SMART
INDUSTRY

The IoT Business Magazine

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10 HOTTEST STARTUPS IN EUROPE

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Aiming for a digital Union

IBM WATSON'S
GERMAN
CONNECTION

WHY CONNECTING TO THE INTERNET OF THINGS SHOULD TOP YOUR PROJECT LIST

YOUR THINGS HAVE A STORY TO TELL –

ARE YOU LISTENING?

THE INTERNET OF THINGS (IOT) IS MADE UP OF BILLIONS OF SMART DEVICES, LIKE SENSORS AND CAMERAS AND CONTROLLERS, ALL USING WIRELESS TECHNOLOGY TO COMMUNICATE WITH US AND WITH EACH OTHER

Currently, there are around 15 billion devices in the IoT, with 5.5 million new ones connecting each day. And the insights gleaned from the data provided by all those connections is rapidly reshaping the world we live in.

From self-monitoring restrooms to self-adjusting HVAC systems, the IoT is empowering new capabilities and opening up new possibilities.

Whether you're looking to cost-effectively automate an existing structure, or build a smart new one from the ground up, the IoT empowers you to monitor, manage, and maintain all aspects of your building that impact operations, energy, and comfort.

intel.com/iot

THE BIG
DISCONNECT

Tim Cole
is the editor-in-chief of
Smart Industry – the IoT
Business Magazine. He
is the author of "Digital
Enlightenment Now!"

Everybody agrees that the Internet of Things – make that the "Internet of Everything" – will change the world as we know it. Machines are talking to each other and coordinate which gets the next load of spare parts first. Smart systems will be able to accurately predict who will cancel a subscription or sign up for an insurance policy, not to mention explaining why early retirement leads to shorter life expectancy and vegetarians miss fewer flights.

All this is just around the corner, IoT enthusiasts insist. But I wonder: when was the last time these guys walked through a typical middle-sized company and watched people at work? They still lug heavy file binders around, don't they? Office boys still push carts through the corridors piled high with mail to be delivered to the desks, even though the recipient may actually be on vacation or sick at home, so the mail just stacks up unopened. Companies typically print invoices on paper, fold them up, put them in envelopes, stick on a stamp and take them to the neighboring post box where they rest until the postal service van comes by to pick them up.

This is all so Twentieth Century, as my daughter once said when I asked her why she no longer bothered to answer my emails. "If you want to get in touch with me, post it on Facebook", she said. And I suddenly felt a hundred years old.

Most enterprises I know are still stuck with business processes that are as far removed from the Internet of Things as horse-drawn buggies are from a Tesla S.

For years, companies have been connecting stuff. Digitally networked systems abound – but if you look closely they resemble nothing so much as digital islands. That's because they are: Individual departments asked IT to create a system that would perform a specific task, and since IT professionals are generally nice people they did exactly what they were told. But nobody said: "Oh, and please make sure the information created or stored in that system is available everywhere in the organization!" The result is a huge disconnect. Marketing operates an expensive CRM system full of valuable information about our customers, but nobody outside of marketing ever gets to see it. Purchasing owns a powerful eProcurement system, but anyone who needs a pack of pencils has to ring them up and ask them to order some. My wife and I recently decided we needed a new kitchen, so I went online and discovered that Ikea has a wonderful app called the Kitchen Planner. You can create a floorplan of your kitchen and then take any item available on Ikea's catalog and simply drop it into the diagram. When you're ready, your can even create a 3D rendering of your new design, effectively allowing you to stroll through you beautiful new kitchen before it is even built.

Then comes the hard part: you need to drive out to your nearest Ikea megastore and buttonhole a salesperson so that they can check your design. In our case this turned out to be a charming young woman who nodded approvingly and then said: "Look, this will take a while. Why don't you go and have a cup of coffee."

I stared at her in disbelief. "Sorry, but there is no connection between the kitchen planner and the ordering system", she apologized.

Ikea is a big company with a big IT department. Just imagine what it looks like in a small company that has to manage its IT needs on a shoestring!

Before we can dream of an Internet of Things, we first need to do our homework. This means taking a long, hard look at our internal processes and making sure that they, at least, can communicate with each other. Then we can start reaching our and connecting to suppliers, partners and customers. And someday soon, hopefully, we can really talk about an Internet that brings everything together.

10

Title story:
The German Connection

IBM has chosen Munich as the new world headquarters of its nascent Watson IoT division, meaning that the Bavarian capital will lead the development of "learning" computers and novel insights into how businesses will work in the connected future.

Photo: © HighLight Towers by Rainer Viertlböck

80

Big Data is dead – long live Predictive Analysis

Companies are collecting more and more data these days, but are they making the right use of what they are gathering? The signs indicate that they aren't, and that in fact all they are creating is more and more complexity. Instead, they should focus on using data to make better decisions.

60

The Internet of Things is already here, and it's name is Uber

Leveraging the rapid uptake of smartphones globally, Uber has created a marketplace for drivers and passengers that has made transportation faster and more affordable for millions while thoroughly disrupting traditional players, such as taxi companies. Is this a template for building IoT businesses?

CONTENT

EVERYTHING IS GETTING SMARTER

As the Internet of Things (IoT) continues to develop, our world is becoming more connected—from how cars navigate, to automated factory operations, to multiple intelligent systems within the home that bring greater convenience and efficiency to daily life.

Beneath the visible layer of the IoT evolution, there is a high volume of data being generated from a vast number of sensors and "smart" devices in the IoT that could overwhelm networks and datacenters. For this reason, more data analytics and processing are being pushed to the edge node, requiring more robust processor performance, including a bigger memory footprint to run a full OS.

The i.MX processor family from NXP® provides enhanced processing capacity at the edge node, giving products and systems the autonomous analytical capabilities they need to make meaningful connections and contribute to our daily lives.

NXP

SECURE CONNECTIONS
FOR A SMARTER WORLD

Behind the scenes
SMART PEOPLE

All over the world, brilliant individuals are hard at work creating the technologies and solutions that will one day **make the Internet of Things come alive.** We visited a few of them and listened to their fascinating stories.

Demis Hassabis of DeepMind

The Brain Behind the Brain

The victory of an artificially intelligent computer program called AlphaGo created by DeepMind, a British company owned by Google, over the world champion at the ancient Chinese board game of Go, Lee Sedol, caused quite a stir earlier this spring. Go, it turns out, is far more complicated than chess, a game in which IBM's "Deep Blue" computer managed to beat the then-reigning world champion Garry Kasparov, as far back as 1996.

The mastermind behind this record achievement received little attention in the press, though. Demis Hassabis, co-founder and chief executive of DeepMind, was born in London as the son of a Chinese-Singaporean mother and a father of Greek-Cypriot descent. He began working on artificial intelligence as a computer science undergraduate at Cambridge University and founded the company together with Mustafa Suleyman, a technologist

> **"**
> I know how to play Go well enough to be able to appreciate its beauty.
>
> Demis Hassabis

and childhood friend, and sold it to Google for £400m in 2014.

DeepMind is a neural network which works like the human brain. It is capable of teaching itself and learning from experience. In fact, it mastered the complicated rules of Go without human assistance. Mr. Hassabis, who became a chess master when he was still 13 and has competed in the Mind Sports Olympiad, an annual festival for games of mental skill, served as the machine's trainer and sparring partner, but the cognitive achievement was all AlphaGo's own. Go originated 2,500 years ago in China and is played by an estimated 40m people worldwide, including more than 1,000 professional players. "I know how to play Go well enough to be able to appreciate its beauty" Mr. Hassabis told the Financial Times "but it is not one of the games I'm strong at, so I've not actually played AlphaGo myself as it surpassed my ability almost from the beginning."

In March, AlphaGo wrapped up the five-game series against Mr. Lee (who is considered the best Go player in the world over the last decade) by winning four times, in the process taking home a prize of one million U.S. dollars.

Will MacHugh of Eltopia:

Hive Computing Takes Off

In 2012, Will MacHugh was strolling through a country fair in California when he discovered a display about beekeeping, a subject about which he knew nothing whatsoever. As president of Eltopia Communications, a service provider for wireless operators in the U.S. Northwest, he is concerned with putting together cellular networks. But the idea of helping beekeepers solve their problems captivated him, and he went back to Oregon with his head full of ideas. One of the biggest problems facing apiarists are mites: tiny arthropods that live as parasites on plants, animals and yes, bees. Previously, the only way beekeepers could combat mites was by placing their beehives in an oven and literally toasting them. MacHugh and his team decided to attack the problem from another angle. They ➡
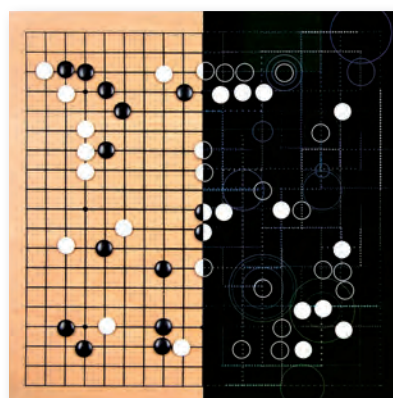
created a heater element that they coated with wax and which looks exactly like the normal frame in a beehive.

The solution, which they named "MiteNot", monitors the temperature in the beehive and constantly adjusts it to a setting that kills the mites but keeps the brood comb healthy. Sensors count the number of mites going in and out of the hive, so the system only runs when the parasite level gets high enough to be worrying. MacHugh has already sold his first production run, and he thinks the market will be huge. There are more than two million commercial beehives in the United States alone. A single unit is priced to be substantially cheaper than a pesticide-based solution which apiarists use today. "Success is sweet", MacHugh says.

Kate Darling of MIT Media Lab:
Shedding Tears For a Dead Robot

Back in 1942, science-fiction author Isaac Asimov set down his famous Three Laws of Robotics as an organizing principle and unifying theme for his series of robot-related books and stories. The idea that human inventors should be compelled to program some kind of ethical behavior framework into their machines has inspired writers and technologists ever since.

> ## It turns out that it's the humans who are dangerous, not the robots.
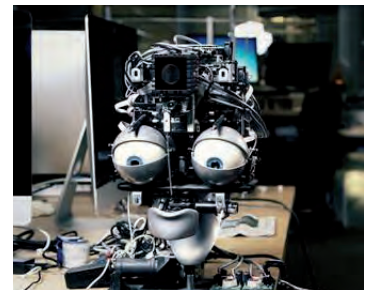>
> Kate Darling

MiteNot
A pesticide-free way to remove mites in bee hives. Groundbreaking new technology, code named 'MiteNot', will eliminate the pests without harming the bees.

Kate Darling, who was born in Switzerland and studied law at ETH Zurich, works at the MIT Media Lab in Cambridge, MA, as well as at Harvard's Berkman Center for Internet & Society. She is hailed as an expert on human-machine interaction and feels that Asimov's laws need an update. "A faultily programmed robot can do lots of damage", she believes. As robots become cognitive and self-teaching, limits must be hardwired into them that will ensure that they behave in a socially responsible fashion. After all, she maintains, robots will always be part of a human-dominated world.

When HitchBOT (an autonomous robot created by scientists in Canada and sent off to hitchhike on its own across the continent) was smashed by unknown vandals in Philadelphia in August, 2015, Darling was shocked. "It wasn't just that they destroyed a machine, but because they destroyed a figure with which many people were able to connect emotionally. HitchBOT carries the hopes and dreams of its creators. The idea was to see what would happen if a robot that could speak but not move about on its own could rely on the help and cooperation of humans. Normally the question goes the other way around. It turns out that it's the humans who are dangerous, not the robots."

Daniel Fallman of Mindbreeze:
Driving the Digital Dumpster

Secret treasure troves lie buried in every organization, and Daniel Fallmann is out to salvage them. "The problem is that everybody has lots of digital data they can't use because nobody can find the relevant pieces when they need it. We want to illuminate what your company knows", he maintains. And in 2005, he set out with his Austrian start-up "Mindbreeze" to fix the problem.

While some data is available in coded form and thus is easy to store in searchable data bases, most are not. E-Mails, Word and Excel files, audio and video recordings: all these are valuable company assets, at least theoretically, but unfortunately the only way to find and use them is by mind-numbing manual search. "Digital landfill", Fallmann calls this. „I guess that makes us part of the next generation information recycling industry", he says.

Poking around in other people's digital garbage bins may not be everybody's idea of fun, but Fallmann believes his company can provide an essential service as enterprises move into the age of Digital Transformation. After all, what use are data that are essentially hidden from view?

To solve the problem, Fallmann and his team have created what one might call a "Google for companies"; a black box that connects to each and every digital system within the enterprise and launches software "crawlers", similar to the ones Google uses to catalog the World Wide Web. The device then creates a network of every bit and piece of information it finds and stores it in a central knowledge base, regardless of the data's format.

By simply clicking on the information, employees can launch the appropriate application that enables them to view, watch or listen to whatever the data contains and even interact with the data directly. Moreover it uses artificial intelligence and deep learning to understand the information and give the most accurate answers to questions. This is especially important for voice recordings, Fallmann maintains, because every company deals with customers on the phone. In call centers, these conversations are recorded and stored for later review, as we are all constantly being reminded every time we dial our supplier to complain, ask for help, or order an item. Because the review process is so tedious, most companies restrict themselves to random spot checks. As for the rest – often thousands and thousands of hours of direct one-on-one interaction with clients and customers – they land in the digital dumpster.

Based in Linz on the Danube, Mindbreeze launched its first "search appliance" it calls InSpire. In 2013, Gartner, an analyst group, raised them to the status of "Challenger" in its Magic Quadrant for Enterprise Search, especially praising the company's ability to execute.

Daniel Fallmann admits to a weakness for science fiction novels, but in business he stays down to earth: "I was always fascinated by the ability of computers to understand information and connections - a concept that has not ceased to captivate me to this very day."

Michael Mohr of Plugilo:
Making Data Smarter

Few still remember the Dotcom Bust of 2001, but with Michael Mohr, the memory still rankles. Flush with cash from going public with his successful startup DCI, a company specializing in trade databases, he too suffered when the bottom fell out of the stock market. But unlike thousands of others, he survived, and now he's back to settle the score.

Today, DCI AG operates subsidiaries in Hanoi and Shanghai, where busy programmers are hard at work creating the "The Plug", as Mohr calls it. Actually, the wall plug he proudly drapes around his shoulder for photo ops is just a symbol for what he describes as "plugging into the world of Cloud Content". His ambition is to link every company database in the world through a "meta-level" in which products and services can be described in a common language, thus ending the "techno-babble" that causes confusion and loss of sales.

Today, every manufacturer has its own system of product and serial numbers as well as its own nomenclature to describe what the product does and how it works. This information is constantly being updated internally as new product releases appear, but this information seldom makes it out into the real world, where the product may already be listed in hundreds of webshops and online

Mindbreeze
Daniel Fallmann has created an Intelligent Enterprise Search solution that turns scattered information into knowledge and serves it up automatically at the push of a button.

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Our ultimate goal is to "make data smarter".

Michael Mohr

marketplaces. As a result, potential customers are often misled by outdated or non-existent product information.

"Getting manufacturers to agree on a common system to describe their stuff is the task of Sisyphus", Mohr maintains. So instead he decided to plug everybody into a system that acts as a mediator between the various manufacturers, vendors and customers.

"Every time a new picture of a given product is stored in the company database, it is automatically updated all over the Web", he describes the way his new company, called Plugilo, operates. The ultimate goal, he says, is to "make data smarter".

Right now, Plugilo is still very much Mohr's dream child, although the technology behind it is ready and working. Remember all those little Vietnamese programmers? What is lacking is the worldwide organization and the funding to maintain it. Mohr envisions the Plug as a universally recognized symbol stating that the information you are about to access is updated regularly.

In fact, clicking on the plug will take consumers directly to the manufacturer's database, which for Mohr is the fount of all real knowledge about a product. And while the system relieves vendors of the need (and cost) of updating the information about the products they sell, manufacturers for the first time get a direct line to the consumer – something they have been dreaming about for years.

IBM's New Watson HQ

THE GERMAN CONNECTION

IBM has chosen Munich as the new world headquarters of its nascent **Watson IoT division,** meaning that the Bavarian capital will lead the development of "learning" computers and novel insights into how business will work in the connected future.

■ by Tim Cole

When a company changes a slogan that it has been proudly displaying for over a hundred years and that has long become a household word, then you know something big is happening.

"THINK" read a small sign that took pride of place on the desk of Thomas J. Watson from the day he was appointed chairman and CEO of International Business Machines in 1924 until he stepped down in 1956 a month before his death. According to corporate legend, Watson came up with the catchphrase as an inexpensive source of publicity, then saw it become the most widely quoted corporate slogan in history. In December 2015, standing in the top floor of a 34 story skyscraper in Munich, Germany, Watson's successor Ginni Rometty, announced that IBM was changing its motto to "OUTTHINK" to signal the start of a new era.

For one thing, the opening of the new world headquarters of IBM's new IoT division at a location outside of the U.S. marked a big break from tradition. According to Rometty, the campus in the Bavarian capital is Big

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> **IBM's motto is no longer „Think", but „OutThink".**

Blue's largest investment in Europe in more than two decades and will eventually house more than 1,000 data scientists and consultants, half of the total the company has committed to its new Internet of Things group. IBM has said it will be investing $3bn over the next four years in IoT-related research and development, among other things eight "client experience centers" based in Beijing, Boeblingen (Germany), Sao Paulo, Seoul, Tokyo as well as Massachusetts, North Carolina and Texas in the U.S. The move is highly symbolic, analyst Frank Gillett of Forrester Research insists; European companies, especially major ones in Germany, the continent's largest economy, are concerned about American tech companies siphoning off their business data and acumen. "By plunking down in Europe, IBM is essentially saying, we are firmly with you, we are rooting ourselves in your environment and we intend to work with you", Gillet believes.

Even more importantly, Munich will be the official home of Watson, IBM's fabled "cognitive" computer built to mimic the way human brains function. Watson, IBM claims, is in-

telligent enough to teach itself and reach new conclusions without being told what to do by human programmers.

"Learning computers" such as Watson or Google's AlphaGo are designed as self-teaching systems that use data mining, pattern recognition and natural language processing to mimic the way the human brain works. The goal is to create automated IT systems that are capable of solving problems without requiring human assistance.

In addition to the new business centers, IBM also announced additional application programming interfaces (APIs) for its IoT practice in areas such as machine learning and image analytics. These include:

Natural Language Processing (NLP), an application designed to let users interact with systems and devices using simple language; solutions that understand the intent of hu-

At CeBIT 2016 in Hanover German chancellor Angela Merkel got a quick lesson in cognitive computing from the head of IBM Germany, Martina Koederitz.

man language by correlating it with other sources of data to put it into context in specific situations. For example, a technician working on a machine might notice an unusual vibration. He can ask the system "What is causing that vibration?". Using NLP and other sensor data, the system will automatically link words to meaning and intent, determine

Dr. Watson Will See You Now

■ **Memorial Sloan-Kettering Cancer Center, New York City**

More than 14 million Europeans are diagnosed with cancer each year, and finding the right information on each patient to be able to manage their disease with any degree of success is a huge challenge. Filtering countless health websites for relevant, accurate and trustworthy information is daunting, as is drawing insights from multiple sources, not to mention advances and discoveries

in molecular biology and genetics in recent years. Together with the Memorial Sloan-Kettering Cancer Center in New York City, IBM hopes to revolutionize how physicians get access to world-class information about cancer. The two organizations are combining IBM's Watson's natural language processing and machine learning capabilities with Memorial Sloan-Kettering's clinical knowledge and repository of cancer case histories. The goal is to develop a decision support tool that can help physicians everywhere arrive at individualized cancer

diagnostic and treatment recommendations for their patients based on the most complete and up-to-date information.

Watson is billed as a "self-learning system". This means that after receiving an initial query, it can ask for additional information to help it understand more precisely what the human wants to know. Also, physicians can view the logic and evidence upon which Watson makes a recommendation. Watson uses the patient's medical information combined with a vast array of medical information gathered from the Internet and other sources, such as an extensive library of medical literature, diagnosis and treatment guidelines, a database of MSK cancer cases and the institution's knowledge management system. Watson, its creators maintain, will be able to learn from its encounters with clinicians. It will also get smarter as it amasses more information and correlates treatments with outcomes.

If the team working on the Watson-based solution is successful in developing an effective decision support tool, physicians anywhere could potentially have access to the knowledge of some of the field's top experts–and more cancer patients could get better care no matter where they live in the world.

photo©: IBM

the machine he is referencing, and correlate recent maintenance to identify the most likely source of the vibration and then recommend an action to reduce it.

Machine Learning processes data automatically, monitors new data and continuously and ranks data on user interactions based on learned priorities. Machine Learning can be applied to any data coming from devices and sensors to automatically understand the current conditions, what's normal, expected trends, properties to monitor, and suggested actions when an issue arises. For example, the platform can monitor incoming data from fleet equipment to learn both normal and abnormal conditions, including environment and production processes, which are often unique to each piece of equipment. Video and Image Analytics which uses unstructured data from video feeds and image snapshots to identify scenes and patterns. This knowledge can be combined with machine data to gain a greater understanding of past events and emerging situations. For example, video analytics monitoring security cameras might note the presence of a forklift infringing on a restricted area, creating a minor alert in the system; three days later, an asset in that area begins to exhibit decreased performance. ➡

photo©: IBM

# How's the Weather? Just ask Watson!

■ The Weather Company

Power outages are mostly caused by the strains of wind, rain, sleet, snow and ice. According to Brandon Hertell, a certified consulting meteorologist and a manager at IBM's Analytics division, an aging grid and growing population makes the electrical grid seven times more susceptible to failure. 70 percent of storm-related outages to the U.S. are responsible for between $20 and $55 bn in damages annually, he estimates. In a world in which the climate is changing, and major weather 'events' are becoming more frequent, data suggests the number of weather-related outages will continue to rise.

Today, utility managers examine multiple sources of diverse and mostly unstructured data to figure out what the weather will be like. Then, in a separate analysis, they try to figure out what the impact will be. "If they missed one seemingly innocent feature or data point, like leaves still on trees", Hertell says, "the whole scenario changes."

With the acquisition of The Weather Company, the owner of one of America's most popular weather forecasting website weather.com, and with the help of advanced analytics, IBM hopes to create order out of chaos and in the process find a way to tell us in advance if it will rain or shine.

The Weather Company handles up to 26 billion inquiries to its cloud-based services each day. Using the data supplied by weather.com, IBM's advanced analytics aims at combining the weather, infrastructure and historical impact information saving time and allowing you to focus on proactively responding to the storm.
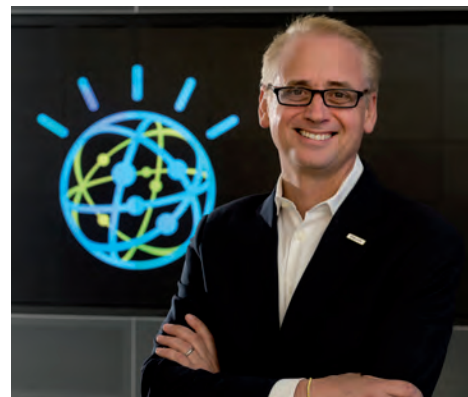
photo©: IBM

Lead-time will be in days, not hours, allowing you to make the appropriate calls for restoration resources. Notifications can go out to employees so staffing plans can be developed. Improved customer communications will prepare them for potential outages. This will improve their experience with the utility providers and reduce regulatory scrutiny. If the weather forecast changes or you want to run scenarios on different storm strength, path, or timing it's all possible with a cloud-based solution. You can even perform signature analyses and compare current weather to past events. Weather will always be unpredictable, but the power of cognitive insight, combined with analytics can help utilities better prepare, and create new systems that reason and learn over time. Combining weather data with traditional business data from an unprecedented number of Internet of Things enabled systems and devices has the potential to significantly impact decision-making. Maybe we can't change the weather, but at least we will know what's coming our way.

photo©: IBM

The two incidents can be correlated to identify a collision between the forklift and asset that might not have been readily apparent from the video or the data from the machine. Text Analytics enables mining of unstructured textual data including transcripts from customer call centers, maintenance technician logs, blog comments, and tweets to find correlations and patterns in these vast amounts of data. For example, phrases reported through unstructured channels — such as "my brakes make a noise", "my car seems to slow to stop," and "the pedal feels mushy" — can be linked and correlated to identify potential field issues in a particular make and model of car.

Connectors like these can plug into a client's own systems to make Watson IoT insights available without the need to transfer information outside the company's own data center. Harriet Green, IBM's vice president and general manager for Internet of Things, will be moving from London to Munich later this year to head the new division. The decision to place its new headquarters in Germany, she maintains, is based on the fact that Germany, Europe's largest economy, makes so much of the stuff (from cars to washing machines to giant industrial production systems) that researchers believe will someday connect to the Internet. The Munich site will be responsible for automotive, industrial automation and insurance sectors, while the planned sites in Beijing and Sao Paulo will handle markets such as retail and environment.

"Watson opens the door for enterprises, governments and individuals to finally harness this real-time data, compare it with historical data sets and deep reservoirs of accumulated knowledge, and then find unexpected correlations that generate new insights to benefit business and society alike," Forbes, a business magazine, noted. This indeed, would be a whole new way to think about – or to outthink – your competition.

Welcome to Watson

photo©:IBM

■ Hilton McLean in Virginia

The perfect concierge's job is to make sure guests are happy – possibly the most satisfying job in the world. Now, enter the robo-concierge. "Connie", named Connie after Conrad Hilton, the founder of the worldwide hotel chain, is the first Watson-enabled robot concierge in the world and draws on domain knowledge from IBM's Watson supercomputer and WayBlazer, a cognitive service that uses natural-language information to answer difficult questions like, "I'd like to go to a four-star beach resort in January with my wife and two kids, and I'd like activities for two kids plus recommendations for good restaurants." Based on the NAO humanoid robot infrastructure created by SoftBank Robotics, Connie will work side-by-side with Hilton's Team Members to assist with visitor requests, personalize the guest experience and empower travelers with more information to help them plan their trips. Currently stationed near reception at the Hilton McLean in Virginia, Connie is learning to interact with guests and respond to their questions in a friendly and informative manner. By tapping into WayBlazer's extensive travel domain knowledge, Connie can also suggest local attractions outside the hotel.

The more guests interact with Connie, the more it learns, adapts and improves its recommendations. "This project with Hilton and WayBlazer represents an important shift in human-machine interaction, enabled by the embodiment of Watson's cognitive computing", said Rob High, IBM fellow and vice president and chief technology officer of IBM Watson. "Watson helps Connie understand and respond naturally to the needs and interests of Hilton's guests – which is an experience that's particularly powerful in a hospitality setting, where it can lead to deeper engagement and happier guests."

Battling Beijing's smog with Big Data

■ IBM Research China

No other city in the world suffers from the kind of air pollution the residents of China's capital Bejing have to endure almost every day. Smog and dust are believed to be the cause of thousands of premature deaths each year. Authorities in Beijing recently teamed up with IBM's IoT division to create a project dubbed Green Horizon which is expected to provide, among other things, quality management, renewable energy management and energy optimization within China's heavy industries. The plan calls for harnessing the power of Big Data analytics, supercomputing and weather modelling. Green Horizon will provide meteorological satellite data to be crunched by IBM's Watson supercomputer to generate a map identifying smog patterns and the sources of contaminants at the local level.

But understanding pollution is one thing, reducing it is quite another. IBM intends to use weather modelling and Big Data analytics to forecast the availability of intermittent renewable energy sources like solar and wind power. This would help the city to limit the amount of wasted energy. At least in theory cutting down on energy use – particularly fossil fuels such as

© festling/Shutterstock.com

coal – should lead to less pollutants being pumped into Beijing's air. In the short term, the focus on monitoring air quality should have a more immediate impact, at least in terms of showing people the government genuinely wants to tackle this problem. As Dr. Qing Wang of IBM Research China notes, many Beijing residents ignore measures designed to slash auto emissions, because they suspect the government is only using them to squeeze out more tax revenues. But because "IBM is renowned [for] advanced technologies [the government] will be able to improve the accuracy and the authority of the analysis. People will have to realize they are part of the problem before they can to be part of the solution."

