

BMW

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The New BMW iDrive 8

- Will be introduced with new BMW iX and i4 fully electric vehicles.
- All-encompassing driver-vehicle interface
- Large combined, curved display
- Enhanced BMW Personal Intelligent Assistant
- Available 5G connectivity

Woodcliff Lake, NJ – March 15, 2021...Debuting in the upcoming iX and i4, the newest iteration of BMW's driver-passenger-vehicle interface acts as a digital, intelligent and proactive partner during the time you spend inside your vehicle. Advances have been made all-around to deliver a more natural interactive and holistic user experience between the driver and their BMW. Underpinning the unique user experience are a new generation of displays, controls, software, and extremely powerful connectivity and data processing.

iDrive 8 is designed with a focus on voice and dialogue-based interaction using natural language and touch operation via the BMW Curved Display. The BMW Intelligent Personal Assistant is the main way to interact with your BMW using voice, adjusting to the driver's routines as well as to what is happening around the vehicle. A new customer experience welcomes the driver and invites them into their BMW with a choreographed routine. It all starts with illumination of the area around the vehicle and its interior before the doors unlock automatically and the cabin is prepared for the occupants. During the journey, the new **My**

Modes use an interplay of various functions set the mood using a combination of vehicle functions and the interior ambience lighting.

The new BMW iDrive 8 is constantly processing large amounts of not only self-generated data, but also data collected from the BMW Group vehicle fleet to implement the driver's wishes in a context-related way. Paving the way for greater personalization is the **BMW ID**. This system recognizes repetitive situations, learns from them and provides suggestions on how functions can be activated accordingly. Remote Software Upgrade allows the new BMW iDrive to benefit from regular over-the-air improvements, integrate additional functions and stay up to date.

The integration of third-party apps is more comprehensive than ever. The most important applications in each individual market around the world can be imported seamlessly into the vehicle's operating system. The display and operation of these apps will be familiar to customers from their smartphones.

History of BMW iDrive

The arrival of iDrive 20 years ago saw BMW ushering in a new era of in-car operating technology. Keen to get a grip on the constantly expanding array of functions in vehicle interiors, in 2001 BMW introduced a paradigm shift in the then new BMW 7 Series – one which enabled the inexorable march of buttons and controls throughout the cockpit to be checked and reduced. In their place came a color screen in the center of the instrument panel (the control display) and a rotary dial on the center console (the iDrive Controller). This multifunctional system allowed drivers to control a large number of vehicle settings, entertainment, navigation and telecommunications functions with a single operating tool. Within the space of a few years, iDrive effectively became the new industry standard and proved to be extremely future proof.

20 years later, the developers and designers focusing on user interaction and on the user experience have faced a new set of challenges - a constant stream of new functions is joining the fray, functions are gaining in complexity all the time, and operating them needs to become easier and more natural. The BMW cars of today are intelligent and able to build a detailed picture of their surroundings and make sense of it using modern sensors and data processing. They are permanently connected to the **BMW Cloud** and therefore benefit from the combined computing power, long-term and real-time data, machine learning, and swarm intelligence generated by the 14 million connected BMW vehicles out on the roads.

The developers of the new BMW iDrive have carried over the car's expanded technical abilities into an all-embracing user experience distinguished by its intelligent symbiosis of hardware and software. Looking ahead, the car will become an increasingly smart and automated device which maintains a natural dialogue with the user. This interaction will involve the user simply making iDrive aware of their wishes and requests, while the system learns how its user behaves, comes up with suggestions in real time (based on an extensive pool of detailed knowledge) and actively proposes them to the driver – who then only needs to confirm.

What began with the introduction of a rotary dial and a digital display is now an all-encompassing, intelligent, multi-sensory experience tailored to the user. That is what the new BMW iDrive 8 represents. It brings about another paradigm shift – this time to a natural dialogue between the user and their vehicle: more intuitive, personal, but also engaging.

