



BOSCH

January 5, 2016
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Invented for life:

Bosch solutions for a simply connected world

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Bosch Group,

at the Bosch Press Conference, CES 2016, Las Vegas, NV

January 5, 2016

Check against delivery.

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Good morning, everyone. A very warm welcome to the Bosch press conference. I'm really thrilled to be here at the center of the consumer electronics universe. Let's have a look at some of the innovations that are going to shape our lives in the years to come.

It's an environment in which I feel right at home. After all, we at Bosch are fond of saying that we have innovation written in our corporate DNA. It's been an essential part of our identity for nearly 130 years now.

What's important to understand, though, is that our founder, Robert Bosch, wasn't interested in innovation for innovation's sake. Instead, he believed, and I quote, that "improvements in the world of technology and business should always also be beneficial for mankind." It's thus not by chance that "Invented for life" has become the strategic imperative for our work. It's evident in the products we're showcasing here at CES.

I'd like to introduce you to one of those products right now – a new touchscreen we've developed. It's really extraordinary. And we're not the only ones who think so: it won a "CES 2016 Innovation Award" in the in-vehicle audio and video category. Although it looks like a normal vehicle display, when touched, the screen responds with haptic feedback as well as visual and acoustic signals. Running your fingers over the screen, you can actually feel the individual keys. To trigger an action, you press down firmly, as if you were pressing a real button.

Want to try it out for yourself? We're featuring it at our booth in the North Hall in a show car. It's certainly cool, but it also has real implications for safety: to operate your radio or navigation system, you barely need to take your eyes off the road. In the best possible sense, it's "Invented for life."

Before I tell you more about the other solutions we're exhibiting, I'd like to give you just a few key facts about Bosch. Worldwide, we employ some 380,000 people in more than 60 countries.

This includes a strong presence in North America: we now employ over 30,000 people and have more than 100 locations across the continent. I'm also pleased to tell you that our business here is doing very well: in 2015, Bosch recorded year-on-year sales growth in North America of 7 percent in dollar terms. This is considerably higher than we expected.

As you know, we're a leading global supplier of mobility solutions and some of you might have household appliances or power tools from us at home. But we're also one of the leading suppliers of industrial technology such as packaging machinery, and of energy and building technology, which encompasses everything from security to heating systems. In all of these areas, we're pursuing innovation in electrification, automation, energy efficiency, and not least, connectivity.

As a company, our strategic aim is to create solutions that make life easier, safer, more comfortable, and more eco-friendly – across the globe. And we believe that new solutions have to focus first and foremost on users and their needs. One of the keys to achieving this is making them connected – "Simply.Connected."

Unlike many traditional hardware companies, though, at Bosch we recognized the potential of the internet of things very early on, and began building up our expertise accordingly. Of the 55,000 associates we currently employ in research and development at more than 100 locations worldwide, one-third are software engineers are concerned solely with the internet of things – a figure that we expect to rise.

Today, Bosch is the only company that is active on all three levels of the IoT: sensors, software, and services. We're more than just a solutions provider for the internet of things – we're a fundamental enabler of it. And we're better positioned than almost any other company in the world to take advantage of the opportunities it brings. The result is connected solutions for smart homes, cities, mobility, and industry – the four areas of application we're showcasing here.

To better facilitate this work, we've become a company of two speeds. In areas where absolute reliability and safety are required, development according to traditional processes remains essential. However, where agility and flexibility are needed, we apply faster approaches like the scrum method. What is commonly used in software development is now increasingly valuable for hardware as well.

In this way, we are combining the requirements of the worlds of industry and IT. Even in our automotive business, we're supplying new players such as Google and Tesla. It remains to be seen whether this business will develop in an evolutionary or disruptive way, but one thing is clear: Bosch is already part of it.

With this in mind, we're actively promoting entrepreneurship within the company. For example, two years ago we established our own start-up platform, which is designed to rapidly make research findings outside our core business ready for the market. This has given rise to a number of start-ups so far: one has developed the Bonirob, an agricultural robot

capable of identifying plants and weeds, thus minimizing the use of fertilizers and pesticides. Another focuses on solutions for warehouse logistics. And a start-up based in Palo Alto is working on domestic robots.