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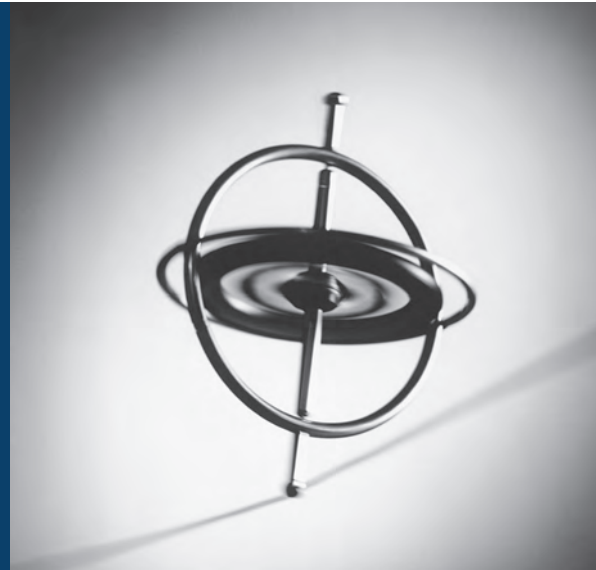
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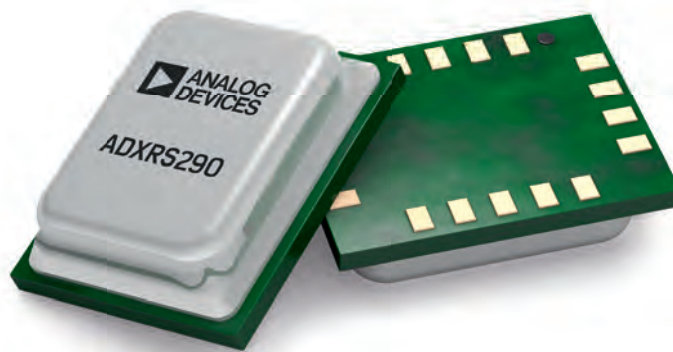
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Interview with IBM's Harriet Green

A NEW ERA OF COMPUTING

Can we call you "Ms. Watson" now?
Ha – good question. As the leader of one of IBM's Watson businesses, I certainly spend a huge amount of my time and energy on it – setting up this new business and putting in place the teams and technologies to best serve our clients. However, this is not just about one or two people, Watson's significance and potential is so huge that it will become part of and improve many people's lives.

How so?
Watson is the first open cognitive computing technology platform that people can tap into and innovate on. It represents a new era in computing where systems understand the world in ways similar to humans. From hospitals to call centers, buildings to cities, airports to factories, Watson will transform the way that people interact with the world, enabling better decision making, more effective approaches and better outcomes for individuals and whole societies.

Why did IBM choose to locate its Watson HQ in Munich of all places?
First and foremost it is important to remember that the Watson IoT Center will be a global business hub recruiting and bringing together some of IBM's most talented people and domain experts from around the world as well as tapping into local talent pools. Our decision to select Munich as the location was based on a number of important factors. Firstly, Germany – and Bavaria in particular – is globally recognized as

Harriet Green
General Manager,
IBM Watson IoT

photo ©: IBM

Talent pool
The Watson IoT Center will be a global business hub recruiting and bringing together some of IBM's most talented people and domain experts from around the world,

a pioneer in IoT technology given a huge boost by the German government's Industry 4.0 initiative. Some of the most innovative automotive, manufacturing and industrial companies – many of them IBM clients and partners - are based there including BMW, Allianz and Siemens. On the other hand, being located in Munich gives us access to cutting edge technology talent which

will be crucial for shaping the future of our business. The Munich region is home to a number of important universities – such as The Technical University Munich which one of the largest and most notable German institutes of technology with over 150 degree programs in engineering, computer science, medicine, life sciences, business and economics. ➔

TI connects more to the Internet of Things

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TEXAS INSTRUMENTS

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How many people will work here and what exactly will they be doing?

The new Munich Watson IoT Center represents IBM's single largest investment in Europe for more than two decades. The 2000sqm facility will become home to over 1000 Watson IoT experts including researchers, developers, engineers, business

and technology specialists. The center will benefit from a campus-like open environment enabling our clients and partners to access the talent, technology and tools they need to create products and services that deliver on the promise of cognitive IoT. It will feature a number of interactive spaces for clients and partners to work alongside IBM experts and experience, explore and learn about Watson IoT.

How will cognitive computing change the world as we know it?

Cognitive technologies are driving a whole new era of computing which will change the way we live, work, produce and consume. Their development has come in tandem with the rise of Big Data. 2.5 billion gigabytes of data are created every single day. That's the equivalent of

about 170 newspapers being delivered to every man, woman, and child on this planet every single day. Effectively making use of that data is a challenge almost impossible without technology. In fact, today 88 percent of data in the world is not utilised and remains dark or 'unseeable'. We are literally throwing away huge amounts of valuable information because we don't have the ability to process it.

How can Watson help us make sense of all this information?

That's where IBM's Watson and cognitive computing comes in. Watson is IBM's revolutionary technology platform that uses natural language processing and machine learning to reveal insights from large amounts of unstructured data. It became world-famous in

Simplifies interiors.

2011 when it successfully competed against human contestants in the general knowledge game show Jeopardy. Today it is helping businesses, hospitals, researchers and governments turn „dark data" into actionable insight.

What does Watson mean in terms of IoT?
Watson cognitive technologies will help to realize the potential of the Internet of Things and help the world turn the streams of structured and unstructured data that it generated by a plethora of sensors and digital devices. IDC estimates that there will be 29 billion devices embedded in everything from cars, to buildings, to bridges to our homes and even the things we wear by 2020. Within the next few years this 'Internet of Things'

will be the single greatest source of data on the planet creating huge opportunities to transform how humans interact with the physical world. Fundamental to the viability of the Internet of Things is our ability to turn the massive amounts of data that it generates into insight – which is why we are investing $3BN to bring Watson cognitive computing to the IoT challenge.

Can we talk about your business model? How does IBM expect to make money with Watson?
Watson is a fully commercial business unit within IBM. In 2014 we announced a $1b investment for the development of cloud-delivered cognitive computing technologies that represent the commercialization of artificial intelligence across a variety of industries. We then went

2.5 billion gigabytes of data are created every single day.

on to create Watson Health dedicated to improving the ability of doctors, researchers and insurers to surface new insights from the massive amount of personal health data being created and provide turnkey solutions to deliver personalized healthcare. And in 2015 we announced the formation of the Watson IoT which I lead which is focused on making sense of data embedded in billions of connected sensors and devices operating in the world today. The progress over the past few years has been immense. Already today, Watson is being used to expand expertise and improve decision making in over 35 countries and in more than 29 industries including– healthcare, financial services, law, retail, education, aerospace, transportation, manufacturing and smarter buildings.

START
UPS

for the next
BigThing

IoT will shape our future.

Billions of things connected – from industrial machines to home appliances - open doors for new technological solutions, business models, and investments. **Read about ten promising IoT/IoE-startups from five European countries!**

■ by Ariane Rüdiger*

We help companies to keep an eye on the location and environment of their shipments.

Azhar Hussain
CEO Hanhaa

The London startup **HANHAA** offers Parcel Live - parcel tracking as a service. "We help companies who want to keep an eye on the location and environment of their shipments" says Azhar Hussain, CEO. With Parcel Live, they can e.g. offer their customers advanced parcel tracking as a service, prove proper transport or analyze damages during transport. The service is based around Hanhaa taking care of forward and reverse logistics. On reaching its destination, the recipient unpacks the parcel and sends the board to Hanhaa free of charge for erasure and reuse. Beta tests are currently running.

SPICA was founded in 2015. The IoT system integrator has developed an application framework for connected devices - devicepoint™ built on IBM software technology. It integrates well into third-party-offerings. "We enable our clients to rapidly prototype use cases, and build enterprise-grade production solutions with rapid ROI" says co-founder Tim Streather. Additionally, Spica is building out a number of industry-specific IoT solutions, e.g. devicepoint™ for Healthy Weather for monitoring Legionella, a dangerous water-borne bacteria that must be controlled through water temperature testing.

We enable our clients to rapidly prototype use cases, and build enterprise-grade production solutions with rapid ROI.

Tim Streather
Sales and Marketing Director, Spica

We enable wireless networks and content distribution everywhere without tech skills.

Armine Saidi
CEO and co-founder Wicaster

London based wireless specialist **WICASTR** started 2013 as a member of a UK IoT incubator program. Among its funders are US and UK based angels and Granatus Ventures. With its patented SMART platform for wireless networking, Wicastr was among Cisco's Top 5 UK Internet-of-everything-Startups to watch. "We enable our customers building cheaply and easily wireless networks and content distribution everywhere and without tech skills", says Armine Saidi CEO and co-founder of Wicastr - e.g. for developing countries, transportation and logistics. Among customers are Unilever and Home Depot.

NEMETRIS, founded in 2013 in Balingen, has developed an IoT framework that can run on any appliance, e.g. a router independent of a server infrastructure and in the cloud. Only local networks have to work properly. "So far, we are the only player on the market with this capability" says Markus Schwarz, CEO. At this stage nemetris has realized different apps for production IT like a Web Dashboard. The framework supports important automation interface standards and more are to be integrated nemetris trusts in a broad network of partners to build solutions.

> Our IoT framework runs on every appliance – so far, we are the only market player with this capability.

Markus Schwarz
CEO nemetris

> With our solution, customers discover things they never were looking for.

Ronnie Vuine
CEO micropsi industries

Berlin-based **MICROPSI INDUSTRIES,** founded in 2014, focuses on AI for the IoT. It has developed a neuronal-network-based model creation process for production environments. The algorithms, with some human help, generate a system's digital twin from sensor and ERP data. "Our models often help our customers discover patterns they weren't specifically looking for", says Ronnie Vuine, CEO. VC investors have been convinced by innovative ideas and best talent at hand. High potentials choose Micropsi due to their excellent access to the leading AI community and its real hands-on mentality.

TADO was founded 2011 by Christian Deilmann, who wanted to effectively heat his student flat in Boston (Mass.), but that proved difficult. So he invented an app that regulates a thermostat: Depending on how far the user and his smartphone are from the flat, the thermostate turns up and down the heater automatically without tricky on-the-go settings on the smartphone screen. Later, Tado also developed an Air Conditioning Controller. "The best technological ideas grow from real problems of everyday life solved in a new way", says Deilmann. Success is proven: Tado already sells worldwide.

> Technological ideas solve everyday problems in a new way.

Christian Deilmann
Founder of Tado

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SIGFOX, founded in 2009 by technology-savvy Christophe Fourtet and entrepreneurial-oriented Ludovic Le Moan, created a simple, affordable, global IoT communications service with guaranteed quality of service. "IoT startups have to think of scaling, global reach and building an ecosystem from day one", says Thomas Nicholls, Executive Vice President Communications. SIGFOX sells its service to IoT solution providers. Microsoft uses it for its IoT solution. SIGFOX is already active in 16 countries. Network, IT and venture capital firms invested 127 Million €, looking forward to an IPO around 2018.

„„

Scaling, global reach and building an ecosystem from day one.

Thomas Nicholls
Executive Vice President
Communications Sigfox

„„

Find segments where you can quickly become market leader.

Fred Potter
Founder Netatmo

NETATMO, founded in 2011, belongs to the most-funded French IoT startups and has been profitable since 2013. Founder Fred Potter: "We want to make users life easier and simpler by products with unique features that help them to save time and to get information easily. We are looking for market segments where we can quickly become leaders and address them fast." Netatmo builds connected smart home objects for security, environment and heating enriched with Artificial Intelligence, like intelligent camera solutions for in- and outdoors.

MAMMOTHDB provides affordable enterprise analytics. In Q2 2015, 3TS and Empower Capital invested 1,6m Euros in the Bulgarian start-up founded in 2012. It doubled its revenue each of the past two years. "Our end-to-end cloud-based BI platform is fully SQL compliant and integrates with all popular front-end tools including Microsoft Reporting Services, Highcharts, Tableau and D3. MammothDB is business-user friendly, scalable and affordable", says Boyan Benev, CMO. Clients include Cisco, DHL and Publicis. Among partners are MapR, Tableau and public clouds like AWS and Microsoft Azure.

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MammothDB is business-user friendly, scalable and affordable.

Boyan Benev
CMO, MammothDB

„„

Most end-users do not understand data generated by Smart Home Systems.

Hjalmar Nilsonne
CEO Watty

WATTY, a 14-employee-startup from Stockholm, Sweden, developed intelligent software for energy and energy service providers. It takes the data from a sensor for electrical usage mounted on top of the smart meter and analyzes the data to disclose the big power users in the household, like stoves or washing machines. Data is anonymized to hide the identity of the user. The system enables energy providers to develop new, intelligent services for conserving energy. "Most end-users do not understand the data generated by Smart Home Systems – we solved this problem", says Hjalmar Nilsonne, CEO.

Leading the way
Investments in digital cross-border infrastructure are more important than rails and roads, Günther Oettinger believes

Günther Oettinger

AIMING FOR A DIGITAL UNION

As the European Commissioner for Digital Economy and Society, Günther Oettinger is **reponsible for IoT in Europe.** At CeBIT in Hanover, we sat down with him to discuss the digital future.

Given the dominance of U.S. companies, how can Europe hope to play a major role in shaping the digital future?

If you look at the major areas of digital innovation – the U.S., South Korea, China, Japan – you can't help but notice that Europe remains in the forefront in many areas of hardware and software. I strongly believe that Europe will continue to have a major influence on industry and society. Europe, after all, isn't just a union for peace and common values; with 28 member states and 510 million consumers, as well as associates in Switzerland, Norway and the Western Balkans, Europe constitutes the largest market in the world.

But unlike the U.S., Europe consists of a hodgepodge of national markets with very different laws and cultures.

You're right: whereas Europe has common markets for things like cars and industrial products, we lack a common domestic digital market. Our standards, rules and regulations, indeed most of our infrastructures are national. A startup entrepreneur wanting to develop a new digital app in London or Berlin needs 28 attorneys to tell him how to implement 28 different data protection acts. He'll prefer to go to America. The Americans have a huge domestic digital market of 330 million consumers; they possess common standards, a single data protection law and a shared network strategy. That's why the European Commission and the European Parliament are so keen on creating a common European digital marketplace.

But the EU only has limited power compared to the United States?

Europe doesn't need to do everything, but there's simply no sense in pursuing 28 separate digital strategies. In 2015, the Commission, the Parliament and the Council of Europe agreed on common European privacy regulations. The Network Information Security Directive laid a common groundwork for cybersecurity in critical infrastructures such as energy grids, traffic control centers and financial institutions. These are important milestones on our way towards becoming a true digital union.

What do you think will be most important?

Investment in digital infrastructure will be the key. Connectivity and powerful networks should be an argument in favor of Europe, not against Europe. But first we need to define what goals we will have to meet by 2025 in terms of bandwidth and connectivity. Three megabytes isn't enough; we will need 30 or 50 MBps in order to meet the future demands of industry and society. Europe needs a gigabyte infrastructure! If you add up everything – uploads and downloads, streaming services, social media, connected cars, eHealth, eLearning, eGovernment, smart factories, M2M – the demand for bandwidth will be many times greater than even our greatest experts expect today. Milliseconds in latency will make the difference between winners and losers.

But digital infrastructure has to compete with traditional infrastructure for public money.

Investments in cross-border digital infrastructure are much more important than rails and roads. We need it all: satellites, cable, twisted pair, vectoring, fibreoptics to the factory and to the home, and of course 5G. The European Commission has set aside 700 million Euros for 5G infrastructure, and we have established a private-public partnership, called "5G PPP", which will spend an additional 3.5 billion Euros to provide 1000 times higher wireless area capacity and more varied service capabilities, saving up to 90 percent of energy per service provided and in the process creating a secure, reliable and dependable Internet with a "zero perceived" downtime for services provision. The goal is to secure Europe's leadership in the particular areas where Europe is strong or where there is potential for creating new markets such as smart cities, e-

> With 28 member states and 510 million consumers, as well as associates in Switzerland, Norway and the Western Balkans, Europe constitutes the largest digital-market in the world.

health, intelligent transport, education or entertainment & media.

But that still doesn't solve the problem of national networks, each pursuing its own agenda.

We are currently reviewing the Telecommunications Act 2001 with the intent of getting the member states to agree on a common spectrum policy for all of Europe. 28 frequency auctions without any coordination will seriously limit the success of 5G and hamper future communications. If you drive from, say, Hanover to Florence, everybody uses the same currency, nobody asks you for your passport or for you to open the trunk of your car. But every time you cross a national border you know it because, for about five minutes, you are in a dead zone without any connectivity at all. We aren't talking deepest Africa here: this is hi-tech Europe in the 21st century! National borders may still be relevant for things like culture, language, internal security, and economic development, but for digital technology they are completely out of date; many of them hail from the times of Napoleon and the Congress of Vienna. But Napoleon knew very little about digital communication, I believe.

In reality, aren't there are still plenty of borders in cyberspace?

Of course, and we need to tear them down. For instance we need to address the issue of geo-blocking and other discrimination based on consumers' place of residence or nationality. Imagine: You buy a case of wine in Bordeaux and you expect ➡

to be able to drink it in your home in Stuttgart. For analog goods and commodities we have been used to enjoying the benefits of common domestic markets for decades. But try to buy the same case of Bordeaux online, and chances are you will be redirected to an online shop in Hamburg or Bremen. As a digital consumer, you do not enjoy the freedom of choice you have come to expect from the European common market. That needs to change! Before the year is out the Commission will submit suggestions for rules and regulations for member states to enact that will eliminate unjustified geoblocking.

But some business models in Europe rely on territoriality. What about the film industry? What about sports broadcasts?
Our goal is to create a common digital market, but of course we need to consider exceptions. Exceptions are a necessary complement to fundamental principles, for instance when it comes to preserving the European film industry.

What about innovation? It seems that Europe lags far behind the United States when it comes to research and development.
Digital R&D are a major focus for the Commission, and the European Parliament is assisting us greatly through initiatives like "Horizon 2020" with nearly €80 billion of funding available over seven years. There are areas where Europe actually has a head start, for instance in robotics. But "R" could be an important letter for Alphabet, too. The Americans are hot on our heels and are pouring billions into automation and autonomous machines, so we need to keep up our momentum. But Europe also enjoys a leading position in fields like photonics and sensors, and we intend to keep it that way.

Just how amicable are your relations with the Americans?
We recently managed to renegotiate Safe Harbor following the decision by the European Court which imposed a new set of strong obligations for compa-

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> **We will need 30 or 50 MBps in order to meet the future demands of industry and society. Europe needs a gigabyte infrastructure!**

nies' handling of EU citizens' data and offering clear safeguards and transparency requirements for U.S. government agency access to those data. The new agreement is called "Privacy Shield", and we hope to ensure that it is passed into law before the end of this year. Without such an agreement, thousands of companies of all types and sizes – in both Europe and the United States – would face widespread uncertainty and serious impacts to their operations and their ability to conduct business across the Atlantic. It is especially important for SMEs to be sure that European privacy and data protection standards are being followed in the Cloud, namely in data centers operating in the U.S. Here, again, Europe needs to take the lead. It doesn't make any sense to negotiate 28 separate data protection deals. We intend to reach similar agreements with other countries outside of Europe in order to reduce bureaucracy and increase legal security for companies and citizens all over Europe and the rest of the world.

The automobile industry is facing big changes as we enter the era of autonomous trucks and self-driving cars. What is the EU doing to make this happen?
At last year's IAA in Frankfurt we started an intensive dialogue with car makers aimed at creating guidelines for the Mobile Future. And this year, we sat down with the telco industry at Mobile World in Barcelona to ensure that they cooperate in creating

the necessary networks and equipment. If driverless vehicles are to become a reality we need both the automotive and the telecommunications industries to work closely together. Mercedes' new E Class shows where new developments are heading, but it will require a completely new and seamless digital infrastructure if these innovations are to translate into a new driving experience for millions of automobile owners across Europe. For this reason we have challenged other companies as well to join us in establishing a framework for autonomous driving; the insurance industry, for instance. There are loads of ethical and legal issues we need to tackle; no trivial task. After all, cars are full of sensors nowadays, and they are constantly creating, transmitting and storing data not only about the car itself, but increasingly about such things as weather and traffic conditions, proximity data to other cars, as well as road conditions. Which begs the question: Whose data are these, anyway? Do we need to step in and regulate? Or will car manufacturers and car owners negotiate their own set of deals? And how level is the playing field between the two?

Do you believe that we need to set out European rules and regulations governing data ownership and data usage instead of leaving these crucial questions for the market to work out?
What we definitely need is a common European answer to these questions. In fact, what we really need is a European Civic Code, si-

milar to the German BGB which contains property laws, laws of obligations, rights of ownership, usage and indemnification. We are just starting to have a real debate about how all of these apply to a digital economy, but we need to set up a common legal system that will take into account the fundamental changes happening today in terms of our everyday lives, in trade and industry and in mobility.

What about cybersecurity?
The Commission has the ambition to ensure the highest possible degree of security for both hardware and software. We want "IT Security made in Europe" to become an international label of quality. Of course there's no such thing as complete security, but we believe we can organize efforts in order to ensure that citizens and enterprises get as much security as possible. For critical in-

frastructures such as energy grids, traffic control centers, financial institutions and data centers, we already have a regulatory framework in place to ensure that they are reasonably safe from terrorist attacks and hackers. But we need to do more. I don't believe that all the stakeholders are fully aware of the threats posed by smartphones or other digitally connected devices. In areas such as occupational safety or workplace security, people are very aware of the risks involved, and companies are heavily invested in appropriate systems and precautions. A robot from Kuka stops dead in its tracks if a human gets too close; an industrial press by Schuler freezes the minute an operator sticks his arm in the machine. The same goes for traffic safety: everyone is aware of the problem, and lots of time, effort and money has been invested over the years in ma-

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IT Security made in Europe" should become an international label of quality.

king cars safer. It used to be neck supports and safety belts, now it's distance sensors and dynamic stability control. As car owners, we invest a lot in safety and security; unfortunately, the same doesn't go for cybersecurity.

What comes next?
I don't say we have all the pieces in place yet. But we try to achieve as much transparency as possible. That's why we invite all the players to join us in an ongoing dialog, from tiny startups to large corporations, from individual citizens to local, state and national governments. We all must do our part in creating a new Digital Europe that can coexist and compete peacefully with our partners in the U.S., in China, in South Korea, Japan and elsewhere. What we need most right now is expertise, creativity and investment in our common future.

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Big Data

HOW TO GET THE BIGGER PICTURE

Everybody's heard of the business applications touted by big data advocates – data-driven purchasing decisions, enhanced market insights and actionable customer feedback. But organisations only have to look inwards to find **more untapped potential**. Two major internal IT processes can benefit from embracing big data: network management and application delivery.

■ by Ingo Schneider*

S NS Research estimated Big Data investments reached $40 bn worldwide last year. Industry awareness and reception is equally impressive – 89 percent of business leaders believe big data will revolutionise business operations in the same way the Internet did, according to a study by Salesforce, a business software company. But big data is no longer simply large volumes of unstructured data or just for refining external business practices – the applications continue to evolve. The advent of big data analytics has paved the way for smarter network and application management. Big data can ultimately be leveraged internally to deliver cost saving effici-

Looking ahead
Predictive analytics techniques enable a transition from a reactive to proactive approach to network management.

encies, optimisation of network management and application delivery. Achieving complete network visibility has been a primary concern of CIOs in recent years. Now the arrival of tools to exploit big data provides a lifeline.

Predictive analytics techniques enable a transition from a reactive to a proactive approach to network management. By allowing IT departments visibility of devices - and crucially applications - across the network, the rise of the Bring Your Own Device (BYOD) trend can be safely controlled. The newest generation of switch technology has advanced to the stage where application visibility capability can now be directly embedded within the most

advanced switches. These switches are capable of providing an advanced degree of predictive analytics. he benefits of these predictive analytics are varied – IT departments can establish patterns of routine daily traffic in order to swiftly identify anomalies.

What`s trending on your network?

Put simply, the ability to detect what is "trending" – be it backup activities, heavy bandwidth usage or popular application deployment – has now arrived.

More tasks can be automated than ever before, with a dynamic response to network and user needs becoming standard practice. High

 *Ingo Schneider is Director Business Development Data Network Infrastructure at Alcatel Lucent Enterprise Germany

> **Through the effective deployment of resources based on big data insight, ROI can be maximised.**

ployment, and reduces the need for investment in further costly hardware and applications.

Networks converging on the future

Big data gathering, processing and analytics will all continue to advance and develop as more businesses embrace the concept and the market grows. But while the existing infrastructure in many businesses is capable of using big data to a limited degree, a converged network infrastructure, by providing a simplified and flexible architecture, will maximise the benefits and at the same time reduce Total Cost of Ownership (TCO) and meet corporate ROI requirements. By introducing this robust network infrastructure, businesses can ensure a future-proof big data operation is secure.

The advent of big data has brought with it the ability for IT departments to truly develop their 'smart network'. Now it is up to businesses to seize the opportunity.

priority users, such as internal teams requiring continued collaboration, can be prioritised the necessary network capacity in real-time.

Effectively deploy your applications

Effective application management has its own challenges, such as the struggle to enforce flexible but secure user and device policies. Big data provides the business intelligence necessary to closely manage application deployment by analysing data streams, including application performance and user feedback. Insight into how employees or partners are using applications allows IT departments to identify redundant features or little

used devices and to scale back or increase support and development accordingly. Smarter targeting of resources makes for a leaner IT de-

INTERNET OF THREATS

Today more and more everyday devices are interconnected. While they are certainly making life easier, they have also created new attack vectors for hackers. As we begin to enter the world of IoT it is important to be aware of and **understand the new and expanded security risks** involved and how to combat them.

■ by Gerhard Kafka*

Now that we are going to connect everything to the Internet, new opportunities are arising for cybercrime. The IoT refers to any object or device which connects to the Internet to automatically send and/or receive data. These include automated devices which remotely or automatically adjust lighting or HVAC (heating-ventilation-air-conditioning), security systems, such as security alarms or Wi-Fi cameras, including video monitors used in nursery and daycare settings, medical devices, such as wireless heart monitors or insulin dispensers, thermostats, wearables, such as fitness devices, modules which activate or deactivate lights, smart appliances, such as smart refrigerators and TVs, office equipment, such as printers, entertainment devices to control music or television

from a mobile device, and fuel monitoring systems, just to name a few.

As organizations and vendors rush to create a totally connected society, they are typically faced with two

> ❞ Intelligence services will use the IoT to gain access to networks

James R. Clapper
Director of US National Intelligence

photo©: Wikipedia

daunting question. The first: How to develop products quickly enough to gain a time-to-market advantage, with the markets and applicable regulators dictating requirements and thus the level of investment in product security by vendors. And the second: How to embed security throughout the lifecycle of IoT product development, as this will result in higher costs and slower time to market, albeit clearly adding value in the short, medium, and long term.

Both are tough questions, but unless cyber-security is considered in every phase of IoT development, including requirement setting, product design and developmental, as well as deployment, the problems companies have encountered with embedded systems in the past will seem like child's play.

*Gerhard Kafka is an experienced writer and author of numerous books in the fields of digitalization and IoT

A word of warning from the FBI

A public service announcement by the Federal Bureau of Investigation released last September details a number of specific IoT risks, and it warns companies and the general public to be aware of new vulnerabilities that cybercriminals could exploit. Specifically, the FBI worries that exploiting the Universal Plug and Play protocol (UPnP) widely used in many modern IoT devices will be a pathway of choice for many cybercriminals. UPnP is a set of networking protocols that permits networked devices to seamlessly discover each other's presence on the network and establish functional network services for data sharing, communications, and entertainment. Unfortunately, UPnP was originally intended only for residential networks and not for enterprise-class devices. Crooks could also exploit default passwords to send malicious code and spam mails or to steal personally identifiable or credit card information. Other scenarios to Feds worry about are the possibility of compromising IoT device to cause physical harm, to overload them, thus rendering them inoperable, and to intercept and interfere with business transactions.

On the other hand security leaks could be used by intelligence services to get access to areas of interest. James R. Clapper Director of US National Intelligence has made an according statement in the report "Worldwide Threat Assessment of the US Intelligence Community", published in February 2016: "Smart devices incorporated into the electric grid, vehicles – including autonomous vehicles – and household appliances are improving efficiency, energy conservation, and convenience. However, security industry analysts have demonstrated that many of these new systems can threaten data privacy, data integrity, or continuity of services. In the future, intelligence services might use the IoT for identification, surveillance, monitoring, location tracking, and targeting for recruitment, or to gain access to networks or user credentials."

In July 2015 Gartner published the fourth edition of the IoT Hype Cycle. IoT has the potential to transform industries and the way we live and work. This Hype Cycle helps enterprises assess the levels of risk, maturity and hype that are associated with a transformative trend.