Design and operating concept

The first BMW vehicle to receive the new iDrive 8 system will be the iX. The all-electric Sports Activity Vehicle was developed from the inside out to deliver an engaging experience in performance, technology and inside the cabin space. Advances made in the field of digital design are reflected in the appearance of the user interface which fulfils its functional role in an extremely clear and very aesthetically pleasing way. This artistic approach uses graphics to enhance the interaction between driver and vehicle.

A prime example of this form is the use of a minimalist design language in both the exterior and interior of the car, which is carried over in the reduced design of the digital elements of the BMW iDrive. For example, the clear structures of the surfaces for the interior door trim – dominated by diagonal lines – are reflected in the graphical user interface of the BMW Curved Display. This creates an uninterrupted connection between the user interface design and the vehicle design.

The most distinctive new addition on board is the BMW Curved Display, which groups together the slim, non-reflective glass, high-resolution 200 ppi 12.3-inch information display and 14.9-inch control display. This curved screen offers a futuristic interpretation of the traditional BMW driver orientated cockpit design and gives it the appearance of almost floating. The BMW Curved Display is angled towards the driver, making the intuitive touch control very straightforward. The front passenger however still retains a full view of the displays and can operate the system by touch control with ease.

The BMW Head-Up Display features optimized graphics and additional design content to enhance the information provided to the driver. It is now integrated flush into the surface of the instrument panel with no bezel surround, and therefore fits invisibly into the minimalistic interior design.

The “**Act, Locate and Inform**” principle, which ensures information is distributed clearly, takes the BMW driver-orientated cockpit design to a new level. Pre-filtering ensures that only information relevant to the driving situation is presented to the driver – and always shown where they can absorb it as quickly and easily as possible. This is an example of the BMW Group’s “Eyes on the road – Hands on the wheel” design principle at work. The driver is shown certain instructions in the Head-Up Display (**Act**). If the route guidance function of the navigation system is activated, this is where they will see recommendations on which lane to be in or the distance to the next exit or turn. Meanwhile, a detailed map in the display behind the steering wheel offers location-finding information (**Locate**). And the large map view in the right-hand area of the BMW Curved Display provides the driver and front passenger with an overall overview of their trip. (**Inform**).

In order to provide an improved interactive experience with a more technologically sophisticated and complex product such as the BMW iX, voice control and touch functions of the BMW Curved Display are prioritized. The number of buttons and switches has been reduced by almost half compared to current vehicles. At the same time, control clusters for relevant and frequently used basic functions are retained where customers expect to find them.

The control panels on the center console and instrument panel have an all-new minimalist design. The familiar iDrive Controller is the central control element. The Touch Controller is designed in an extremely smart glass-effect finish for the BMW iX. The color and materials used for the center console give it a very sophisticated appearance. The Controller is enclosed by a panel with a High-gloss Black frame, a glass-effect surface and white backlit buttons. On the center console, the control surface with active haptic inputs subdivided by feeler bars is used to select the iDrive menus, **My Modes** and other functions. The Controller, the rocker switch for gear selection, the audio roller control and the seat adjustment buttons can also be specified in an optional polished crystal finish.

Graphical user interface

The new generation of BMW iDrive brings with it a new design language with eye-catching graphics, modern colors, futuristic textures and forms and expanded use of light to create an immersive visual experience. At the same time, the user interface has been optimized to present just the right amount of information in an easy-to-understand way.

The extensive individualization options available for the screens in the instrument display can be accessed quickly via the function keys on the steering wheel. The two-axis operating system enables user-friendly vertical list navigation of on-screen content with the rotating key, as well as toggling between menus by tilting the key horizontally. This allows the driver to move quickly between the content and layout menus and make changes via vertical list navigation. The driver can switch between three layouts and various different widgets according to personal preference by using the thumb control.

The driver can choose from a media widget, a portion of the navigation map for orientation, detailed status displays for the driver assistance systems in the Assisted View and a G-force meter, which displays longitudinal and lateral acceleration in figures and graphics. In addition, a 3D graphical range display provides a quick overview of the car's current operating range (calculated according to the current driving style), the minimum and maximum remaining range, and – if the navigation function is activated – the distance to the driver's destination.

