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# 1. **BMW ConnectedDrive – a new milestone in networked mobility.**



BMW ConnectedDrive has been setting the pace in the field of automotive connectivity for many years now, and is renowned for forward-looking in-car concepts and technologies that maximise customer benefit. The new functions mark another milestone in the BMW ConnectedDrive success story and once again demonstrate how the BMW Group is striving to retain its status as the leading innovator in this area.

- The new generation of the BMW Navigation system Professional boasts more powerful and impressive performance than ever, featuring a design rendered entirely in 3D, a modified display and control concept as well as a host of extra Navigation, Office and Multimedia functions.
- Dictation function with full speech recognition system: for the first time, the driver is able to compose short texts for emails and SMS messages while driving by simply dictating them. Meanwhile, the function for recording voice memos then sending them by email ensures that any flashes of inspiration at the wheel can be instantly preserved.
- BMW iDrive Touch Controller: following the addition of a multi-touch touchpad, not only does the Controller allow characters to be entered with the finger, it lets drivers navigate in maps and websites or magnify them.
- Product debut: the BMW LTE Car Hotspot ushers in the next generation of mobile internet. This particular accessory makes the BMW Group the first car manufacturer to bring the ultimate in high-speed mobile internet to the road – and, what's more, for every BMW.
- Integration of smartphone applications from third parties: the BMW Group's Software Development Kit (SDK) facilitates the integration of third-party apps into the vehicle's native control and display logic, allowing drivers to use their favourite apps in their car, too.

## **2. The new-generation BMW Navigation system Professional.**



### **2.1 Taking display and control into the third dimension.**

It was back in 1994 that BMW became the first carmaker to offer a built-in navigation system when it made such a system available for the BMW 7 Series. The functionality of navigation systems from the BMW Group has increased enormously since that time, so that route guidance is now just one of a whole array of functions designed to interconnect driver, vehicle and the outside world as intelligently as possible. The new generation of the Navigation system Professional is yet another milestone achievement for the BMW Group.

The new-generation BMW Navigation system Professional instantly makes a winning impression, boasting a new design and an optimised control concept that give its various displays an even more sophisticated, even sharper, even more attractive look. The readouts appear against a black background in a very reduced layout, and the state-of-the-art feel is further intensified by an atmospheric lighting effect. Overall, the new display concept makes the contents even clearer to read and the functions even easier to use. For the first time, the individual menus are structured entirely in virtual, three-dimensional spaces and calculation is performed in real time. Quite apart from allowing smooth scrolling and browsing, the high-performance system with a 1.3 GHz processor and dedicated 3D graphics chip features top-quality animations and dynamic transitions to make the whole operating experience an immensely enjoyable one.

The previous system's proven menu navigation has been deliberately retained for the new generation of the BMW Navigation system Professional, while new functions have been added to enhance the system's capabilities and enrich the customer experience. For instance, a new spatial dimension has been added to the way in which the menu levels are displayed: when sub-menus are selected, they appear dynamically from the right, while the corresponding top menus fade into the background on the left, where they are still visible. In this way, the tactile feedback for the user is accompanied by a direct visual confirmation of their interaction with the vehicle,

which furthermore allows them to clearly see their current position within the menu structure on the display.

## 2.2 Navigation that breaks new ground.

Besides the new menu display, the route guidance graphics and the map views within the navigation function have also been modified and improved by the addition of various interactive options. The split-screen portion of the central information display, for example, now includes new display functions for the navigation mode. While the driver is still entering the destination by selecting the country, city and street, the chosen destination additionally appears in the map view on the split screen for easier orientation. If necessary, the driver can use a zoom function to change the section of map shown and check that the selected destination is the intended one.

### **High Guiding and 3D City Models.**

For the purposes of actual route guidance, the familiar guiding function using arrows in the split screen has now been supplemented by a High Guiding variant, which clearly flashes up detailed navigation information in the multifunctional instrument cluster display, the central information display as well as the Head-Up Display. High Guiding is automatically activated when the vehicle comes within a certain range of the next navigation instruction: from a distance of 300 metres outside built-up areas and 150 metres in built-up areas, the reduced arrow display switches to a detailed bird's-eye perspective of the surrounding area. The driver furthermore receives precise directions for changing lane at the right time. As the driver draws closer to the event, the display gradually shifts from the bird's-eye map view to an overhead view of the traffic situation for optimum orientation and guidance. A dynamic display of the vehicle's present position calculated in real time serves as an aid that allows drivers to closely track their progress throughout the turn-off phase.