Predicting security for IoT

Digital security is defined as a combination of current cybersecurity and risk practice with digital business practice to protect all digitalized assets of an organization, whether at the core of the enterprise or at its edge. It is the alignment of information security, IT security, operational technology security, IoT security and physical security to form cybersecurity solutions. An IoT business solution is a heterogeneous mix of several assets including IoT endpoints such as sensors, devices, multidevice systems, fleets, and actors, one (or more) IoT platform(s), and various non-IoT back-end systems which all have to be included into an overall security solution. An IoT platform is a software suite or cloud service (IoT PaaS) that facilitates operations involving IoT endpoints, cloud and enterprise resources. Looking for IoT platform offerings, the advice for CIOs, planners and architects not only should include device and its

IoT device manufacturers fail to implement basic secuity standards

James Lyne
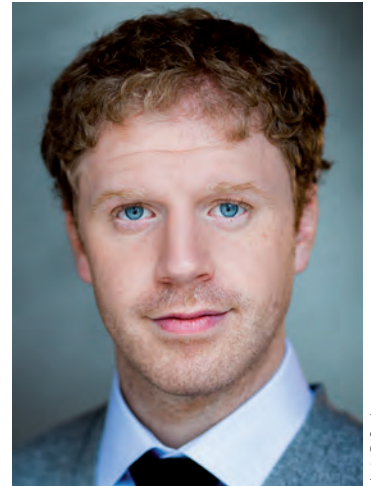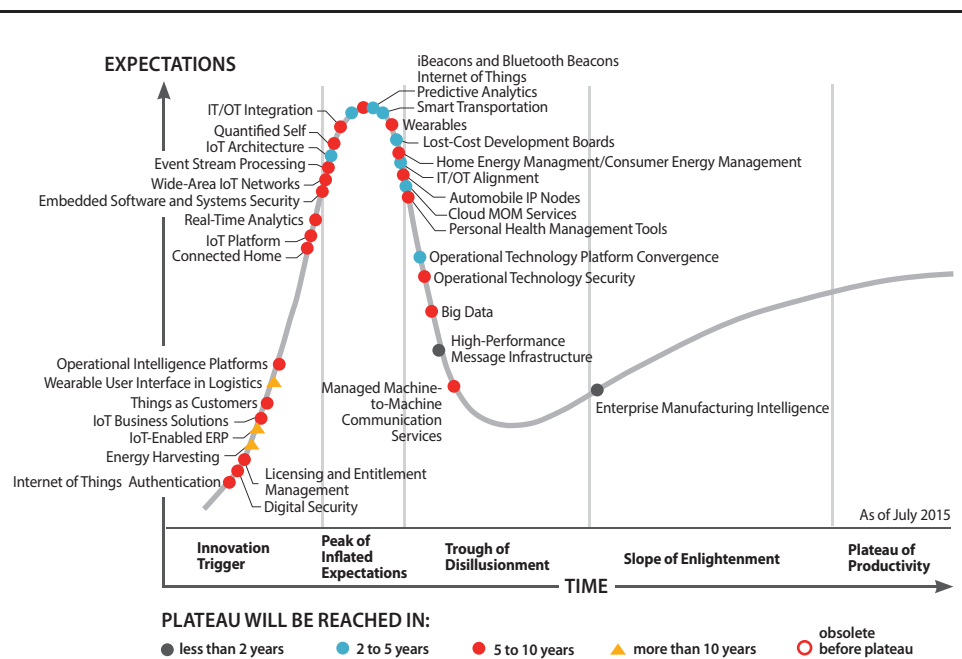Global Head of Security Research, Sophos

Riding the curve
Digital Security has reached the area of innovation trigger. It will take five to ten years to reach the plateau of productivity

application software management, data aggregation, integration, transformation, storage and management, event processing, analysis and visualization, self-service user interface, but also security.

To protect hardware and firmware from compromising attacks and assist in the delivering integrity and confidentiality of the data those systems process it is recommended to implement embedded software and systems (ESS) security which is practice and technology designed for engineers and developers. The requirements of ESS are complex, because the devices have long field lives, are often accessible to attackers, and ➡

PLATEAU WILL BE REACHED IN:				
● less than 2 years	● 2 to 5 years	● 5 to 10 years	▲ more than 10 years	○ obsolete before plateau

photo©: ForeScout

Myles Bray
Vice President of EMEA Sales at ForeScout Technologies, Inc.

photo©: F-Secure

Mika Stahlberg
F-Secure Director of Strategic Threat Research

need policies and mechanisms for provisioning and patching. Cybersecurity planners and architects must gain a full understanding of these issues. Thus CIOs and CISOs must embrace new governance and planning practices that include ESS needs. Assign one or more individuals on your security team to fully understand the magnitude of how the IoT will need to be managed and controlled.

"Since 2014 we've seen more evidence that manufacturers of IoT devices have failed to implement basic security standards – either they haven't learned from the long and painful history of failures of mainstream computing or, in their rush to go to market, they just don't care", explains James Lyne, Global Head of Security Research, Sophos in his report "Security Threat Trends 2015" "Companies are constantly under attack, fuelled by the proliferation of the number and different types of devices connecting to the network. Traditional security tools lack visibility of these devices," said Myles Bray, Vice President of EMEA Sales at ForeScout Technologies, Inc., "but ForeScout's innovative agentless approach makes the invisible visible – including Internet of Things devices. Coupled with flexible, automated response capabilities and

Suzanne Schwartz
"All medical devices that use software and are connected to hospital and health care organizations' networks have vulnerabilities – some we can proactively protect against."

extensive third party integrations, ForeScout is uniquely positioned to help organizations protect and secure their network, with optimum efficacy." According to Mika Stahlberg, F-Secure Director of Strategic Threat Research, these security concerns are quite understandable considering the kinds of devices consumers are adopting. "After entertainment, IoT adoption is focusing on quality of life products. Products like security cameras, smart locks, and smart cars all play significant roles in physical security. So online threats will take on a real-world element as more people start using these devices, and people are right to be concerned about this."

Planning for IoT security

Internet-connected computing capabilities related to smart building, industrial control systems and medical applications were the most commonly cited concerns after consumer products. While these types of applications do not receive much IoT hype in the press, the use of embedded computing in those devices will cause major breakage in existing IT management and IT security visibility, vulnerability assessment, configuration management and intrusion prevention processes and controls.

LSEC, an internationally renowned Information security cluster, a not-for-profit organization that has the objective to promote Information Security and the expertise in BeN-

photo©: FDA

eLux and Europe, wants to help to understand the needs from the user community.

LSEC recommends end-to-end security implementation for the Industrial Internet. Implementation must provide protected device-to-device communications, confidentiality and privacy of the data collected, remote security management and monitoring. Simultaneously, they need to address both existing as well as new technologies, seamlessly spanning both Information Technology (IT) and Operational Technology (OT) as well as subsystems and processes without interfering with operational business processes.

The Industrial Data Space initiative which emerged from the research project Industrial Data Space (IDS) of the German Federal Ministry of Education and Research aims at creating a secure data space that supports enterprises of different industries and different sizes in the autonomous management of data. A total of 18 companies and organizations are among the founding members. Launched by the Fraunhofer Society, the strategic initiative aims to create a secure data room. It will enable secure exchange of data and provisioning of networked services for collaboration in value networks.

Kurt Kammerer, CEO of regify GmbH recommends the IDS approach from Fraunhofer. Where IoT data and services need to be available in and across business networks, regify offers an IDS solution ("regispace") which protects IoT and other data against unauthorized access and enables data owners to make their data available to partners on granular level and in an end-to-end secured process. „For companies that want to benefit from IoT/Industry 4.0, we offer a networked solution for flexible communication and collaboration", Kurt Kammerer maintains.

Cybersecurity for medical devices

According to a new market research report "IoT Healthcare Market by

Components, Application, End-User - Global Forecast to 2020", published by MarketsandMarkets, the global IoT in healthcare market is expected to grow from US$ 32.47 Billion in 2015 to US$ 163.24 Billion by 2020. Thus security threats to medical devices are a growing concern. The exploitation of cybersecurity vulnerabilities presents a potential risk to the safety and effectiveness of medical devices and thus represents also dangers for the human being. Just imagine what could happen if somebody tries to remote control your pacemaker.

In January, the U.S. Food and Drug Administration (FDA) issued draft guidance outlining important steps medical device manufacturers should take to continually address cybersecurity risks to keep patients safe and better protect public

health. The draft guidance details in a separate chapter "Medical Device Cybersecurity Risk" the agency's recommendations for monitoring, identifying and addressing cybersecurity vulnerabilities in medical devices once they have entered the market. "All medical devices that use software and are connected to hospital and health care organizations' networks have vulnerabilities—some we can proactively protect against, while others require vigilant monitoring and timely remediation," said Suzanne Schwartz, associate director for science and strategic partnerships and acting director of emergency preparedness/operations and medical countermeasures in the FDA's Center for Devices and Radiological Health. She believes that "today's draft guidance will build on the FDA's

> **Our goal must be flexible and secure end-to-end communication and collaboration**
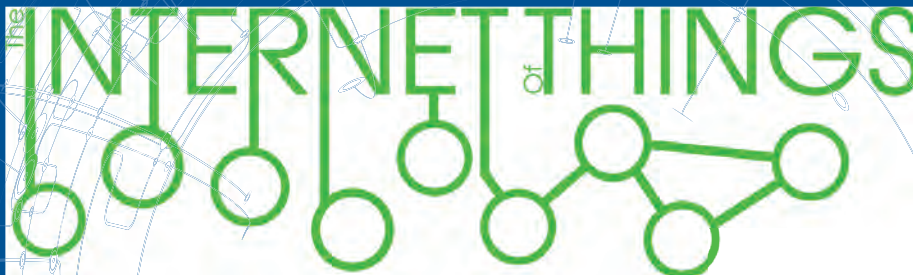
Kurt Kammerer
CEO of regify GmbH

photo© regify GmbH

existing efforts to safeguard patients from cyber threats by recommending medical device manufacturers continue to monitor and address cybersecurity issues while their product is on the market."
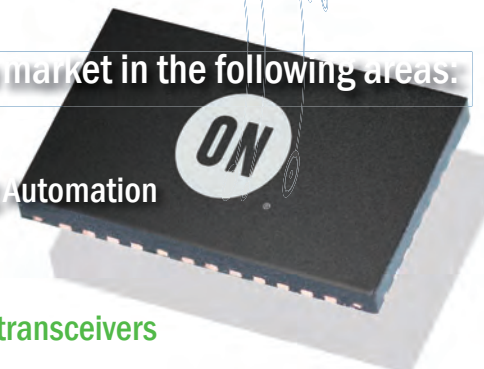
INTERVIEW

> **There is a path that guarantees the lowest possible risk.**
>
> **Guillaume Crinon**
> Technical Marketing Manager EMEA at Avnet Silica

Is it true that IT security is a thing of the past in an IoT world?

In the past 15 years, IT architects have successfully upgraded their security schemes from an all-wired-stationary desktop world to all-wireless-mobile laptop and smartphone fleets without compromising on security, and even improving it.

The same thing will happen in the years to come when beyond laptops and smartphones we will connect many more machines and objects to application servers through networks.

We will first see a lot of Intranet-of-Things deployments in the industry, where corporations will focus on keeping full control of the flow, storage and processing of data produced by their own devices without opening them to the outside world. In such schemes, the main challenge of expanding a good security coverage to these devices will be to design security schemes complying with both IT and embedded hardware standards:

This is exactly what Avnet Silica is investing into, providing full security reference-designs encompassing:
● Secure elements with customizable security protocols
● Secure personalization services for making each secure element unique

● Embedded stacks using the secure elements
● Server code talking to the secure elements

What exactly can companies do to protect their digital assets and their smart devices?

I believe that the first thing for a corporation to do is to assess the level of protection they are looking for. Security is like insurance: some will consider they do not need any, some will go for the full coverage depending on what they are seeking to protect, the value and the potential cost of recovering from a breach in terms of image, intellectual property, competitive advantage, retrofitting etc.

The second rule is to strictly follow the rules. There is a safe path, and wandering away from it is always dangerous. Protecting oneself is all about reducing the risk of being attacked. It all has to do with probabilities: It is impossible to reach zero, but for a given level of security there is an optimum path which guarantees the lowest risk of a problem to happen.

Minimizing the risk for a car accident would be following a checklist like this one: check tyres, adjust mirrors, fasten seatbelt, strictly follow the signs, traffic lights and driving rules.

Minimizing the risk of a plane accident requires a similar, but much longer checklist.

Minimizing the risk of a security breach in a connected objects system will be:
● Design for security from day one: no backdoors in software, no unnecessary test modes. You should always take a top-down approach to global architecture
● Use certified security components
● Use standardized cryptography primitives
● Apply standard security protocols
● Take advice from experts if necessary
● Never apply home-brewed solu-

tions; they are less secure than a standard proofed by armies of specialists

Is privacy protection still a realistic goal in a totally networked world?

It is probably not a goal for many businesses who would love to make money out of private data collected in different ways. So the question I would ask would rather be "Is privacy protection still possible in a totally connected world?"

I tend to believe it is possible if people are careful enough to avoid behaviours and applications exposing their privacy, whereas many of these applications will try to trade cool services for personal data: Is five percent off worth giving away one's personal details to a clothing brand? We already rely a lot on our smartphones and some websites by confiding personal data to them like passwords we are too lazy to type or remember, credit card numbers, and so on.

All the connected objects, devices, machines around us promising to improve our lives, our efficiency and our well-being will not do it for free. They will ask for data in return and it will be up to each individual and corporation to recognize whom they want to trust for keeping their secrets secret.

What role will breach detection and forensic systems play in the future?

Very important, I suspect. It is said that most corporations being hacked do not realize it right away, and some never do. Being hacked in the life of a corporation is almost 100 percent certain, so the important thing beyond ensuring that the probability is kept to a minimum and everything is in place to ensure a proper recovery is to be able to detect a breach as soon as possible, so you can apply appropriate countermeasures.

THE PIPES ARE
CALLING

Not even one percent of the water on earth is available as fresh drinking water. Still, as the infrastructure of most **water-distribution systems is aging, a lot of precious liquid is lost** on the way to the customer. But modern sensor-technology can help put our water infrastructures into a better shape.

■ **by Rainer Claaßen***

specially in areas that are subject to regular bouts of drought, the loss of water due to leakages in the pipe-system can cause serious problems. But even where there is no real shortage of fresh water, the economic damage due to ineffective maintenance is often huge.

In the past, experts in the area of pipe-control have attempted to analyze the condition of the water main simply by listening to the sounds from the pipes and with the help of a tool similar to a doctor's stethoscope. But even well trained employees are not always able to tell exactly where a crack has occurred by this method. This means high costs to dig up culverts to find leaks. However, with the help of new technology and predictive maintenance methods, water suppliers in Europe and the U.S. are finally solving the seepage problem.

"Be like water making its way through cracks" – these are the first words of a famous quote of martial-arts legend Bruce Lee. A man, whose ability to control his body is unsurpassed. Examples for intelligent water distribution will continue and be implemented in many other places, we will be able to have better control over the flow of waters in our civilization. Thus being able to effortlessly guarantee higher efficiency, less pollution and more quality of life to the people.

Plugging the hole

■ LeakFinderST

Existing equipment is unable to detect leaks in plastic water pipes with any accuracy or consistency. Severn Trent – a big water supplier in England – uses the LeakFinderST developed by the Canadian company Echologics to check for leakage. The system makes leak detection a lot easier – and it can find leaks other systems are unable to detect. Keiron Maher, research and development manager of Severn Trent, believes that "this is a fantastic piece of kit that significantly reduces the amount of time needed to accurately locate

photo©: Echologics

leaks, especially in plastic pipes. This is great news for us and our customers, as more and more of our pipes are plastic now, because we're upgrading and replacing the old metal pipes. And this new technology will help us in our quest to drive down levels of leakage." LeakFinderST enables municipalities to locate "quiet" narrow band, low frequency leaks and leaks previously identified as background leakage on water mains, with materials such as plastic, concrete or cast Iron.
The system uses the correlation method to notice leakages and to locate them exactly (see caption below). Developed and patented in collaboration with Neil Dixon and James Flint, electronic engineers from Loughborough University, Echologics acquired a license to incorporate the technology into their next generation of leak detection products. The system received the Outstanding Innovation Award at the UK's Water Industry Achievement Awards last year.
A disadvantage of the system used in Severn Trent is that leakages can only be detected where you look for them. The mobile teams equipped with Echologics need to attach smart sensors to hydrants all across town to find cracks. A leak may stay unnoticed as long as the teams do not make measurements nearby.

Fixed installations

■ SebaLog

In Dortmund, Germany. 600.000 people rely on DEW21, the local water company, for their water supply. In 2014 they installed a system with fixed sensors at 109 measuring points in their water net which stretches over 350 kilometers. The sensors make recordings during nighttime,

photo©: SebaKMT

when noise disturbance is comparatively low. The data is transmitted wirelessly to the analysts at DEW21. If they can hear an increase of the lowest noise level, chances are that there is a leak. If no fixed sensors are available to detect the precise position of the leak, service teams with mobile loggers do a closer examination of the area. The illustration from manufacturer SebaKMT (left) shows how the correlation method is used to locate the exact position of a leak. If two sensors are near the leak, its precise location can be calculated from the different times it takes for the noise to reach the two sensors. The information is transferred to cloud servers or directly to the service station of the water company.
Depending on the location of the sensors and the material of the pipes, the location of a leak can be detected very precisely. With this method leaks can be detected at a very early stage, which makes it easier to repair the damage, and as service teams know exactly where to look the costs of digging up the streets are lower, too.
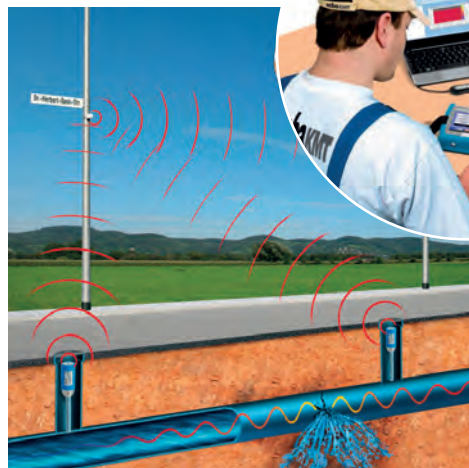
*Rainer Claaßen (50) is a media engineer, entrepreneur and tech journalist

Boosting circulation

photo©: SUEZ

■ RAMSES

Water companies not only take care of the water supply; they also need to make sure that wastewater is being cleaned and returned in a natural cycle.
In Bordeaux, the French company Suez has installed a smart water remote-control center called RAMSES (Régulation de l'Assainissement par Mesures et Supervision des Equipements et Stations/Regulation of Sanitation by Measures and Supervision of Equipment and Treatment Plants) that utilizes data provided by the France weather forecast service, including rainfall measurements, RAMSES accurately determines the threat posed by heavy rain and thunderstorms in real time. The system is able to predict the location and volume of potential floods 24 hours ahead in dry weather, and six hours ahead in rainy weather. The system also provides a birdseye view of the entire sanitation system using meteorological, metrological, hydrological and hydraulic data. This enables authorities to prevent flooding or overflow of retention systems. But RAMSES can do even more: It ensures that surface water can be stored using the capacities of a wide range of existing sanitation infrastructures such as pumping stations, main sewers, and surge ponds. The system makes sure that these infrastructures are fully utilized by means of dynamic management of incoming water and by redirecting the movement of water towards available infrastructures until the network resumes its usual flow, thus creating an economic and financial solution which makes best use of storage capabilities at the right place and at the right time.

Support from Brussels

■ THE ICEWATER PROJECT

Municipalities are not always alone in their efforts to develop or aquire systems to increase the efficiency of their water distribution. In 2013 the ICeWater-project was launched in Italy with funding from the European Union's Seventh Framework Programme. The project is hosted by a consortium of companies including the Rumanian water supplier Aquatim, along with Toshiba and Siemens who conducted studies aimed at increasing the stability of freshwater supply to citizens in urban areas by adjusting the water supply to the actual consumption, thus minimizing energy use through smart-grid integration, as well as reducing water losses through leak detection. In a pilot-project in the center-south of Milan several steps were taken to move closer to the intelligent town of the future. A decision support system using advanced simulation and optimization algorithms and cloud computing was installed. Benefits included

- planning of the water supply system with respect to operational and strategic aspects
- energy reduction and water quality control

photo©: icewater-project.eu

- intelligent water waste and consumption reduction system that supports leak detection and water spill with a "fix before break" approach
- a water demand management system that is highly adaptive and supports dynamic pricing for water asset management
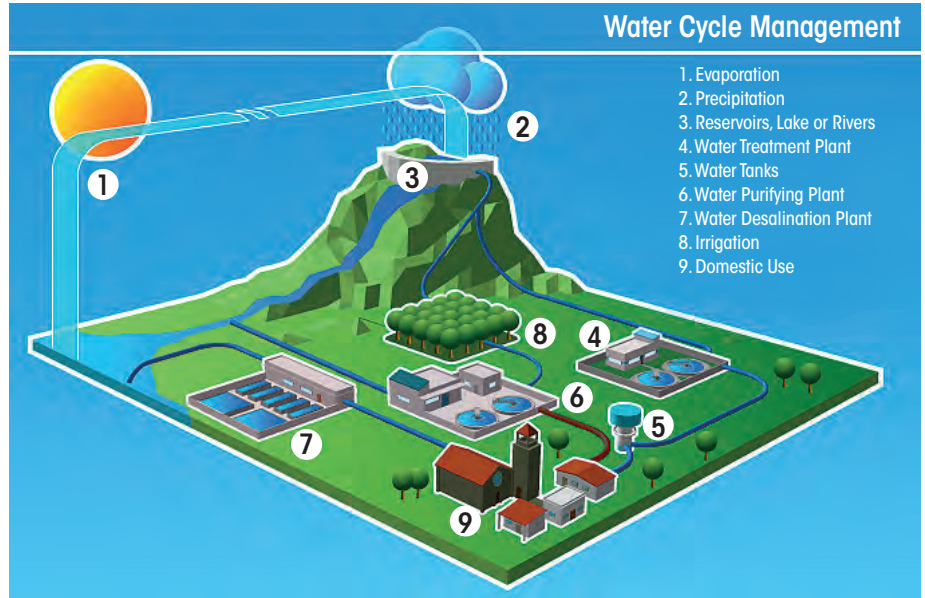- networking components, service infrastructure and communication platform for interconnecting all subsystems.

The ICeWater project took three years to complete and went operational in October 2015. Final results haven't been published yet, but the project operators are sure many communities will profit from this pilot project since it proves how important information and communication technology will become in the field of water supply.

Water Cycle Management in Valencia, Spain

■ PRETESIC

In Spain, the Institute of Computer Technology (ITI) uses a system called PRETESIC that was developed in collaboration with the Polytechnic University of Valencia (UPV) and Telefonica Cathedra. It was recently deployed in the city of Valencia and monitors water quality by measuring a wide range of environmental parameters. The main advantage is the system's ability to reduce the time needed to deploy a wireless sensor network. Networks such as these are called Quick Deployment Sensor Networks (QDSN). The nodes use Waspmotes, an open source wireless sensor platform specially focused on the implementation of low consumption modes, making the sensor nodes ("motes") completely autonomous. Parameters are measured and transferred to Unit Control via the Internet, including

- Temperature
- Acidity
- Conductivity
- Oxidation and reduction "redox"
- Clarity
- Chemical oxygen demand

Water Cycle Management

1. Evaporation
2. Precipitation
3. Reservoirs, Lake or Rivers
4. Water Treatment Plant
5. Water Tanks
6. Water Purifying Plant
7. Water Desalination Plant
8. Irrigation
9. Domestic Use

photo©: Libelium Comunicaciones Distribuidas S.L.

The system can react to unexpected situations, avoiding possible damage from natural disasters such as floods.

One of the main advantages is that PRETESIC allows deployment of sensor nodes almost anywhere, and the sensors can start to receive data immediately. In the near future systems like this will greatly increase the amount of information on the water circulation available to communities and water departments.

Remote control

■ LISA

It's always good to know the status of your water-net, of course. But when the information has to trigger a reaction, time is at a premium. The Berliner Wasserbetriebe, the company that supplies water to the German capital, recently installed a system called LISA ("Leit- und Informationssystem Abwasser" = Guide- and Information System for waste water) that controls 300 pump stations, rainwater reservoirs and other facilities all over the city and the surrounding areas. Status information is gathered centrally. Circulation of wastewater is controlled remotely from the control center, too. During heavy rain, the flow of wastewater can be redirected to sewage works that still have free capacity remaining.
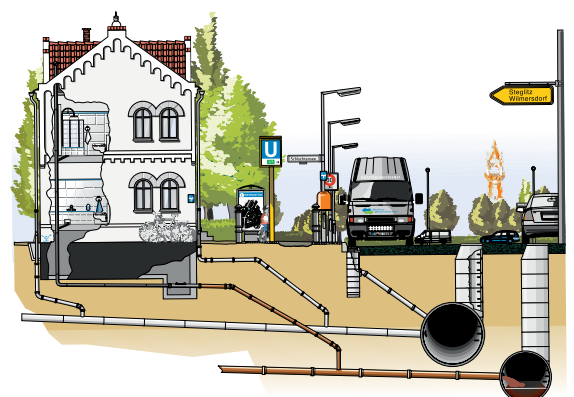
photo©: Berliner Wasserbetriebe

DON'T TAKE
FOREVER

Interview with Vernon Turner, Research Fellow and IoT Evangelist at IDC

Vernon Turner,
Research Fellow and
IoT Evangelist at IDC

Everybody these days seems to be talking about IoT, but are they actually doing anything about it?

IDC has never had a Research Fellow, but we feel that IoT is so fundamentally important to the IT market that they gave me this title. There's a lot of evangelism going on right now around IoT, because there is this big knowledge gap. And yes, there's a lot of talk, but its important that we start implementing.

Surely there must be examples?

There are several initiatives that are highly visible, and there are many more that are behind the scenes and sort of creeping up on us. Let me give you a few cases. On the B2C side, we have seen a jump start in wearables such as Fitbits and other devices that perform what I would describe as rudimentary functions like measuring your heart rate, your sleep, and the

number of steps you take. That has been successful in creating public awareness about what will eventually happen. This development has been pushed mainly by the big sporting companies. The problem is: What do I do with that data? When you shift over to the B2B side you start to understand that there's an opportunity to enter a new world of products and services we've never seen before.

Are companies ready for this?

When I talk with customers who want to start an IoT implementation as a B2B company, I first ask them the following: Do you have a mature cloud strategy? That can be a private cloud or a hybrid cloud or a public cloud. You see, if we do IoT correctly, it will require significant scaling of IT resources, and you can't do that with an old-fashioned IT model. You need to be able to scale at will and at speed because of the sheer number of devices that will be connected to your network. And to handle that data you need to have an analytics or business intelligent strategy. If you don't, then why are you collecting all this data? Harking back to the Fitbit example, you end up with information with-out enriching it to create an intelligent business outcome.

What does that mean?

An intelligent business outcome, in the context of manufacturing, should mean that you're using that data to

improve the factory floor, to improve the way your robots work, to improve your supply chain and your logistics, the movement of goods inside and outside your company. You achieve that through an analytics approach. When you add cloud and analytics to your processes, you start to get into the latest trend that goes hand in hand with IoT, and that is transforming your business. Unfortunately, not everybody is ready and willing to transform their business. That's where you start to get what I like to call the paintball deployments of IoT. Somebody says hey, I've got a great idea. We can write an IoT app in fifteen minutes, and we'll use our existing corporate network – easy! But then comes the moment when you stop and ask yourself: Are we really ready for this? Are we ready to take advantage of the information it gives us?

What does the readiness and ability to adopt IoT strategies mean for a company's bottom line and hence for its valuation by analysts and for its credit rating?

I take a leaf out of GE's approach to IoT in the sense of what we call the one percent. This is not a Bernie Sanders discussion, by the way. That means if you were to improve your company's performance by one percent, whatever business you're in, you would see disproportionate improvement in your bottom line. If Ford Motor Company. were to improve just its manufacturing process by one percent, they would realize something like eleven percent improvement in profits. If you apply that analogy across other industries, you get similar results. Think about Smart Water, for instance: If water companies were to save one percent of water through IoT we would account for 30 percent of this country's water needs! That's because we lose so much water through faulty distribution systems and leaking pipes. If you do this right, the returns are measurable and hugely impactful.

Do banks and analysts today understand enough about IoT to judge a company by its ability to execute on the promises of IoT?