In the **Drive** layout, drivers can use a dynamically changing area in the center of the information display to show individually selectable information. The **Focus** layout, meanwhile, has been designed for dynamic driving situations – wider instrument needles and higher-resolution dials allow driving information to be visualized in a highly detailed format. By contrast, the **Gallery** layout largely minimizes the driving information view to clear as much space as possible for widget content. For example, information on the media source currently being played, the map display or the interventions and action prompts of the driver assistance systems are presented in greater detail. In all three layouts, the driver can activate a “**calm**” mode, in which only the current vehicle speed, in digital form, is shown in the center of the information display. Color-coordinated, three-dimensional animations give each of the three layouts a distinctive character.

The new arrangement and structure of the widgets displays them horizontally, stretched across the control display. The widgets are lined up in a ribbon on the home screen. The content of

the widgets is pared back to essential information and presented as a live image. Frequently used functions are shown in the widgets and can be activated by touch. Examples in the navigation widget include a button for changing the map view or selecting the most likely destination for route guidance. The phone widget has buttons for accepting/rejecting calls and frequently selected contacts. The driver is free to select widgets on the home screen and display them in any order. As with smart devices, the user can use a long press on a widget to select it for changes and move it around via drag & drop.

At the same time, widgets can change depending on the context using fluid graphics to show more or less information, as the situation demands. The standard widgets overview gives the navigation map a prominent position. If a navigation instruction is imminent during a journey – such as an upcoming turn – the map is enlarged to give the user a visual prompt and detailed orientation information.

Three views can be selected for the navigation map. In **Adaptive** mode, the driver can view relevant information along the route, and this is adjusted according to the driving situation. The presentation of information takes on a more focused form in **Reduced** mode. For example, here only the most frequently used points of interest are displayed. **Expanded** mode shows all available information on the vehicle's current surroundings.

Like its predecessor, BMW iDrive 8 enables fast access by swiping downwards from the upper edge of the BMW Curved Display or by tilting the iDrive Controller upwards. The fast access menu contains shortcuts and frequently used functions. In addition, the user's own shortcuts can be stored and edited via the same menu (the previous-generation iDrive system used physical shortcut buttons for this process). Radio stations, navigation destinations, phone numbers and links to submenus are among the preferences that can be set as a shortcut. In each case, the type of shortcut is visualized by a symbol in the digital fast access view, so the user can quickly find their way around.

Natural dialogue with the BMW Intelligent Personal Assistant

The new generation of BMW iDrive also brings additional abilities for the BMW Intelligent Personal Assistant. For a more personal interaction, users can still give the BMW Intelligent Personal Assistant a name of their choice, which they then use as a prompt. The BMW Intelligent Personal Assistant has an important role to play in creating a natural dialogue

between the user and their vehicle. The personal assistant is the central interaction interface with the user – the “face” of the in-car intelligence.

In communication between people, a great deal of information is conveyed non-verbally. The BMW Intelligent Personal Assistant has thus been upgraded with a greater focus on how it is presented visually. This new visualization approach features spheres of light in differing sizes and brightness levels, giving the assistant more space and new ways of expressing itself. This visual image also gives it a “face” with a clearly visible point of focus and identifiable states of activity.

To also enable non-verbal communication with the vehicle occupants in the future, the user experience designers gave the BMW Intelligent Personal Assistant a visual form that also allows it to display gestures. This was based on studies with test persons who were asked to answer selected questions non-verbally. Their movements were recorded, and patterns were established in how certain moods and activities were expressed. These patterns were carried over to the new geometry of the BMW Intelligent Personal Assistant’s visual image with the help of insights from art, as used in the making of animated films. Visualizations were chosen from a selection of over 100 design approaches to be able help it express different emotions and states of mind non-verbally and in a human-like manner.

