

#NEXTGen 2020.

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Buenos Aires, 11 de noviembre de 2020. The BMW Group is writing the next chapter in the future of mobility – and #NEXTGen 2020 provides the ideal platform on which to present this latest instalment. Following the highly successful inaugural event in 2019, this year's programme will be staged in digital formats. In a world that is changing more radically than ever, the BMW Group has set itself the target of continuing to spearhead technological development, set trends and be an instrumental force in shaping the future face of mobility with an attractive product portfolio and its Power of Choice strategy.

At #NEXTGen 2020 the BMW Group will open doors that are normally kept firmly shut. It showcases new technologies and vehicles, while also looking at some very specific examples of what next-generation mobility might – or will – look like. Indeed, as well as presenting highlights from the Research and Innovation Centre (FIZ), #NEXTGen 2020 will host world premieres from the BMW Motorrad and MINI brands. And the event will also take a look at the design of the series-production version of the BMW iNEXT, which will go on sale in late November 2021 badged as the BMW iX.

Oliver Zipse: “The BMW Group is constantly striving to reinvent itself.”

A rapidly approaching future sets the tone for this year's #NEXTGen 2020. Topic areas such as connectivity, electric drive systems, artificial intelligence, international alliances and BMW's new Driving Simulation Centre provide an ideal introduction to the BMW Group's role in this dynamic climate. After all, they each form an established element of the BMW Group's day-to-day reality and are playing an increasingly important role in the development of current and future vehicles. The BMW Group isn't just ready for the future – it is helping to actively shape it.

“The BMW Group is constantly striving to reinvent itself – that is a key element of our corporate strategy,” says Oliver Zipse, Chairman of the Board of Management of BMW AG. “The BMW iX encapsulates this approach in highly concentrated form.”

Production of the BMW iX will begin at BMW Plant Dingolfing in 2021. On the one hand, it amalgamates all the developments, experience and innovations accumulated by BMW in recent years in its capacity as the leading premium provider in the field of electric mobility. But its development also illustrates the crucial role already being played by artificial intelligence (AI). At the current time, the BMW Group employs AI in over 400 applications and in every relevant department of the company, for example in development, sales/marketing and production. It is also used for processing and interpreting large quantities of data. AI forms the basis for automated driving and the most natural in-vehicle operating experience possible.

Another major step along the road to future mobility – automated driving – can only be turned into reality with the aid of technology from a field in which BMW has played a pioneering role since the 1990s: connectivity. BMW already offers over-the-air software upgrades and digital services for many of its models today. The BMW iX now goes one step further as the first premium model to employ 5G mobile technology. A multitude of extremely powerful sensors – ranging from cameras to radar and ultrasonic units – coupled with numerous different antennae, from Bluetooth through to 5G, and assisted by artificial intelligence and Data-Driven Services convert the BMW iX into a high-performance computer on wheels.

The BMW Group's new Driving Simulation Centre in Munich provides an ideal setting for these activities. The most sophisticated and versatile facility of its type, this 11,400-square-metre facility is home to a total of 14 simulators, including a high-fidelity simulator and a high-dynamic simulator. These allow the experience of driving on the road to be transferred to the lab in more realistic form than ever before.

International alliances open up new avenues.

The BMW Group's alliances also highlight how determined the company is to forge new paths. For example, the engineering tools used in the past were no longer able to handle the complex requirements of the BMW iX. This was one of the reasons why BMW contacted Epic Games back in 2015 and not long after became the first carmaker to implement a mixed-reality system in vehicle development that had been created entirely using components from the gaming industry. It is based on Unreal Engine 4 from Epic Games.

World premiere for the MINI Vision Urbanaut.

When MINI presents the "MINI Vision Urbanaut" at 14:00 on 17.11.2020 at #NEXTGen, the brand will exclusively unveil its totally new vision of space. There's something to be excited about.

BMW Motorrad Definition CE 04 revolutionises the scooter segment.

Like the MINI Vision Urbanaut, the second model making its global debut at #NEXTGen 2020 is also designed for purely electric travel. The near-production BMW Motorrad Definition CE 04 scooter has evolved from the BMW Motorrad Concept Link and merges the customer's analogue and digital worlds under the motto "Plugged to Life". It offers city commuters a means of transport and communication in one, with many of the innovative elements and details of the BMW Motorrad Concept Link – which was seen as a radical vision for the distant future back in 2017 – set to find their way into series production.

This clearly shows how far electrification of the entire BMW Group model fleet has already progressed. And this is set to continue in the near future. A quarter of all vehicles sold by the BMW Group in Europe in 2021 are expected to have an electrified drive system, with this proportion rising to a third in 2025 and half in 2030.

In 2023, BMW Group customers will be able to choose from 25 electrified models, approximately half of which will have an all-electric drive system.

Modern leadership in many different areas.

At #NEXTGen 2020, the company is also exploring a variety of projects that demonstrate the meaning of leadership today. A collaboration with streetware label Kith in New York, for instance, allows BMW M GmbH to detect the latest trends in a young and influential fashion scene. The Electrified Wingsuit by BMW i represents a leap into a new dimension in every sense. With the support of BMW i and BMW Group company Designworks, Austrian Peter Salzmann used it to make the first ever flight by a human wearing an electrically powered wingsuit. These are just two examples of how the BMW Group is setting trends, picking up on new developments and anticipating what customers want.

Electric drive system .

BMW Group covers the entire process chain for electric driving .

BMW has been the leading premium provider in the field of electric mobility for many years now and has made a name for itself with innovative vehicle concepts, such as the BMW i3 and BMW i8. The company employs state-of-the-art production methods and facilities across the board in order to offer the customer a well-balanced product range whose drive systems – in keeping with the Power of Choice approach – fit in exactly with their preferences and needs. To further strengthen its leading position, the BMW Group is forging ahead with the expansion of electric mobility and its model portfolio.

“The performance of our electric drive technology – now in its fifth generation – has benefited from more than ten years of experience through the BMW i brand across all areas: the high-voltage battery, electric motor, battery cells, power electronics and charging technology,” sums up Frank Weber, Member of the Board of Management of BMW AG, Development. “This far-reaching expertise in all the major components will allow us to further increase the number of electrified models in our line-up to 25 in just over two years.”