We're still early in the IoT maturity curve, so there are still few best-of-breeds out there. It's a five-stage model which essentially moves from proof of concept through to reengineering a company. Reengineering your company is where you really start maximizing your data and creating repeatable solutions, thereby changing the way the company is run. Right now lots of companies are still at stage one, quite a few are at stage two and three, and only a handful are at stages four and five. We aren't seeing enough companies yet getting to that critical mass to be able to measure the results accurately. Banks and analysts don't know very many examples of successful IoT companies yet.

So there simply isn't enough data?
Short answer: We aren't seeing enough companies today that are making enough noise for banks and Wall Street or industry analysts to be able to say, yes, this is truly happening.

What we still see are lots of proofs of concept. And while many lines of business realize by now that this will be good for them, they still haven't manage to create end to end integrated solutions yet.

Since most of your clients seem to be at the very beginning, what do you advise them to do for a start?
It kind of depends on which industry you're in. I like to see a workflow in place that is self-contained and where it's easy to integrate IoT sensors. Take building management. You might want to sensor just one floor to be able to measure things like heat, air conditioning, lighting, air quality. My suggestion is, start small and stay contained. Understand what it takes to collect the data and create the workflow you need to understand that data. And finally, make sure you have a visualization process in place that will let you know what you have here and what you need to do next.

> **My suggestion is: Start small and stay contained in that process.**

Whose responsibility is that?
You need an advocate within the company, be it the COO or the CFO, as well as the CIO. And you need a dedicated team that can the proven ability to think different. If you have the same people who have been running the business forever, they will tend to try and keep on running it that way even if you give them all this new data. I hate to say this but you need a kind of generational transition; people who are fine thinking outside the box and who can take that information and say, know what? If I combine that with some other form of information, then I create a new solution. So to sum up: Start simple with a workflow solution you can get your hands around, but have a distinct post-processing plan for what to do once you get all the data. You should be working on no longer than 90-day cycles. This should not take forever. We have seen that approach work very well in several of our client engagements.

5G IS COMING

but will it get here in time?

5G was the big topic at this year's edition of Mobile World Congress in Barcelona. But how will the **fifth generation of mobile technology** meet the demands and business issues by the time it is officially launched in 2020? And what will it mean for the future of real-time applications and IoT?

■ by Gerhard Kafka

Today's mobile networks are designed primarily to provide mobile broadband. However they were not engineered to support the expected growth in demand for digital content and machine connectivity in comming years. Volker Held, head of 5G Market Development at Nokia, thinks that demand wlli far outstrip supply in terms of capacity and connectivity. "At the current rate of adoption, 3G, 4G/LTE, small cells, and Wi-Fi-like technologies will only satisfy about 81 percent of the conservative demand forecast by 2020," he maintains.

If more disruptive predictions are true, Held believes operators will only be able to meet about 75 percent of total market demand. Bell

© Source: 5G PPP

The current vision is that in ten years from now, telecom and IT will be integrated towards a common very high capacity ubiquitous infrastructure, with converging capabilities for both fixed and mobile accesses. capability of 5G with an artificial hand capable to remote control operations in contaminated areas.
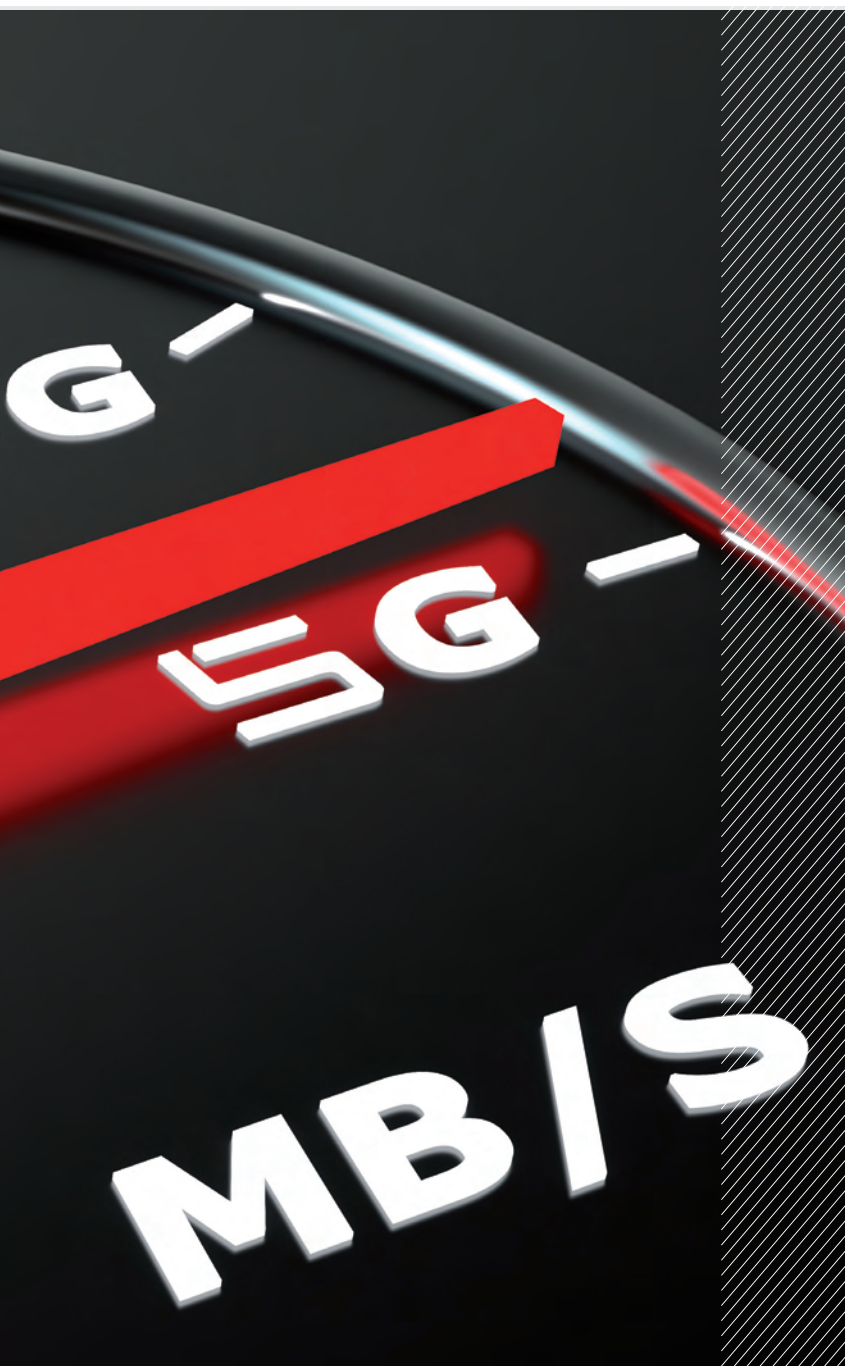
Labs predicts a global average increase in usage of 30 to 45 times from 2014 levels — with some markets experiencing as much as a 98 times jump over the same period.

5G is all about anytime, anywhere support for: massive broadband that delivers gigabytes of bandwidth on demand, for critical Machine-Type Communication (MTC) that requires immediate, synchronized eye-to-hand feedback for virtual reality applications that will allow users to remotely control robots, creating the tactile Internet, as well as for massive MTC that connects billions of sensors and machines, from watches to refrigerators, parking meters, and cars.

In February 2015 the NGMN Alliance, which currently consists of 89 partners from the telecommunications in-

dustry and the research community, including 28 mobile network operators ("Members"), 36 vendors/manufacturers ("Contributors"), and 25 universities or non-industrial research institutes ("Advisors"), published a 5G white paper laying out a comprehensive vision for the next generation of mobile communications.

What is G5?

"5G is an end-to-end ecosystem to enable a fully mobile and connected society", the report states. "It empowers value creation towards customers and partners, through existing and emerging use cases, delivered with consistent experience, and enabled by sustainable business models."

There will be a large number of new use cases ranging from delay-sensi-

tive to ultra-low latency applications, and from best effort applications to reliable and ultra-reliable ones such as health and safety. NGMN is focusing on eight families of use case:

● Broadband access in dense areas – pervasive video

● Broadband access everywhere – 50+ Mbps in all areas

● Higher user mobility – high speed train communications

● Massive Internet of Things – sensor networks

● Extreme real-time communications – tactile Internet

● Lifeline communications – natural disaster

● Ultra-reliable communications – e-health services.

5G also will expand to new business models to support different types of customers and partnerships. Operators will be able to support vertical industries by configuring individual networks to actual user requirements. Furthermore, 5G will use new network technologies and infrastructures to provide the actual capacities needed to humans and machines.

In addition, 5G services will complement and largely outperform the current operational capabilities for wide-area systems, reaching high-performance indicators: such as guaranteed user data rate everywhere of 50 Mbps, aggregate service reliability of at least 99,999 percent, and the ability to serve over 7 billion people. Other benchmarks include:

● Mobility support at speeds ≥ 500 km/h for ground transportation

● Airplane connectivity – 80 per plane, 60 airplanes per 18.000 sqkm

● Accuracy of outdoor terminal location of less than one meter.

This makes clear that 5G is not just another generation of mobile networks; it represents a whole new network concept that will enable ubiquitous access for cooperative, cognitive, and heterogeneous wireless resources, with fixed optical access reaching at least the 10 Gbps range. In addition it will make possible new functions and functionalities that will allow simplified and unified control.

There is a shared awareness among stakeholders that the development of new communication networks will depend on the emergence of globally accepted standards for interoperability, offering economies of scale with affordable cost for system deployers and end users.

Standardization: work in progress

In early 2012 the International Telecommunication Union Radiocommunication Sector (ITU-R) embarked on an ambitious program to develop "IMT (International Mobile Telecommunication) for 2020 and beyond", setting the stage for 5G research activities that are currently underway around the world. Through its Working Party 5D, ITU's Radiocommunication Sector has finalized its view of a timeline towards IMT-2020. The first 5G standard isn't expected before the year 2020. The detailed ➔

Mobile communication: from 1G to 5G

As this illustration shows, a new mobile technology enters the markets about every ten years on average. If this cycle repeats itself, 5G should be ready by the year 2020. That is also the timeline of the various organizations involved in the development and standardization of 5G.

investigation of the key elements of 5G are already well underway, once again utilizing the highly successful partnership ITU-R has with the mobile broadband industry and the wide range of stakeholders in the 5G community.

In September 2015, ITU-R finalized its vision of the 5G mobile broadband connected society. This view of the horizon for the future of mobile technology will be instrumental in setting the agenda for the World Radiocommunication Conference 2019, where deliberations on additional spectrum are taking place in support of the future growth of IMT.

Securing European leadership

The 5G Infrastructure Public Private Partnership, in short 5G PPP, has been initiated by the EU Commission, vendors, telecommunications operators, service providers, SMEs and researchers. The 5G PPP will deliver solutions, architectures, technologies and standards for the ubiquitous next generation communication infrastructures of the coming decade. The challenge for the 5G PPP is to secure Europe's leadership in the particular areas where Europe is strong or where there is potential for creating new markets such as smart cities, e-health, intelligent transport, education or entertainment & media. The Architecture Working Group of 5G PPP is working on a White Paper with focus on the design of the architecture for the 5G era, which should be available in June 2016.

The current vision is that in ten years from now, telecom and IT will be integrated towards a common very high capacity ubiquitous infrastructure, with converging capabilities for both fixed and mobile accesses.

5G PPP has defined 19 projects in Phase 1. The core project Euro-5G coordinates an effective and efficient cooperation and integration between all projects of the 5G PPP, the European Commission, the 5G-Infrastructure Association, Networld2020 ETP, related projects from EUREKA,

and related national initiatives to maximize the European momentum towards, and benefits from, the future 5G integrated, ubiquitous and ultra-high capacity networks. The Euro-5G project will

● Drive the 5G PPP goal to maintain and enhance the competitiveness of the European ICT industry in the 5G domain

● Ensure that European society can enjoy the economic and societal benefits of these future networks through promotion of uptake and stimulating adoption and use

● Monitor and analyze international 5G activities and will facilitate respective activities such as meetings, workshops etc.

● Launch and maintain a comprehensive communications and dissemination program emanating from a lively and continuously updated 5G PPP.eu website including various social media tools as appropriate.

The call for Phase 2 has just been opened with a deadline in November 2016 and will focus on a model addressing 5G Infrastructure PPP Strategic Objective, research and validation of critical technologies and systems, convergent technologies such as ubiquitous 5G access leveraging optical technologies, and Next Generation Communication Networks (NGCNs).

Ensuring the Technologies Are Mature

A consultation for the targets of Phase 3 (2018 – 2020) was already undertaken and was closed in April 2016.

NGMN has defined a 5G roadmap that shows an ambitious time-line with a launch of first commercial systems in 2020. At the same time it defines what experts consider a reasonable period for all the industry players to carry out the required activities, such as standardization, testing, trials ensuring availability of mature technology solutions for the operators, and attractive services for the customers at launch date. The key milestones are:

● Commercial system ready in 2020
● Standards ready end of 2018
● Trials start in 2018

Families | Categories | Use Cases

Families	Categories	Use Cases
Broadband access in dense areas	Broadband access in dense area	• Pervasive video • Operator cloud service • Dense urban society
	Indoor ultra-high broadband access	• Smart Office
	Broadband access in a crowd	• HD video/photo sharing in stadium/open-air gathering
Broadband access everywhere	50+Mbps everywhere	• 50 Mbps everywhere
	Ultra low-cost broadband access for low ARPU area	• Ultra-low cost networks
High user mobility	Mobile broadband in vehicles	• High speed train • Moving Hot Spot • Remote comuting
	Airplane connectivity	• 3D Connectivity: Aircrafts
Massive Internet of Things	Massive low-cost/long-range/low-power MTC	• Smart wearables (clothes) • Sendor networks
	Broadband MTC	• Mobile video surveillance
Extreme real time communication	Ultra low latency	• Tactile internet
Lifeline communication	Resilience and traffic surge	• Natural disaster
Ultra-reliable communication	Ultra-high reliability & Ultra low latency	• Automatic traffic control/driving • Collaborative robots • Remote object manipulation Remote surgery
	Ultra-high availability and reliability	• eHealth: Extreme Life Critical • Public safety • 3D Connectivity: Drones
Broadcast like services	Broadcast like services	• News and information • Broadcast like service: Local, Regional, National

NGMN's use case categories

The NGMN Alliance,is focusing on eight families of use cases including a large number of new ones ranging from delay-sensitive to ultra-low latency applications

At CeBit 2016

Prof. Dr. Gerhard Fettweis (center), Vodafone Chair Mobile Communications Systems TU Dresden and Dr. Hannes Ametsreiter (right), CEO Vodafone Germany demonstrated the real-time capability of 5G with an artificial hand capable of remote controlling operations in contaminated areas. such as nuclear reactors

Smart antennas with MIMO (multiple input, multiple output) and beam forming will ensure efficient usage of the available frequency spectrum. Small cells will help to increase the capacity.

A completely new feature called "Network Slicing" allows operators to define a collection of 5G network functions and specific radio access technologies (RAT) settings that are combined together for the specific use case or business model. Thus, a 5G slice can span all domains of the network: software modules running on cloud nodes, specific configurations of the transport network supporting flexible location of functions, a dedicated radio configuration or even a specific RAT, as well as configuration of the 5G device.

With the present hype around 5G businesses should not lose sight of what's possible with existing and advanced 4G networks. LTE advanced (LTE-A) will address specific applications such as e-health, IoT, and autonomous vehicles by meeting the special requirements such as low latency and high speeds. That means you can already design your 5G services today by using LTE-A features and migrate step-by-step to 5G when available.

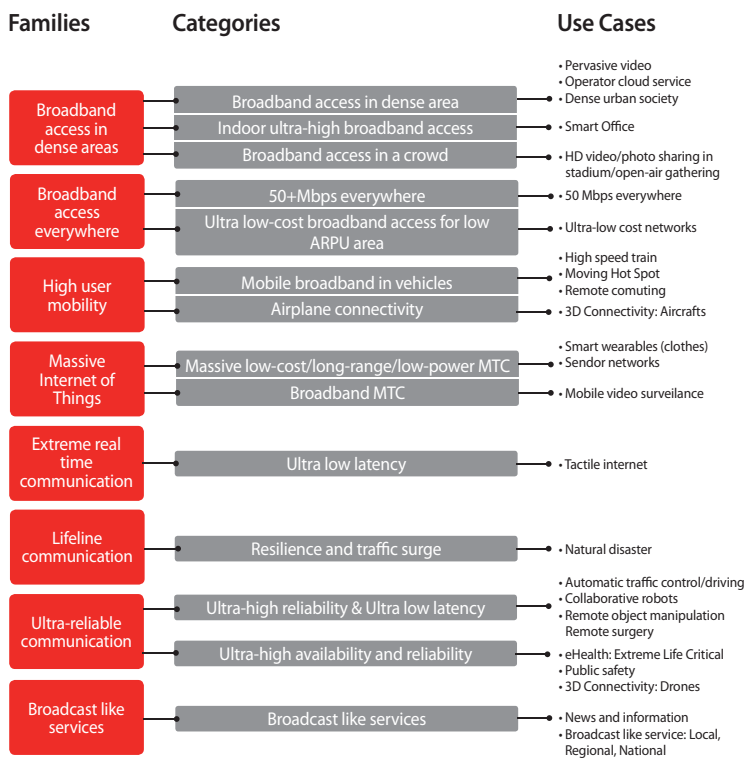
● Initial system design in 2017.

The launch of 5G will occur on an operator-specific and individual country basis. Some operators might plan to launch in 2020 – others will plan for a later deployment. The first public trial of a 5G system is expected to be in operation for the Olympic Winter Games in Pyeongchang, South Korea in February 2018. SK Telecom is planning the first network test as early as in 2017.

5G will build on earlier generation mobile technologies and will bring additional capabilities. Spectrum bands already licensed to mobile network operators will form an essential foundation for 5G mobile services. It is therefore important to allow operators to "re-farm" existing spectrum bands to 5G technology according to their deployment strategy. This will enable improvements in spectrum efficiency to be achieved and new capabilities to be introduced. Some of the described 5G features will require very wide channel bandwidths that can only be accommodated in bands above 6 GHz. The proposed frequency bands to be further studied include 6 – 20, 20 – 30, and 30 – 86 GHz.

Following the growing demand for spectrum for mobile broadband services, the World Radio Conference 2015 (WRC-15) identified frequency bands in the L-band (1427 –1518 MHz) and in the lower part of the C-band (3.4 – 3.6 GHz). WRC-15 took a key decision that will provide enhanced capacity for mobile broadband in the 694 – 790 MHz frequency band in ITU Region-1 (Europe, Africa, the Middle East and Central Asia) and a globally harmonized solution for the implementation of the digital dividend. The final assignment of the 5G frequency spectrum is expected during the next WRC in 2019.

Software Will Manage Services

Software Defined Networking (SDN), Network Functions Virtualization (NFV), and Self Organizing Networks (SON) will be implemented thus employing software to manage services, hardware and infrastructure in an orchestrated and automated manner.

Prediction system

BIG DATA ANALYSIS

Data are the crude oil of the 21st century.
But how to make sense out of petabytes of information?
Alexander Thamm has set himself up as Europe's first
Data Science service provider. Smart Industry
asked him what that means.

Rising star

Alexander Thamm

is founder and CEO of Germany`s first Data Science Consultancy. The analysts of Experton Group recently promoted his company to „Rising Star" status

What does a Data Science Consultant do all day?

You can't describe a typical day of a data scientist consultant, as the tasks vary and depend on the phase of the project. In the Business Processes stage, the key business questions need to be identified. The Data Intelligence phase includes steps such as extraction and preparation as well as evaluation of the data. For Predictive Analytics, we develop a model for statistical analysis. The final results are then visualized using an interactive dashboard which enables the customer to examine and evaluate the outcomes from different viewpoints.

Who are your clients?

We have clients from many different industries and from all sorts of functions and departments. For marketing and sales, we are involved in optimizing the customer journey, defining the next best offer or calculating the best price. In production, predictive maintenance is a big topic as well as the Internet of Things. Controlling and management need smart reporting and visualization to save time and – even more important – to enable better decision-making. Most of our clients are large companies like BMW, Daimler, Vodafone, MunichRe, or EnBW. We often work in so-called data labs or centers of excellence. These are like a start-up within a large company. You work in a very innovative environment, you can experiment, and decisions are made quickly.

> I think there is a huge potential, especially in Germany with its many "hidden champions".

What about small and medium-sized companies: Do they use your services, too?

Medium-sized companies are just beginning to discover the possibilities of data science and analytics. I think there is a huge potential, especially in Germany with its many "hidden champions". Right now, for instance, we are working with a German tool maker who wants to better understand his customers. Typical questions are: "How do my end customers actually use the product?" "How do my customers make a buying decision?"

Who do you talk to when you're with a client – management, IT, or both?

Our first contact is almost always with management. In my experience, the best and quickest progress is made if there is a strong commitment from the board to invest in big data and digitalization. A pragmatic Chief Analytics Officer or Chief Digital Officer who wants to go new ways and set a framework for the data strategy is also quite helpful. Our solutions need to fit into the available infrastructure, so it's important to make sure the IT department is on board at an early stage.

You seem very excited about something you call "Data Intelligence". What does that mean?

There are many different types of data: you have numbers, meaning measured values or operating figures. Then there are binary variables that describe a client's yes or no purchase decision. Then there is structured data, for example a model designation, or unstructured ➜

Getting the picture
Studies show that people remember 80 percent of what they see, but just 20 percent of what they read and 10 percent of what they hear. Our brain can processes images 60,000 times faster than text.

data like customer reviews. These different types of data have to be organized. Put simply, we need to make sure the data all speak the same language. It is also very important to validate the data by asking ourselves: "Is the data plausible?" "Are some observations obviously wrong, perhaps due to coding error?" "Are important values missing?" What we call data intelligence is often the most intense phase of the project, and it's where most of the work needs to be done. Good data quality is crucial for the actual analysis.

Why, exactly, is a picture is worth a thousand numbers, as you maintain?

We need to clarify here: the right picture is worth a thousand numbers. But an interactive dashboard is even better than a picture. Studies have shown that people remember 80 percent of what they see, but just 20 percent of what they read and 10 percent of what they hear. Our brain can processes images 60,000 times faster than text.

How do you use visuals to get your messages across?

Visualizations are especially helpful

to communicate relations and results to the management – and to get their attention! We once presented a dashboard to the management of a client showing them their market position across different regions in Germany and across all age groups. The whole map was blue which meant they were the market leader. Only one region was grey because there their main competitor was ahead. Then we changed the picture to show the age group 18-29, and suddenly the whole map went grey! Our dashboard proved that they had a serious problem with young customers. Simply showing them a table with hundreds of figures wouldn't have had the same dramatic effect.

You believe that machine outages and downtime will eventually be a thing of the past. How so?

Though predictive maintenance. True to the motto "fix it before it fails", predictive models can calculate the right time to schedule the maintenance of plant or machines in order to avoid unnecessary costs and machine failure. One of our clients is a global automobile manufacturer who wanted to identify defective vehicles before they actually break down. Thanks to our forecast

model they are now able to identify two-thirds of all affected vehicles beforehand. The warranty costs went down by over 50 percent!

You say that car manufacturers will be able to certify automobiles remotely without any need for manual inspection. How so?

Honestly, I think we are not very far away from that. Tesla can already update a car's software via the Internet – for them it's just one click. Today's cars have loads of sensors on board to monitor things like tire pressure or engine temperature. Other sensors provide information on things like speed, distance, etc. By entering all this data into a predictive model, we can reliably identify cars where a problem is likely to occur soon. Remote certification of cars will be technically feasible in four or five years. However, it will take a lot longer to establish such a system in practice. You need to lots of long-term tests, not to mention legal changes and a new infrastructure.

Banks are especially keen on gaining predictive insights on the creditworthiness of people and businesses seeking loans.

First of all, it is important to note

that both the bank and the customer profit from better solvency predictions. Take for example the emergency loan algorithm, which we developed for a German bank. The emergency loan is a kind of micro credit, usually for amounts of 100 or 200 Euros, with a one or two-month repayment term. In Germany, the most commonly used way to estimate creditworthiness is the score provided by SCHUFA, a credit rating company. In many cases, the target group for emergency credit already has a SCHUFA entry disqualifying them from further loans. Therefore, we need to examine other factors to determine if they are credit-worthy and likely to repay. Our algorithm considers all sorts of data, from personal credit histories to recent transactions and even social media activities. That way we can reduce credit losses by over 90 percent even though the granting rate remains the same.

In what other areas will predictive analysis revolutionize the way companies do business?

As a general rule, companies have to become more data-driven and establish a hypothesis-based decision-making culture. Business is becoming less plannable, and core products and services are being commoditized. Probably, the next disruptor business model is already knocking on your door. The ability to experiment with new ideas, prototype a viable product or process, and quickly learn from results, enables a whole new way of thinking. Predictive analytics, data science and leveraging value from data will be the big differentiator as enterprises head for the digital future. Predictive analytics not only helps them make better decisions; if done holistically, it allows them to really understand their customers in ways never seen before. By analyzing the customer journey, by predicting customer lifetime value, by recommending products for cross- and up-selling, and by preventing customer churn, manufacturers and retailers stand to dramatically increase customer engagement and satisfaction.

You claim to be able to analyze business processes, customer behavior and even mechanical properties of equipment and translate the problem into tangible IT demands. How far can you go?

We are a data science consultancy, and we are independent from any single technology provider. Within the last four years, we have recommended over 50 different technology solutions, each tailored to fit the project needs of the client. Our expertise and practical experience with technologies like ETL [Extract, Transform, Load; basic data warehouse functions] or visualization tools is an important competitive advantage for us. Selecting and using the right tools is essential for successful data science projects. Most of our customers choose to rely on our expertise in the selection process. Knowing as many tools as we do, we can give them truly objective advice. What we are looking for is the best solution for our customer. There is no such thing as the "best" visualization tool. It always depends on the use case, the present IT infrastructure, the volume of data and many other factors.

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As a general rule, companies have to become more data-driven and establish a hypothesis-based decision-making culture.

SMART
COMPANIES

Microsoft's two-speed approach to IoT

When Microsoft acquired Solair, an Italian company specialized in Internet of Things (IoT) services for the enterprise, earlier this year, there was a lot of buss about where the software giant will position itself in the rapidly evolving world of IoT. Smart Industry caught up with Oliver Niedung, Senior Channel Executive, IoT Device Experience at Microsoft in Germany and talked with him about what people in Redmond are thinking lately.

Oliver Niedung
Senior Channel
Executive, IoT Device
Experience at Microsoft
Deutschland

What is Microsofts vision for an IoT world?

As Microsoft, our mission is to empower every person and every organization on the planet to do more and to achieve more. We are powering the IoT as a platform technology provider and support companies to embrace the digital age and deploy disruptive new IoT services. Our IoT technologies and services enable the retrofit of existing installations (brown field) as well as green field installations aimed to preserve investments. All of our products and services reflect our strong commitment to protecting customers in a mobile first, cloud first world. We ensure security to enable digital transformation through our comprehensive platform, unique intelligence, and broad partnerships.

How far are you and what's your timetable?

What we are hearing from our customers and partners is that we are providing the broadest portfolio of IoT platform technology already that helps them succeed. Scaling from development tools (Visual Studio), device technology (Windows 10 IoT), heterogeneous connectivity with SDKs (Azure IoT SDK on GitHub), device management, public and private cloud services, advanced analytics services with the Cortana Intelligence Suite to new scenarios with HoloLens. There is so much more we are working on within our worldwide partner network.

What, if any, is the difference between IoT and Cloud Computing?

There is quite a number of differences, depending on which definition you use. Cloud computing is basically internet-based computing on shared processing resources. It has grown from its infancy of infrastructure services (IaaS) to mature platform and software services that provide significantly higher value. IoT, on the other hand (there is a good definition from ITU) enables advanced services. Cloud computing is a key element of most IoT implementations, since cloud-based Machine Learning is an enabler of advanced services.

What are the major components you will put in place to help business customers make the transition?

Microsoft is offering hybrid cloud platform technology to enable innovation at our customers' and partners' terms. It is their business model, their disruptive services that we want to enable with our platform technology. We don't want to interfere with

their business model, instead, look at all the partners that are leveraging Azure, like SAP, Oracle or Red Hat. We want to empower them to compete with disruptive services on the highest level through innovation such as cognitive services or global hyper scale. And, we want to enable breakthrough global development through Visual Studio on all platforms and make Windows 10 the best choice for most devices in terms of security and manageability.