Advances have also been made in the functionality of the BMW Intelligent Personal Assistant. An expanded pool of data and information has not only made the digital assistant more intelligent, it has also enabled it to act more according to context. It can, take into account the situation in the vehicle and its external surroundings when considering how and when to communicate with those on board. And the BMW Intelligent Personal Assistant can control functions such as climate control, ambient lighting, audio playback, opening and closing of the side windows, shading of the panoramic glass roof, switching between **My Modes**, the driver assistance systems and more. The BMW Intelligent Personal Assistant also plays the role of vehicle expert by answers questions on operating functions, Check Control messages, driving history and vehicle characteristics. It also has access to information on points of interest such as restaurants, parking, shops and cultural institutions.

The personal assistant follows the shy tech principle of design in terms of how and where it is visible. When it is spoken to, it appears in a fluid animation on the relevant screen (information or center control) area and spreads out over the displays. The BMW Intelligent Personal Assistant can distinguish who is talking to it. If the driver is actively engaged, the Intelligent

Personal Assistant's visual image appears in the right-hand area of the information display or in the BMW Head-Up Display and signals its readiness to accept spoken instructions. If prompted by the front passenger, the assistant's image appears in the right-hand area of the BMW Curved Display, where it is easy to view for the front passenger. A widget designed especially for the BMW Intelligent Personal Assistant enables rapid access to other settings and suggestions. For example, it may provide the user with tips on possible voice commands or unaccessed vehicle functions which may be helpful to the driver. Its interplay with the vehicle's intelligence systems allows the personal assistant to manage complex tasks. The assistant can therefore not only operate a function on behalf of the driver, but also save them having to think about how to activate a particular function.

The BMW Intelligent Personal Assistant will learn new functions and new forms of expression as the ongoing development of BMW iDrive continues. These new features are regularly imported into the vehicle by means of Remote Software Upgrade.

Greater personalization using the BMW ID

When interacting with the BMW Intelligent Personal Assistant and using the new BMW iDrive 8, customers benefit from increased personalization of the user experience based on the **BMW ID**. Current BMW ConnectedDrive customers are able to use their existing credentials to access their **BMW ID**. In future, it will be possible to securely store more personalized settings in the **BMW ID** and transfer them between vehicles. A PIN code can be created for the **BMW ID** associated with a particular key to prevent other vehicle users from accessing personal data. Simply scanning a QR code is all it takes to create a new **BMW ID** on a smartphone. With the new **My BMW App**, which will be launching soon in the U.S. and replacing the former **BMW Connected App**, the existing **BMW ID** will be automatically imported into the car when the QR code is scanned.

This QR code method can be used to transfer the **BMW ID** securely into vehicles with BMW iDrive 8 or BMW iDrive 7. Once the **BMW ID** has been loaded, the driver will receive a personal greeting which will include the customized profile image that can be uploaded in the **My BMW App**. At the same time, personal settings for seat and steering wheel position, exterior mirrors, navigation system, driver assistance functions, display layouts, shortcuts and favorites as well as infotainment system settings will be imported automatically. Even personalized suggestions from the BMW Intelligent Personal Assistant are stored in the **BMW ID**, together with individually selected wake words and privacy settings. Once the **BMW ID** has been activated

with the associated key or by selecting the **BMW ID** function in the vehicle, the personal settings are instantly adopted.

A warm welcome from vehicle to driver

Besides producing a more personal interaction between driver and vehicle, BMW iDrive 8 also creates unique experiences to appeal to the senses. “**Great Entrance Moments**” is the name given to the user experience from the point when the driver first approaches the vehicle until the journey commences.

Ultra-wideband (UWB) radio technology is key to enabling all of this. It allows precision location pinpointing between vehicle and the key or smartphone, meaning that the car knows exactly where the driver is approaching from and how far away they are, to within a few inches. As soon as the distance drops below ten feet, the vehicle starts to wake up and indicates this with a gradually intensifying, dynamic lighting effect using the headlights and rear lights. A soft, subdued light comes on in the cabin. The vehicle shows the customer the way to the entrance area, which is lit up by a light carpet in the vicinity of the driver’s door featuring geometric forms inspired by the elements of the graphical user interface. At the same time, the door handles and trunk lid handle are illuminated.