Over a million electrified BMWs by the end of 2021.

It was the presentation of the BMW i3 in 2012 followed by its launch just one year later that kicked off the modern era of electric mobility at BMW. The groundbreaking electric car is also a fine example of the advances that BMW has made in the intervening period, as the storage capacity of the high-voltage battery in the BMW i3 has doubled since its debut – without the battery taking up any more space.

Today, some 13.3 per cent of all BMW and MINI models newly registered across Europe have all-electric or plug-in hybrid drive systems. The BMW Group expects

this proportion to already rise to a quarter by 2021, a third by 2025 and then half by 2030. BMW and MINI vehicles with an electrified powertrain are now available in 74 markets around the world. Total sales of electrified models in these markets had exceeded 500,000 by 2019 and are likely to top the one million mark by the end of 2021.

In-house developments from the BMW Group for all elements of electric drive.

The BMW Group is relying on in-house developments for all elements of BMW eDrive technology to help it fulfil these ambitious targets. The quality of the electric motors, high-voltage batteries, charging technology and power electronics is rooted in the experience garnered with the BMW i brand since 2011.

The BMW Group will in future manufacture battery modules, high-voltage batteries and electric motors for its electrified models on eight production lines at its competence centre for electric drive systems in Plant Dingolfing. The company plans to install a further four lines over the coming years and ramp up production capacity significantly. Having started with 8,000 square metres of production space in 2015, the competence centre for electric drive system production is set to grow tenfold to 80,000 square metres. The objective is to produce electric drive systems for over half a million electrified vehicles a year in Dingolfing alone as soon as 2022.

Dingolfing already boasts many years of expertise in the manufacture of electric vehicle componentry – the high-voltage batteries for the BMW i3 have been volume produced here since 2013 and the facility has also been building electric motors since 2015. Today, Dingolfing exemplifies the BMW Group's Power of Choice approach; its innovative production system allows plug-in hybrid and combustion-engined models to roll off the assembly line here alongside fully electric models. This makes the facility a prime case study in how to address the diverse spread of mobility solutions and requirements in play today and to come in the future.

BMW Group covers the entire process chain for electric driving.

The company's equivalent to Dingolfing for battery expertise can be found in Munich. The Battery Cell Competence Centre opened in 2019 maps the entire value chain of battery technology – from research and development via composition and design to large-scale production. This means the BMW Group is already developing forthcoming generations of battery cells, focusing on customer-relevant aspects such as improving energy density, peak output, service life, safety, charging characteristics and performance at varying temperatures, as well as cost reduction.

In 2022, the centre's findings will be put into practice at the BMW Group's new pilot plant for manufacturing lithium-ion battery cells. Currently under construction in Parsdorf near Munich, the facility marks a decisive step in the company's quest to continue strengthening its position as the leading premium provider of electric

mobility. This pilot plant will make BMW the first carmaker to cover the entire process chain for electric driving in-house.

The BMW electric powertrain strategy revolves around the Power of Choice, i.e. providing the customer with the best and most appropriate overall package for their individual requirements every time. As far as electric mobility is concerned, this is primarily a question of striking the perfect balance between performance and range. The development of cutting-edge testing methods and test cases was an important step along this path and has also led to increased efficiency and faster processes.

With this in mind, the BMW Group's E-Drive system test rig in Munich assists with the development of new system components from day one and enables testing of any conceivable driving manoeuvre. To this end, high-dynamic dynamometers can simulate any combination of rolling, air, gradient, acceleration and inertial resistance in all manner of different conditions – driving in sun, snow, wind, rain, through a city centre or even on the Nürburgring-Nordschleife. And this can all be done every day, round the clock. The facility even allows test drives to be conducted remotely from the engineer's home. So electric drive system development work at BMW never stands still – and it is getting faster all the time. The E-Drive system test rig plays a central role here, helped by what is arguably its most impressive feature: the ability to test parts that are not yet available in finished product form by simulating them as virtual components. Together with increased process efficiency, this serves to shorten the development time for innovations by as much as one-and-a-half years.

Fifth-generation eDrive: major benefits for production and sustainability.

The fifth generation of BMW's eDrive technology is now entering the fray. Key advantages of this highly integrated electric drive component include the absence of rare earths, a compact construction resulting from the integration of electric motor, transmission and power electronics into a single housing, and the flexible scalability rooted in the technology's modular design. The drive system is compatible with all vehicle concepts and available in a range of power ratings for different models. It will also feature in the BMW i4 and BMW iX models from 2021.

In keeping with its status as a trailblazer for sustainability, the BMW Group has signed contracts with its suppliers committing to the use of green power only from now on in the manufacture of fifth-generation battery cells. As production volumes increase, the switch to green power will save around ten million tonnes of CO₂ over the coming decade. That is roughly the quantity of CO₂ generated by a city the size of Munich every year.

"The BMW Group is already working on the development of new vehicle concepts that will help shape the future of electric mobility. Because electric drive is not merely a technical innovation and a logical step towards greater sustainability – it also has the potential to open up a new dimension in driving pleasure," says Martin Schuster, Head of Development E-Powertrain. This is currently being demonstrated behind closed doors by the company's "Power BEV" experimental vehicle, as it

explores the limits of the technically possible. Three fifth-generation electric motors producing a maximum system output of over 530 kW/720 hp have been fitted in a current BMW 5 Series production model. This trio of drive units were integrated without encroaching on the passenger compartment and deliver extremely dynamic longitudinal and lateral performance. The prototype is equipped with two independently controllable electric motors at the rear axle. These promise pure driving enjoyment thanks to their E-torque vectoring function, as electric drive brings a new and richly engaging angle to the driving pleasure for which BMW is renowned.

Connectivity.

The ultimate in connectivity, computing power, data processing and intelligence.

The principle of swarm intelligence is best known from bees. The individual members of a hive interact and communicate with one another, cooperating as a single organism to also make intelligent decisions, for instance when searching for a nesting site or the most efficient route to a source of food. Such decisions based on information from a swarm tend to be far more intelligent than those taken by one individual on their own.