Many companies today lack fully networked end2end processes. Instead, their infrastructure resembles an archipelago of "digital islands" – unconnected systems, where information constantly needs to be re-entered, in the worst case by hand. Is this lack of true digitalization a serious roadblock on our way to an IoT world?
In most cases, it is a sign that business processes are not optimized. Operating procedures grow over time, and as long as they are not challenged, they continue to grow. IoT in fact provides ways to optimize procedures, e.g. through B2B wearables, digital assistants like Cortana and process optimization through Machine Learning. It also enables the integration of data siloes and better decisions based on near real-time, personalized KPIs. Microsoft is enabling this with Power BI.

Are certain European countries further along than others in this area?
In fact, we see companies across EMEA embracing IoT at different speeds. It is less a question of the country, but more of vision and execution of key decision makers and their influencers. Even within large companies, we see teams embracing IoT at very different speeds. But let me be clear: Some companies in Europe are building IoT solutions with amazing speed and are expected to have a significant impact in their vertical industry. They have the potential to become a global leader or maintain their leadership position with new, disruptive services. Some organizations on the other hand have for various reasons not yet taken a first step in the direction of digitalization.

Nanobiosensors
Creating a Nanonet of Things

Beyond Smart Phones, a vast new world of sensor technology and sensor deployments is emerging in the field of nanotechnology, where some are now talking about the Internet of NanoThings (IoNT). Nanotechnology is actually a combination of multiple disciplines such as physics, chemistry, and mechanical engineering. It describes a host of techniques for bending nature to the will of humanity at or near the molecular scale where things are measured in nanometers (one billionth of a meter). Within the United States, for 2017 the federal government is investing more than $1.4 billion for the National Nanotechnology Initiative (NNI). This brings to approximately $24 billion the total investment made by that government in the field since 2001. To be sure, most of this spending goes to fundamental research rather than the applied research which nanosensors would include. However, the feasibility of using nanotechnol-

ogy to provide many kinds of data that were not available in the past and in some cases to initiate functions at nanoscale means this field is also ripe for IoT engagement. For instance, the Nanobio-electronics & Biosensors Group (http://www.nanobiosensors.org), led by Prof. Arben Merkoçi at the Catalan Institute of Nanotechnology in Barcelona, Spain is conducting research on the integration of nanotechnology methods, tools and materials into low cost, user friendly and efficient sensors and biosensors. According to the group's website "The developed (bio)sensors take the advantages of nanoparticles, nanotubes, graphene, nanochannels and other nanomaterials while being integrated into innovative, high sensitive and mass production platforms", with the aim of designing nanotech devices that can deliver fast medical diagnostics, control food quality, and more.

WATTx
Smart Climate Innovation

His goal is to shoot for the moon in IoT, and Bastian Bergmann, CEO at WATTx in Berlin, is well on his way. His company, an innovation lab focused on IoT and specifically smart climate solutions, specializes in IoT Engineering as well as connecting machine and consumer data to empower a smart climate future. By

creating innovative digital experiences along the customer journey, Bergmann hopes to reimagine service models for residential and industrial customers to empower smart climate innovation. "We think big", he maintains, "and we strive to turn the most ambitious ideas into reality."

photo ©: by Simon Mills, www.brewbot.pr.co/presskit

Getting online with a pinch

Simprints, a non-profit technology company based in Cambridge, UK, has developed a biometric finger-print scanner that connects wirelessly to mobile phones and will allow some of the most vulnerable people in the world to access basic services such as healthcare and financial services. Its core product is a low-cost, rugged and durable fingerprint scanner which uses a curved sensor, which is more intuitive for individuals to make a 'pinching' gesture rather than to simply lay their finger flat on the surface of a reader. Registered as a nonprofit, Simprints has so far attracted more than £1 million in seed funding. This includes funding from the private sector as well as from a range of institutional funders and foundations, including UKAID and the Bill & Melinda Gates Foundation. Simprints was recognized by Business Weekly as the "Startup of the Year 2015."

BrewBot

Beer Smarts

Making your own beer is almost as simple as pouring a pint if you use the app designed by BrewBot Britain. Founded in 2013 through a Klickstart crowdfunding project, the company is dedicated to making brewing easy to anyone. Brewbot is a mix of both hardware and software, providing a complete brewing setup out of the box. The Belfast-based team provides a smartphone app that downloads beer recipes and trigger the brewing process. The smart appliance does the rest, taking care of the temperatures, timings and volumes and allowing you to follow along on the app as water is turned into beer.

Levis

Weaving a "Smart Jacket"

What happens when wearable technology meets IoT? The jeans-maker Levi Strauss is teaming up with Google to find out. At first glance, "Levi's Commuter x Jacquard by Google Trucker Jacket" showcased at Google I/O 2016, a developer conference, look just like aby other piece of outdoor clothing. The difference lies in the weave, an interlacing grids of conductive yarns, so that the wearer can perform tasks through a smartphone or other device by simply touching the jacket or making swiping gestures across it. Think about rubbing your sleeve to change music tracks or answer a call on your smartphone, and you get the general idea. By developing "interactive" fabrics that can bring gesture and touch recognition to clothing and other objects, Google hopes to open the door to making those items more interactive or otherwise collecting data about people and their environment. For the moment, Google is testing the ruggedness of the fabric and working to make touch and gestures more readable. Again, a new universe of sensors and "active" materials could empower creation of new services related to delivery, entertainment, building operations, and more.

**Comarch**

Tapping into Wealth Management

Comarch, an international software house and systems integrator based in Kraków, Poland, has launched a prototype of a wealth management app taking advantage of technology never used before in the world of private banking: virtual reality. The mobile app prototype combines financial planning and investment advisory into a single tool. "It lets well-off bank clients control and multiply their assets, often scattered throughout the world, with no more than a few taps – and a little help from a personal advisor'", says Grzegorz Prosowicz, Head of Product Management for Capital Markets at Comarch. As for the banks themselves, the app allows in turn for devising investment strategies closely aligned with clients' needs and objectives.

Braster

A simpler way to halt breast cancer

The medical company Braster in Poland has developed a device to early detect breast cancer. A special foil inside the device measures slight changes of temperature on the breast and takes a picture of this image using a TD next camera module provided by Avnet Silica. The device sends the picture via Bluetooth or Wifi to a mobile phone and the mobile phone send the picture to a hospital center where a doctor analyses the picture and decides if something is wrong and in this case contact the patient to advise her to contact a specialist, thus avoiding the need for examination via X-ray mammography scans.
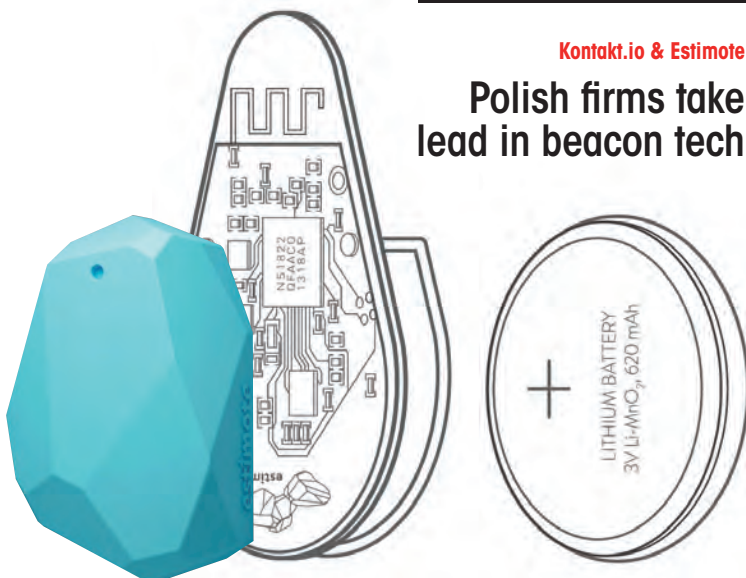
Kontakt.io & Estimote

Polish firms take lead in beacon tech

Two Polish companies, Kontakt.io and Estimote, made it into the Top Five list of BLE beacon vendors worldwide recently released by ABI Research, a market intelligence provider specializing in transformative technology innovation. Real-time location services are expected to be a key part of IoT ecosystem solutions. Kontakt.io, based in Kraków, aims at creating "secure and configurable beacon hardware and software, enabling you to build any proximity-based solutions", according to co-founder Szymon Niemczura. Estimote has made a name for itself by supplying small, wireless sensors and accompanying software to provide indoor location technology for many Fortune 100 companies, and recently succeeded in landing $10.7 million in Series A funding. "Beacon technology is not something the everyday consumer thinks about, but it's changing the way they interact with the world around them, while using their smartphone", says co-founder Steve Cheney. U.S. retailer Target is using Estimote's smartphone application that works hand-in-hand with beacons placed around the stores in order to provide information and recommendations to shoppers, along with deal alerts.

photo ©: www.parce.de

Parce

Lights, Action!

Parce, a Munich-based has announced Apple HomeKit, a wall plug device that provides an easy, secure way to control your home's lights, doors, thermostats, and more from your iPhone, iPad, or iPod touch, using the Siri function voice-control lighting and track energy consumption. Triggers based on time or location can be configured Parce to turn on lights as soon as the owner pulls up to the house. Parce One is available for download at the App Store.

SensorBeat

Moving Along

photo ©: www.imagimob.com
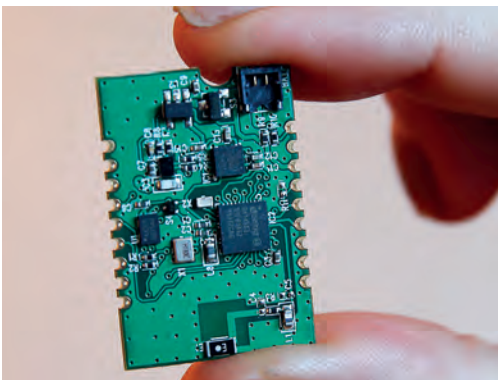
Imagimob, a Swedish company specializing in artificial intelligence products for movement analytics of things and people, has just been granted a patent for "Movement pattern generation using an accelerometer" by the Swedish Patent and Registration Office. Their product, SensorBeat, is billed as the world's first motion intelligence system on the edge. Consisting of a complete package that contains all the necessary electronics and artificial intelligence for understanding the motion of things and people, it can be easily integrated into 3rd party products. It targets a wide range of segments from gaming (gesture recognition), health/medtech (human motion analysis, body analysis), industry (preventive maintenance), personal security (accident/attack detection) to animal behavior (tracking pets/animal health).

photo ©: www.kiwi.ki

Kiwi.ki

Open Sesame!

Kiwi.ki, a startup based in Berlin, wants to bring the same convenience that's available to car owners via keyless entry to residential multi-unit complexes, making it possible for anyone who lives at one to just walk up to the door and open it, thanks to an RFID device carried in their pocket. Recently, they signed an exclusive deal with already partnered with Deutsche Post in Germany to make it easy for mail carriers to gain access to apartments for simpler delivery of letters and packages.

Sensolus

Deep Freeze

photo ©: www.sensolus.com

Sensolus, has teamed up with the Belgian Polar Secretariat and Sigfox to create a partnership to strengthen safety and security during research and field operations at the Belgian polar-exploration. The 2015-16 BELARE Antarctic expedition consists of a team of technicians and researchers specialized in glaciology, climatology and geomorphology in charge of various Belgian and international scientific projects. People on expeditions and moving materials (equipment) in a range up to 40 km around the base station are monitored though with 45 SticknTrack GPS trackers from Sensolus based on the SIGFOX communication network. These devices will not only inform about the location of the materials, but can also about temperature which in Antarctica can sink to -90 degrees Celcius and below, as well as usage and other crucial parameters.

Creating sustainable IoT success

Making the Internet of Things smart, secure and power-efficient

The right technology brings IoT business models to life and ensures ease-of-use, reliable performance and security. From a technical perspective, IoT business models across industries rely on the smart aggregation and interpretation of data. This data is provided by individual "smart" objects equipped with semiconductors, such as **sensors, processors, security controllers and actuators**. At Infineon, we strengthen our customer's IoT business models and partner with them to become more successful: Because our semiconductors make **the IoT smart, secure and power-efficient**.

Our core competencies are essential to create sustainable IoT success for our customers

Advanced sensing capabilities
› More than three billion integrated sensors sold over past 10 years
› Special packaging technologies, dedicated processes and robust sensing elements to withstand the harshest conditions
› Break-through innovations such as 3D image sensor for Gesture Control

Trusted security protection
› Hardware-based security as a trust anchor
› End-to-end, easy to implement
› Tailored to the application
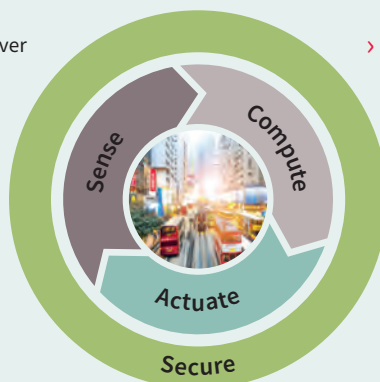
Cross application control
› Cross-domain expertise and systems understanding
› Strong processing and steering know-how from decades of MCU market leadership for industrial, automotive and multimarket applications

Efficient power management
› Reduced energy consumption due to highest power density
› Increased power performance by smart power management
› New opportunities due to digital power innovations

www.infineon.com/iot

Enabling the 'Fourth Industrial Revolution'

BETTING BIG

Amazon, already a heavyweight in Cloud service providing, is joining the IoT game with **Amazon Web Services IoT platform (AWS IoT).** What is their strategy and how will they stack up against major competitors?

■ by Simon Torrance*

Steve Jobs used to quote the great ice hockey player, Wayne Gretzky, when he said "I skate to where the puck is going, not where it is now". Recent analysis shows that the puck is most definitely heading to the IoT. There's an $8 trillion market in IoT-enabled business and consumer services over the next decade for those companies clever enough to know how to address it. And Amazon is certainly one of those companies.

Werner Vogels, Amazon's CTO, told analysts about the 'Amazon Growth Flywheel', a concept that was apparently created on a napkin in a café in Seattle around 2000 by Jeff Bezos and some of his execs as they grappled with how to redress the flatten-ing growth curve of their online retail business.

The 'Bezos Napkin Diagram', as it's also known, summarizes how Amazon conceives of its business and the role that new developments, like the IoT, play.

It started with a foundational question: what do our customers really want? They felt that the answer was 'choice' and 'selection' from one source. That drives customer experience, which drives usage and traffic. Then, back in 2000, they paused…

Was there an alternative way for Amazon to deliver choice and selection without having to source and manage their own inventory with all the risk that entails? And

*Simon Torrance is CEO of Metaflight, an advisory company specializing in digital innovation.

were there others who would be interested in leveraging Amazon's traffic and infrastructure?

The 'a-ha moment' came when they realized that third-party merchants – potentially competitive vendors – could not only satisfy customers' demand for choice, but also would be happy to pay to take advantage of Amazon's advanced e-commerce infrastructure.

By sharing their 'platform' with others, Amazon could also reduce their total cost structure over time, which could enable them to reduce their prices, which would drive customer experience, leading to more traffic, more merchants, more selection and so on. Werner Vogels told the analysts that since Amazon imple-

mented this plan, it had become two businesses: an online retailer and a platform business, of which the retail part of the business was a customer in the same way as the 3rd party merchants.

Taking the concept further, Amazon realized that it could white-label its platform to other retailers and, more recently, make its advanced cloud platform (now called AWS) available to any enterprise.

Amazon is now the master of the platform business – making its infrastructure available to other people to enable them to run their businesses more effectively. And their move into the IoT is part of the same strategy. Rather than trying to create end user services, it's easier and more scal- ➔

IoT-enabled business and consumer services
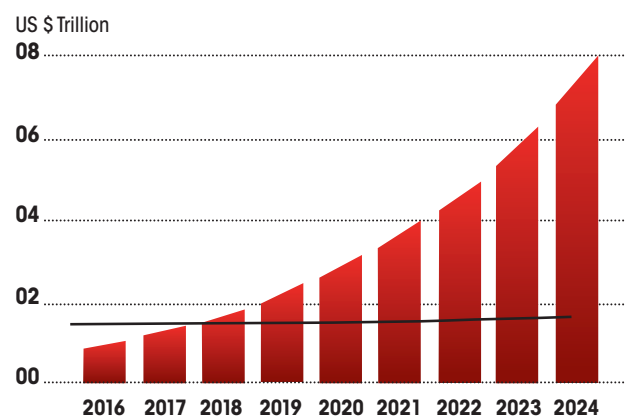
US $ Trillion

© Global Figures. Sources: Bearing Point, Gartner, McKinsey Global Institute

On the upswing Analysts estimate that the impact of IoT on the global economy might be as high as $8 trillion by 2025. Given the breadth of applications being developed, the potential market will continue grow.

amazon

amazon web services

Original Amazon Flywheel

Original Amazon Flywheel

- Lower Cost Structure
- Lower Prices
- Selection
- Customer Experience
- Sellers
- GROWTH
- Traffic
- Amazon Branded
  • Connected IoT Devices
  • New Access Points
  • From Devices
  • In Content

AWS IoT Flywheel

- Third Party IoT Devices
- AWS IoT Developer Tool
- Consumption of ALL AWS Infrastructure
- AWS GROWTH
- Lower Cost Structure of AWS
- Scale

able to enable others to do so.

If your platform can be used by an ever expanding ecosystem of producers and consumers, then you create what economists call self-reinforcing network effects. The more producers there are, the more attractive it is to consumers, and vice versa. You make it easy for people to use your platform, mine the data of their usage to optimize it, charge people to use it, and identify more opportunities to provide your own services to your ecosystem participants.

Amazon is not alone in deploying this model. Alibaba, Apple, Google, Microsoft and 170 other powerful 'digital native' organizations operate under the same business model and collectively are now worth over $4 trillion.

Amazon has been so successful with the model of leveraging its infrastructure and resources with 3rd parties, that AWS now generates $11bn in revenue, and is growing at 45% per annum, as more and more traditional enterprises look to transform the way they consume IT.

The next phase on from this is to help enterprises transform more than their
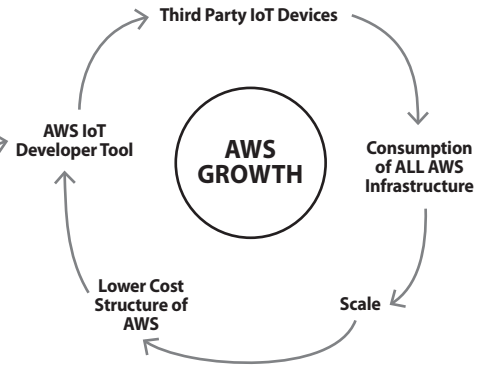
> **Those who recognize the value of being ecosystem enablers will be the winners.**

IT. And this takes us back and the $8 trillion IoT-enabled services market opportunity – where the puck is going. Traditional businesses in all sectors are under pressure from the global economic slowdown, which is likely to persist for the foreseeable future. Add on to that competition from new digital disruptors, then the need for companies to innovate their core business model – just like Amazon had to do back in 2000 – becomes more intense.

Product companies are looking at how to become service companies, to deepen their relationship with customers beyond the purchase of the product. B2B companies – like car manufacturers – are looking at how to move to direct B2C relationships. Companies in all sectors are looking to add digital services to their portfolios. In parallel, governments are looking to tackle the issues of urbanization, climate change, and lower productivity caused by aging populations. They need solutions to dramatically reduce costs and create more positive outcomes for their citizens in areas such as healthcare, traffic management, energy consumption, food security – to create 'smart cities' which leverage data and the IoT.

So this is the market that Amazon is preparing for. Amazon Dash, Dash Buttons and the always-listening Echo device, are examples of experiments that it is undertaking to understand how special-purpose IoT devices can support not only their retail business but also their platform business.

AWS and its IoT elements provide the processing power to make their platform solutions and tools for enterprises more powerful: to enable lots of companies and product developers to design, build and operate IoT-enabled services.

Getting connected

IoT elements provide the processing power to make Amazon's platform solutions and tools for enterprises more powerful.
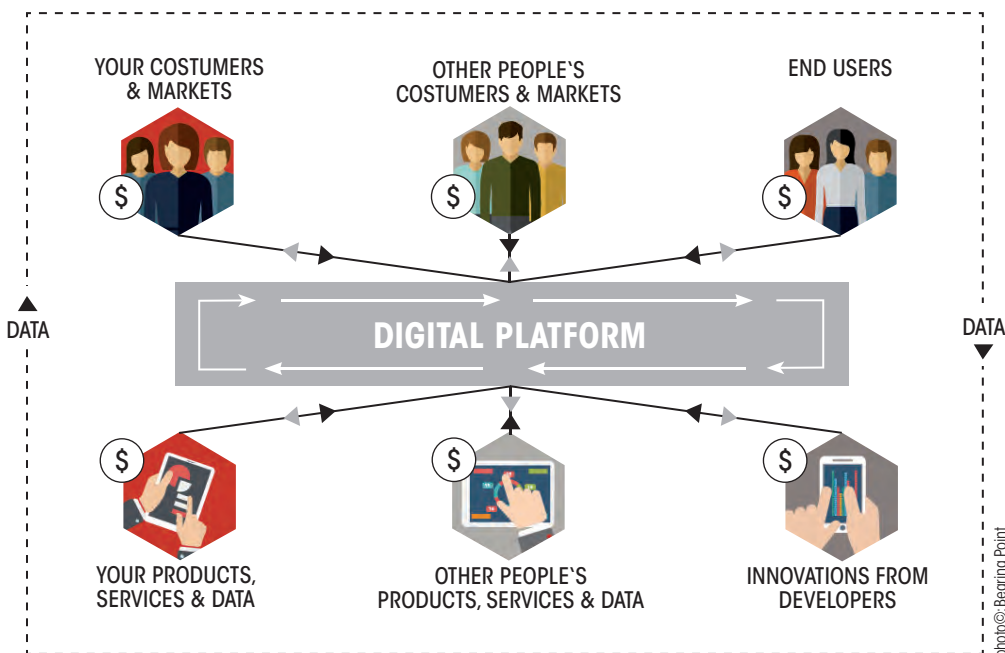

YOUR COSTUMERS & MARKETS

OTHER PEOPLE'S COSTUMERS & MARKETS

END USERS

DATA

DIGITAL PLATFORM

DATA

YOUR PRODUCTS, SERVICES & DATA

OTHER PEOPLE'S PRODUCTS, SERVICES & DATA

INNOVATIONS FROM DEVELOPERS

The IoT device is the "tip of the iceberg" in creating an end-to-end solution. The IoT value chain also covers connectivity, big data, algorithms, and business processes. As more and more IoT devices get introduced, a nore data is generated. These devices and services can take advantage of AWS's infrastructure.

Back to the flywheel: the more demand for its infrastructure, the lower Amazon's costs which, in turn, makes it more attractive to companies.

AWS's IoT-enabling products include AWS Redshift, AWS Kinesis, AWS Machine Learning and, last year they acquired 2lemetry, a cloud-based application-enabler platform in order to provide M2M capability. These products support the growing number of companies and developers looking to build IoT-based services. They support an AWS-IoT flywheel, which is the real motivator for Amazon.

Amazon's biggest competitor is probably Microsoft, another platform company. The Microsoft Azure IoT portfolio covers a lot of the same ground as the AWS proposition: gateway, cloud, value-added tools for analytics, and so on. The issue for AWS is that it that it lacks a full complement of components to offer truly end-to-end IoT solutions to enterprises. Microsoft also lacks a full portfolio, but is much more experienced in serving the enterprise market.

Jeff Bezos, critics believe, is right to say that we are still at 'day one' in terms of the impact of the Internet on society, and that his company is still in the 'early days' of its business lifecycle. At its event in Davos in January this year The World Economic Forum announced the beginnings of a Fourth Industrial Revolution: "We stand on the brink of a technological revolution that will fundamentally alter the way we live, work and relate to one another – a fusion of technologies that is blurring the lines between the physical, digital and biological spheres."

Amazon, and other organizations which recognize the value of being ecosystem enablers, rather than just end-user service providers, will be the winners in this brave new world.

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UHF RFID Wireless Sensors Allowing Passive Sensing of Temperature, Moisture, Proximity and Pressure
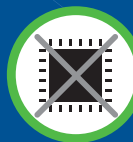
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The Internet of Things
is Already Here

AND IT IS CALLED

The company that has **revolutionized transportation** can also be a template for building IoT businesses.

■ **by Alan R. Earls***

Hailing a cab is an activity ingrained in habit the world over. It's an action that applied to Hansom cabs in Victorian London, gas guzzling behemoths in mid-century Manhattan, and pedicabs in the developing world. And, then along came Uber… Leveraging the rapid uptake of smartphones globally, the company created a marketplace for drivers and passengers that has made transportation faster and more affordable for millions while thoroughly disrupting traditional players, such as taxi companies. Hailing cabs the traditional way is a thing of the past for many. However, Uber has also pioneered what might well be seen as a giant Internet of Things enterprise; one that offers lessons and inspiration for other entrepreneurs.

To be sure, most casual observers would be unlikely to classify Uber as an IoT company at all. As blogger, Dr. Jim Walsh, CTO at GlobalLogic, a product development services provider, notes in a post on Uber, we tend to identify the company with what it provides us – a comfortable and affordable way of getting places if we are a passenger, and a easy-entry business opportunity for drivers. However, Walsh explains that once the Uber app is launched, "the location sensors associated with both the passenger's and the driver's mobile devices (the actual 'things' being monitored) are regularly broadcasting their location to a 'back end' system that is hosted by Uber in the cloud. Uber's cloud service then provides analytics to determine which car/driver combinations are relevant to each service request. That's not unlike the architecture of any other IoT system.

Quoted last year in the Guardian, technology guru Tim O'Reilly, founder

of O'Reilly Media, put it more directly: "Uber and Airbnb are interesting because they are really Internet of Things platforms. They are able to catalyse a swarming marketplace management model because everyone is carrying around a connected sensor package." For Uber, "life" following this approach has been good, with the company expanding rapidly across the U.S. and globally in just a few years. Building on its success, the company has also tested out Uber-based online food ordering service, a package delivery system, and a car pooling service. Its successes have created like-minded companies, most of which operate similar services, in a process sometimes dubbed "uberfication."

Given its mastery of this new kind of infrastructure, Uber may be contemplating a further strengthening of its links to the devices of its members in hopes of leveraging them for additional use – potentially tapping them as sensors for new kinds of business. "If you look at the Uber model, it is easy to imagine a company offering what one day in the future could be part of a smart city strategy – with Uber hypothetically going around and collecting data that could then be applied in ways only limited by imagination," says John Jackson, program vice president for mobility research at IDC, an analyst firm.

And, he notes, there's every reason to think future IoT opportunities could also be similarly loosely coupled; linking information from or about physical assets, locations, or activities to an intermediary service that enables transformative and profitable activities. Again, the sky is the limit.

Just think what IoT sensor data from "oberfied" agricultural activities in California's Central Valley might be able to tell a railroad or trucking company about when to plan for peak harvest
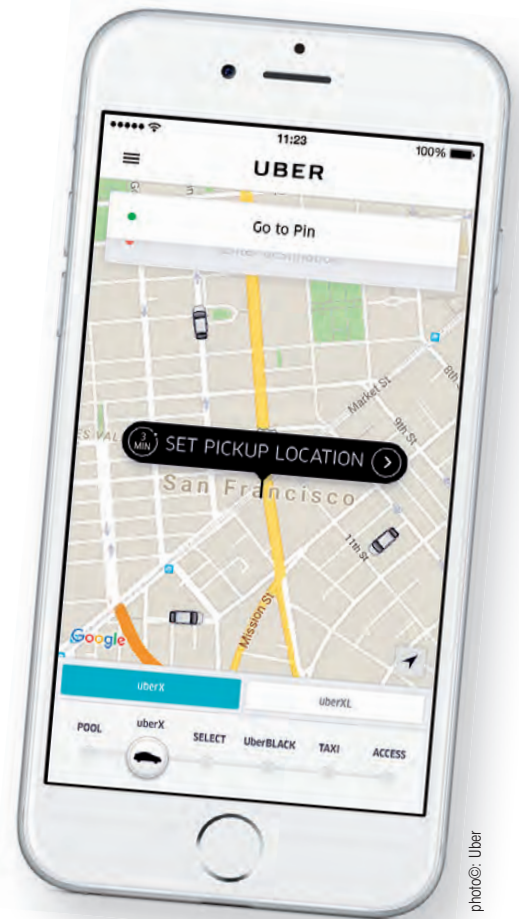

photo©: Uber

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Uber and Airbnb are interesting because they are really IoT platforms.