Once the driver moves to within five feet, the vehicle unlocks no matter whether they are carrying their UWB-equipped key or a smartphone with BMW Digital Key Plus. The vehicle also now indicates that it is getting ready to drive by folding out the exterior mirrors. Opening a door activates the seat’s entry assistance feature along with the surface and steering wheel heating. The interior light illuminates the area from the entrance to the center console. The entire BMW Curved Display is taken up by a BMW-style welcome animation that shows the system is starting up.

The personal settings from the BMW profile are loaded and a connection is established with the driver’s smartphone while they are still getting into the car. If a phone call is in progress, it will be seamlessly transferred to the vehicle’s microphone and speakers. At the end of the animated sequence, information on the vehicle’s state of charge is shown on the information display. Meanwhile, the control display shows a welcome window with a personal greeting, suggestions on activating / setting up services or information on vehicle functions or available upgrades. When the start/stop button is pressed, the characteristic BMW startup sound can be heard, the headlights are aligned as required and the light in the cabin dims. “**Great Entrance**

Moments” guides the customer to their car, facilitates entry, welcomes them and makes sure they are perfectly prepared for the journey ahead.

An all-encompassing driving experience: My Modes

The new **My Modes** feature ensures an all-encompassing user experience focused on the driver’s personal preferences, creating unique moments for both the driver and their passengers. When designing **My Modes**, consideration was given to a multitude of functions relevant to the driving situation in order to maximize the functionality of the user experience. **My Modes** are designed to stimulate multiple senses, from sight to hearing to touch. They can be selected by voice command or by using a dedicated button on the center console. This will replace the **Driving Experience Control** switch in future and offer an even greater range of functions.

The initial version of **My Modes** will combine up to ten different parameters in the vehicle, whose settings are activated with a single command. These parameters include the previous driving experience mode functions, such as engine throttle and transmission control, steering characteristics and chassis settings. The activated configuration is indicated by variations in the graphics specially developed for **My Modes**, the style and layout of the displays, and a change in the display color, which adapts to the experience setting in the same way as the ambient lighting. Switching between **My Modes** produces acoustic changes, too, including adjustment of the engine/motor sound.

Efficient Mode is focused on sustainable driving and configures the vehicle to keep consumption as low as possible. The driver is given tips by the intelligent Efficiency Trainer. The design of the displays in this mode was inspired by flowing water and reflected sunlight. The interior ambience is made as calm as possible: a pleasant blue shade sets the tone for the lighting mood and the noise from the engine/motor is reduced. This all has the effect of immersing the driver in a uniquely relaxing environment.

Sport Mode, by contrast, adjusts vehicle characteristics such as acceleration and handling for a sporty drive. The power unit’s sound is increased and provides distinct acoustic feedback when accelerating. Thrilling Orange becomes the dominant color for the interior lighting, while the displays take on a pared-back, more focused appearance to help the driver concentrate fully on the road.

Personal Mode offers customers an option for creating their own **My Mode**. The vehicle characteristics are set to a balanced configuration. The customer can choose various lighting and color settings and display layouts, and also select other settings to create their personal ideal driving experience.

The new BMW iDrive 8 system will be launched with these **Efficient, Sport** and **Personal** Modes. Further modes will be added as part of the ongoing development of BMW iDrive in the future. This will also include modes that do not revolve primarily around the driver or the task of driving. Additional functions will be integrated into the modes and the options for configuring functions extended. These enhancements will be imported into vehicles via over-the-air updates.