The same principle underpins a key aspect of connectivity at the BMW Group. As Christoph Grote, Senior Vice President BMW Group Digital Car, explains: Our customers already benefit directly from the swarm intelligence of our connected fleet today. Smart vehicles use their sensors to gather information on traffic, parking spaces, hazardous situations or road signs, for example. This data is aggregated in anonymised form in the BMW cloud and evaluated with the help of machine learning. Relevant information is then fed back to the vehicles, depending on the specific situation. This gives each individual vehicle access to the collective knowledge of 14 million others, and in some respects the swarm will know more than a human possibly can.”

Digital vehicle platform.

It is the high degree of connectivity within the BMW vehicle fleet that makes all the difference. BMW has over 20 years of connectivity experience under its belt. The company installed the first SIM card in a vehicle back in 1997 before going on to lay the groundwork for connected, more individual mobility with BMW ConnectedDrive. Things have progressed at a rapid pace in the meantime. The new digital platform being introduced with the BMW iX sets new standards for connectivity, performance and intelligence. When all vehicle functions are active and operating at full load, the amount of data for processing flowing through the car's network is between ten and 20 times greater than in the current model generation, with data rates of up to 30 Gbit/s. This is all made possible by the first ever use of Gigabit Ethernet technology in a BMW.

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. The growth in the volume of data is largely down to the vehicle's improved system of sensors and is needed for the driving assistance systems.

A multitude of extremely powerful sensors coupled with over 30 antennae and the highly centralised architecture in which complex software functions are concentrated in a handful of central high-performance computers convert the BMW iX into a digital top performer on wheels. It is the first model to feature this technology toolkit, which paves the way for new and highly complex vehicle functions.

Connectivity as an enabler.

This all underpins extremely fast processing of the acquired data. Part of the pre-processed data from the vehicle is transmitted to the cloud at BMW, where the aggregated and anonymised fleet data is analysed and evaluated with the help of machine learning. Relevant information is then sent back to the vehicles, depending on the specific situation, where it helps to increase comfort, efficiency and safety for the driver.

Vehicles with On-Street Parking Information, for example, are already capable of not just showing the driver where there is a parking space, but also estimating the likelihood of it being available at the calculated arrival time. Taking this data as a basis, the route offering the greatest probability of finding a parking spot close to the destination can be calculated for the remainder of the journey, saving customers time and stress. At peak times, cars searching for parking spaces account for as much as one third of the total volume of car traffic in large cities. Shortening the search for parking would therefore result in considerable fuel and emission savings in urban areas, meaning that everyone benefits.

This advanced degree of digitalisation and connectivity is ushering in a new generation of vehicles at BMW that will enjoy continuous improvement during their life cycles. Since the introduction of the modular BMW Operating System 7 vehicle software in 2018, BMW has been offering extensive over-the-air Remote Software Upgrades for its latest generation of models. As a result, BMW vehicles are always up to date, no matter whether they are fresh off the production line or already in action out on the road. The largest and most extensive upgrade campaign in the company's history got underway in mid-October 2020. More than 750,000 BMWs around the world are set to receive an array of new functions and improvements, such as the cloud-based navigation system BMW Maps and the integration of Android Auto™. This is the largest over-the-air update ever to have been rolled out by a European manufacturer.

BMW Group to become the first premium manufacturer with 5G in series production.

The BMW iX will now go one step further by becoming the first premium model to be equipped 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 data and sensor system information to the BMW cloud. Together with the improved 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 transferring vehicle functions requiring a lot of computing power to the BMW cloud, where the combined performance of an entire computing centre is available with the ability to process vast quantities of data and complex tasks. The computed data is sent back to the car in a matter of milliseconds courtesy of 5G.

This cellular mobile technology and, most notably, the 5G standard also have the potential to connect vehicles with other road users. C-V2X (Cellular Vehicle to Everything) solutions allow cars, motorcycles, buses and trucks to communicate with one another, with the smartphones of pedestrians, cyclists and scooter riders and even with the infrastructure directly without any need to connect to the mobile network. This enables information such as direction of travel to be shared in specific traffic situations and warnings of potential hazards to be transmitted.

5G is nothing less than the next level of connectivity and it represents a crucial advance for mobility's next evolutionary step.

More complex functions, simpler operation.

The increasing functionality and connectivity of vehicles and their extensive digitalisation inevitably add to the complexity of the overall system. By contrast, vehicle operation is becoming simpler, more intuitive and more natural. This is made possible by increasing levels of intelligence and function automation on the one hand, but also through the deployment of shy tech and pared-down, clearly arranged controls like those in the BMW iX. As vehicle intelligence increases, more complex functions can be taken off the driver's hands, allowing the person at the wheel to focus purely on the essentials and the pleasure of driving. If on-board intelligence is handling more tasks and more information is being made available, this also means that the vehicle is playing a more active role in the interaction between human and machine. After all, in a mobility context, vehicles sometimes know more than the driver: where the next free parking space or fast-charging point is, for example, or that heavy rain is starting to fall a few hundred metres further on, that a corridor for emergency vehicles needs to be formed in a couple of miles, or that there is an upcoming temporary speed limit due to moving roadworks – all information that is relevant for the driver. What is crucial here is that the right information is presented in the right place at the right time, allowing the driver to react and interact in an appropriate manner for the situation at hand. Interaction design at BMW clearly focuses on multimodal operation using a combination of physical controls and touch, voice and gesture control.

Accumulated digital expertise in development.

At the BMW Group, a team of digital experts strive for perfection as they work together eagerly to integrate groundbreaking technologies into a car and fuse hardware and software to harmonious effect. They interconnect mobility and the digital world and turn the vehicle into a highly integrated, integrative device that dovetails seamlessly with the customer's digital ecosystem.

The BMW Group operates with an international network of developers stretching from China via Europe – through the Research and Innovation Centre in Munich and Critical TechWorks in Portugal – to various sites in the USA. This way, different skills and areas of technical expertise and, most notably, the differing customer requirements of each region are incorporated into the design and development phases. The young team of more than 7,200 software and IT experts encompasses a diverse range of disciplines, including software engineers, UX designers, psychologists, data scientists, as well as specialists in AI, robotics, autonomous driving and smart production. Agile work processes and methods in workspaces that have been purpose developed for collaboration lend themselves to short development and innovation cycles.