Tim O'Reilly,
Technology guru and founder of O'Reilly Media

shipments. Vehicles could be deployed "just in time" from other geographies to ensure timely and efficient movement of perishable products. Similarly, IoT-enabled roadways could power services for autos, the supply chain, entertainment, or almost anything else that can be imagined given how central motor transport is to the economy of the developed world.

Sensor technology – a potent enabler

As both Walsh and O'Reilly have pointed out, the Uber model relies on the rich set of hardware and applications available on a typical smart phone. GPS is the most obvious, but many other sensors are already built-in and more will likely appear in the future. Thus, researchers at the Indian Institute of Technology, have proposed a traffic and road condition estimation system using smartphone sensors; a system they call Wolverine. They believe that better monitoring could improve traffic efficiency.

Up until now, solutions that have been put forward have generally required investment in dedicated hardware such as GPS devices and accelerometers in vehicles as ➜

*Alan R. Earls is a Boston-based freelance writer focused on business and technology.

photo©: Uber

well as roadside cameras. Instead, they propose simply harnessing the sensors present in smartphones – either directly measuring aspects of traffic flow or inferring events such as acceleration or braking. The net result would be an inexpensive, near-real-time monitoring system that could potentially even help re-route drivers and vehicles in response to traffic jams.

Cautionary Voices

All of these initiatives and technologies are moving fast; too fast in the eyes of some.

One warning comes from Lev Lesokhin, executive vice president of strategy and analytic at New York City-based CAST, a company focused on software risk prevention and analysis. "Broadly, there are two types of software; one is focused on information technology, the software that runs personal computers and businesses and connects the internet. The other kind of software is embedded software, which runs devices, machines, and sensors," he notes. Those two families of software are very nearly separate industries because they have different standards and expectations.

People working to program devices in automobiles have their own standard for quality, as do others in other parts of the embedded world. "In fact, in general the way embedded people

> "
Uber is a perfect example of information driven software.

Lev Lesokhin
Executive vice president of strategy and analytic at CAST

approach quality has tended to be more rigorous than with information tech," he says. The motivation is obvious. If a personal computer has a glitch, or even if an Uber driver misses a message, the consequences are usually annoying rather than calamitous. Embedded devices, on the other hand, may control medical equipment or machinery or ensure the safety of vehicles, the failures of which could have life-threatening consequences. Thus, he noted, embedded products take more of an engineering approach to software design, development, and testing.

The consequence for those aiming to build a new world of IoT around embedded devices and sensors, though, is the necessity to fuse those two worlds together, making sure that both are "improved" in the ways needed to make a robust system.

"IoT changes the challenges for the embedded people, especially from an engineering and quality standpoint," says Lesokhin. That's because, when you are writing embedded software, by definition it has almost always been isolated at the device. So you have to work with the sensors and hardware on the device, and manage that – nothing more.

On the other hand, IT-oriented software typically considers transactions and interactions between different pieces of the overall information systems. "If you think about any kind of cloud-based software or any system that runs organizations, you collect info in one place and send it to another to process," he says.

That contrasts sharply with embedded and the IoT industry is still trying to come to terms with how to bridge the divide, Lesokhin believes. Uber is a "perfect example of information driven software," he says. "They are tracking where all their vehicles are. They are also tracking information about you and how many stars you get as a rider and how many stars the driver has and putting that together," he adds.

So, once you start thinking about writing embedded software to connect broader systems, there is a dif-

ferent set of rules in terms of quality and the kinds of risk you are exposing that device to in terms of stability, he says.

Another important concern for all of IoT is security. Indeed, Uber itself has suffered at least one substantial data breach in its brief history. Again, Lesokhin points out that security has always been the last thing on the mind of embedded developers. There is a huge need to update thinking and capabilities as IoT engages more embedded devices and systems.

Last year Uber launched a private, beta bug bounty program for over 200 security researchers who ended up finding a total of some 100 bugs – all of which have since been fixed. As a follow up, Uber recently announced an official public "bug bounty" program. Payouts will go up to $10,000 for critical issues. Future Ubers will also need to tackle their own security challenges head on.

Performance is also an issue, he says, specifically network latency. When the network is a little slow are you managing your timeouts correctly? These aren't things you think about on an embedded device.

"I think that is the fundamental starting point for what makes for reliability, security and performance of software on embedded devices," he says.
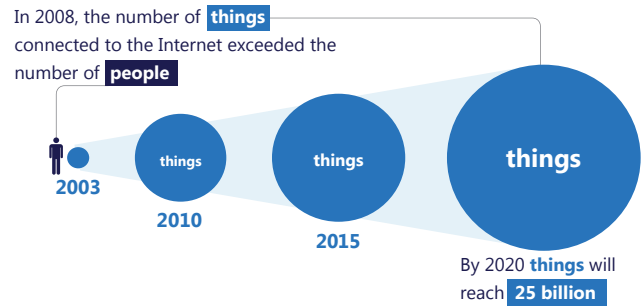
Making it All Work

Lesokhin says the cures for these system challenges are in the works or on the horizon. For instance, the Object Management Group (OMG) and the Software Engineering Institute at Carnegie-Mellon University have worked to put together a set of standards for creating software that is reliable. "I think that a set of standards like that is going to be an important part of making sure IoT is safe, sound and secure," he says.

"Hypothetically we are all in effect nodes for Google, Apple, Facebook, Amazon, and Uber and thus can end up through third parties in the IoT space," says IDC's Jackson. Today, Uber might not count as IoT under a traditional definition, "but these lines will blur," he adds.

Windows 10

Do Great Things with Windows 10 IoT

Market Opportunity Business are looking for ways to reduce costs and inefficiencies, increase revenue, and create new business models.

$1.7 TRILLION
market opportunity by 2020

25 BILLION connected things

6 BILLION smartphones and tablets

— Gartner

In 2008, the number of **things** connected to the Internet exceeded the number of **people**

2003

things **2010**

things **2015**

things

By 2020 **things** will reach **25 billion**

> Beginning in 2016, **5.5 million** new things will get connected **every day**.
>
> **– GARTNER**

35% GROWTH
Device sales from 2014 to 2019

– Business Insider

Why Windows 10 IoT? One common platform for all your devices.

One Windows platform
- Shorter time to market
- Reduced development and support costs
- One common toolset, app platform, and deployment and management system

Security-enhanced
- Meet customer needs with enterprise-grade security
- Access a Security-enhanced connection to the network
- Ensure intended use of devices with advanced lockdown capabilities

Connected
- Shorter time to market
- Reduced development and support costs
- One common toolset, app platform, and deployment and management system

Line of business ready
- Uses existing investments in Win32/.NET
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Consistent manageability
- One management and deployment approach
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Windows 10 IoT is transforming industries

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Improve customer services. Increase employee engagement. Streamline operations.

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Microsoft

NEWS

Can chatbots reduce app overload?

Executives of both Microsoft and Facebook think users suffer from app overload, and that chatbots are the answer. "Bots" are stripped-down software agents that understand what you type or say and respond by answering questions or executing tasks. Microsoft CEO Satya Nadella unveiled his version at the Build 2016 developer conference in San Francisco, Mark Zuckerberg announced the new Facebook Messenger. They join a growing host of intelligent personal assistants such as Apple's Siri, Amazon's Alexa or Google Now. Zuckerberg is excited about the marriage of popular text-messaging programs and burgeoning artificial-intelligence techniques, and analysts expect the new bot to boost Facebook's bottom line. Bots will know what you like, remember what you've told them and cooperate to make your life easier.

Connected wine

Smart bottle keeps wine fresh

Answer me!
Chatbots, or „bots" for short, will know what you like and remember what you've told them even if you can't
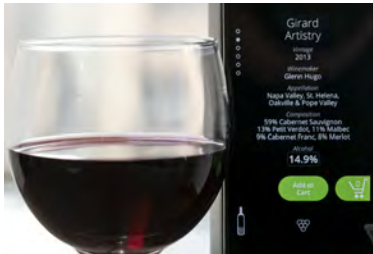
The Boston startup Kuvée has launched what they call the "world's first connected wine bottle" – an intelligent flask equipped with Wi-Fi and a touchscreen that they claim will keep an opened wine fresh for 30 days. The system is expected to open up the benefits of a good restaurant-wine for home use. Currently only available in the U.S., the world's first connected wine bottle comes with a selection of four wines from leading California growers including the famous estate owned by film director Francis Ford Coppola.

French Retail

French retail facing big change

At a conference in Lyon, France, professionals and industry experts were askied to give their estimates of how new technologies will impact retail. Their answers: Connected devices are changing not only business models ibut how sales are handlied in stores. These products, they believe, are part of a disruptive trend that will see the emergence of new sales techniques or challenge existing models. Some atendees said they were thinking about production-based valuation opportunities as well as ways to offer additional services to improve the perceived value of the products themselves.

Connected

Doubts about connecting everyday objects

Lamps, watches and washing machines that connect to the Internet are fine, refrigerators, toasters and coffee machines maybe not so much. In a recent survey the German technology and innovation consulting company Ivensity asked professionals worldwide to choose which everyday objects

Connect or not?
Lighting systems and watches will lead the way to IoT, many professionals believe.

they believe are best suited to be part of the Internet of Things. Almost two-thirds say lighting systems and watches will lead the way. Only two percent believe in connected toasters.

Talking Machine

Talking to the operating machines

Thanks to networked medical devices, surgeons can communicate with a hospital's IT infrastructure in real time while performing an operation. Or.net, a project developed under the auspices of the German Ministry of Education and Research (BMBF), provides interfaces for data exchange between medical devices from different manufacturers. „For complicated surgical procedures it is important that doctors work fast and accurately and can fully concentrate on the patient. All necessary information must be available at a glance and directly at the operating table", says Johanna Wanka, the German research minister.

A SIMPLE WAY
TO ENTER THE WORLD
OF IOT

A s they enter the world of IoT, enterprises routinely encounter degrees of complexity that far surpass anything they have known before. Many of our customers, for instance, have long been in the business of making embedded products like for instance smoke alarms, and they feel very comfortable both with how to design and manufacture them at competitive cost as well as how to distribute them effectively into the market.

But today, the big challenge is to connect these products and then start to display and use the data they generate in new ways that will create a desired business result. To do this you usually need to generate a workflow: the business or enterprise software such as SAP needs to be able to recognize the data and then drive an action with it. And of course there's lots more data around, which means eventually you begin to realize there are things you can do which you never could in the past.

But just to capture the data, store it on a server and present it to the business software means that the customer will have to meet many, many challenges that he never had to deal with before. Usually, they already have the necessary actuators which are part of the embedded product, but then you need to get the data through some kind of gateway and some kind of common infrastructure, then probably out into the cloud where it in turn needs to be linked back to the enterprise software you're using every day anyway.

However, things like gateways and clouds are usually quite foreign to these traditional manufacturing companies. In fact, it's a whole new world; one of messaging protocols and telecoms; a world full of strange new low-power standards like NarrowBand IoT, Sigfox or LoRaWAN. How do you choose which one to use? What's the network coverage like? Does it really penetrate deeply into buildings if your application requires it? And while many companies may have heard of these things, most of them simply aren't prepared to deal with them, at least not yet. Besides, the new technol-
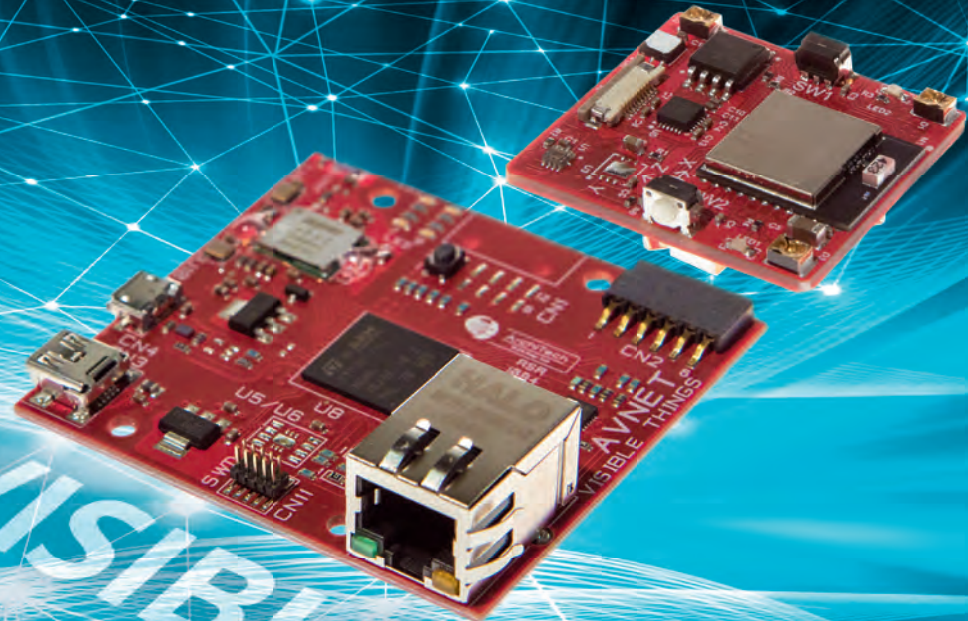
ogy is forcing them to go through public communications networks, so they need to know how good coverage is in, say, Benelux, or whether the new network standards have already been rolled out in, say, the UK. What does the roadmap look like in each individual country? Is putting in a private network a viable alternative costwise? What new standards for narrowband is GSMA driving?

The world is getting more and more complex even just where it means picking the right network, much less to implement a solution.

Working with a broad range of technology partners we at Avnet Silica have come up with an IOT reference platform, called Visible Things which we are currently deploying in the U.S. and Europe and which will enable customers to roll out IoT solutions quickly and easily. We have put all of the technology building blocks together along with the gateway and cloud infrastructure and used our expertise to pre-integrate and package them so they are very easy to evaluate and implement. Our customers are used to buying components, and that's exactly what we're giving them through Visible Things. One example is cloud services as a component. Technically all we did was just integrate everything and make it easy to use. And that allows customers to simply take the starter kit we provide and use it to extract data from their systems, visualize it through a cloud service and then do something with the data using a simple rules engine. This demonstrates that all the challenges of going from edge to enterprise have been met. The Internet of Things (IoT) is changing our world, including our development and strategies for buildings, equipment, devices and applications. It is shaping the way people acquire information, how they interact with each other, and how they make decisions. But unless we reduce complexity, these promises will remain empty. Hopefully, Visible Things will be the first of many steps that can get our customers started on their journey to the exciting new world of IoT.

> The Internet
> of Things
> is changing
> our world.
>
> **John Jones**
> Director of Innovation
> Avnet Silica

BUILDING THE FUTURE

Until recently, even the tallest office towers and hotel complexes basically just consisted of an assortment of building blocks. But today architects need to manage complexity as demand for intelligent buildings that require new **integrated planning methods and smart computer solutions** instead of old-fashioned drawing boards grows. Many of them are already taking IoT to a more macro scale with the "Building Internet of Things."

■ **by Rainer Claaßen***

Listening to modern-day developers discuss "smart" buildings sounds a lot like science fiction: Garages that guide drivers to free parking spaces, elevators that take you to the right floor without the need to press a button, meeting rooms that order the appropriate number and type of beverages attendees at a meeting will want long before the conference is convened: all this sounds pretty farfetched to laymen's ears. But even more exciting, at least for the people who will have to pay for them, is the potential to raise efficiency by orders of magnitude, and in the process reduce building costs and overhead.

According to the International Energy Agency, buildings account for more than 30 percent of worldwide energy consumption. That means that reductions will pay off disproportionately.

German hi-tech giant Siemens, a major player in the merging market for smart buildings, claims that the recently opened Taipei Financial Center, which is equipped with IoT-Technology, operates at a third of the cost of a conventional building.

Writing in Electronic Digest last September, notes Cabe Atwell, a Chicago-based writer and electrical engineer "On a grand scale, the Building Internet of Things will allow building engineers to better manage their properties."

Energy only where it's needed

"From monitoring the number of people in every room and temperatures of individual offices to controlling each light switch remotely, BIoT technology will help make life easier. There will be no more walking around a 100-story building to turn off light switches or tinkering with thermostats," he continued.

Some of the obvious applications could be more granular monitoring of occupied spaces to make sure comfortable temperatures are maintained when they are occupied and to lower temperatures when no one is in the room.

However, Atwell also points out that BIoT will "revolutionize the way we collect data." All that granular data will provide enormous amounts of quality information that can be analyzed for contributions to improved security, automation, and energy management. It could also contribute to region-wide management efforts, helping whole cities, for example, to become more energy efficient and helping police locate relevant surveillance information to solve crimes.

How to achieve this? Buildings are like living organisms, Atwell says. And just as many animal species have developed very efficient lifestyles, managing systems of smart buildings can develop similar capabilities. Ideally, in a smart building energy will only be used when and where it is needed. Probably the most obvious example is the efficiency of heating systems: As modern systems are able to heat up a room in a very short time, an intelligent building can lower down the temperature in areas that are not used at a given time. As soon as movement-sensors detect that all workers have left an office in the evening, the temperature can be lowered – and the light can be turned off. Or conference rooms will only be heated a short time prior to the time a meeting is to take place.

Use of air-conditioning can easily be optimized in a similar way: For example windows will either be dimmed or darkened by blinds, thus preventing the rooms from heating up – just like animals searching for shade in sunny weather. The efficiency of such systems can even be increased even more by adding data from recent weather forecasts.

Connecting to the grid

As renewable energy becomes more and more important, buildings themselves are being turned into energy generators. Modern Building Energy Management Systems (BEMS) include components such as Heating, Ventilation, Air Conditioning (HVAC), solar and wind power generation, thermal storage, E-car chargers and smart meters, just to name a few.

Increasingly, buildings feed energy into the grid instead of the other way

> "I don't believe the industry has put a lot of thought into what a 'connected' system really is and the ramifications it will have upon our industry. Time will tell.

Phil Zito
Author of the blog „Building Automation Monthly"

IoT on every floor
The Taipei Financial Center, which uses Smart Building technology from Siemens, operates at a third of the cost of concentional buildings

around. This calls for both flexibility and efficiency in managing loads. Experts believe that smart buildings will play a fundamental role in stabilizing the grid through smart consumption. Not only will they be able to produce energy but they will be also to store it, and to do this through energy consumption forecasts that they share with utilities and grid operators.

Taking security to the next level

But of course the consumption and the flow of energy isn't enough. Modern buildings need to take security to a completely new level. Connected systems such as security cameras and face recognition software will give workers access to their offices without having to wave a card or type in a code, allowing them to enter the building at all hours of the day. These systems will also ensure that employees can only enter those areas of the building that they are authorized to be in.

Fire safety is another major concern for smart building developers. People in the affected area will be warned, ventilation systems shut down, firewalls closed and higher pressure generated in areas near the fire. Without human intervention, smart buildings will take care that neither flames nor smoke can spread. far

Intelligent buildings can make life a lot easier as long as they work the way their builders intended. But as the number of components that rely on each other grows, down-time ➜

on any part of the system needs to be kept a minimum. Here, again, BIoT technology can help: sensor-equipped components detect potential breakdowns before they happen and even order up the spare parts that will be needed to repair them.

Keeping out the hackers

But what about the danger of hackers breaking into a smart building? In Star Wars movies, the robot R2-D2 is able to open every door in the Deathstar. Similarly, a determined hacker could conceivably gain access to sensitive areas, and the more components that can be controlled remotely, the higher the danger of cyber-sabotage or blackmail attempts.

IBM's X-Force, an ethical hacking team, recently managed to crack the servers that control door sensors and thermostats in their own office building through hidden flaws in the firmware. While the white hats failed to gain full control through the open Internet, they were able to do so wirelessly from the parking lot.

So far, hacks like this have only been performed by security experts wishing to draw attention to potential vulnerabilities. But a recent survey by IBM showed that 84 percent of building automation systems are in some way connected to the Net, and only 29 percent of system managers had taken action to improve cybersecurity. Building automation software must be isolated from the rest of the network, the IBM experts insist, and patches must be applied regularly. The systems themselves should be monitored for unusual activity, just

like other corporate software applications. Simply relying on the firewall is a sure recipe for disaster.

The Wikipedia entry for "building automation systems" lists 17 different protocols and a wide range of industry standards that can apply in Smart Buildings. This may still prove to be the greatest hurdle on the road to the widespread deployment of building automatization systems. The effort required to get systems using different standards to communicate smoothly can be daunting and can be a real problem during the initial planning phase, especially if different components speak comnpletely different "languages". Besides, architects and building engineers often lack the special knowhow nedded to ensure good data connectivity throughout the edifice.

Watching the bottom line

Energy efficiency and lowering maintenance can significantly reduce the costs of erecting smart buildings. BIoT technology can also increase worker productivity by orders of magnitude. Studies show that improved ventilation and air quality, which can easily be achieved and monitored by intelligent building systems, lead to fewer sick days, and greater comfort can allow employees to focus better on their work.

The payoff from smart buildings can come in many ways. Li Hang, technical director of Lilacs International Commercial Center in Shanghai, which used a Building Automation System provided by their partner Siemens, explains that "with the communications systems and the data we collect, such as marketplace traffic and the operational performance of every store, we can help our retailers analyze buyer behavior and optimize their sales strategies." Managers can determine how popular a particular store in the company's sprawling retail complex is in the view of shoppers.

"The answers all can be found in our data", says Hang. "If customers hesitate to enter a store, it could be because of the store's window displays

or its prices. Based on the data we collect in our building, we can deliver vital feedback of this kind to our tenants."

Building tomorrow

To catch a glimpse of the future of Building Automation, all you need to do is travel to Hamburg, Germany, where Internet entrepreneur Lars Hinrichs recently fullfilled a childhood wish by building his hi-tech dream house; a modern hi-tech boarding house where tenants are shown the way to their apartment via a fiber optic guidance system in the hallway; apartment doors are opened and closed automatically when the inhabitant's smartphone approaches; lighting, electric sockets and room temperatures are controlled by apps; smart washing machines are pre-installed in each apartment; biologically designed lighting is attuned to the tenant's sleeping patterns; an in-house power plant produces electricity while heat pumps reduce energy consumption levels.

The building boasts a guiding system for the parking garage, of course, which also is equipped with power sockets for e-cars. And on the basement floor there are 30 flexible co-working spaces which can be quickly turned into venues for product presentations or conferences.

Hinrichs thinks his smart apartment will appeal to professionals in the high-income bracket who are only stopping over for limited time periods. And while rental prices start at a whopping 4,000 Euros, he currently runs a backlog of customers eager to sign on the dotted line.

The future looks bright for building automation. But building professionals also need to consider what all this will mean for them and their business. In an article entitled "Do People Have a Clue What to Do With IoT?", Phil Zito, author of the blog "Building Automation Monthly" concludes that "on the flip side, I don't believe the industry has put a lot of thought into what a 'connected' system really is and the ramifications it will have upon our industry. Time will tell."

> ”
>
> **On a grand scale, the Building Internet of Things will allow building engineers to better manage their properties.**
>
> **Cabe Atwell**
> Writer and electrical engineer

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TEXAS INSTRUMENTS

THE EYES & EARS
OF IOT

Sensors typically transform physical values into electric signals.
As they get smarter, the latest generation of sensors are helping to make machines
cheaper, safer and more powerful than ever, and they allow them to **hook up directly
to the Cloud.** In the process, they will transform and revolutionize entire industries
and business models – and that's just for starters!

◼ **by Bernd Schöne**

In the driver's seat
Through a link to the Cloud, Smart Sensors in cars will deliver feedback directly to the manufacturer and also warn the driver long before a breakdown occurs

The future of computing will see information flowing constantly from the real world into the Cloud and back. That, at least, is what leading experts have believed now for a number of years. But as always when a major paradigm shift happens, the devil is lurking in the details

Sensors, for instance, have traditionally lacked a direct connection to the Internet. While a sensor may register the temperature of a cylinder head and be able to transmit that data to an engine control system, the latest models can do much more: through a direct link to the Cloud they can deliver feedback directly to the car's manufacturer who can take action immediately, for instance by sending the driver a message to stop by the nearest garage, or even to pull over at once and wait for a maintenance technician (or the tow truck) to arrive

because some essential part is about to fail.

The number of sensors needed to create the Internet of Things is mind-boggling. Gartner, an analyst company, estimate that some 26 billion smart sensors will be installed by 2020 in anything from cars to conveyor belts, from buildings to bridges, from road signs to refrigerators, from test beds to toasters. Garbage bins will know when they need to be emptied; air conditioners will check the local weather forecast to determine when they need to start cooling down or heating up.

„There's no limit to the number of things Smart Sensors will be able to do", says Dr. Markus Schwaderlapp, head of R&D at Deutz, an engine manufacturer. He remembers the early days when the dernier cri of sensoring was a temperature feeler in a car's front bumper that triggered a red warning light when temperatures fell below freezing. In those days, conscientious drivers regularly checked their oil levels and tire pressures before setting off on a lengthy journey.

Today, sensors take care of all of that, telling us to within a tenth of a degree exactly how hot or cold it is outside. "Our heavy diesels contain more than 30 of them, each responsible for continuously monitoring vital engine functions and the exhaust system", Schwaderlapp maintains.

Smart Sensors are increasingly viewed not as an extra, but as essential. Prof. Peter Gutzmer, CTO and a board member at Schaeffler Group, says that rolling bearings in hi-speed trains in China are required to include sensors

> **The number of sensors needed to create the Internet of Things is mind-boggling. Some 26 billion Smart Sensors will be installed by 2020.**
>
> **Gartner**

Gearing up for success
Machine tool makers expect to add new productivity gains to existing products through the use of Smart Sensors, thus ensuring they get top dollar for their goods

that are able control vibration, acceleration and lubrication. "The Chinese are taking the lead here", Gutzmer says: by 2020 all such bearings will need to be retrofitted with the appropriate sensors to fulfill regulatory mandates because they not only keep the trains running smoothly; they also help detect faulty sections of tracks.

Gartner forecasts that some 26 billion devices and machines will be connected to the Internet of Things by 2020 alone. Add to that some seven billion PCs, laptops and smartphones, and the dimension of the problem becomes clear. Unlike The UK and France, Germany has been slow to transfer its industrial production to offshore locations such as China or Southeast Asia. The traditional German "Mittelstand", most of the small and medium-sized companies, including many "hidden champions" with substantial market shares in their narrowly defined sectors, still make highly specialized machines and tools that command premium prices. They are looking to cash in on the expected windfalls that IoT will bring, but are averse to taking big financial risks. Smart Sensors, they believe, will enable them to maintain the high standards of engineering and quality the label "made in Germany" implies, while adding new productivity gains and thus ensuring that they receive top dollar for their goods.

Large multinational corporations have, for the most part, already successfully transitioned to smart sensors. ABB, a huge Swiss technology conglomerate, offer electric motors that are equipped with extensive ➜
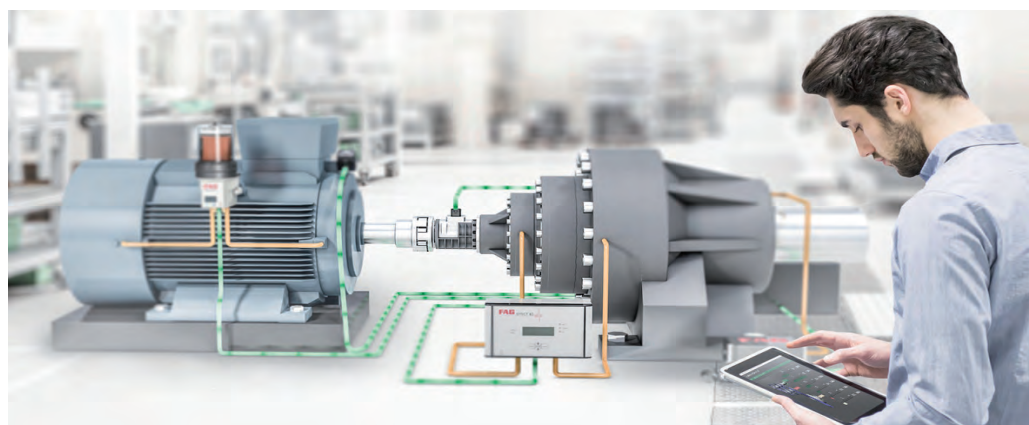
self-monitoring functions and sensors that report back to the manufacturer every time a device show signs of malfunctioning; thanks to predictive maintenance, engine downtime is virtually a thing of the past.

