

BMW

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Four Superbrains for the Neue Klasse: More intelligent, more efficient, more powerful.

- BMW takes the next step for the Software-Defined Vehicle (SDV).
- Concentration of computing power for key customer functions in four "Superbrains".
- Zonal wiring harness architecture 30% lighter and with 600 meters less wiring.
- Technology scales across all drivetrain variants.
- Future-oriented and flexible software architecture from the chip in the vehicle to the cloud.

Woodcliff Lake, NJ – March 10, 2025...BMW is the first automotive manufacturer to launch a completely newly developed digital nervous system for all drivetrain variants and vehicle segments. It is more intelligent, more powerful and more efficient and will be rolled out for the first time in the models of the Neue Klasse. Four high-performance computers, also called "Superbrains", consolidate the computing power for the most important customer functions: infotainment, automated driving, driving dynamics, and basic functions such as vehicle access, climate control, and comfort. The four Superbrains provide more than 20 times the computing power compared to the current vehicle generation and are already designed for upcoming software and function updates, including AI-powered customer experiences.

"Technology openness is the key to BMW's success. Starting with the first model of the Neue Klasse, we will roll out the technologies of the Neue Klasse across the entire future model portfolio – across all segments and all drivetrains. This also applies to our completely newly developed electronic architecture made up of powerful 'Superbrains' and highly interconnected software platforms. This architecture allows us to decouple the development of the vehicle and software from each other. The advantage: More than ever before, all future BMW models will

remain digitally up to date via over-the-air upgrades and will receive updates even from the next and subsequent vehicle generations," says Frank Weber, Board Member for Development at BMW AG.

A fundamental component of the digital nervous system is the radically simplified wiring harness. It is based on a so-called zonal wiring harness architecture, which uses 600 meters less wiring and brings 30% weight savings compared to the previous generation. The wiring harness is divided into four zones: front end, center, rear and roof. The Superbrains are connected via high-speed data connections to smaller control units, the zonal controllers, which manage and consolidate the data flow of the electronics in and out of the zones. The wiring in the vehicle is therefore zone-related and can thus be shorter, thinner, and lighter. A crucial prerequisite for thinner and lighter wiring are the so-called "Smart eFuses". These are digital fuses that replace up to 150 traditional fuses. Smart eFuses can be intelligently programmed for digitally controlled energy distribution to components. The selective activation of components allows for the design of intelligent power modes for various vehicle states such as driving, parking, charging, and upgrading, in which unnecessary consumers can be identified and switched off. Thus, the eFuses make a significant contribution to the 20% improved energy efficiency.

The completely newly developed electronic architecture forms the basis for the next generation SDV. From the launch of the Neue Klasse, the upcoming BMW model generation will benefit from it. The first fully electric derivative of the Neue Klasse will go into series production later this year at the Debrecen plant in Hungary.

The advanced software architecture of BMW builds on this new electronic architecture. With the multitude of digital functions in SDVs, it is crucial that functions can be continuously developed on stable software platforms rather than being newly developed for every new generation. This is precisely what is achieved with the Neue Klasse. In the vehicle the software platforms run on the respective Superbrains, and the vehicle functions run on top of them. The "Shared Service Layer" acts as a connecting element (middleware) and provides, among other things, state-of-the-art cybersecurity and flexible over-the-air updates. It also enables customer-relevant AI functions thanks to intelligent networking of cross-domain data sources.

"With the introduction of the Neue Klasse, we are entering a mode of software development where we achieve software continuity. This means we continuously develop software rather than starting from scratch each time," says Christoph Grote, Senior Vice President BMW

Group Electronics and Software. "Based on our advanced software architecture and the fact that today our global development teams generate 130 times more software than ten years ago, we see ourselves in an excellent competitive position. More than ever, our software developers can focus on product innovations."

For the Neue Klasse, the development teams are working on well over 1,000 software modules, over 20 GB of software, and over 500 million lines of code, which will ultimately be integrated into the Superbrains and the rest of the electronic architecture in the vehicle. To achieve this, BMW has established a solid foundation for future-proof and highly effective vehicle software development in recent years. Innovative methods and tools have been anchored in the continuously growing global developer network. At the heart of vehicle software development is the integrated developer environment: a tailored tool-chain called "CodeCraft." The speed and quality of development have been enhanced with the use of a variety of tools that support the software developer with generative AI. CodeCraft runs in the cloud on up to 75,000 virtual CPUs, supports the simultaneous work of well over 10,000 software developers, and records up to 200,000 software builds per day at peak times. This corresponds to a productivity increase of more than 130 times compared to ten years ago.