On average, 70 customer studies a year are conducted in relation to interface design alone. These studies are an essential component of customer-centric and data-driven development. They allow prototypes to be continuously checked for user-friendliness and compared against the customers' mental model. Clear feedback is evaluated and subsequently fed directly into the next development steps. Development also factors in anonymised data from the vehicle fleet. The information from the vehicles of customers who have actively consented to data being transmitted is depersonalised and aggregated in order to provide a picture of how the majority of users behave and how behaviour varies in different regions of the world. Further customer-centric development tools include specially designed dialogue formats as well as trend scouting and research.

The overriding objective is to develop a system that is as easy and intuitive to use as possible, suited to all customer groups and therefore highly flexible and customisable.

Virtual collaboration.

BMW Group is using technology from the gaming sector.

What does gaming sensation Fortnite have to do with the BMW iX? It's a question that might leave even BMW connoisseurs and gaming experts with a blank look on their faces. And yet the most successful computer game of recent years – it recorded 350 million players in May 2020 – and the BMW Group's new technology flagship do indeed share common ground: they used Unreal Engine from Epic Games in their development.

What may sound astonishing at first is, on closer inspection, actually quite logical. After all, with the BMW iX embodying the dawn of a new age in driving pleasure, a radical change in thinking was needed in the development process. Existing engineering tools were no longer fit for purpose given the car's complex specification brief. Added to which, BMW had set itself the goal of elevating the functionality and user experience the BMW iX offers its customers to unprecedented levels.

"We took the development of the BMW iX in totally new directions," explains Frank Weber, Member of the Board of Management of BMW AG, Development. "For example, we used innovative technologies from the gaming industry to visualise the interface between design and technology as realistically as possible. The BMW iX is the first car to be developed using the game engine we modified."

Partnership with Epic Games.

These were two important reasons why BMW decided to rethink the development of the BMW iX from the ground up. The company contacted Epic Games back in 2015 – and it wasn't long before it became the first carmaker to introduce a mixed-reality system into the vehicle development process in which components from the gaming industry played a central role. The system is based on Epic Games' Unreal Engine 4, which also powers Fortnite and the racing simulator Assetto Corsa Competizione.

"Today, gaming technologies offer many of the functions – for example, virtual reality and the interaction between users – that we are lacking in our engineering tools," explains Matthias Oberhauser, Product Owner Design and Virtual Product Experience BMW. "That's why we have taken a lead from gaming technology for this project. In 2015 a small team at BMW set about modifying the game engine so we could use it in vehicle development."

The tech duly saved a considerable amount of time and money in the early development stages, in particular. Before this system started work, virtual reality testing was only possible with the help of expensive, specialised equipment. Using consumer electronics gave the developers a previously unimagined degree of flexibility, as they could implement and test changes extremely quickly. In addition, developers around the world could get involved in decision-making from wherever they happened to be, removing the need to travel long distances. Only when designs have been assessed in virtual reality and using 3D glasses are they turned into physical models for further testing.

"When BMW came to us, we were surprised at first," recalls Doug Wolff, Business Development Manager, Manufacturing Epic Games. "But then we were really excited about the idea of using innovative technologies from the gaming sector in vehicle development – especially at the interface between design and technology. You can certainly say that BMW leads the way in both the automotive industry and beyond when it comes to collaboration tools based on game engines."

Mixed reality assists BMW iX development.

However, BMW went a step further in the development of the BMW iX. An example here is its use of technology for the car's spectacular interior. As visual impressions are often not sufficient in this area, BMW employed a reusable interior design. The use of rapid prototyping – a fast-paced process for manufacturing sample components – adds a mixed-reality dimension to the development process. I.e. it benefits from the intelligent combination of surfaces you can actual feel and control elements presented using virtual reality.

The result is an all-encompassing experience enhanced even further by accurate reproduction of the signature BMW engine sound, for example. Using the virtual reality model allows the vehicle to be experienced in a variety of environments. The totally realistic vehicle impression created in this way is currently unique in the automotive industry.

The ability to present vehicle functions and new interior concepts extremely quickly by means of these visual experiences in the virtual reality space opens up various new avenues – for example, simulation of journeys through cities. Here, it is possible to test aspects including visibility over the area around the car and to check how different viewing angles and seating positions affect the view of a display on a screen or how difficult it is to reach. This gives the development engineers the impression of experiencing a real-life road situation inside an actual car.

BMW Group extends use of gaming technology into other areas of the company.

The BMW iX is the first car to have been developed at BMW using gaming technology. It meant the engineers and designers were not only able to assess the static geometry of the car, they could also experience the BMW iX and all its functions virtually at every stage of the development phase.

However, for BMW this is only the beginning. The potential of gaming technology for future projects is enormous; it is capable of revolutionising not only vehicle development but also other areas, such as design, production and sales/marketing. Indeed, the BMW Group is already employing the short development cycles of consumer technology in many other areas of the company. And it has now developed the technology into a platform which is used in almost all processes and is being further expanded. Other BMW projects – such as factory planning and sales organisation – are now learning and benefiting from the experiences gained in the production of the BMW iX.

Artificial intelligence.

The basis for automated driving and natural interaction .

The BMW Group currently employs artificial intelligence (or “AI” for short) in more than 400 applications and in every relevant area of the company. Development is one example; here AI provides the basis for automated driving and the most natural possible in-vehicle user experience. “Artificial intelligence plays a central role at the BMW Group,” says Simon Euringer, BMW Group, Head of Intelligent Personal Assistant. “It helps us with the processing and interpretation of large quantities of data – whether that’s in sales, production or research.”

Extensive data pool provides the basis for all AI applications.

Artificial intelligence requires an extensive pool of data, whatever the application. In order to virtually reproduce driving situations at the Driving Simulation Centre and, in the next step, train BMW Group vehicles for automated driving, the actual road network and traffic situations first need to be digitalised.

The basis for data-driven development therefore consists of the data collected worldwide by the vehicles of the BMW Group Automated Driving Test Fleet, plus – since the end of 2019 – the data from vehicles owned by BMW Group customers, who have consented to this anonymised information being transmitted and processed.

As of October 2020, this already equates to over 250 million kilometres of real-world driving experience from the regions of Europe and North America. From the totality of data from these two sources – the BMW fleet and BMW customer vehicles – particularly relevant driving scenarios and environmental factors are selected and their relevance is continuously increased.