Navigation, parking and charging with BMW Maps

The **BMW Maps** navigation system was introduced in 2020 for models with BMW iDrive 7. This first ever cloud-based system enables routes to be calculated significantly faster and more dynamically by combining real-time information with forecasting models. This means that, on longer journeys, the estimated time of arrival isn't just calculated based on the current traffic situation. Instead, probability models are used as a basis for also factoring in the traffic situations on the upcoming sections of the route in 15-minute intervals, all the way to the destination. This allows arrival times to be calculated with very high levels of accuracy – by both automotive and smartphone standards. The data pool for this is provided by the **HERE** map, enhanced by data gathered through the swarm intelligence of the BMW Group's entire connected fleet (over 14 million vehicles worldwide).

As well as incorporating real-time data, machine learning algorithms are employed in the **BMW Cloud** that compute probability models for the occurrence of certain traffic phenomena based on long-term data sets. The Cloud also contains additional contextual information on points of interest, such as ratings, opening times and images.

With the arrival of the new BMW iDrive 8, the digital services for navigation, parking and charging are fully integrated into the cloud-based **BMW Maps** system.

One of the key functions is "Learning Navigation", meaning that **BMW Maps** uses the habits associated with the individual **BMW ID** as the basis for learning and anticipating the destination the driver is likely to head for next. This saves drivers the trouble of entering the destination

again for regular journeys, especially the daily commute to work, when they may wish to be alerted to delays or hazards along their route. Information on the current traffic situation for the journey ahead and the estimated driving time are sent to the **My BMW App** prior to departure. An individually configurable Traffic Widget in the car shows the predicted destination with the accompanying traffic information. If the driver wants to find an alternative route, pressing a direct-access button activates the fastest route to the destination at the present time. All of the learned destinations can be viewed from the vehicle and in the **My BMW App**, and deleted if desired.

There is a choice of three different views for the navigation map, allowing its appearance to be customized as required. The **Adaptive** view shows relevant information along the route that is tailored to the specific driving situation and user habits. If, for example, the vehicle is running low on fuel or the high-voltage battery charge is low, fuel or charging stations in the vicinity will automatically be shown on the map. The information becomes more focused in the **Reduced** view, which only displays the four most popular points of interest and omits detailed information about the surrounding area. Meanwhile, in the **Expanded** view all available local information can be seen on the map, including points of interest such as fuel stations, charging and parking facilities, restaurants and other catering establishments, as well as the traffic situation on side roads and the current parking situation.

Prior to reaching the destination, the system will ask the driver whether it should help them search for a parking space and if they prefer to park on the road or in a car park close to the destination. The route currently being followed is adapted accordingly. For roadside parking, a parking search route is calculated based on a probability analysis. This guides the driver to their destination along a route offering a very good chance of finding a free space.

Intelligent automation of climate control

The introduction of the new-generation BMW iDrive 8 brings a reduction in the number of controls in the cockpit. Control of the air conditioning system will be incorporated into the BMW Curved Display as customers less often need to adjust the climate control settings. To make this possible, all temperature and comfort functions will now be intelligently controlled together. Each adjustment made to the settings by voice command or from the menu in the control display is registered by the system and stored in the user profile for the **BMW ID** so that users do not have to keep making the same adjustments.

The ideal pre-set configuration has been programmed based on the evaluation of more than 440 million customer trips across all model classes and regions of the world. Besides fan speed (airflow) and air distribution, the intelligent automatic climate control also regulates the steering wheel and surface heating as well as the seat heating and ventilation in order to ensure optimum levels of thermal comfort. These additional comfort functions are controlled automatically to suit the specific situation and are done independently for the driver and front passenger. To make operation of the air conditioning system as energy efficient as possible, the automatic climate control considers factors, such as the number of occupants, where they are sitting and the intensity and direction of the sunlight. This means BMW's intelligent climate control system is arguably interconnected to a higher degree than any other air conditioning system in the automotive industry.

