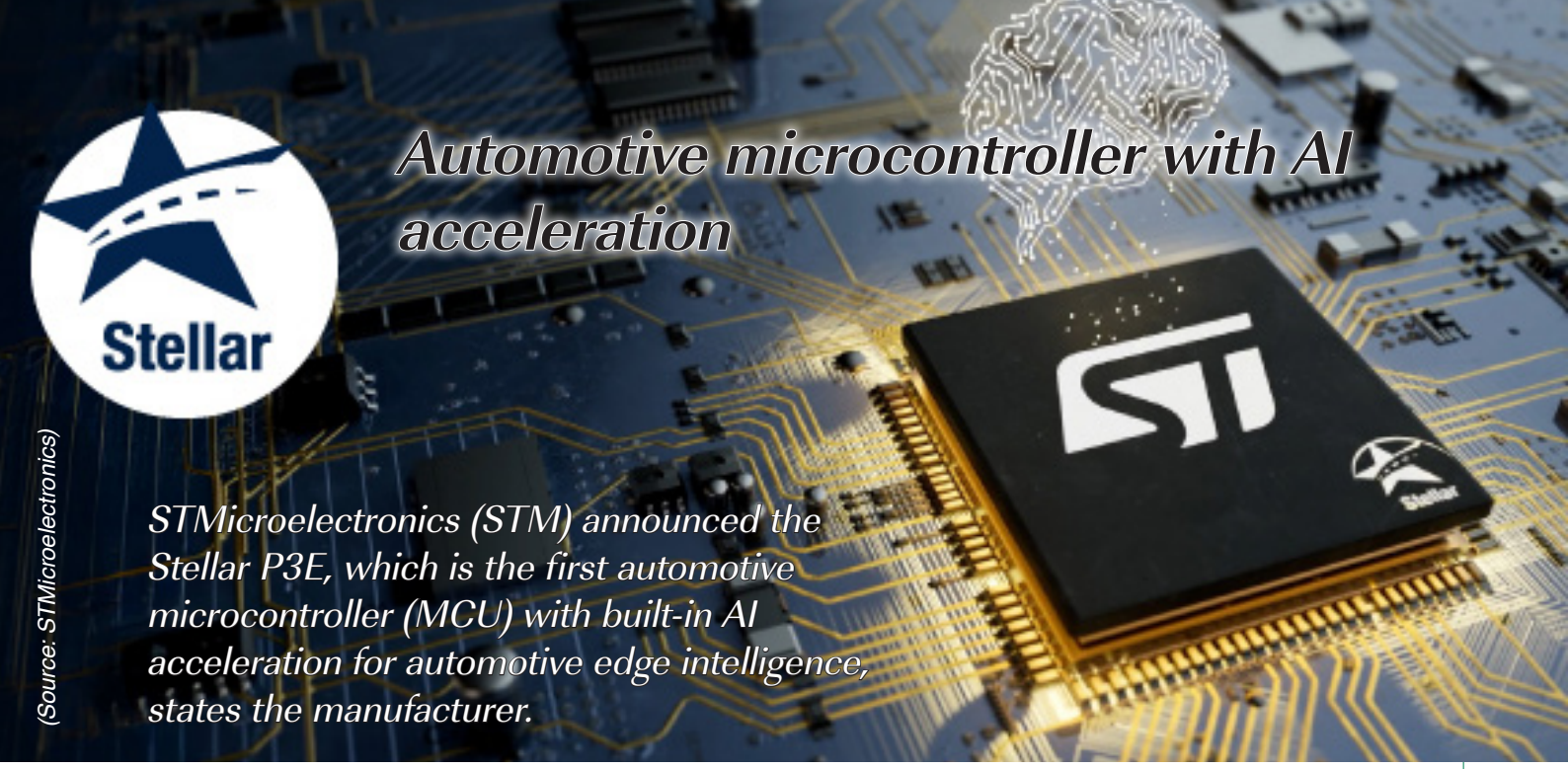
Automotive microcontroller with AI acceleration



(Source: STMicroelectronics)

STMicroelectronics (STM) announced the Stellar P3E, which is the first automotive microcontroller (MCU) with built-in AI acceleration for automotive edge intelligence, states the manufacturer.