The new navigation view option "3D City Models" features a realistic depiction of surrounding streets and buildings to help drivers get their bearings, provided such a visualisation of the city in question is stored in the vehicle's database.

## **The extended toolbar – putting extra functions at the driver's fingertips.**

In navigation mode, there is now an extended toolbar that, for the first time, allows the map contents to be customised quickly and easily without having to exit from the map view. The desired change takes effect immediately, and the driver is able to effortlessly switch the view to suit the current situation and the information required. The moment the driver selects the icon for the extended toolbar with the iDrive Controller, a second toolbar appears as an extension of the original icon bar. This can then be used to open additional selection options in the same view, which were previously only accessible via Option menus. The settings here allow the user to call up Real-Time Traffic Information (RTTI) or weather information, for instance, to display POIs, or quickly switch from the overhead map view to the bird's-eye view. Depending on the data required, drivers are therefore able to activate individual features, quickly find the necessary information, and then return to their preferred map view.

## **Interactive map and PIE menu.**

The new BMW Navigation system Professional also adds several new functions to the interactive map view. The iDrive Controller can now be simply turned to alter the map scale or tilted to move the section of map in the display, even in a diagonal direction. Another new feature of the interactive map view is the ability to call up special functions directly from the map itself. All the driver has to do is select a point on the interactive map and the PIE menu will open up in front of the map, providing quick and easy access to a wide range of actions. Depending on the information stored, the driver just has to click to show points of interest in the vicinity, view details for them (where available), start navigation to them, change the map view or display the current location or destination. And should any additional data be available for the selected location, such as a telephone number, website details or an email address, the driver can retrieve this information with a click too, then visit the homepage, for example, or write an email. The real beauty here lies in the system's straightforward, intuitive and quick operation.

**RTTI – Real Time Traffic Information.**

The latest generation of the BMW Navigation system Professional once again employs RTTI technology for calculating routes and diversions accurately and reliably by factoring in the real-time traffic situation for both route guidance and calculation of the arrival time. By using the 3G mobile network and the vehicle's built-in SIM card, RTTI offers the benefit of faster data transmission combined with more extensive coverage. What's more, the new system extends beyond motorways and major highways to cover country roads and even a large number of urban routes as well.

## **2.3 Office functions: connection of two telephones and new-look calendar.**

The arrival of the new BMW Navigation system Professional also sees new functions being added to the BMW ConnectedDrive Mobile Office portfolio. It is now possible to have two telephones connected to the vehicle simultaneously, in which case the contact details from both are combined into a joint contact list for phone calls and emails. Calendar and contact information is imported in next to no time thanks to the high-performance hardware, meaning that both telephones are fully readied for in-vehicle use as quickly as possible.

The calendar from an integrated smartphone is now displayed in an enhanced, new-look format. Appointments are visualised in the same way as in popular email programs, while the daily view and calendar navigation have been further simplified, too.



## 2.4 Multimedia – more music, favourites and extended radio functionality.

On the multimedia front, a 40 GB hard drive makes for a far richer in-car entertainment experience. Meanwhile, the Music collection search function has been reprogrammed to allow the desired track to be located for playback even faster than before. The extended toolbar principle is once again employed for fast access to additional sub-menu options, as well as even greater simplicity and ease of operation.

New playback functions have been added for a more pleasurable entertainment experience. If the driver likes the song that's currently playing, for instance, and would like to hear more of the same, simply activating the new "More like this" function generates a new playlist containing similar tracks from the Music collection. The facility for saving favourites in the Music collection by clicking on the "Add to favourites" star icon during playback is another new feature. All favourite tracks can then be found together by going to the Playlists menu item.

### **Radio+: seeing what you're hearing.**

For the first time, FM radio programmes are accompanied by graphics in the central information display's player screen, just like digital radio. Where FM radio stations broadcast the necessary data (via radio text or radio text+), the artist, album and genre cover will now be visualised in the same way as they are when listening to DAB radio or using a top-of-the-range device. And even if no data is transmitted by the station, a generic genre cover and the station name will be displayed for a neat, high-quality effect.

### **BMW Online widgets.**

Besides the online functions, widgets can be displayed in split-screen mode. These miniature versions of the BMW Online browser apps have been optimised for the split screen, and blend harmoniously into the high-quality display of the remaining contents. It is initially planned to include a clock as well as a Panoramio widget, with further widgets set to follow.