The air conditioning is operated centrally by specifying a target temperature for each climate zone. Based on the individual user settings in the air conditioning menu, the intelligent climate control automatically regulates the airflow and operates all the additional features available itself. Consequently, there is no longer any need for manual operation of functions such as the seat heating. The current temperature settings for the driver and front passenger side are shown at the bottom of the control display, where they can be adjusted by touch control or voice command. Voice commands can also be used to communicate various requirements directly. Saying, "My feet are cold," for example, will result in the temperature in the footwell being increased. The system even recognizes which seat the request came from, allowing it to adjust settings selectively. Integrating the air conditioning readouts and controls into the control display allows additional information to be shown to the user that illustrates what the system is doing. This is the case, for example, with the blue / red animation next to the set temperature for visualizing the cooling and heating processes. The animation disappears once the target temperature has been reached.

Technology and Connectivity

BMW iDrive 8 is the most powerful and encompassing technology ever created by BMW. In recent years, there has been a huge increase in the software scopes for the iDrive system. Today, BMW's iDrive handles a wide array of tasks that extend far beyond a conventional display and operating concept. These range from integrating telematics and connected services to data processing and preparation, connecting to devices and deep integration of third-party apps or projected modes, as well as seamless integration of cloud-based services like **BMW Maps**.

The BMW Group has been developing the central control unit and software integration platform in-house, entirely on Linux since 2013. Having complete control over software is crucial for creating a stable, upgradeable, high-quality system that distinguishes the brand. In the past, the BMW display and iDrive system has been overhauled on average every three years, a cycle that is roughly half as long as the complete product development cycle for a vehicle. In the era of fast-paced digital development, it is no longer enough to completely update a model's digital features every three years, and this resulted in a fundamental change of approach in 2018.

The arrival of Remote Software Upgrade means the vehicle is now designed and conceived as a digital platform. So, when a new-generation BMW iDrive is launched, the development work is far from finished. Instead, it acts as the basis for ongoing development during the product life cycle. The interaction between the digital software platform and hardware and the ability to think of this holistically from the moment development starts are vital, as this is the only way of enabling dynamic development. The digital and functional vision aimed for at the end of the life cycle dictates what is required of the hardware in the development phase.

Remote Software Upgrade.

Since the introduction of BMW iDrive 7 in 2018, BMW drivers have been able to keep their vehicle up to date with the latest software at all times by means of the Remote Software Upgrade. New functions can be imported quickly and easily over the air, either using the car's built-in SIM card or via the **My BMW App**. The installation files are prepared in the background while the vehicle is on the move. Once this is done, installation can be launched by the customer. Remote Software Upgrade has a crucial role to play in the new BMW iDrive 8 by offering the possibility of performing extremely complex and large software updates in areas such as driving assistance and partial automation.

BMW iDrive 8 will allow customers to schedule the installation of a Remote Software Upgrade. For this, the vehicle must first be securely parked in accordance with the instructions. The installation can then be carried out automatically at a pre-set time – meaning it can be done overnight too – without the customer having to start the installation manually from the vehicle.

The BMW Group is one of the key players in the field of over-the-air function upgrades. By 2020 it was already carrying out the largest upgrade campaigns of any European carmaker. Just recently, in late February 2021, a Remote Software Upgrade was simultaneously made

available for over one million vehicles worldwide. And the BMW Group has set itself the goal of having the largest over-the-air upgradeable fleet of any manufacturer in the world by the end of 2021. By that time, a total of over 2.5 million vehicles from the BMW brand will be able to receive Remote Software Upgrades.

Fast, reliable data transmission using 5G mobile technology

The BMW iX will be the first premium model available worldwide that is compatible with 5G mobile technology. 5G offers extremely high data bandwidth and low latency – meaning fast data transmission – and also expands the possibilities for connectivity between the vehicle and its environment. It forms the basis for real-time reception and transmission of large volumes of data and sensor system information to the **BMW Cloud**. Together with the quality of service offered by the 5G network, this will bring about significant enhancements and innovations in the areas of entertainment, infotainment, automated driving and road safety. The high data transmission rates will additionally enable a far greater degree of cloudification. This involves moving vehicle functions requiring a lot of computing power to the **BMW Cloud**, where the combined performance of an entire computing center is available for processing vast quantities of data and complex tasks. The computed data is sent back to the vehicle within a few milliseconds' courtesy of 5G.