Designed for future software-defined vehicles, the MCU simplifies multi-function integration for X-in-1 electronic control units (ECUs) that reduce system cost, weight, and complexity. Thus, it delivers flexible, real-time performance for safe, responsive applications from hybrid/EV systems to body zonal architectures, adds STM.

Key technical features include four 500-MHz Arm Cortex-R52+ cores and the Split-lock architecture enabling designers to optimize the balance between functional safety and peak performance. The MCU provides eight modules supporting CAN CC and CAN FD as well as two modules with CAN CC/FD/XL support. The I/O and analog capabilities offer diverse functions, including advanced motor control for enhanced vehicle dynamics.

A defining feature of the Stellar P3E is its integrated ST Neural-ART Accelerator for real-time AI efficiency. Powered by this neural processing unit (NPU) with an advanced data-flow architecture for AI workloads, and combined with its rich sensing capabilities, the P3E enables smart sensing for such applications as virtual sensors. The P3E delivers inference processing at micro-second speeds, achieving up to 30-times greater efficiency compared to traditional MCU core processors, informs STM. This enables always-on, low-power artificial intelligence (AI) that can support real-time functions, including predictive maintenance and smart sensing, delivering benefits across a wide range of applications. For example, these capabilities can enhance charging speed and efficiency in electric vehicles and enable rapid deployment of new features, whether in the factory or in the field. Original equipment manufacturers (OEMs) can introduce new functions and more intuitive behaviors through different AI models, reducing the need for additional sensors, modules, wiring, and integration effort.

As the automotive industry embraces the shift toward software-defined vehicles (SDVs), Stellar P3E's integrated xMemory, ST's proprietary non-volatile memory based on phase-change memory (PCM), provides the scalability and flexibility needed. Offering twice the density of traditional embedded flash memory and qualified for automotive environments, this extensible memory solution enables dynamic expansion of software storage to accommodate new features and updates without requiring any hardware redesign.

The P3E is fully supported within the ST Edge AI Suite, a comprehensive edge-AI ecosystem that spans from dataset creation to on-device deployment for data scientists and embedded engineers. As part of this suite, NanoEdge AI Studio tool is now available for the entire Stellar MCU family. In addition, the Stellar MCU is already integrated into Stellar Studio, STM's all-in-one development environment tailored for automotive engineers. The start of production of the Stellar P3E is planned in the fourth quarter of 2026.

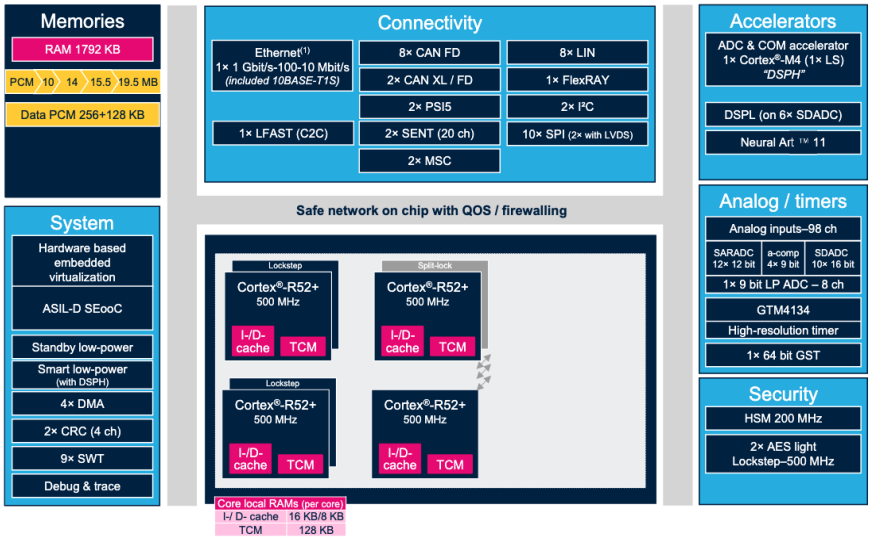


Figure: Stellar P3E block diagram (Source: STMicroelectronics)