Particularly challenging scenarios for AI-based simulations are, in turn, extracted from this to ensure that the intricacy of reality is taken into account as fully as possible in the development of complex driver assistance systems like the Driving Assistant Professional and future automated driving applications.

These vast quantities of data are processed by the BMW Group High Performance D3 platform with over 230 petabytes of storage capacity (in the planned expansion) and an extremely powerful computer platform with more than 100,000 processor cores and over 200 GPUs (Graphics Processing Units).

The development of automated driving with the BMW iX.

AI creates an algorithm based on the data collected, and this then calculates safe and anticipatory automated driving functions. So without AI, automated driving cannot progress. All of the results of the calculations are tested directly at the BMW Group Autonomous Driving Campus in Unterschleißheim, which is connected directly to the BMW Group High Performance D3 platform located just a few kilometres away by high-performance fibre-optic cables.

In the future, the BMW iX will play an important role in the ongoing development of automated driving. “With its all-new technology toolkit, its computing power, high-performance sensor technology, highly advanced data-driven development and embedded AI for processing complex tasks, the BMW iX offers the potential to continue developing automated driving functions year after year,” says the BMW Group’s André Roskopf, an expert in data-driven development and AI.

AI can already be experienced in BMW vehicles.

Artificial intelligence can already be used and experienced by drivers and passengers in BMW Group vehicles. The Intelligent Personal Assistant (IPA) – available in a large number of models since the end of 2018 – employs AI to make it easier for customers to use functions in their vehicle. The driver activates the IPA using the prompt “Hey BMW” and can operate a host of functions by voice control without having to use pre-defined commands. “The key here is AI and machine learning. These are indispensable elements of natural interaction – i.e. intuitive vehicle operation – and enhance both the comfort and safety of those on board,” explains Simon Euringer.

Driving Simulation Centre.

The new benchmark for the automotive industry .

When the BMW Group was planning its all-new Driving Simulation Centre, the technology the company decided to use included supercapacitors, direct drive with linear motors and 360-degree projectors. At the same time, the entire planning process was made customer-centric. The outcome is a Driving Simulation Centre that sets new standards.

“With 14 simulators on a site measuring 11,400 m² in total, our new Driving Simulation Centre in Munich is the most advanced and diversified facility in the automotive industry,” says Frank Weber, Member of the Board of Management of BMW AG, Development. “Here, simulators with a wide range of motion systems are being built – all the way up to highly dynamic units that use direct drive with linear motors to recreate a realistic BMW driving experience. This takes us to a new level of virtual development.”

Building work in Munich began in 2018 and the new Driving Simulation Centre will be put into operation gradually. Here, the BMW Group is turning the most progressive concept in the automotive industry into reality. The company is creating every opportunity for its vehicle research and development engineers to simulate and test the product requirements of the future under realistic conditions.

Optimum simulation tools for every stage of development.

The new Driving Simulation Centre will provide the ideal simulation tool for every area and every phase of the vehicle development process. At the same time it will take customer involvement in the development process to a whole new level. "We can perform test drives for studies with up to 100 test persons per day," says Michael Brachvogel, Head of BMW Group Research, Interiors, User Interaction, User Experience and Driving Simulation, who involves not only BMW Group engineers but also external test persons in the virtual test drives. "The new Driving Simulation Centre makes an enormous contribution to our customer-centric product development. We can integrate direct customer feedback into the development process at any given moment."

Virtual experience of every last detail.

For years now, driving simulation has played a key role in the driving dynamics segment of the development function at the BMW Group. The new Driving Simulation Centre will enable the virtual development process to be further expanded, thereby reducing the number of prototypes that need to be built as well as the duration of the development cycle. "Both in the early phase of development and at the validation stage, every nuance that goes to make up that signature BMW driving feeling can be sampled in the state-of-the-art simulators," says Thomas Lachner, a driving simulation expert with the driving dynamics development team.

The Driving Simulation Centre is the perfect response to the ever-increasing requirements facing the development of intelligent, highly connected vehicles. New display and control concepts can be subjected to intensive tests, for example to analyse the risk of driver distraction or the effectiveness of the multi-modal controls. "With the aid of extensive tests in the driving simulator we can design our systems in such a way that our customers in their vehicles obtain the right information at the right time and in the right place – all in the most intuitive way possible and in every conceivable driving situation," says Marion Mangold, team lead User Interaction Concept.

Traffic scenarios that involve risk or occur only rarely are almost impossible to test on the road. So driving simulation offers major advantages, in particular for the development of driver assistance systems and functionalities that will in future be automated. In the simulator, these kinds of situations can be replicated safely and in great detail as often as required. "Our preparations for the introduction of our driver assistance functions are extremely thorough. Driving simulation is a major factor in ensuring that we can develop the best and safest products for our customers," says Manuela Witt, expert for Safety-in-Use and Effectiveness Analysis.

Total immersion in seamless simulation.

The Seamless Simulator Experience was conceived by the BMW Group's simulation experts with the aim of immersing test persons much more deeply in virtual driving situations. For example, in selected studies test persons wearing a VR headset will in future make their way from a virtual BMW or MINI dealership to the vehicle waiting outside for a test drive. They only remove the headset immediately

before entering the simulator. This leads to a very high level of immersion. “This way we get very valid and robust results for the optimisation of our user functions,” says Martin Peller, overall project manager of the new Driving Simulation Centre.

High-end simulators use direct drive with linear motors for a realistic BMW driving experience.

In the high-fidelity simulator, driving scenarios are reconstructed in great detail and with high precision. This means that, for the first time, complex urban driving situations – which present a particularly wide range of challenges for automated driving systems – can now be replicated under laboratory conditions. In this simulator’s almost 400-square-metre motion area, longitudinal, transverse and rotational movements of a vehicle can be represented simultaneously. The simulator is capable of putting a total mass of 83 metric tons through maximum acceleration of 0.65 g. For its part, the High Dynamic Simulator – the second highlight of the new Driving Simulation Centre with a 21-metre sled and a moving mass of 23 metric tons – can generate longitudinal and lateral acceleration of up to 1.0 g. It permits the replication of highly dynamic evasive action, emergency braking and hard acceleration.

