



BOSCH

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IoT “Like A Bosch”:

How we’re turning our vision of a better tomorrow into reality today

Dr. Markus Heyn,

Member of the board of management

of the Robert Bosch GmbH,

and Mike Mansuetti,

President of Bosch in North America

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Robert Bosch GmbH
Postfach 10 60 50
70049 Stuttgart, Germany

Communications &
Governmental Affairs
E-Mail
Melita.Delic@bosch.com
Phone: +49 711 811-48617

Senior Vice President:
Prof. Dr. Christof Ehrhart
www.bosch-press.com

Good morning, everyone. Thank you for joining us! It's great to see so many seats filled at this, our seventh press conference here at CES!

Today actually marks the global premiere of our new IoT campaign "Like A Bosch". We're very excited to be able to launch it here, since what better platform could there be than our press conference at CES, the beating heart of the IoT universe? I can imagine, though, that a few of you are scratching your heads about one thing. What exactly is IoT "Like A Bosch"?

Well, it's simple, really. These days, a lot of companies are trying to position themselves as an IoT leader, an IoT expert. And with good reason: by next year, IoT market volume is forecast to reach 250 billion dollars, an annual increase of 35 percent. And by 2025, it's estimated that there will be 55 billion IoT devices globally, and an aggregate IoT investment of nearly 15 trillion dollars.

Still, when you look closely, you'll see that not all IoT companies are created equal. "Like A Bosch" refers to what sets us apart – to how we do things differently. It refers, for example, to the emphasis we place on the beneficial aspects of our innovations – after all, we put humans at the heart of our solutions, not technology. Behind every solution we develop is the question: "How is this going to improve someone's life?" For us, that's not a nice-to-have, it's non-negotiable.

Here at CES, we're showcasing some of our latest technological answers to this very question in two key domains: mobility and the home.

"Like A Bosch" also refers to the sense of responsibility we demonstrate to our customers, our communities, and the environment that drives our innovation. And just as important, it refers to our unwavering commitment to treating our customers' data with care, and giving them full control over how it's used.

Essentially, “Like A Bosch” is how we translate our “Invented for life” ethos into our IoT activities. We want to enable people to live more easily, efficiently, and safely in a connected world. And that’s exactly what we offer with our solutions – solutions that reflect our unique perspective on the IoT.

IoT is firmly rooted at Bosch

Over the past few years, Bosch has evolved from an industrial enterprise into a leading global IoT company. Of Bosch’s more than 400,000 associates worldwide, 27,000 are software engineers, nearly 20 percent of whom are working exclusively on the IoT. We have technical expertise across the entire spectrum: in addition to having more than 130 years’ experience with hardware and manufacturing, today we are a leading provider on all three levels of the IoT – sensors, software, and services.

For example, our Bosch IoT Suite now connects 8.5 million sensors, devices, and machines with users and company applications – an increase of nearly 40 percent over last year. Among these are four million cars, whose connectivity and over-the-air updates are enabled by our software platform. We also have our own IoT cloud, which hosts more than 270 IoT projects in various areas, such as mobility, smart cities, and agriculture.

You could even say that where Silicon Valley connects the digital world, Bosch connects the real world. But not only that: we also enable connectivity at the most fundamental level.

We’re the leading global producer of micro-electro-mechanical sensors, or MEMS. Since 1995, Bosch has produced more than ten billion of them. Semiconductors in general are an extremely fast-growing market and reached some 450 billion dollars in global sales last year. After all, no vehicle can drive without them these days. These sensors supply a vehicle with important information regarding its handling, such as if the vehicle is braking, accelerating,

or skidding. The electronic stability program then uses this information to keep cars, trucks, and even motorcycles safely on track and in their lanes.

And as a key technology for the IoT, sensor applications extend far beyond mobility. Bosch MEMS sensors appear in more than half of all smartphones worldwide, as well as in millions of health, fitness, and smart-home devices.

To open up even more possibilities for these tiny wonders, we're working with various partners like California-based SiTime Corporation to develop next-generation MEMS timing technology. Stable, reliable MEMS timing devices are needed for the successful operation of next-generation electronics, and will enable things like the higher speeds of 5G communications, longer battery life for IoT devices, and increased reliability for driver assistance systems.

The IoT is opening up one of the newest technological frontiers: artificial intelligence. We see tremendous potential in this technology and we believe that AI solutions hold the key to bringing down the number of road deaths worldwide, reducing energy costs in factories, making agriculture greener, and keeping ourselves and our living spaces safe, secure, and healthy, to name just a few examples.

This is why we're on the forefront of AI research. Our center for artificial intelligence employs 170 experts at four locations: Renningen, near our headquarters in Stuttgart, Germany; Bangalore, India; Pittsburgh, Pennsylvania, and Sunnyvale in Silicon Valley. We plan to increase the number of experts to at least 400. Our aim is that within ten years, all Bosch products will either have AI integrated into them, or will have been produced or developed using it. For example, we're currently applying AI to video-based fire detection. Here, security cameras use smart image analysis to identify fires within a few seconds. This is far faster than conventional fire or smoke-detection systems, in which

precious minutes are often lost before heat or smoke reaches the system's sensor. It's a great example of what we mean by technology "Invented for life."