### **3. BMW iDrive Touch Controller – fingertip control at its finest.**



The introduction of the BMW iDrive Touch sees the development team at the BMW Group integrating a touch-sensitive pad into the iDrive system's central control unit, the iDrive Controller, for the very first time. Measuring 45 mm across, the multi-touch surface makes certain in-vehicle control functions more intuitive, faster and easier to use.

Incorporating the touchpad into the iDrive Controller means it is ergonomically positioned where it is easy to reach: with entry, selection and confirmation being performed in the usual way using the control knob's rotate-and-press mechanism, the direct proximity to the touchpad means there is no need for any fumbling around.

The touch surface will initially be made available for the Chinese market from July 2012 and will add various convenience-enhancing functions to the iDrive Controller, including handwriting recognition as well as navigating in maps. One year later, availability of the iDrive Touch and these new functions will be extended to almost all other markets. At this point, a function for surfing the internet is also due to be added, which will allow the mouse pointer to be controlled in exactly the same way as on many handheld devices.

#### **Handwriting recognition.**

The handwriting recognition function enables characters to be entered with the finger by simply "writing" them on the surface of the touchpad. Whereas previously this could only be done with the "Speller" – a circular arrangement of letters in the display – by turning the control knob, the touch-sensitive surface now recognises the letters and the Speller instantly jumps to the right point of the alphabet. To further reduce driver distraction, a voice output repeats the character that has been recognised.

The handwriting recognition function is a tremendous boon for the Chinese market especially, which is why the BMW iDrive Touch Controller is making its debut there. With several thousand characters and as many as 21 strokes per character, entering text is a far more complex task than with the Latin alphabet. The reason the iDrive Touch Controller is of such great benefit in

China is that the sequence of strokes for starting Chinese characters is basically set in stone, meaning that the selection of characters is already narrowed down considerably with the very first stroke entered by the driver. The choice is further refined with each additional stroke, allowing rapid selection of the relevant character.

**Map navigation.**

Apart from recognising handwriting, the iDrive Touch also makes it possible to navigate freely within the route map shown in the display and zoom in on it, too. The scale is changed using the two-finger pinch gesture already familiar from many laptops and smartphones. If there is a traffic jam ahead, for example, the driver can adjust the scale of the displayed portion of map using the touchpad, move the view to the hold-up and take a look at the suggested alternative route. The driver can also use touch control to mark the points of interest (POIs) stored in the map, then press the control knob to confirm his choice and display more detailed information. The later version of the iDrive Touch will furthermore allow the mouse pointer to be moved across the display while surfing the internet, just like on a home PC. Pressing the iDrive Controller will then have the same effect as clicking with the mouse.

## 4. The BMW LTE Car Hotspot brings ultra-high-speed mobile internet to the road for the first time.



The BMW LTE Car Hotspot ushers in the next generation of mobile internet, and will make the BMW Group the first car manufacturer to bring the high-speed mobile internet experience to the road when it is launched in November 2012. All that is required apart from the BMW Car Hotspot is an LTE-capable SIM card, which is inserted into the hotspot. Once it has been put into service in the vehicle, the adapter works just like any hotspot, meaning the passengers can enjoy LTE high-speed internet access on any devices they connect up. The hotspot additionally comes with a built-in battery pack and antennae, allowing portable use for up to 30 minutes outside the vehicle without an external power supply. A standard USB power supply unit even enables fully autonomous use without the need for either vehicle or battery.

Users connect their device via WiFi to the BMW LTE Car Hotspot, with its Long Term Evolution technology for going online. Of course, the adapter also allows multiple devices to be linked up simultaneously, so that the LTE internet connection can be shared by all passengers. Meanwhile, the galvanic connection to the vehicle aerial not only improves reception, it reduces radiation inside the car, too.

The BMW LTE Car Hotspot fits into any BMW centre console with a phone base plate, and can be retrofitted quite easily without changing the aerial and without a great deal of installation work. Even older BMW vehicles can be easily equipped with the latest in mobile internet technology by adding this accessory.

In areas where LTE is not yet available, the adapter will switch to the UMTS or GSM network.

### **LTE – high-speed internet.**

Streaming music or videos from the internet to a mobile device or to the vehicle is already a reality today, with the data being transmitted over the mobile phone network. The bandwidth of the present UMTS 3G standard is restricted, however, meaning that media often cannot be streamed in

optimum quality. And because sufficient network coverage isn't available everywhere, not only is video playback sometimes in low resolution, it is jerky too, while music streaming is plagued by pauses.