That said, a start-up culture is nothing new for us. We have several successful businesses that started as spinoffs. One great example is our subsidiary Bosch Sensortec. We set up this company as a start-up ten years ago to provide MEMS sensors for consumer electronics applications. MEMS stands for micro-electro-mechanical systems. Three out of every four smartphones worldwide now feature a Bosch MEMS sensor. Statistically, that means three-quarters of you have a Bosch product in your pocket right now.

But these innovative sensors are not just for cell phones. They're used in a wide variety of domains, and we're the leading global supplier. Since we started producing them for automotive applications in 1995, we've manufactured nearly seven billion, and currently ship four million a day.

These sensors are the crucial element behind a lot of our most innovative products and services. But before I introduce them, I'd like to tell you more about the sensors themselves. They quite literally form the bedrock upon which the IoT is being built.

They're small parts, but they have a big impact: they save lives, increase driving comfort, and help conserve energy. MEMS sensors are the eyes and ears of many mobile electronic devices, measuring things like acceleration, sound, temperature, and air quality. They make billions of things smart, enabling them to share information about themselves and to communicate with one another. They're in cars, computers, game consoles, wearables, appliances, and many more smart objects. Our product showcase offers you the chance to experience the many ways in which these sensors improve our everyday lives.

This year we're exhibiting a number of important new additions to our sensor portfolio. We have a 9-axis sensor with possible applications in areas like augmented reality and robotics. We also have a new cross-domain development kit for professionals. Here, we're taking a sensor platform we've been using ourselves and making it available to anyone, thus enabling the development of completely new IoT applications and reducing their time to market.

As I mentioned before, we're focusing our innovation on four main domains: homes, cities, mobility, and industry. Let me introduce you to each one individually.

1. Smart home

First, the smart home. We've been collectively dreaming about smart homes for decades. Something about the idea of a home that anticipates our needs resonates deep within us.

But what does a smart home look like in the real world? Let me paint you a picture. A smart home is one in which you never have to wonder if you locked the door on your way out, or whether you left the upstairs windows open before a rainstorm, because the doors and windows are equipped with sensors. It is always the perfect temperature inside because the heating system automatically checks the weather forecast, and adjusts itself to maintain your preferences. It's one in which various systems work together to cut your energy use by up to 40 percent. A smart home is one in which every light switch, and every appliance, can be controlled with the touch of a button on your smartphone – from anywhere you might happen to be.

This may sound like a fantasy, but it's not. According to recent estimates, around 15 percent of all households worldwide, some 230 million, will be equipped with smart home technology by the end of this decade. As for

the technology, Bosch is ready to supply it – and more importantly, we know how to put it to use.

Our new Smart Home System, for instance, brings together all our expertise. Featuring one platform, one app, and one user interface, it connects all compatible home-related devices, including those of other manufacturers. To simply and quickly operate electronics, appliances, and lighting in your home, all you need is a central control device and a smartphone or tablet.

In our own portfolio, too, we already have connected devices in every product category: from ovens and refrigerators to washing machines, to heating and security systems. These and many other smart-home solutions are showcased in an interactive display at our main booth at the Sands.

We're also inviting other companies to collaborate on our platform. For example, we've joined forces with Philips to create connected, self-learning lighting. And last year, we launched mozaic operations, a joint venture with ABB and Cisco. Our goal here is to establish a B2B software platform for the smart home, which will be open to suppliers from widely differing sectors. Ultimately, we believe that no company will be able to create the connected world alone.

2. Smart city

But we're not content with just making homes smart. We want to increase the intelligence of entire cities. Today, nearly four billion people live in cities around the world. By 2050, this number is set to reach almost six and a half billion. Smart, connected cities offer the potential to provide a higher quality of life for everyone.