We're also pursuing numerous partnerships in this field. For example, we're partnering with Pittsburgh-based Astrobotic Technology Inc. to send experimental sensor technology to the International Space Station as early as May of this year. Onboard the ISS, we'll be using machine learning to analyze the noises emitted by machinery, with the goal of identifying whether something needs to be repaired or replaced before it breaks.

Now let's take a look at some of the specific innovations we're showcasing in the domains of connected mobility and connected living.

Connected mobility – Move "like a Bosch"

First, let's look at mobility. Or as we would now say, moving "like a Bosch." Around the globe, how we get from A to B is changing on a fundamental level. At Bosch, we're working toward a vision of mobility that is as accident-free, stress-free, and emissions-free as possible. We also want to make it accessible and affordable. To achieve this, we're harnessing our innovation leadership in the automotive domain to develop pioneering technologies and business models for the mobility of the future.

Let me tell you how we see it. Imagine this: it's a few years from now. You want to head downtown to do some shopping, so you pull out your smartphone and bring up the app to call a shuttle. With the press of a button, you've booked one and paid for the trip; a couple minutes later the shuttle pulls up outside your door.

With the press of another button, the car unlocks and you step inside. You're alone, but an automated voice greets you by name and informs you of your

journey time – it’s just enough time to check your email and catch up on the news.

Thanks to its electric drive, the shuttle is whisper-silent at full speed. Despite the number of vehicles on the road – many of them shuttles like yours – there is no congestion anywhere. That’s because they’re all in constant communication with one another and with the infrastructure, which keeps traffic flowing like clockwork.

Before you know it, you’ve reached your destination. The car lets you out in a drop-off zone at the shopping center’s entrance. In years past, a similar journey in downtown traffic would have left you frazzled, on-edge, and probably running late. Today, though, you’re relaxed and caught up on the day’s news as you head inside to do your shopping.

This scenario is just around the corner. In the U.S., Europe, and China alone, some one million on-demand shuttles are expected to be in service by 2020. By 2025, that number is forecast to rise to 2.5 million, and many of those will also be fully electric and self-driving. This new kind of transportation will bring numerous benefits: not only will city-dwellers of all ages enjoy increased freedom of movement, but everyone will benefit from the shuttles’ reduced ecological footprint, increased safety for all road users, and improved traffic flow.

And as it happens, Bosch already has most of the technologies needed to realize such shared, self-driving urban shuttles. And we’re working to put them on city streets tomorrow. What’s more, we want to make them completely electric and fully connected to the internet. And to prove it to you, we’re showing you what this kind of mobility could look like in an actual concept shuttle at our booth.

Every square inch of this concept shuttle contains existing Bosch solutions – from our **e-axle**, an electric powertrain that's compact, efficient, and affordable, to **360-degree surround sensors** for automated driving, to our **connectivity control unit** for full V2X connectivity and state-of-the-art **vehicle computers**.

It also features the system we call **Perfectly keyless**. This CTA honoree can gain or grant access to your car with the touch of a button on your phone. With our system, user identification happens via a digital fingerprint on each individual smartphone. Compared with keyless entry systems already on the market, this offers a major advantage in terms of security. Here at CES, we're also offering a separate demo of Perfectly keyless in a Ford Mustang – come by and try it out for yourself!

Importance of mobility services

Bringing this vision to life will take more than just developing sophisticated hardware and systems. When it comes to getting around in the future, services are going to be a central element of the mobility landscape. Worldwide, their market volume is projected to grow to 160 billion dollars by 2022 – an annual increase of more than 25 percent. At Bosch, we're so convinced of the importance of digital mobility services that we set up a division dedicated to developing and selling them.

Our current portfolio encompasses everything from **road condition services**, which notify automated cars in real time about conditions along the route, to **predictive diagnostics**, which help minimize servicing time and breakdowns in fleet vehicles, to **automated valet parking**, to **over-the-air software updates** that enhance vehicles' capabilities and keep them secure.

Worth a special mention is our new suite of **convenience charging services** for electric vehicles, which offer real-time information on range and recommendations for recharging. With these, we're ensuring it will be as easy to

recharge the shared electric shuttles of the future as it is to refuel a conventional car today.

Another example of our service offerings is a web-based ridesharing service, thanks to our acquisition of the U.S. startup **SPLT**. This service offers a platform for employers to coordinate ridesharing offers for their employees. We're also exploring its potential to benefit other groups as well. For instance, the startup was recently awarded a grant from the state of Michigan to develop a pilot project focused on transporting the elderly in rural areas.

We're also pleased to announce the first service resulting from our partnership with **Mojo**, which provides a cloud platform and software solutions for connected cars. By combining our advanced crash-detection algorithm and emergency call services with Mojo's cloud platform service, we can connect any type of vehicle directly with the cloud. This means help will arrive quicker in case of an accident.