These two high-end simulators move on a sophisticated system of wheels and rails, which reacts virtually instantaneously to driver inputs such as steering commands. Acceleration is provided by linear electric motors with no moving parts. These hover above a series of magnets, using much the same technology as maglev trains. Supercapacitors deliver the peak power required by the motion system in fractions of a second, while regenerative braking is used to resupply them with energy.

BMW iX.

The dawn of a new era.

The BMW iX is the BMW Group’s new technology flagship. It opens the door to the next level in all-electric driving pleasure and, in the process, ushers in a new age of mobility focused on a reinterpretation of design, sustainability, driving pleasure, versatility and luxury.

Due to come onto the market at the end of 2021, the BMW iX is currently in the final phase of development. It takes all of the knowledge, experience and innovations amassed by BMW – the leading premium supplier in the field of electric mobility – over recent years to a new high point. This is the first BMW model to be based on an all-new technology toolkit and was conceived from day one for purely electric mobility.

“The BMW Group is constantly striving to re-invent itself. That is a central element of our corporate strategy,” says Oliver Zipse, Chairman of the Board of Management of BMW AG. “The BMW iX expresses this approach in an extremely concentrated form.”

Fifth-generation BMW eDrive technology delivers outstanding efficiency and high range.

The new era of mobility will unfold at BMW Plant Dingolfing from 2021. The BMW iX leads the way with future technologies that will also be incorporated into other BMW models in the foreseeable future. At the heart of the BMW iX is the fifth generation of BMW eDrive technology, which encompasses the car's two electric motors, its power electronics, charging technology and high-voltage battery. The power unit was developed by the BMW Group and is manufactured in a sustainable production process without the use of critical raw materials known as rare earths. According to the latest predictions, its maximum output will exceed 370 kW/500 hp, with 0 – 100 km/h (62 mph) possible in under 5.0 seconds.

The drive system delivers not only impressive driving dynamics but also a combined electric power consumption figure of less than 21 kWh per 100 kilometres in the WLTP test cycle (the most relevant method at market launch). This is exceptionally low for its segment. With a gross energy content of more than 100 kWh, the latest-generation high-voltage battery enables a range of over 600 kilometres in the WLTP cycle. That equates to more than 300 miles according to the EPA's FTP-75 test procedure. (All figures relating to performance, energy consumption and range are predicted values based on the car's current stage of development.)

DC fast charging at up to 200 kW allows the battery in the BMW iX to be replenished from 10 to 80 per cent of its full capacity in just 40 minutes. Stopping off at a fast-charging station allows users to top up the car's range by more than 120 kilometres (75 miles) within ten minutes.

The batteries fitted in the BMW iX are designed as part of a long-term resource cycle and enable an exceptionally high recycling rate. "Technology is driving the advances we need to tackle even the greatest challenges. This applies in particular to climate protection," says Oliver Zipse. "We are firmly convinced that mobility has to be sustainable if it is to represent a truly outstanding solution. For the BMW Group, premium mobility is not possible without responsibility."

Design for a new kind of mobility.

The BMW iX also raises the bar in terms of design. Its innovative use of forms redefines the successful BMW Sports Activity Vehicle (SAV) concept. Muscular exterior proportions, a flowing roofline and reduced surfacing turn the locally emission-free model into an experience space delivering comfortable mobility both in day-to-day use and over longer journeys. At the same time, with dimensions roughly similar to those of the BMW X5 and BMW X6, the BMW iX exudes a new kind of poise and authority anchored in sustainability, driving pleasure and premium characteristics.

One visible symbol of the fusion of innovation and design at work in the BMW iX is the new kidney grille design, which is fully blanked off and performs a digital role as

an intelligence panel. Camera technology, radar functions and other sensors are integrated seamlessly into the grille behind a transparent surface with a three-dimensional pyramid structure. This provides the driver with advanced assistance systems that pave the way for automated driving. The surface of the kidney grille has a self-healing effect which can repair minor scratches, for example, within 24 hours at room temperature.

Shy tech: the seamless and invisible integration of high-tech functions.

Users can sample the groundbreaking design of the BMW iX in most depth when inside the car, although they begin to experience the “shy tech” principle in play here while climbing aboard. Shy tech refers to technology that remains largely in the background and only reveals its functions when they are being used. On entry into the car, the function in question is the electrically powered door locks. The interior welcomes the occupants of all five seats with a luxurious lounge-style ambience, and provides the space required to explore new ways of using time spent inside the car.

The omission of the centre tunnel gives the cabin an airy and spacious feel, and ensures passengers in the second row also enjoy extremely generous legroom. This further accentuates the lounge-style ambience and long-distance comfort provided by the interior.

The displays and controls are all stripped down to the essentials, and the shy tech approach for the interior can be seen in a number of features, including speakers that have been integrated out of sight, intricately styled air vents, heated surfaces and the BMW Head-Up Display’s projector, which is recessed discreetly into the instrument panel. For the first time in a model from the BMW Group, there is the option of integrating speakers into the seat structure. Meanwhile, the hexagonally shaped steering wheel (making its debut in a BMW), a rocker switch for gear selection and the BMW Curved Display that forms part of the next-generation BMW Operating System clearly advertise the futuristic form of driving pleasure on offer. The BMW Curved Display is held in place by a supporting structure that is concealed from the occupants’ view, so it appears to be standing freely in the cockpit. This new technology takes the traditional driver focus of a BMW cockpit to the next level, uniting the 12.3-inch instrument cluster and 14.9-inch Control Display to form a single unit that curves towards the driver.

“No other user interface on the market can be operated as simply and as safely as ours,” says Frank Weber, Member of the Board of Management of BMW AG, Development. “In the BMW iX we have taken this to a new level with a new digital vehicle platform.”

Optimised aerodynamics and lightweight design for increased range and efficiency.

As well as impressing in terms of design, sustainability, driving pleasure and premium characteristics, the BMW iX also convinces with the technology underpinning this new age of mobility at BMW.

Credit for the drive system in the BMW iX goes to the fifth generation of BMW eDrive technology, which encompasses the car's two electric motors, its power electronics, charging technology and high-voltage battery. BMW teams the eDrive tech with far-reaching measures for optimising aerodynamic properties and minimising weight. The interplay of these three factors enables even lower energy consumption and therefore increased range. The handling qualities of the iX and the level of comfort inside the cabin likewise benefit from reduced drag and the car's bodywork structure, with its aluminium spaceframe and pioneering Carbon Cage.