Imagine a city in which multiple modes of transportation are linked up, and can be booked and paid for with the tap of a finger: bus, subway, train, shared car. Imagine a city that intelligently regulates its street illumination at night, turning off lights where they're not needed in order to reduce its carbon footprint. Imagine a city where a sensor in a street light detects cars and optimizes traffic flow accordingly.

We already offer a basic building block for the smart city of the future: the software that gives it brains. The Bosch IoT Suite provides the technological basis for internet of things applications. It integrates every feature required for connecting devices, users, and services. Applied to a smart city, our technology can connect people with things like vehicles, charging stations, traffic lights, energy systems, the transportation infrastructure – even libraries and restaurants. It also connects all these things with each other.

We currently have smart city projects running across the globe, in places like Spain, England, Germany, and the United States. Here in the U.S., we've also recently launched a related initiative together with Carnegie Mellon University to develop, test, and realize a connected campus environment. The intelligent campus buildings will help improve efficiency and comfort by optimizing temperature, air quality, and lighting.

Two specific smart city solutions we're showcasing at CES help drivers find parking in urban areas more easily. The first solution is our active parking lot management system. Here, sensors embedded in the

pavement recognize whether a space is occupied. This solution can also help parking garage operators utilize their capacity better. The second solution is what we call community-based parking. It relies on cars equipped with parking assistance systems, which automatically identify and measure the gaps between parked cars as they drive past.

In both cases, sensors transmit information about available parking spaces to a central server, which our algorithms use to create a real-time parking map. Drivers can then access this map via their smartphones or in-car internet connection. This will help them quickly find a suitable parking space. Since up to 30 percent of all urban traffic is caused by the search for parking, imagine the benefits this technology will bring in terms of saving time and reducing CO₂ emissions.

3. Connected mobility

Since we're on the subject of cars and parking, let's move into the third Bosch domain – connected mobility. Nowhere is connectivity set to revolutionize our lives as much as with connected driving. Connected vehicles are safer and more efficient, and make drivers' lives easier.

These days, we can hardly imagine a life without the internet – and soon that will be true of the internet in the car as well. Connected cars are able to see ahead – further than any sensor, and with much more up-to-date information than any map.

Our connected horizon does exactly this. It helps drivers identify hazards before they appear and can even slow down the car automatically in case of danger. This function combines current vehicle position and locally stored map data with real-time information from the cloud. On the one hand, this boosts efficiency, enabling navigation systems to optimize routes and electrified vehicles to implement predictive driving strategies. In this way, CO₂ emissions can be reduced by ten percent or more.

On the other hand, it contributes to vehicle safety. For example, imagine that several vehicles report an intervention by the ESP system at the same point. The system could then reference weather information and conclude there is black ice present, and warn approaching cars. So: time and fuel saved, and safety increased.

And speaking of safety, I'm very proud to be able to introduce a new solution that will doubtless save lives: the market's first retrofit eCall. Our new device can be easily retrofitted to any type of car, and works in conjunction with an app on the driver's smartphone. If its sensors detect a forceful enough impact, retrofit eCall automatically contacts a call center. There, an operator will attempt to contact the driver and, if necessary, dispatch emergency roadside assistance to the scene of the accident. Bosch offers eCall services already in 30 countries around the world.

As you can see, Bosch is a provider of both technology and services, which is again an advantage for us in the connectivity business. Another service that will offer a boost to safety is a cloud-based wrong-way driver alert system. It relies on a software module which compares the movement of a vehicle on a freeway with the permitted direction of travel. If these two factors differ, it alerts the driver and oncoming cars automatically – and does so in seconds rather than minutes. The service will be available in the U.S. and other countries later this year.

As the driving experience becomes more connected, the human-machine interface continues to gain importance. Progress here has the potential to increase both safety and convenience. For one thing, it will give drivers the right information at the right time, minimizing the distraction that causes ten percent of the fatal crashes on U.S. roads. For another, it will allow drivers to control their car via gestures and voice commands.

You can experience Bosch's vision for the car-driver interface of the future in our show car in the North Hall. It features large, curved displays that

can be controlled with a combination of gestures, and eye movement – as well as our touchscreen with haptic feedback I told you about earlier.