The Smart Sensors installed in ABB's motors monitor such parameters as vibration, temperature and load which are constantly compared with the desired values. Communication between the motors and the company's cloud-based computer systems is achieved through wireless networks; data are encrypted in real time. According to ABB this results in up to 70 percent less down time, while a motor's useful lifespan can be increased

> There's no limit to the number of things Smart Sensors will be able to do.

Dr. Markus Schwaderlapp
Head of R&D, Deutz

by roughly a third. Energy consumption is also reduced by about ten percent. ABB promises its customers a return on their investment in new, sensor-equipped technology within one year.

Today, such calculations can only be performed reliably for relatively large and expensive machines since the price of the necessary intelligent, Wi-Fi-equipped sensors is relatively high compared with their „dumb" predecessors. In addition, these sensors often need to be protected against unfavorable environments and working conditions through expensive shock absorbers or temperature-resistant housings.

While the business side tends to focus on the value of the data collected through smart sensors, engineers are more excited about being able to anticipate undesirable events such as breakage or excessive wear and tear. By comparing measurement values gathered from similar machines, computer algorithms are becoming increasingly adept at anticipating glitches and scheduling maintenance tasks well ahead any undesirable occurrence. "Predictive maintenance is the killer application for smart sensors" says Prof. Michael Beigl who heads the department for Purvasive Computing at the Karlsruhe Institute of Technology (KIT).

Beigl and his students have been working with smart sensors for years, and he envisions other important uses for them, for instance in monitoring environmental effects such as particle density. "Extremely fine dust particles behave differently than gases that tend to dissipate more quickly. By measuring the particle density over a wide area, using lots of monitoring stations equipped Smart Sensors, we are better able than before to pinpoint the source of contamination", he says. His system consists of several dozen small, low-power sensors that use Bluetooth in the smartphones of people passing by to essentially hitch a ride home to the servers that do the actual work of evaluating the data.

Smart Sensors with wireless capability use a wide range of communications standards such as RFID, WLAN, NFC (Near Field Communications), Bluetooth or Zigbee to keep in touch. Scientists at the Fraunhofer Institute IPMS in Dresden have developed tiny sensors that can be attached directly to electric wires, where they siphon off the energy they need to do their job, which is to monitor the temperature of the wires themselves and send the information to a central server via RFID. The technology is installed in enclosures where they can warn of possible overload.

The simplest way of building IoT applications for legacy equipment is by installing short-distance, low-power sensors that can use existing connections to access the cloud, says Dr.

Moving from Dumb Parts to "Genius" Sensors

■ Supersmart Sensors

They go by such exotic names as "Negative Temperature Coefficient Thermistors" (NTC) or "Light Dependent Resistors" (LDR), and every electronics technicians knows them well. Their job is to measure temperature or light through the changing electrical resistance in their parts. In the old days of analog systems, the results usually had to be read off of some kind of graph or scale. Today, their digital descendants are connected to sensors that transfer the data digitally via a computer bus directly to a server. But the latest generation Smart Sensors can do more than that: thanks to

on-board microprocessors they are able, for instance, to detect noise signals and reduce the flow of data and power consumption to the lowest possible levels. The logical next step will be to move the processing owner directly to the sensor by placing the sensor along with the necessary processor and storage on the same chip. Once out of the laboratory these supersmart sensors will themselves be a part of the Internet of Things, increasing the scope and power of IoT by orders of magnitude. Stay tuned for new developments by companies like Samsung, Toshiba or Infineon who are all working on next-gen "genius sensors".

Setting Standards for Smart Chips

■ Industrie 4.0

The German industry is getting serious about "Industrie 4.0", as the Industrial Internet is called in that country. At the recent Hanover Industrial Fair, a group consisting of virtually all the major industry associations involved in manufacture and electronics got together to found the "Standardization Council Industrie 4.0" which will be tasked with helping to create national and international standards and reference architectures for IoT applications. Recognizing that Germany lags behind others in IoT readiness, the Council will seek to establish working groups with associations in other European countries to create a counterbalance to U.S. domination in this field. Members include the Society of German Engineers (VDE), the IT industry association Bitkom, as well as the Electronics Industry Association ZVEI and the standards body DIN.

Michael Scholles, who also works for Fraunhofer's IPMS. According to him, the high cost of more powerful Smart Sensors is still prohibitive in many cases, but they are necessary for most high-value projects in the realm of IoT. "We need to see a substantial reduction in sensors' prices sometime soon", he believes. Since wafer space in semiconductor manufacturing is limited, the best way to make sensors cheaper, he believes, is to reduce their size so you can fit more them on each substrate. Adding extra technology to the silicon is not the best idea, he thinks; a better way would be to try and combine existing chips in order to avoid the high costs of developing new ones.

Dr. Gunther Kegel, the vice president of the German Engineering Society (VDE) and CEO of Peperl+Fuchs, an SME specializing in factory automation systems, agrees. "The large investment necessary to create more highly integrated chips is self-defeating", he believes. His solution is to "borrow" existing technology from other fields. "Sensors can be made universally adaptable", says KIT's Prof. Beigl, "the subsequent production steps can't." In order to be integrated into complex manufacturing processes, systems need to be easily customized. And in order to keep the number-crunching costs as low as possible, reference architectures and know-how transfer will be necessary, he believes, if SMEs are to be able to become the future champions in a world of IoT. If not, they will be priced out of the market. Security is the other big issue companies worry about when considering whether to move to Smart Sensors. This is especially true for smaller companies, especially since most sensors are manufactured in the Far East or in America where data protection and privacy rules are perceived as less strict than in Europe. They fear that the quality of their products could sink and they themselves be swamped by legal suits brought against them by irate customers.

"IoT must be fully protected against shoddy sensors and manipulated data", says Oliver Winzenried, CEO of Wibu Systems, a cybersecurity company. Sensors should be able to au-

> **"** In order to be integrated into complex manufacturing processes, Smart Sensors need to be easily customized.
>
> **Prof. Michael Beigl**
> Karlsruhe Institute of Technology (KIT)

thenticate themselves, he believes, automatically providing proof of their origin and the integrity of their data transmission systems. Appropriate symmetrical and asymmetrical encryption solutions are available today, he maintains, but sensor manufacturers often fail to use them due to cost concerns. The best way to go about, Winzenried feels, is to move the authentication and security functions to a separate chip, which shouldn't cost more than 10 Cents or so. Even cheaper are pure software solutions, for which Wibu charges a flat 0.5 percent of the total price of the systems they sell. "A sensor that costs 2 Euros needn't cost more than one cent extra," he says. And software offers the best possible way of securing a "naked" sensor, be it ever so smart.

Sensors

BLE-Link

TCP/IP-Link
SRWN-Link

APP

Cloud Server
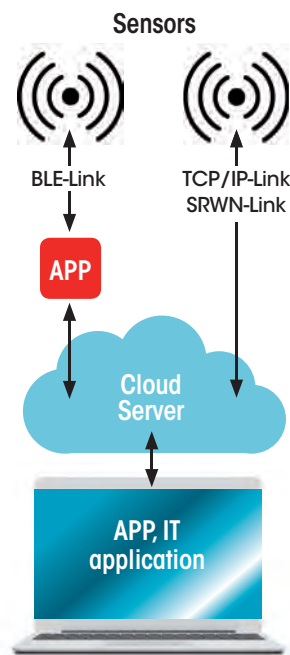
APP, IT application

Keeping in touch
Smart Sensors with wireless capability use a wide range of communications standards communicate with other applications via the Cloud.

GERMAN ANGST

The German computer security authority BSI recently released a 592-page report on the proceedings of its latest biannual Cybersecurity Congress in Bad Godesberg, and it makes fascinating reading. This time IoT was the hot topic. In fact most of the experts talked about nothing else. And what they had to say sounded very, very German, especially to people of the Anglo-Saxon persuasion. They were very, very worried. In fact they scared stiff.

Of course, Germans always have a tendency to view the future with a mixture of skepticism and good old German Angst – a vague sense of impending doom. Where others see opportunities, they tend to see risks, which often makes it difficult to communicate across cultural borders. Brits and Americans seem to be talking about a completely different subject than their German counterparts.

In this case, the big issue was the worry that, in terms of automation and smart factory applications, the world is about where office IT was back in the 90ies, or so the German participants tended to believe, many of them hailing from very prestigious institutions and official agencies. The consensus was sort of like this: stop everything! First, we need to devote lots of serious research to solving the problems before we can take a cautious step forward.

As if to confirm their greatest fears, news circulated around the conference rooms that two American hackers, Charlie Miller and Chris Valasek, had just demonstrated on public television how they were able to take control of a passing automobile from a distance of more than half a mile, switching the lights on and off and applying the brakes while the drivers were reduced to helpless passengers, paralyzed with fright. They then proceeded to take over the wheel and drive the car into a ditch. Okay, all this was done under controlled circumstances on a test circuit, and nobody got hurt. But everybody could readily imagine what it would be like if you were careening down a German autobahn at 130 miles an hour. Germans love their cars, and they trust in German automotive engineering. For them, it was as if the world had just started rotating in the wrong direction.

As a result of the televised live hack, Fiat, an Italo-American manufacturer, was forced to recall 1.4 million vehicles which had been proven vulnerable, including Dodge, Ram and Jeep models. All were found to need an immediate software update in order to close the hole through which Miller and Valasek had been able to gain access.

At the conference, the German IT expert Stephan Gerhager publically asked if the same thing could happen to German automobiles. When he got home he hired an automotive engineer and a graduate student who were given two months to attempt to similarly penetrate the biggest and most expensive German cars. It turned out it was a cinch: using off-the-shelf computer systems available in any backstreet garage they were able to listen in on the in-car data communications and insert malware that was able to take complete control through the so-called CAN Bus, a communications interface that is standard in most German cars of more recent vintage.

The good news was that they had to be sitting in the car to do it. Any attempt to duplicate the stunt by the American hackers and steer the car remotely via wireless control failed dismally.

It turned out that the German engineers had done their homework. The vital systems over which entertainment and engine communications flow were hermetically sealed off from the outside and from each other, like the systems of compartments that can keep a ship from sinking if it suddenly develops a leak, thus making them impossible to tamper with, at least remotely.

It appears that German Angst actually paid off in this case: the car makers had been worried about the kind of stunt Miller and Valasek had pulled, even though there had been no proof up to that point that the deed could actually be done.

As it turns out, virtually every German car manufacturer has gone an extra step by now and added encryption and strong authentication to their vehicle systems. The CAN Bus is now virtually impregnable.

Stephan Gerhager conducted his research independantly, but he received funded from Allianz, the largest German car insurance company. But Alliance also insures large factories, and it seems that many industrial robots also use CAN Bus technology. They, too, are potentially subject to outside attack by remote control systems used by hackers to bring production to stop or, more worryingly, to cause the factory to produce faulty products, a fact that would probably only turn up after they have already been delivered to customers.

Conceivably, this realization will cause even non-German engineers and managers to wake up to the fact that they need to do something, and do it fast! Working on the principle that worrying too much about security is bad for business, and that if something is broke we can fix it later, may be typically American. But sometimes a dose of German Angst can be quite helpful.

> ,,
> ## Germans always have a tendency to view the future with a mixture of skepticism and good old German Angst.

Bernd Schöne
is a veteran German Internet journalist and an expert on cybersecurity.

Photo ©: Fraunhofer FEP / Jürgen Lösel

Making a thinner glass

Researchers at the Fraunhofer Institute FEP are teaming up with Corning, an American manufacturer of glass and ceramics, to create ultra-thin glass for sheet-to-sheet and roll-to-roll processes right through to application in organic electronics. Ultra-thin glass can be used as a substrate as well as for encapsulation in many smart products such as smartphones, curved displays, OLED light sources and photovoltaics. Especially appealing is to use ultra-thin glass in wearable electronics as well as in intelligent micro-optics and touch-sensors. Moreover, ultra-thin glass has excellent surface properties that considerably exceed the ones of conventional plastic films.

University of Illinois
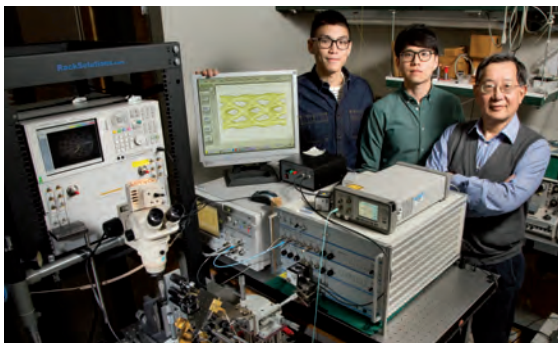## Revving up fiber networks

Photo ©: L. Brian Stauffer

A team from the University of Illinois has successfully transmitted error-free data at a rate of 57 gigabits per second (Gbps) through a fiber cable, thus creating a fast lane on the information superhighway. According to professor Milton Feng, the new technology, which is based on a special semiconductor laser, can operate at temperatures of up to 85 degrees, eliminating the need for additional cooling in hi-speed fiber networks. As big data has gotten bigger, the need has grown for a high-speed data transmission infrastructure that can accommodate the ever-growing volume of bits transferred from one place to another. Computing components grow warm over extended operation, as anyone who has worked on an hot laptop knows. Achieving high speeds at high temperatures is tricky Feng admits. Besides, cooling systems cost money. Latin America are squeezing out weaker players and reducing profit margins of those that remain.

Need for speed
Milton Feng (r.) and his team are pushing the envolpo for fibre cable

Liebherr
Smart Construction Trucks

Forget self-driving cars: Liebherr, a manufacturer of heavy-duty construction vehicles, recently showed of a 320 ton hauling machine that comes equipped with sophisticated GPS gear and sensors that allow it to operate 24/7 without a human in or near it. Instead they are operated from a control center which can be a thousand miles away. Some of the areas that mining companies have to work in are in hostile or extremely remote areas, making it difficult to find qualified professionals to fill the jobs. The self-driving system also increases productivity by approximately 12 percent, Liebherr claims. After all, an autonomous construction vehicle is not required to take occasional breaks and can't call in sick to work. First public field trials are scheduled for 2018.

BigRep
LWorld's largest FDM 3D printed drone

The Berlin technology startup BigRep has printed the largest FDM 3D printed drone of the world: Duster. Reinforced with carbon threads, the two meter-wide he drone's copter frame is designed to accommodate eight electric motors and carry payloads of up to 60 kg. Flight time can be between seven and 40 minutes, but BigRep is working on new battery technology that will enable flights of up to 70 minutes. Duster was developed together with the drone specialists Robert Reichert of OiC Drones, a full-service drone provider, and is destined for use in the industrial sector and in agriculture.

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Parallel NOR	64Mb–2Gb
XTRMFlash™ Memory	128Mb–2Gb
DRAM	
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LPDDR1-4	512Mb- 16Gb
SDR	64-256Mb
Modules (DDR2/3)	2GB- 8GB
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NAND + LPDDR1/2	
NOR + PSRAM	

Big Data is Dead

LONG LIVE PREDICTIVE ANALYSIS

Businesses are collecting more and more data these days, but are they making the right use of the **information they are gathering?** The signs indicate that they aren't, and that in fact all they are creating is more and more complexity. Instead, they should focus on using data to make better decisions.

■ by Tim Cole

As a buzzword, Big Data has been around for almost half a decade, and it was supposed to trigger a true revolution in the way companies view their markets and their customers. It was supposed to hand us the tools needed to exploit the endless growth of data.

Instead, many companies and their IT departments complain more loudly than ever about "information overload", and it's true: the numbers are staggering. Facebook claims that it processes 2.5 billion pieces of content and over 500 terabytes of data daily.

In addition, it collects an average of 2.7 billion "Likes" and 300 million photos a day. Every hour, Facebook scans more than 200 terabytes of data. And that's just one company, although admittedly a very data-hungry one.

"A customer-focused business with Big Data in its grasp has an unparalleled source of knowledge from an increasing number of sources now; mobile data, social data, transactional data, locational data, financial data, family data, medical data, carbon footprint and consumption data", writes Theo Priestly in Forbes.

But increasingly, experts are wor-

Cross-selling cable to broadband customers

■ YouSee

Denmark`s leading provider of cable TV and broadband services faces two challenges. First, customer churn is a constant problem. Second, multi-product customers are more profitable and more loyal but many YouSee customers only subscribe to a single product. Using predictive analytics, a call center agent can now make a decision about a cross-sell or retention offer while still on the phone with a customer. YouSee created two models they knew would improve this decision – the likelihood of a successful cross-sell of cable TV services to a broadband subscriber in the next 90 days and the likelihood that a broadband subscriber will churn in the next 90 days.

ried that companies aren't asking the right questions, namely the ones that will fill understanding gaps and help them interpret results. "Really effective analysis combines brilliant technologists and cutting-edge code we all recognize with human understanding, social science research, philosophy, and mission expertise", says Peter B. LaMontagne, a blogger at Huffington Post.

To make matters worse, data is often stored very traditionally and "crunched" the old way, namely in batch processes. This begs the question: what use is that for real-time operational decisions?

Another worry is that data is being collected indiscriminately and without any kind of fact-checking or ways to determine the credibility of those providing the information. Faced with a variety of sources, companies understandably choose to cherry-pick their data. Employees tend to select data from the easiest sources, or the ones with the least privacy or classification protections. And analysts are often happiest with sources that support their own view.

"Today's data reliability demands that

companies innovate, finding novel ways to pair analyst experience and expertise with automation, overcoming the velocity, volume, and variety of data they see", LaMontagne maintains.

His colleague James M. Connolly of Newsweek says the problem is the focus on bigger and bigger data. In reality, he thinks, it's just good old data, stupid! "It's time to de-emphasize the 'big' in "big data", he writes. By making the whole enterprise analytics concept too complex, rather than focusing on the idea of using data to make better decisions, that type of complexity can turn nasty, he cautions.

In the end, Big Data is just data. Okay, there's more of it, and it comes in more flavors; it is generated and transmitted faster than ever. But here are some questions we need to ask ourselves if we want to transform these masses of data into intelligent business decisions:

●Which pieces of data really help us to create new insight and understanding?

● Do we know how was this data was sourced, treated and stored?

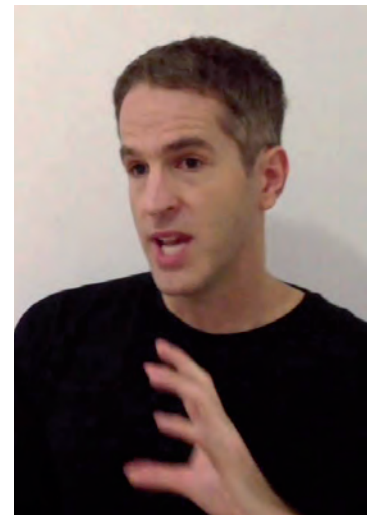● Can we describe the results in terms a manager can understand?

Recently, a whole new field of knowledge management has sprung up which goes by the moniker "predictive analysis", or PA. This is essentially an intelligence technology that aims to create a predictive score for each customer or organization. PA optimiz-

❞ Predictive Analytics: is the Power to Predict Who Will Click, Buy, Lie, or Die.

Eric Siegel
Former professor of data mining and Artificial Intelligence at Columbia University

Beyond forecasting
Thanks to predictive systems BlueYonder claims it is possible to improve turnover, margins and the customer experience, all at the same time

es activities like marketing campaigns and website behavior to increase customer responses, conversions and clicks, and to reduce churn rates. Based on each customer's predictive score, actions can be taken with that customer.
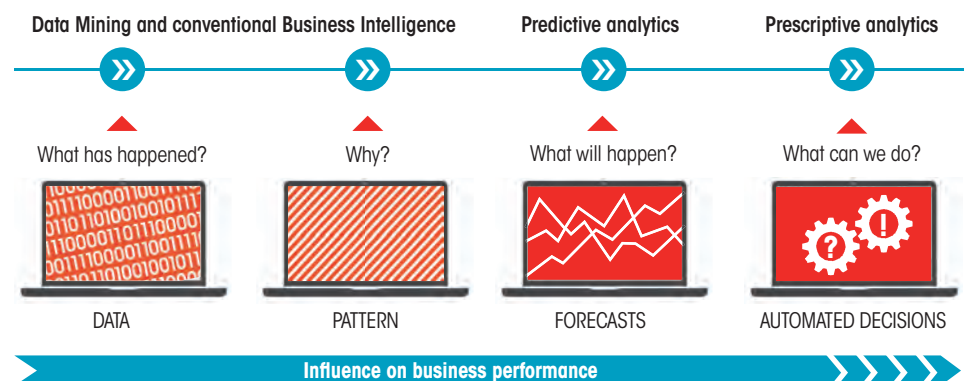
In his bestselling book, "Predictive Analytics: the Power to Predict Who Will Click, Buy, Lie, or Die" (Wiley, 2016), Eric Siegel, a former professor of data mining and Artificial Intelligence at Columbia University, sets out examples of what kind of information can be gathered from complex, multi-faceted data streams, and how these can affect decisions within companies and government institutions, for instance:

● Predicting which people will drop out of school, cancel a subscription, or get divorced before they are aware of it themselves.

● Why early retirement decreases life expectancy and vegetarians miss fewer flights.   ➔

Stages of Analytics Blue Yonder

Data Mining and conventional Business Intelligence		Predictive analytics	Prescriptive analytics
What has happened?	Why?	What will happen?	What can we do?
DATA	PATTERN	FORECASTS	AUTOMATED DECISIONS

Influence on business performance

photo©: Stages of Analytics Blue Yonder

A bird's eye view of customer behavior

■ HSE24

The home shopping channel based in St. Petersburg, FL, operates affiliate networks all over Europe. Its biggest challenge is developing deep relationships with its customers to both attend to and even anticipate their needs without face-to-face interaction. The company's electronic and mobile commerce segments have grown at nearly twice the rate of the company's business as a whole, leading to a tremendous increase in the amount of customer data it needs to handle. Using customer engagement intelligence applications running on in-memory computing provided by SAP, HSE24 is able to target the customer segments that would be most likely to respond to specific campaigns, by querying the data in real-time to detect customer buying patterns. The tool displays the analysis in the form of graphics and charts, making it easy to see and react to data patterns.

• How European wireless carrier Telenor, and the Obama's 2012 campaign calculated the way to influence each individual.

• How Target, a retail chain, figures out you're pregnant and how Hewlett-Packard deduces you're about to quit your job.

The tools for achieving these kinds of insights usually combine elements from such disparate fields as Data Mining, machine learning, and statistics, to extract information from sets of data in order to find patterns and predict future consequences. These range from expensive professional software solutions like SAS Predictive Analytics or IBM SPSS Statistics, which provide ad-hoc analysis, hypothesis, and model testing (among other features) to add-ins for existing ERP solutions such as SAP Predictive Analysis and even freeware such as R from Revolution Analytics or Orange, an open source analysis tool.

In Predictive Analysis, as in most business cases, one size does not fit all. In fact there are distinctly different approaches depending on the industry involved and the aims companies feel they need to follow.

Churn Alert: Many businesses worry about losing customers over time. Bringing in new customers can be expensive; retaining existing customers offers a more affordable solution. Preventing churn by identifying signs of dissatisfaction among customers and identifying those likely to leave is one of the main areas in which Predictive Analysis can benefit companies, for instance in fields such as media, insurance, banking, and telecommunications.

CLT: Instead of searching for new customers, many companies seek to make existing customers more profitable. This is one of the main areas of focus for Customer Lifetime Value, or CLT. Predictive Analysis can offer marketing departments and top management in fields such as retail, utilities, banking, and insurance new insights that will allow them to target customers that promise the greatest lifetime value.

Product Predilection: Digital marketers are constantly trying to optimize "right offer, right person, right time" through their campaign management solution. So-called "propensity" models offer to improve response and revenue by identifying customers who are "leaning" towards a certain product or service, by analyzing their online behavior in various social media channels.

Predictive Maintenance: Enterprises

> "
> Amazon knows what you want to purchase before you even know you want to buy it, and that's what we're doing for sales!

Amanda Kahlow
Cofounder and Chief Executive, 6Senese

Predictive Analytics use cases by Industry

	Churn Prevention	Custumer Lifetime Value	Customer Segmentation	Next Best Action	Predictive Maintenance	Product Propensity	Quality Assurance	Risk Modeling	Sentiment Analysis	Up-and-Cross Selling
Automotive	●		●				●	●		
Banking	●	●	●	●		●		●		●
Education				●					●	
Insurence	●	●	●	●		●			●	●
Life Sciences				●			●		●	
Logistics					●		●	●		
Manufacturing					●		●	●		
Oil & Gas					●		●	●		
Retail	●	●	●			●			●	●
Telecoms	●	●	●	●					●	●
Utilities		●	●		●		●	●		

with big investments in infrastructure and equipment such as automotive manufacturers, logistics and transportation companies, or oil and gas suppliers are increasingly demanding the capability to analyze metrics and data that will keep their precious investments up and running at all times. Predictive Analysis enables them to reliably forecast both probable maintenance events and upcoming capital expenditure requirements, reducing maintenance costs and avoiding potential downtime.

Possibly the greatest benefits to be reaped from Predictive Analysis are in up- and cross-selling, where companies need to make smarter and faster decisions about marketing strategy than ever before.

Say a shoe store has spent years investing in paid searches, but has only recently begun to explore the possibilities of social media advertising. According to the traditional view of Customer Lifetime Value, the cost for gaining a new customer via social media channels would be prohibitive. But with the help of Predictive Analysis, retailers can determine the true value of an individual customer within days or weeks, thus allowing them to precisely target these customers in ways that were impossible back in the days of paid search. The slightly higher upfront costs can prove to be a bargain in disguise.

Forecasting revenue based on historical data is essentially an old-fashioned, backward-looking approach. Much more interesting from a company perspective would be to extrapolate from close observation of new shoppers and combining the results with additional information about the customer mined from a variety of sources, from data brokers to social media platforms, to find out who they are, what channels they prefer to shop through and what demographic group they belong to. This allows smart predictive systems to accurately estimate their probable spending behavior.

Hardly any area of business or industry can afford to ignore these and many other possible advantages brought about by Predictive Analysis.

It's like a crystal ball into the future!

Gerd Leonhard
Analyst and head of The Future Agency, based in Zurich

No wonder the market for predictive data is booming. Analysts at Gartner predict annual growth of 34 percent by 2017, with revenues projected to reach $48 billion. Venture capitalists have been eager to invest in budding PA startups such as Framed Data (which raised 2 million in seed capital) or 6Sense, which raised $12 million in in Series A equity and debt funding.

"Amazon knows what you want to purchase before you even know you want to buy it, and that's what we're doing for sales," says 6Senese's co-founder and Chief Executive, Amanda Kahlow.

Blue Yonder, a German PA start-up with headquarters in Karlsruhe, gained headlines in 2015 by securing funding of $75 million from the global private equity firm Warburg Pincus, the biggest deal for a predictive analytics company in Europe. CEO Uwe Weiss believes that the need for predictive analytics is independent from traditional economic cycles. "The technology is at the plateau of productivity", he maintains. „People can use this technology now and produce ROI."

Blue Wonder's solution is a cloud-based platform aimed at retail companies and offering them innovative ways of determining pricing and automating merchandise planning. "This means that you can improve turnover, margins and the customer experience, all at the same time," Uwe believes.

Who would ever dared to predict anything like that?

Limiting the damage of natural catastrophes

■ Swiss Re

When a city is ravaged by flooding, or an industrial complex is left in ruin by a tornado, Swiss Re relies on data to evaluate exactly what kind of damage happened, why it happened, and how to prevent it from happening again. Employing powerful analytics on its massive wealth of data, Swiss Re uses predictive modeling to educate insurers, cities, and private builders on the possible risks they face when rebuilding after a catastrophe.

"We needed a consolidated view of all claims, and our business users needed a way to run their reports in

minutes or hours, instead of days", says Reto Estermann Head Finance IT General Ledger Systems, Swiss Re. Deploying IBM DB2 Analytics Accelerator, he gains actionable insights in hours instead of weeks. The mainframe provides Swiss Re a "single source of truth". Thanks to this system, the reinsurance provider can run queries and generate reports – quickly and efficiently. And the mainframe is a safe, scalable platform for Swiss Re's vital data to reside, moving data in the magnitude of 3 petabytes and housing its biggest database that contains 1.5 billion rows.

IOT
COMPLEXITY SIMPLIFIED

Bringing flexibility to the challenges and choices
in Internet of Things system evaluation and development
network management and application delivery.