The drag coefficient (Cd) of the BMW iX is just 0.25 – proof of its outstanding aerodynamics. The driver experiences the tangible effects of this aerodynamic efficiency most clearly in the form of significantly increased range. The bespoke aerodynamics measures for the front end, rear end, underbody and wheel areas alone succeed in adding over 65 kilometres (40 miles) to the range of the BMW iX.

MINI Vision Urbanaut.

Make it your space.

When MINI presents the "MINI Vision Urbanaut" at 14:00 on 17.11.2020 at #NEXTGen, the brand will exclusively unveil its totally new vision of space. There's something to be excited about.

BMW Motorrad Definition CE 04.

"Plugged to Life" – a new form of urban two-wheel mobility .

With its electric drive system, trailblazing design and innovative connectivity solutions, the BMW Motorrad Definition CE 04 is setting out to change the face of the scooter segment as we know it. This close-to-production further development of the BMW Motorrad Concept Link links the customer's analogue and digital worlds under the banner "Plugged to Life" and doubles up as a means of transport and communications hub for city commuters. Add intelligent rider equipment to the mix and the result is an all-embracing, emotionally engaging and newly conceived mobility experience.

As Edgar Heinrich, Head of Design at BMW Motorrad, explains: "Electric mobility is a key form of drive system for the BMW Group and we are employing this technology consistently in our sustainability strategy. Electric drives are also a relevant topic for BMW Motorrad, especially for the urban environment. Since 2013, we have been a pioneer in this area with the BMW C evolution scooter. The BMW Motorrad Definition CE 04 is the logical continuation of the electric mobility strategy for urban centres and provides a concrete preview of what a near-production bike

for taking two-wheeled electric mobility in cities to a new level – both technically and visually speaking – might look like.”

Innovative architecture and pioneering design.

The segment-shaping design of the Definition CE 04 embodies a new urban aesthetic and stylistic evolution. Many innovative elements and details of the BMW Motorrad Concept Link – which was seen as a radical vision for the distant future back in 2017 – are now approaching production readiness. The technical composition of the electric drive system enables groundbreaking design that responds to the fundamental requirements of today’s users in terms of straightforward functionality, a clear aesthetic and their digital reality, and represents a departure from established scooter styling. Clear lines, large surfaces in Mineral White metallic and precise forms create modern proportions. The two-tone colour split adds to this impression. The technical heart of the Definition CE 04 – made up of the drive system, single-sided swing arm, spring strut and tooth belt – is painted matt black. Plus, the slim batteries in the underfloor section and the compact drive unit on the rear wheel offer scope to explore new avenues. The side-access compartment (which can accommodate a helmet, for example) is a case in point. The lower centre of gravity brought about by the low-mounted battery pack ensures playful handling and dynamic riding pleasure.

Practical and ergonomic.

The drive unit and battery pack are designed for a practical everyday bike designed to transport users from home to workplace, or to evening get-togethers with friends. The urban target customers mainly travel short distances of approximately 12 km (7.5 miles) each day, so although the seat should be comfortable it does not require particularly heavy padding. Cue the floating bench design, which also allows riders to climb on easily from the rear and improves ergonomics for single riders, regardless of their leg length or body size.

Connecting the rider with their surroundings.

The BMW Motorrad Definition CE 04 also shines the spotlight on practical and user-oriented solutions when it comes to digital applications. BMW Motorrad sees significant future potential in the interaction between the rider and their equipment in terms of safety, comfort and the emotional experience on board. For example, the rider can connect with their surroundings via a combination of the BMW Motorrad Definition CE 04 and their smartphone. The 10.25-inch display is the largest of its kind so far in the scooter segment and serves as an interface between the rider’s analogue and digital worlds.

Rider equipment joins the outward communications toolkit.

The new rider equipment also enhances connectivity. And if desired, it can even help the scooter communicate with its surroundings. The clothing range developed

exclusively for the BMW Motorrad Definition CE 04 centres on a casually cut warm parka designed for everyday use. Light guides integrated into the sleeves and hood provide improved visibility on the road. They are activated by sensors in the sleeves and can change colour.

To ensure the rider remains contactable at all times, the parka's inside pocket has an inductive smartphone charging panel. The rider equipment therefore slips seamlessly into the user's life and has a cool look which is both urban and extremely practical. The new range, which also includes black riding jeans, stylish sneakers and a white open-face helmet, allows the rider to climb off the bike easily and get on with their day. As well as being extremely comfortable to wear, the rider equipment naturally also offers the protection riders expect from BMW Motorrad and even becomes part of on-bike outward communications.

Graphics as a unique styling feature.

The unobtrusive graphic design showcases the new concept to optimum effect. Completely different design variants are also conceivable that allow customers to express their personality – from modern elegance through to an urban look.

#NEXTGen Voices.

At the cutting edge of development.

For a company such as the BMW Group, being at the cutting edge of development involves far more than just assuming a leading role in automotive production. It also means setting trends in numerous other fields and staying receptive to new movements and customer requirements.

Drivers for Change: a talk about leading transformation.

The automotive industry is currently in a period of transformation that the BMW Group is actively driving. Vehicles such as the BMW iX, the MINI Vision Urbanaut and the BMW Motorrad Definition CE 04 are all outward signs of this. For a company with a global presence, however, this transformation is far more profound and impacts not just products, production and process chains, but the individual employees too.

The “Drivers for Change” talk being held as part of #NEXTGen 2020 will highlight how leadership drives change. Steffi Czerny, co-founder and Managing Director of Digital Life Design (DLD), will be the host of this panel with Member of the Board of Management of BMW AG for Human Resources and Labour Director Ilka Horstmeier and Marie Langer, CEO of EOS GmbH, as they discuss transformation, what it means, how to guide it and the opportunities it presents. Discussion topics will also include the role of motivation and inner conviction in the forthcoming transformations.

A new form of sport – BMW's involvement in esports.