Concentration of computing power for essential customer functions in four "Superbrains"

The first Superbrain carries the joy of electric driving into the future and is therefore named "Heart of Joy". In fully electric BMWs of the Neue Klasse, the first completely BMW-developed driving dynamics control system will be used: BMW Dynamic Performance Control. It enables the most precise driving experience to date, efficient energy recuperation, impressive smoothness even at low speeds, and perfect traction for dynamic acceleration. Motor and chassis control are combined in a single control unit for the first time and respond with a delay of less than one millisecond, ten times faster than the previously used control units.

The second Superbrain for automated driving controls the latest generation of automated and highly automated driving functions. It integrates what was previously distributed across four control units into one powerful computing unit and has twenty times the computing power compared to the previous generation.

The third Superbrain controls BMW Panoramic iDrive and thus the digital experience in the vehicle with the infotainment operating system BMW Operating System X. It orchestrates all content in the BMW Panoramic Vision, 3D Head-Up Display, and central display, as well as

voice interaction, entertainment, and navigation. This Superbrain ensures the intuitive customer experience of BMW Panoramic iDrive and expands it with intelligent, AI-supported, and cloud-based functions.

The fourth Superbrain is responsible for basic functions and acts as the control center for managing vehicle states. It controls fundamental functions such as vehicle access, climate and comfort, interior and exterior lighting, data flow and processing, as well as remote software upgrades. Up to 100 vehicle functions are integrated into this single unit, and it is connected to up to 50 sensors.

Intelligent preprocessing of data by the Superbrains in the vehicle enables optimized data exchange with the BMW Cloud.

Long-standing and proven strategy for software development.

BMW is managing the digital transformation with a consistent and long-term strategy. With the founding of BMW CarIT over 20 years ago, software development began in-house. Since then, the company has expanded its development teams in a global network. In total, BMW employs around 10,000 IT and software experts worldwide.

Despite a high level of internal expertise, BMW has always believed that developing the complete vehicle software in-house would never be sensible. Therefore, the company consistently pursues a strategic “Make-or-Buy” approach. This means, on the one hand, that brand-defining and differentiating software is developed in-house. This includes, for example, the infotainment operating system, which has now been developed by BMW in its tenth generation. Crucial software layers for executing over-the-air updates or the control software for the driving experience are also developed internally. Basic functionalities, on the other hand, for which leading solutions already exist and which do not significantly shape customer experience are sourced from leading companies in the industry or covered through open-source solutions.

BMW Group in the United States.

BMW of North America, LLC was established 50 years ago to support the sales, marketing and distribution of BMW automobiles and motorcycles in the U.S. In 1993 BMW Group Financial Services NA, LLC was founded, and one year later BMW Manufacturing Co., LLC began

assembling vehicles in South Carolina. In 2002 and 2003, BMW Group established MINI USA, and Rolls-Royce Motor Cars NA, LLC relaunching two iconic brands and rounding out its product portfolio.

Today, the BMW Group has a nationwide corporate footprint in the U.S. which consists of nearly 30 locations in 12 different states. Beyond the National Sales Company and Financial Services headquarters in Woodcliff Lake, NJ, its manufacturing plant in Spartanburg, South Carolina, and numerous other operational facilities, BMW Group in the U.S. also includes Designworks, a strategic design consultancy in Santa Monica, CA, BMW Group Technology Office USA, a technology research and development center in Silicon Valley, and BMW i Ventures, a venture capital fund, also in Silicon Valley.

BMW Group Plant Spartanburg is the largest single BMW production facility in the world, and the global center of competence for BMW Sports Activity Vehicles including the X3, X4, X5, X6, X7, and XM. The plant assembles more than 1,500 vehicles each day, and up to 450,000 annually. Since 1994, Plant Spartanburg has assembled nearly 7 million BMW vehicles in the U.S.

The BMW Group sales organization in the U.S. is represented through a network of 350 BMW retailers, 147 BMW motorcycle retailers, 104 MINI passenger car dealers, and 38 Rolls-Royce Motor Car dealers. The company's activities provide and support over 120,000 jobs across the U.S. and contribute more than 43.3 billion to the U.S. economy annually.

Journalist note: Information about BMW Group and its products in the USA is available to journalists online at www.bmwusanews.com , www.miniusanews.com, and at www.press.bmwna.com

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