Long Term Evolution (LTE) technology will soon put an end to such annoyances. Also known as 4G, LTE is one of the fourth-generation mobile standards, and therefore represents the next generation in communications technology after GSM (2G) and UMTS/HSPA (3G). What makes LTE so special is its exceptionally broad bandwidth combined with very low latency: 3G is currently only able to achieve a theoretical data transfer rate of 14 Mbit/s, whereas the maximum with LTE is ten times that. With speeds of up to 150 Mbit/s and latency of just a few hundredths of a second, LTE paves the way for a mobile internet experience that matches – and in some cases even surpasses – that offered by a home PC with dedicated broadband line.

**Coming soon: LTE for the SIM card integrated in the vehicle.**

This will also herald benefits for the mobile services already being offered today under the umbrella of BMW ConnectedDrive, making them faster, more effective and even more widely available. Server-based services, such as in-car video and music streaming, will become even more attractive and easier to use as a result of the high bandwidth and low latency offered by LTE. By incorporating LTE technology into its vehicles, the BMW Group is ideally poised for taking the portfolio of BMW ConnectedDrive in-vehicle services to a whole new level.

After becoming the very first carmaker to offer in-car internet access with the launch of the BMW Online portal in 2001, this latest move further underlines the BMW Group's great innovative flair in the connectivity stakes.

## 5. Product debut: Message dictation function.



The new generation of the BMW Navigation system Professional adds various new speech functions to the BMW ConnectedDrive Mobile Office portfolio, most notably a dictation function that employs a full speech recognition system to simply transcribe the driver's words. The dictated text can then be sent by SMS or email. There is furthermore a voice memo function for making recordings up to two minutes long, which can then either be sent in an email or archived. Meanwhile, the new, more intuitive voice control allows virtually all functions of the BMW Navigation system Professional to be operated more simply, easily, quickly and, most importantly, safely than ever.

### **Dictation function – writing by speaking.**

People are communicating increasingly by email or SMS, both privately and for business. The BMW Mobile Office functions already made it possible to have messages from a Bluetooth-connected mobile device displayed in the vehicle and read out. With the arrival of an automotive world first in the form of the dictation function, this feature is now complemented by a full speech recognition system. For the first time, this gives drivers the ability to dictate text freely and compose short text-based messages simply by saying what they wish to write.

Using a mobile device to write messages while at the wheel is a dangerous distraction from what's happening on the road, which is precisely why it is prohibited in many countries. The dictation function changes all that, however, as it allows short emails or text messages to be composed quickly, easily and, above all, safely while on the move all by the power of speech – with no need for drivers to take their hands off the steering wheel or their eyes off the road. The multilingual dictation function can recognise text read out in six languages at present. Just as with similar desktop applications, punctuation marks and instructions such as “new line” can be dictated, too, if the driver wishes to obtain an end result that is grammatically correct and easy to read.

The speech recognition technology is supplied by the company Nuance under the name Dragon Drive! Messaging, and the recognition work is performed on a remote server while the text is still being dictated. The sheer

volume of the cloud server's vocabulary is of tremendous benefit for a full speech recognition system, as it allows it to draw on millions of words without having to take up any memory space or computing power in the vehicle. Just a few seconds after dictation has been completed, the transcribed text will appear in the display and can also be read out if desired. Needless to say, drivers have a number of easy-to-use editing tools at their disposal for conveniently putting the final touches to emails and SMS messages.

**Voice memos and more intuitive voice control.**

The range of office functions offered by BMW ConnectedDrive has been expanded by another speech-based feature, too. The voice memo function, in contrast to the dictation function, allows the driver to make direct voice recordings of up to two minutes in length and send them straight away by email if required. The great beauty of this is that it allows the driver to make a quick note of any ideas or to-do lists with an additional facility for forwarding them to whoever they may concern – without any great distraction from what's happening on the road. Alternatively, drivers can simply take the recorded memos with them on a USB stick when they leave the vehicle.