The new vehicle generation's on-board network and antenna have been designed to enable full 5G performance. The new BMW iDrive 8 has been prepared for making optimum use of the data speeds offered by 5G. Besides the integration of further cloud-based functions, this also encompasses data transmission via the four, exterior antenna to the occupants' various smart devices for example, HD-quality streaming.

BMW Digital Key Plus with ultra-wideband radio technology

BMW has been pioneering the use of smartphones as digital vehicle keys since 2018, during which time it has been relentlessly driving the development of the BMW Digital Key. The upcoming BMW Digital Key Plus version is based on the ultra-wideband (UWB) technology already integrated into the vehicle and, for example, the iPhone's U1 chip. UWB is a digital radio technology for short-range high-bandwidth applications that offers exceptionally precise location identification combined with maximum security. The high precision of UWB has the additional benefit of ruling out the possibility of relay attacks, where the radio signal is disrupted or intercepted.

Apple and the BMW Group have been working closely together with the Car Connectivity Consortium (CCC) to develop the Digital Key Release 3.0 specification for UWB, which will serve as a global standard for the automotive industry. The BMW Digital Key Plus will be first introduced for the all-electric BMW iX. The new generation of remote-control keys will likewise feature UWB technology, resulting in the same high standards of convenience and security.

More apps, greater diversity: optimized third-party integration

The new-generation BMW iDrive 8's higher degree of flexibility makes in-car use of third-party apps even simpler and more convenient in the future. BMW iDrive 8 features full integration of Apple CarPlay and Android Auto. The control display's large screen clearly presents all available apps in the system's menu. The user's favorite apps can be launched quickly and easily either via the main menu or the toolbar. The increased integration of app functions into the information display and even the BMW Head-Up Display also results in seamless transition throughout the screen grouping. And music streaming and communications apps are now integrated within BMW iDrive 8. They are displayed as original sources in the main menu, enabling customers to make full use of their apps' functions.

Centralized network architecture and Gigabit Ethernet

A multitude of extremely powerful sensors – coupled with over 30 antennae and the on-board network's highly centralized architecture, in which complex software functions are concentrated in a handful of high-performance central computers – convert the new generation of vehicles (starting with the BMW iX) into digital top performers on wheels. The technology toolkit being deployed for the first time paves the way for new, highly complex vehicle functions and redefines standards for connectivity, data processing and intelligence.

When all vehicle functions are active and operating at full load, data for processing flows through the car's network at a rate of up to 30 Gbit per second, meaning the volume is between ten and 20 times higher than in the current model generation. This is all made possible by the first ever use of Gigabit Ethernet technology in a BMW.

The growth in the volume of data is largely down to the vehicle's improved sensor technology comprising over 40 individual sensors, needed by driving assistance systems. Consequently, the data needs to be processed and evaluated instantaneously so that the functions can react

in real time. To give an idea of its capabilities, the network aboard the BMW iX can transmit the data stored on an entire DVD in a little over a second.

BMW Group in America

BMW of North America, LLC has been present in the United States since 1975. Rolls-Royce Motor Cars NA, LLC began distributing vehicles in 2003. The BMW Group in the United States has grown to include marketing, sales, and financial service organizations for the BMW brand of motor vehicles, including motorcycles, the MINI brand, and Rolls-Royce Motor Cars; Designworks, a strategic design consultancy based in California; technology offices in Silicon Valley and Chicago, and various other operations throughout the country. BMW Manufacturing Co., LLC in South Carolina is the BMW Group global center of competence for BMW X models and manufactures the X3, X4, X5, X6 and X7 Sports Activity Vehicles. The BMW Group sales organization is represented in the U.S. through networks of 349 BMW passenger car and BMW Sports Activity Vehicle centers, 143 BMW motorcycle retailers, 116 MINI passenger car dealers, and 38 Rolls-Royce Motor Car dealers. BMW (US) Holding Corp., the BMW Group's sales headquarters for North America, is located in Woodcliff Lake, New Jersey.

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