BMW has always been a true global player when it comes to partnerships and involvement in sport. In 2020, the company stepped up its presence in the world of esports to add arguably the most exciting sporting discipline of the moment to its portfolio. This includes partnership deals with some of the major esports teams as well as fielding a strong BMW squad in the fast-growing sport of sim racing. The focus here is always on the protagonists. Under the campaign slogan 'United in Rivalry', for example, BMW is partnering with the Cloud 9 (US), Fnatic (UK), FunPlus Phoenix (CN), G2 Esports (DE) and T1 (KR) teams as they do battle in the hugely popular League of Legends World Championship. The company is appealing directly to younger target groups with an all-new approach and posting some exceptional storytelling on BMW's esports social media channels. One milestone along the way was the "Berlin Brawl" in August, which saw G2 Esports and Fnatic go head-to-head, interact with their fans and create a digital buzz.

"As with all our sporting commitments, we will be supporting the discipline as a whole and helping it evolve in our role as global esports partner," says Jens Thiemer, Senior Vice President Customer and Brand BMW. "This is a long-term development we are fully committed to. We're here to stay." The same applies to the company's involvement in virtual motor sport with BMW Motorsport SIM Racing. The digital replicas of racing machines such as the BMW M8 GTE, BMW M2 CS Racing and BMW M4 GT4 take centre stage at BMW Cup events held on various simulation platforms. The highlight of the season, taking place on 5 December 2020, will be the BMW SIM LIVE event, in which the most successful SIM racers of the year do battle for prize money of over 30,000 US dollars.

Both in SIM racing and other esports, BMW highlights the sporting angle above all. "We want to not only develop esports as entertainment, but also establish it as a genuine sport," says Thiemer. "Part of this involves impressing on the participants that physical and mental fitness are extremely important factors. The time they spend at their PC or console has to be suitably measured. Responsible use of time online is equally as important as preventing addiction and getting the physical balance right."

These issues will join a list of other topics concerning BMW's latest sporting involvement on the agenda when the brand hosts a major meeting of the esports industry entitled "BMW Esports Boost" at BMW Welt on 12 April 2021. A string of new announcements are in store, along with fascinating meetings between some of the major esports stakeholders. And fans will also play an important role at this event. It is precisely this direct contact with a young audience that is so important to BMW. "With esports, we are coming into contact with a young and dynamic community which is growing all the time around the world," adds Thiemer. "We're aiming to get young people excited about BMW. And we do that by creating new touchpoints with our brand, making ourselves visible and interacting with the community."

Lifestyle on four wheels: the BMW M4 Competition x KITH.

BMW M GmbH has launched a collaboration with New York lifestyle label Kith to help it sense new trends in a young and influential part of the fashion scene. The BMW M4 Competition x KITH has been co-created with Kith founder and BMW enthusiast Ronnie Fieg and features truly unique exterior and interior design details. It will be built in 2021, with production limited to just 150 units. Kith will also be offering a 96-piece collection of exclusively designed apparel and accessories in all of its stores and online. Deliveries of the limited special-edition model will commence in summer 2021.

New, merged logos are a hallmark of the partnerships Kith has forged with other globally renowned companies. And now BMW has also – for the first time – altered its badge for a collaboration partner. For the 150 units of the BMW M4 Competition x KITH, an extra ring was added around the familiar BMW roundel in the BMW M colours light blue, dark blue and red. Plus, there are details in bright lettering focusing on Kith and the collaboration. The M4 Competition badge served as the template for a KITH logo also featuring the BMW M stripes. This can be woven into the surface of the special-edition model's carbon-fibre roof as an extremely eye-catching option.

Available to order in the colours Frozen Black, Frozen Dark Silver and Frozen Brilliant White, the special-edition model is based technically on the BMW M4 Competition Coupé (fuel consumption combined: 10.2 l/100 km [27.7 mpg imp]; CO2 emissions combined: 234 g/km*). The most distinctive changes are found inside the cabin. Exclusively designed features include the tri-colour M Carbon bucket seats with detailing in light blue and red, as well as the embossed KITH lettering in black leather on the head restraints and centre armrest.

Leaping into a new dimension: The Electrified Wingsuit by BMW i.

When visionary power is brought together with innovative spirit, great things can happen – like the leap into a new dimension with The Electrified Wingsuit by BMW i. Following three years of preparation and with the active support of BMW i and BMW Group company Designworks, Austrian base jumper and wingsuit pilot Peter Salzmann made the world's first ever flight by a human wearing an electrically powered wingsuit. BMW i was very receptive to Salzmann's idea of using a lightweight electrically driven impeller – a type of shrouded propeller – in order to attain higher speeds during wingsuit flights and also regain height while flying.

The engineers from BMW i brought all their expertise and experience in electric mobility and battery technologies to bear, while the Designworks experts were also involved from the outset, helping with both the development of the fly unit – which featured two carbon-fibre impellers, each with an output of 7,500 W at approx. 25,000 rpm and around five minutes' worth of peak combined output (15 kW) – and the design of the wingsuit. Extensive testing in the BMW Group's wind tunnels subsequently allowed the necessary fine-tuning to be carried out and confirmed that the idea worked.

The result is The Electrified Wingsuit by BMW i, which enabled Salzmänn to fulfil his dream of elevating wingsuit flying to new heights – in a very efficient, sustainable, quiet and generally astounding way. Peter Salzmänn epitomises the BMW i ethos to perfection with his ideas, passion and courage. The Electrified Wingsuit by BMW i demonstrates what electric power is capable of and proves that the future is electric.

Seeking a Vision for 2040: #NEXTGen Moving Tomorrow Pitch.

At #NEXTGen 2020, the BMW Group will also be taking a look into the distant future in search of a Vision development for mobility in 2040. To this end, the company invited entries for the #NEXTGen Moving Tomorrow Pitch from students, research assistants and professors at top universities and research institutes all over the world. The aim is to find the interdisciplinary team with the best vision for sustainable and individual premium mobility in the year 2040.

The BMW Group has chosen three finalists from the entries submitted. Two teams from Tsinghua University in China and one from the Fraunhofer Institute in Germany will be presenting their visions at #NEXTGen 2020 in Munich in a video lasting no more than five minutes followed by a live two-minute Q&A session on Skype with the panel of three judges. The panel will consist of Ilka Horstmeier, Steffi Czerny and Dr. Andreas Rickert, CEO and founder of PHINEO. The winning team, who will be announced by the judges straight after the presentations, will have an exclusive opportunity to meet top BMW Group executives as well as receiving €15,000 in prize money.

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