The improved voice control offered by the Navigation system Professional is designed to enable more intuitive operation of practically all functions by allowing the driver to phrase commands or questions in whole sentences (in German or English at present) and call up multiple functions with a single utterance, in the same way that the navigation destination can be entered with just one statement. The result is a voice control system that is even more intuitive and easy and convenient to use, making it safer too. All the driver has to do to phone someone, for example, is say the command: "Connect me with John Smith", whereupon the system recognises both the desire to make a phone call and the person the driver wishes to speak to. This works regardless of which order the first and surnames are registered in. The system then double-checks that the displayed number should be dialled before placing the call. The already sophisticated method of destination entry has also been further simplified and speeded up. The prompt "Navigate to London, 63 Park Lane" is sufficient to complete entry of the navigation destination. It is even possible to start composing an email or SMS message by voice control regardless of the current position in the menu structure. This can also be done by stating the intended recipient's name

when in Contacts and selecting their email address, which the system then automatically adds to the address field. All that now remains to do is to enter the subject and text of the message using the dictation function. The upshot of this is that speech can now be used to activate or initiate virtually all functions and actions – from tuning in to a radio station to modifying route criteria. What's more, the system is as unerring in its answers to questions such as "How do I adjust the sound settings?" and "Are there any traffic messages" (when in the map view) as it is with system-related queries instigated with a simple "Help" or "What can I say here?"

**Voice control at the BMW Group.**

The BMW Group has built up many years of experience with voice control of vehicle functions. The introduction of full-word commands in 2006 was followed by a further milestone in 2009, when the BMW Group became the world's first carmaker to offer a system capable of understanding an entire address – i.e. town, house number and street – read out in one go. By so doing, the BMW Group once again set a new standard for rapid, precise entry of navigation destinations. The voice-controlled search for music on the internal hard drive introduced in 2009 was another unique feature, and in 2010, voice control was extended again to include external music players. The overriding aim of voice control is to facilitate easy, quick and, most importantly, safe operation of the increasingly complex array of infotainment functions, especially for navigation, entertainment and telephony/communication applications.



## 6. Third-party apps – “BMW ready”.



In 2010, the BMW Group became the first carmaker to enable comprehensive, application-based integration of the Apple iPhone into vehicles. Apps extend the range of in-car services using the smartphone, making it possible to use features such as web radio, Google™ Local Search or Facebook™ safely and easily in the vehicle. But that's just the start, as the application-based concept is designed to allow the use of “external” apps, paving the way for third-party services to be integrated into BMW and MINI models. With these third-party apps, the range of functions can basically be expanded at will: updating the app or installing another compatible app simply adds new functions, without having to make any modifications to the vehicle itself.

By integrating these third-party apps, the BMW Group gives customers the option of continuing to use the preferred service providers already familiar to them when driving in their car, too. In future, this will allow the wide array of infotainment functions that BMW drivers enjoy when at home or out and about to be smoothly transferred to their vehicle.

### **Software Development Kit for third-party apps.**

In order to ensure optimum integration of third-party applications into the vehicle, the BMW Group offers providers a special Software Development Kit (SDK). The SDK contains guidelines and specific tools that are intended to help the third-party providers develop compatible, vehicle-adapted versions of their apps. Following an approval process, the applications are certified by the BMW Group for MINI Connected, BMW Apps or Rolls-Royce Connect and made available to load on the smartphone.

The prerequisite for all apps is that they meet the requirements for distraction-free operation. The SDK consists of the framework as well as the necessary development tools (e.g. a simulation of the iDrive control logic in the vehicle [HMI]). The framework seamlessly integrates the apps into the display and control concept, thereby allowing them to be operated using the iDrive Controller and the steering wheel buttons. The app is also able to use the audio system and process vehicle data. Deeply embedding the app in the

BMW display and control concept in this way forms the basis for optimum usability during the journey.

**BMW Apps go Android/Expanding to include Android.**

From July 2013, smartphones powered by Android platform will also be able to benefit from application-based integration. With a market share of more than 50 per cent, Android has become the most prevalent smartphone operating system. The BMW Group is therefore vigorously driving forward development in this area. By extending application-based smartphone integration to Android users as well, BMW now covers the bulk of the smartphone market and is opening up BMW apps to an even wider community.

The first concrete results are currently taking shape. The BMW Group specifically chose Samsung as its pilot partner for Android integration. The company is the world market leader across all mobile phone segments, including Android powered smartphones, making it an obvious choice for the BMW Group to join forces with Samsung for the launch of the app-based integration of Android. Android integration will be gradually rolled out to include further manufacturers. The BMW Group is once more highlighting its leadership claim for in-car smartphone integration.

**Leading the way for many years.**

Opening up the platform for apps from other providers once again underlines the leading role played by the BMW Group when it comes to integrating mobile devices and internet-based services into the vehicle. The BMW Group became the first carmaker to enable integration of the Apple iPod into its vehicles' audio systems back in 2004. And in 2007, the BMW Group gave an exclusive presentation of the first technology for integrating the iPhone into its in-car infotainment system in time for the phone's launch.