Connectivity is also the key to realizing automated driving. Our motivation for developing automated driving is first and foremost to make traffic safer. Each year, about 1.3 million people around the world are killed in road accidents. In some 90 percent of cases, the accident can be attributed to human error. In critical traffic situations, the right technology can save lives.

We believe that automated driving will arrive in stages, as a result of progress in driver assistance systems. For work on these systems alone, we employ some 2,000 engineers. Today, our driver assistance systems are already performing many functions, such as helping drivers change lanes, stay in their lane, and brake when encountering an obstacle. Our sales in this field will exceed one billion euros this year.

On the road to fully automated driving, we plan to have achieved fully automated parking – or valet parking, as we call it – by 2018. With automated valet parking, all you'll have to do is leave your vehicle at a designated drop-off zone inside a parking garage. From there, the car will find a vacant space on its own, saving time and fuel.

By 2020, the Bosch highway pilot will be ready for production. This is a highly automated function that will assume control of the car freeways. We've been driving our automated test vehicles on public roads in the U.S. and Germany since 2013.

In the U.S., we are the first automotive supplier to have driven an automated prototype exit to exit on freeways. And we're not just focusing on the vehicle – we're also collaborating with TomTom to develop the extremely accurate maps needed for automated driving.

In the mobility business as well, Bosch benefits from its diverse industrial expertise. No other company in the automotive industry is in a better position to connect the dots between different domains. What if your connected car could communicate with your smart home? In one current test scenario, our engineers have enabled a vehicle's navigation system to automatically turn up the central heating shortly before arrival. Looking across domains opens up a seemingly infinite number of innovative and beneficial possibilities.

4. Industry 4.0

That brings me to our fourth and last domain, manufacturing. The factory of the future is flexible, networked, and smart, and it will see people, machines, and products all communicating with each other and working together. In particular, we see tremendous potential in harnessing connectivity to make manufacturing less resource-intensive and more cost-effective. This connected paradigm is also known as Industry 4.0. Bosch is active here on a number of levels, both as a leading provider and a leading user.

At present, the Bosch Group has more than 100 ongoing projects relating to Industry 4.0, in places like China, India, Germany and here in the United States. For example, associates at our plant in Anderson, South Carolina, now use smartwatches to monitor several production lines. These devices promptly notify line operators if a machine malfunctions, thus reducing or even preventing downtime.

Across our operations, Industry 4.0 applications are enabling us to achieve a reduction in inventory of up to 30 percent, and as much as a 10-percent gain in productivity. Especially in high-cost countries like Germany and the U.S., this is a huge benefit. By 2020, we expect to have achieved annual savings in our own global production of several hundred million dollars as a result.

In addition to connectivity, an integral part of tomorrow's manufacturing will be a new way of using automation: in collaborative work with people. A solution we developed specifically for the factory of the future is the APAS family of mobile production assistants. These collaborative robots can take over dangerous, strenuous and monotonous tasks, leaving people free to do the more pleasant work.

They also enable rapid and flexible adjustments to production. Most importantly, they're safe: thanks to its special sensor skin interface, the APAS assistant is the first system to be officially certified for direct human-machine collaboration. They also, as it turns out, make a great "cup of joe": come visit the APAS coffee bar at our booth in the Sands and taste one for yourself.

Conclusion

Ladies and gentlemen, all-encompassing connectivity is no longer wishful thinking – it's here. And when it comes to harnessing the potential of the connected world, Bosch has an advantage that few other companies possess. From the sensors that form the basis of the IoT, to the connected objects that communicate over it, to the software that orchestrates it, to the beneficial services it's unlocking – wherever you look, you find our technology. Bosch's portfolio of solutions is truly comprehensive. But not only that – we're enabling the connected world at the most fundamental level. And this means we're in the position to actively shape this trend and its technology into something that will make life tangibly better for everyone.

But please, go and see for yourselves. Visit our booths at the Sands Expo and North Hall this week, and experience for yourself Bosch's simply connected and life-enhancing solutions for the homes, cities, mobility, and industry of tomorrow.

Thank you.