Looking ahead, there is of course one final obstacle that still needs to be surmounted before shuttles like the one we're showcasing can become reality. That's the self-driving technology to cope with complex urban environments. Well, we're getting awfully close to overcoming this challenge, too. We're partnering with **Daimler** to bring driverless vehicles to urban streets within the next decade. As soon as the second half of this year, we plan to launch a pilot on-demand ride-hailing service with automated vehicles on selected routes in **San José**, California. The field testing of this project will take us one step closer to improving traffic flow and road safety in cities.

These partnerships demonstrate the value of collaboration . Only by pooling our expertise will we succeed in bringing about a true revolution in mobility. And this is true for how we work with traditional car manufacturers, as well as with newer players, such as Tesla, Rivian, and Byton and even completely new

mobility customers, such as service providers and cities. In order to better harness the huge business potential here, Bosch just established a dedicated unit in Silicon Valley. Via this new unit, we will be stepping up our partnership activities with new mobility players across the globe.

And also on the topic of partnerships, we recently entered into a promising one with U.K.-based Ceres Power, a leading player in the development of solid-oxide fuel-cell technology (SOFC). Together, we're exploring the use of next-generation fuel cells as the basis of connected, decentralized, low-emissions power supply. In the mobility sphere, applications for these cells include large-scale facilities like vehicle charging stations. Beyond that, they could be used to power commercial buildings, industrial applications, and data centers.

The IoT needs a resilient energy supply, and we believe that fuel cells will play a key role in facilitating this, while also contributing to a CO₂ reduction in energy systems overall. For example, data centers alone account for about two percent of U.S. electricity use [source: U.S. Department of Energy's Lawrence Berkeley National Laboratory], and this technology could allow them to someday unplug from the power grid entirely.

Connected living – Live “like a Bosch”

And just as exciting are the changes coming to life within our own four walls: connected living – or in other words, living “like a Bosch.” Did you know that by 2020, some 230 million households worldwide are expected to feature intelligent connectivity? That's approximately 15 percent of all households.

At Bosch, we're working toward a vision of homes that can think for themselves, that get to know their occupants, and can anticipate what they want. What if your home could make you an extra-strong cup of coffee in the morning when you've had a restless night, help you reduce food waste by reminding you of

what's about to expire in your fridge, or recognize when you're not at home and automatically close any doors or windows left open?

In this domain as well, our solutions are designed to measurably improve life by meeting real needs and offering real benefits. For one, our smart home technologies help maximize energy efficiency and minimize resource consumption. And we're constantly getting better: since the beginning of this century, we've improved the energy efficiency of our household appliances by up to 68 percent. For another, our solutions take over many of our most monotonous and time-consuming household chores, helping you reclaim your time for the things that matter. And just as important, they provide peace of mind that your property is secure and your loved ones are healthy and safe from harm.

In developing all these solutions, we make it as easy and intuitive as possible to integrate them into your daily life, and we also design them to be future-proof. That means we build them to remain on the technological cutting edge: by harnessing their connectivity, we can send security and functional upgrades as well as innovative new features to the products you already own. Our motto here is "smart today, smart tomorrow."

For example, we're regularly rolling out new features for our expanding range of **Home Connect** appliances –features that save you even more time and resources. Take our smart fridges with internal cameras. They now offer what we call **smart food storage**, where your fridge automatically identifies dozens of different food items and helps you store them properly so they stay fresh longer.

And since we're in the kitchen already, let's talk about cooking. Whether you enjoy doing it or not, cooking is a messy affair. Well, you'll never have to worry about sauce splatter on your phone or tablet again thanks to our solution called

PAI. Essentially, it's a projector mounted over any work surface which turns your countertop into a touchscreen. It registers your hand movements and lets you look up recipes, watch videos, or even have a Skype call while you cook. And it doesn't take up any space on your counter, so you have more room for cooking equipment!

As I mentioned, our household solutions are also designed to relieve you of time-consuming housework. One way we're enabling this is by equipping them with artificial intelligence. For example, the latest model of our **Indego** robot lawnmower incorporates AI for improved obstacle recognition. With every cut, Indego collects and analyzes sensor-based data until it knows every square inch of your lawn – so you can spend your free time enjoying your perfectly-mowed grass rather than tending to it.

Of course, no discussion about smart-home solutions would be complete without addressing what for many people is the elephant in the room – namely, what happens to all the information they collect. Your information. Before we wrap up, I want to say a few words about our approach to data protection and privacy. Unlike many companies, we've put this issue at the top of our agenda in all our IoT activities.

In a nutshell, making responsible use of people's personal data is a top priority for Bosch. That includes being open about what information we store and process, and what we use it for. When it comes to all of our smart solutions, you as the user have full transparency and control over the data they collect – if you don't want it leaving your premises, it won't.

Conclusion

Ladies and gentlemen, we live in exciting times. Thanks to connectivity, the world we live in and the way we interact with it is changing on a fundamental level. At Bosch, we believe connectivity holds the key to a safer, more efficient,

and less stressful life for everyone. As you can see, we're working hard on translating this belief into solutions that enable people to move and live better than ever before. Or as you could also say, to move and live "Like A Bosch."

Please stop by our booth in Central Hall this week and see for yourself how we're already turning our vision of a better tomorrow into reality today. Thank you.