■ **Philippe Fremont***

Introduction

The Internet of Things (IoT) offers a technological revolution that can deliver higher efficiencies and enhanced productivity in existing equipment infrastructure. More than this, the leveraging of cloud-based IT technologies and capabilities that are becoming increasingly powerful, the implementation of real-time data analysis can enable autonomous decision-making and create the potential for new services and revenue streams for companies. However, it can be a

Great expectations

Analysts predict more than 50 billion Internet-connected devices by 2025 with shipments of new connected device to total more than 12 billion a year

complicated, fragmented and potentially fraught transformation for many, especially those in operating in industrial sectors. For example, the industrial world comes with decades of legacy equipment and existing infrastructure that cannot easily be replaced quickly or cost effectively. Introducing new embedded hardware and software to connect smart sensor technologies up with the cloud and enterprise software, potentially via an Internet gateway in many cases, brings issues of connectivity, interoperability,

security and scalability. All of which can present a serious challenge in connecting up previously unconnected systems and devices, especially when dealing with solutions from multiple vendors.

Markets and Applications

Today there are widely varying estimates for the IoT market – but to choose one from many, market analyst firm IHS predicts rapid expansion over the next few years, resulting in an installed base of more than 50 billion Internet-connected
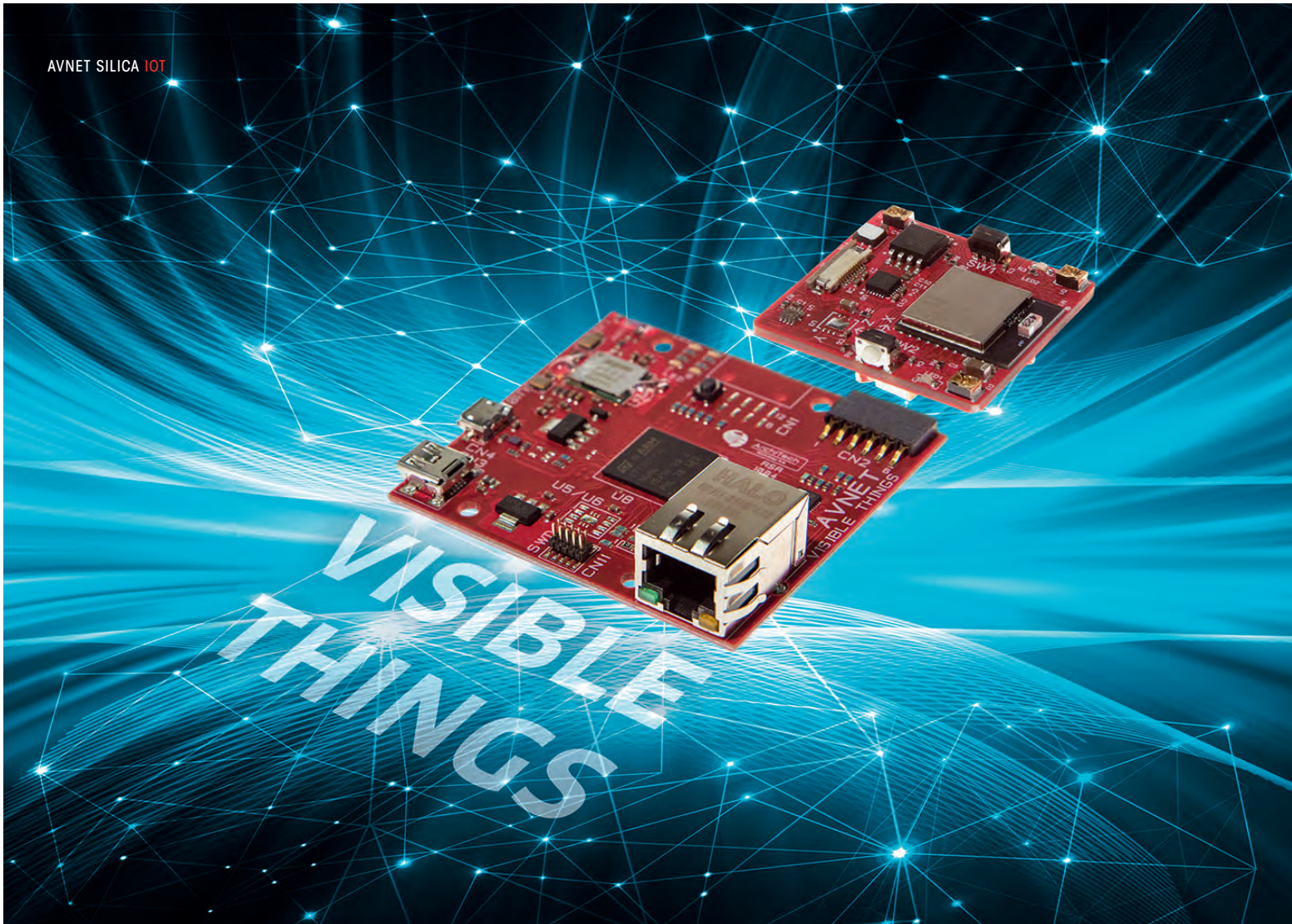
dustry 4.0 revolution in Germany. Another key application is track and trace for transport and logistics markets. The installation of low-power narrowband transmitters within vehicles or large assets, in conjunction with data analytics in the cloud, can enable the real-time tracking of shipments, providing improvements in delivery as well as for insurance purposes. It can also deliver the potential to optimize logistics routes or warehouse capacity. Another example is the installation of fire alarms in homes, where the inclusion of connectivity with additional devices such as presence sensors can deliver a higher level of security as well as the potential to offer completely new applications and services to end customers.

Challenges and Connectivity Choices

There are many challenges for companies looking to introduce IoT systems and applications. These include: the low-power requirements of edge devices, especially remote devices that will typically be required to operate from small batteries; scalability and the ability to manage potentially thousands or even millions of devices; the vexing issues of security; and interoperability of discrete solutions at different levels of the IoT chain.

There are also many choices to be made in terms of connectivity. Traditional possibilities involve short-range wireless communications usually wireless LAN, Bluetooth Smart (Low Energy profile) or ZigBee from edge devices to a gateway, often wired via Ethernet to the cloud or potentially connected via wireless LAN. Another option is cellular connectivity from the gateway or even from edge devices to send data directly into the cloud, but this brings the penalty of high power messaging that is not always suited to the small-size information packets typically required for IoT data.

However, there exist alternative connectivity options with low-power narrowband messaging provided by LPWAN (Low Power Wide Area Network) technologies such as LoRaWAN and SIGFOX. Complementing cellular

devices by 2025 with new connected device shipments predicted to be more than 12 billion per year. A large share of the installed base is expected to be in industrial application sectors with approximately 20 billion connected devices deployed across a range of markets including industrial automation, building and home automation, smart metering and in alarm and security products and systems.

This growth is being driven by numerous new applications and capabilities. A classic IoT application is

predictive maintenance, where for example manufacturing or operation data is collected via sensors located within or near to equipment and sent into the cloud for real-time data analysis. This enables the ability to accurately diagnose and prevent equipment failure, which can be a significant advantage for manufacturing companies and vital for critical-service infrastructure. Predictive maintenance can provide a significant impact in high-tech manufacturing and smart factories and in what is being called the In-

There are many choices to be made in terms of connectivity.

*Philippe Fremont is Vice President Technical Marketing at Avnet Silica, the European semiconductor specialist of Avnet, Inc., a leading global distributor.
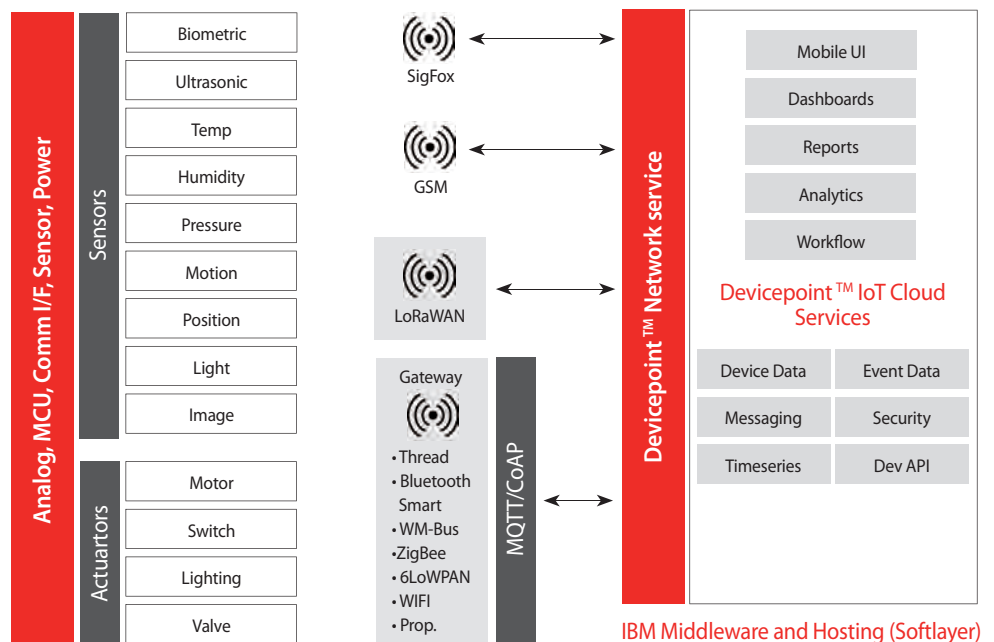
VISIBLE THINGS

mobile network and short-range wireless, the fundamental concept for LoRaWAN and SIGFOX is that many IoT and machine-to-machine (M2M) edge devices will only need to transmit small amounts of data as well as operating from a small battery. These LPWAN technologies enable significantly lower costs and better power consumption characteristics as well as supporting large networks that have many millions of battery-powered edge devices. LoRa offers data rates from 0.3 up to 22 kbps, whereas SIGFOX employs UNB (UltraNarrowBand) technology, which makes it suited to even smaller data sizes, delivering from 10bps up to 100bps. Typical consumption of a SIGFOX modem for example is between 20 and 70mA and is virtually zero when inactive. This level can enable battery life of years for edge devices, especially with occasional rather than continuous transmission demands. Today, however, network coverage is limited to an extent with SIGFOX networks, for example, being rolled out in major cities, but largely within Western Europe

including Benelux, France, Portugal, Spain and the UK.

In addition, there is also a new and emerging LPWAN standard: NB-IoT (NarrowBand IoT), which is backed by major telecom operators and equipment vendors worldwide. The

technology is part of the GSMA's Mobile IoT Initiative to deliver low-cost and low-power communication for IoT networks using cellular standards. Today, the initiative is perhaps still in its nascent phase, but it offers much promise.

Figure 1 – Scope of the Visible Things platform

Visible Things

To help companies looking to take advantage of the possibilities offered by the IoT, Avnet Silica has put together all the building blocks necessary to deliver a highly flexible and comprehensive edge-to-enterprise evaluation and development IoT platform. Targeting a wide range of markets, the Visible Things platform is one of the first IoT systems and applications platforms to made available from an electronics component and systems distributor. The platform delivers tested, proven, secure and integrated hardware and embedded software to connect smart sensors and embedded devices via gateway solutions or LPWAN networking technologies, right through to the cloud and enterprise software applications. It is designed to be a highly flexible offering that provides customers a menu of different options along the path from edge to enterprise.

The platform supports short-range connectivity to a gateway, and Wi-Fi and 3G cellular communications to the cloud and enterprise software applications. It also supports the SIGFOX and LoRaWAN IoT networks, which have been designed to provide secure low-cost narrowband information messaging to meet the requirements of the IoT and smart city, machine-to-machine and industrial applications.

In terms of security, the platform includes the UbiquiOS secure gateway embedded software, which integrates cryptographic technologies as well as Transport Layer Security v1.2, and server certificate (OCSP) and client certificate authentication. For additional security, the platform roadmap includes the early introduction of further silicon-based technologies that will, for example, integrate a secure element for deployment in smart sensor edge devices.

Starter Kits

Delivering a simple out-of-the-box setup, three reference-design starter kits have been made available to enable developers to get applications up and running quickly. Each starter kit includes a board
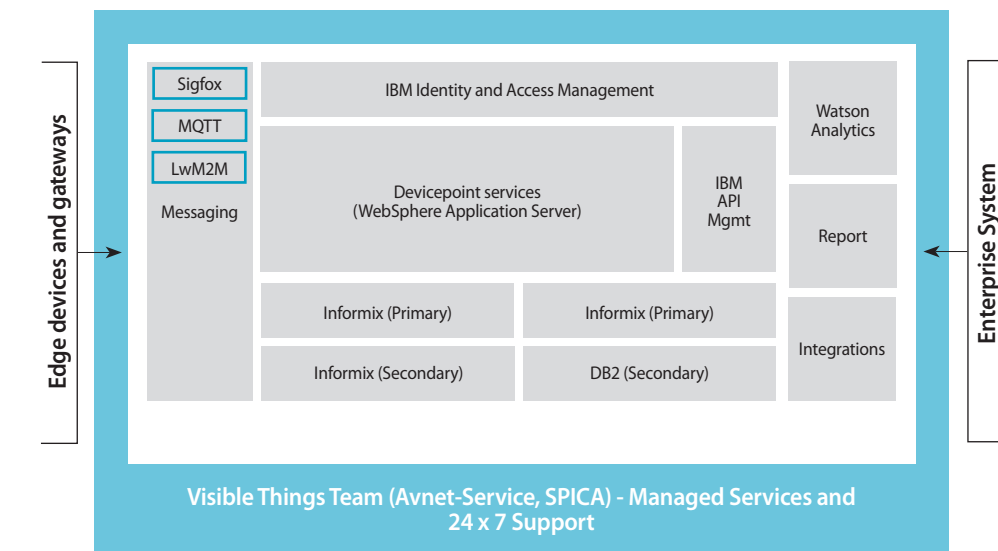

Figure 2- Visible Things Cloud Service

managed by ARM Cortex based microcontrollers. The basic Visible Things starter kit comprises a smart sensor board including Bluetooth Smart connectivity and motion, temperature/humidity and light/proximity sensors, together with a gateway board, which manages connectivity to the cloud service via Wi-Fi. Available as an expansion option, a GSM peripheral module with embedded SIM and SIM-connector options enables cellular connectivity to cloud enterprise software services. SIGFOX and LoRaWAN based kits include SIGFOX and LoRaWAN module sensors respectively, as well as additional motion and light sensors. The Visible Things platform also provides a mobile app, available for iOS and Android based devices, enabling easy access to local hardware configuration and connection to cloud services.

Cloud Services

A key element of the platform is the Devicepoint cloud service. Underpinned by IBM software components, the service builds upon data from sensors and edge devices with contextual information, plus data from other sources to deliver real-time analysis and long-term business intelligence. The tool can also be customised to enable greater management of sensor data for analytics, reporting and workflow management.

Edge-to-Enterprise

While the challenges and choices are many in developing IoT systems and applications, the opportunities are greater still in being able to deliver better efficiencies and new services to customers. The Visible Things platform is comprehensive and flexible IoT development solution that offers tested, proven and integrated components to enable companies an exceptionally fast edge-to-enterprise IoT deployment. The platform will also be continually augmented with new hardware and software options such as support for NB-IoT communications, further cloud services, enhanced SIM services, and increased edge-device security features in the future.
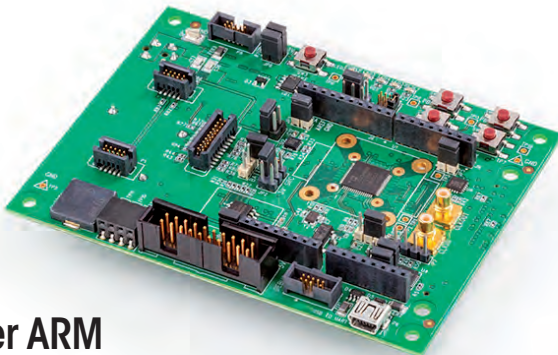
www.avnet-silica.com

> We offer a simple out-of-the-box setup

Philippe Fremont

SMART
SOLUTIONS

ANALOG DEVICES

AHEAD OF WHAT'S POSSIBLE™

ADuCM3029

Ultra Low-Power ARM Cortex-M3 MCU

The ADuCM3029 processor is an ultra-low-power integrated mixed-signal microcontroller system for processing, control and connectivity. The MCU system is based on ARM Cortex-M3 processor, a collection of digital peripherals, embedded SRAM and flash memory, and an analog subsystem which provides clocking, reset and power management capability in addition to an ADC subsystem. To support extremely low dynamic and hibernate power management, the ADuCM3029 processor provides a collection of power modes and features, such as dynamic and software controlled clock gating and power gating. The ARM Cortex-M3 core is a 32-bit reduced instruction set computer (RISC). The length of the data can be 8 bits, 16 bits, or 32 bits. The length of the instruction word is 16 or 32 bits. The ADuCM302x processor provides a number of features that ease system integration like four kinds of processor reset, two boot modes, a combination of protection mechanisms and more.

ARKESSA

Connecting everything from Cities to Wearables

Imagine having technology at your fingertips that would allow you to quickly install, connect and manage almost every aspect of every product you ship, anywhere in the world. Building connectivity into your products and services will help optimise your customer experience and service. It can enable a XaaS business model with monthly recurring revenues. This is what Arkessa and its network of partners can deliver for you. Arkessa is the leading provider of managed connectivity services for the Internet of Things (IoT). **www.arkessa.com/connect**
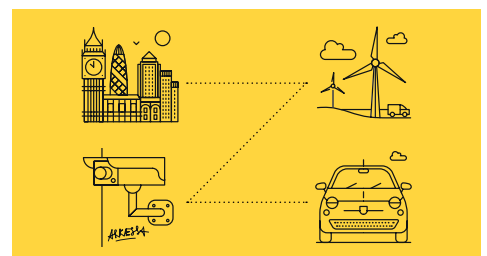
CYBLE-222014-01

Increases security, privacy & data rates with BT 4.2

Cypress Semiconductor's easy-to-use PSoC® 4 BLE Programmable System-on-Chip and PRoC™ BLE Programmable Radio-on-Chip solutions are the world's first to achieve full featured Bluetooth 4.2 qualification. PRoC BLE is a low-power Bluetooth Smart microcontroller with industry-leading CapSense® capacitive touch-sensing functionality, while PSoC 4 BLE offers expanded design flexibility by adding intelligent analog and programmable digital blocks that enable simplified integration with sensors and actuators. Both solutions integrate a Bluetooth Smart radio, a high-performance 32-bit ARM® Cortex®-M0 core with ultra-low-power modes, 256KB flash memory, 32KB of SRAM, direct memory access (DMA) capability, 36 GPIOs, and customizable serial communication blocks, timers and counters. Cypress has simplified the Bluetooth Low Energy protocol stack and profile configuration into a new royalty-free, GUI-based BLE

Component—a free embedded IC within PSoC represented by an icon—that can be dragged and dropped into designs using Cypress's PSoC Creator™ integrated design environment (IDE).
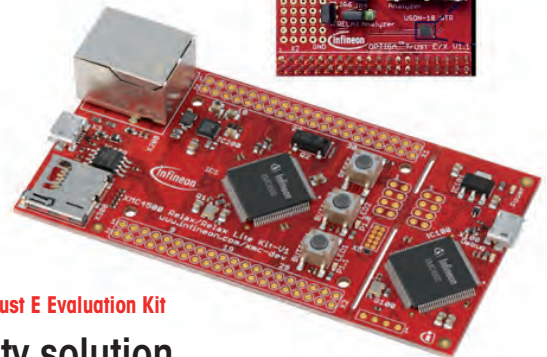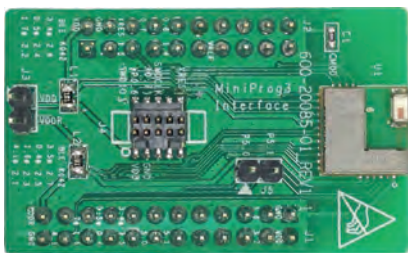
OPTIGA™ Trust E Evaluation Kit

Security solution for high-value goods

The OPTIGA™ Trust E Evaluation Kit is an easy way of getting started with IoT security. The OPTIGA™ Trust E is an authentication device mainly used for IP protection of accessories and spare parts. As a full turnkey solution it comes with a high-end security controller, operating system as well as a library for the main system host controller. The PC plug in board is based on a XMC4500 microcontroller and comes with software providing the user an intuitive graphical user interface. This allows users to try out the applications of the OPTIGA™ Trust E such as a one way authentication, insertion of cryptographic certificates as well as reading and writing data. The OPTIGA™ Trust E evaluation kit is a quick and easy way of getting started with IoT security. Contact your Avnet Silica account manager to get an OPTIGA™ Trust E Eval Kit.

Intel® Quark™

SE Microcontroller
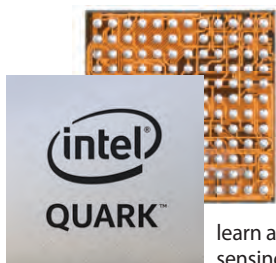
The Intel® Quark™ SE microcontroller brings intelligent power to the edge by combining a microcontroller with an onboard sensor subsystem to manage power consumption through programmable wake cues. It also features a pattern matching technology engine that allows it to learn and differentiate. The result is always-sensing intelligence, bringing real time response down to the next generation of intelligent devices. The Intel® Quark™ SE microcontroller includes an internal sensor hub, which manages multiple sensors, enabling it to support more peripherals. By being interoperable with other Intel® based systems, it simplifies the integration of edge products in end-to-end IoT architectures. More can be handled at the device level, reducing the need for larger gateways. The microcontroller facilitates design and reduces the bill of materials by minimizing external components required on the platform. The Intel® System Studio integrated development environment is included with all Intel® microcontrollers. This maximizes investment of time and money by reusing software to scale up or down to any Intel® processor without additional costs.

FireFly Development Kit

To enable rapid prototyping and development of IoT applications we have created the FireFly Development Kit. The Kit is composed of three critical components. The first being the ICM-30630 with integrated sensor framework software, the second is our new development tool, SensorStudio, and lastly the Arduino Zero board. SensorStudio is our new development tool used to ease the development and programming of the FireFly platform. The simple GUI uses sensors blocks that can be arranged in elegant flow charts for developers to run and validate their program, this makes for rapid prototyping application development. InvenSense supplies our standard sensor block functions derived from our sensor framework software. Developers can also create their own custom sensor functions and verify their functionality in SensorStudio. **www.invensense.com/ products/firefly-development-kit/**

MICROCHIP

DV164140-1

LORA® Technology Evaluation Kit – 800

The LoRa® Network Evaluation Kit makes it easy for customers to test LoRa technology, range and data rate. The full-featured gateway board includes an LCD screen, SD Card for Config Data, Ethernet connection, 868 MHz antenna, and full-band capture radios. The Gateway evaluation kit also includes two RN2483 Mote boards (Part # DM164138). The gateway uses a local version of the LoRaWAN network server running under Windows so it does not need an external network connection. This creates a self-contained demo network that makes testing the LoRa network quick and easy. Features:

● Everything needed to develop a LoRaWAN Network
● 868 MHz Evaluation Kit
● Includes a 6-channel Gateway and two Motes
● Local LoRaWAN Network/Application Server
● GUI for configuration and testing (Windows, Linux and Mac OS)

maxim integrated™

MAXREFDES143#

DeepCover Embedded Security in an IoT Authenticated Sensing & Notification Reference Design

As technology is enabling more embedded devices to connect to the Internet, security emerges as a paramount feature to protect industrial equipment from counterfeiting, track product lifetime, and provide assurance that the data getting to the Internet is authentic. The MAXREFDES143# reference design demonstrates an authenticated data chain from a trusted sensor node to a web server. Additionally, this authenticated data is used to initiate smart notifications to the user via the web server when it is time to change the filter (i.e. the protected sensor node) or if an unsafe filter (i.e. counterfeit sensor node) is installed. The simplicity of this design enables rapid adoption into any sensor node where system decisions will be made based on the data gathered from the sensor. The reference design is supported by mbed libraries and the hardware is Arduino compatible, making it very easy to prototype and integrate into new designs. The DS2465 secure processor included in the reference design provides heightened security at low overhead by offloading the SHA-256 cryptographic computations used in the authentication process.

NXP

i.MX 6UltraLite

Low-power, secure, ARM® Cortex®-A7 applications processor

The i.MX 6UltraLite from NXP is a high performance, ultra-efficient processor family featuring an advanced implementation of a single ARM® Cortex®-A7 core, which operates at speeds up to 696 MHz. The i.MX 6UltraLite applications processor includes an integrated power management module that reduces the complexity of external power supply and simplifies power sequencing. The power management implemented throughout the IC enables multimedia features and peripherals to consume minimum power in various low power modes. Each processor in this family provides various memory interfaces, including 16-bit LPDDR2, DDR3, DDR3L, raw and managed NAND flash, NOR flash, eMMC, Quad SPI and a wide range of other interfaces for connecting peripherals such as WLAN, Bluetooth™, GPS, displays and camera sensors. This efficient, cost–optimized multi-market applications processor provides new ways to address performance scalability and low power for secure smart homes and IoT applications.

QUECTEL
Wireless Module Expert

Two New IoT/M2M-optimized Module Series

EC21 CAT-1 Series – Delivers Power-enhanced Performance and M2M-optimized Speeds
● Module variants for America, Europe and APAC.
● Max.10Mbps (DL)/Max.5Mbps (UL)
● 32.0 × 29.0 × 2.4mm
● 80-pin LCC + 64-pin LGA
● -40 ℃ ~ +85 ℃
● 4.6g

EC25 CAT-4 Series – High-speed LTE Modules with 2G & 3G Fallback
● Module variants for America, Europe and APAC.
● Max.150Mbps (DL)/Max.50Mbps (UL)
● 32.0 × 29.0 × 2.4mm;
● 80-pin LCC + 64-pin LGA
● -40 ℃ ~ +85 ℃
● 4.6g

Both series are fallback compatible with Quectel UMTS/HSPA+ UC20 module and multi-mode LTE EC20 module in the compact and unified form factor. For more information, please visit at:
www.quectel.com

MICRON
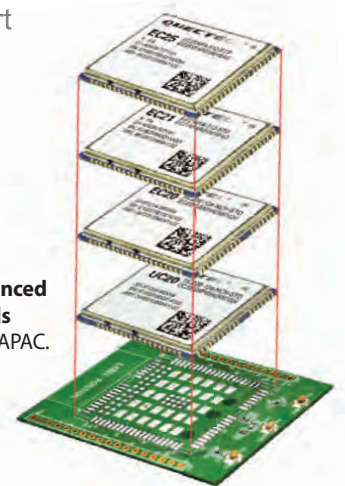
M500IT

SSDs for Industrial Markets

Withstand Rugged Industrial Conditions with Solid State Storage Reliable Performance for Industrial Applications: From aerospace solutions and heavy robotics to remote communication installations and medical equipment, embedded applications are extremely diverse. You can get reliable performance for a variety of conditions with Micron's industrial SSDs, which deliver high capacities and industrial temperature options in several small form factors.

NORDIC
SEMICONDUCTOR

Smart Things Build Smart Businesses

The IoT––a global network of billions of things––will have a major impact on commerce. The Internet has already transformed established businesses in retail, transport and manufacturing but this will be just the start for a world where even the simplest things are smart. Semiconductor devices such as Nordic Semiconductor's proven Bluetooth low energy single-chip solutions endow smart things with a robust bidirectional, interoperable wireless link combined with a powerful microprocessor to optimize the transmission and receipt of information. Such unrestricted information flow allows smart things to share data and analytical resources with other smart things and powerful servers in the Cloud, hugely increasing their usefulness.

Smart things will form the basis of smart businesses. For example, the IoT will allow established companies to enhance the bottom line in ways that were previously impossible. An elevator company, for instance, could use smart sensors to continuously monitor the health of its units and feed the information to a server in the Cloud which would analyze he data to trigger repairs well in advance of a service disruption. Accurate information provided by smart things monitoring eleva-

tors would allow the company to streamline maintenance schedules, reduce spares inventory and safely extend the life of its equipment, lowering costs.

But changing the business models of existing companies is only one part of how the IoT will disrupt commerce. The conventional Internet changed how millions of businesses generated revenues and profit but is also breathed life into a whole raft of firms that didn't exist before its invention. The IoT will exponentially accelerate the rate of business creation.

Nordic Semiconductor is a leading vendor of Bluetooth® low energy silicon solutions including highly-integrated single-chip transceivers, development kits and reference designs. The company pioneered the ultra low power wireless sector and was a key contributor to the Bluetooth low energy specification (a hallmark element of Bluetooth 4.0/4.1/4.2). **www.nordicsemi.com.**

RENESAS Synergy™
Accelerate. Innovate. Differentiate.

Renesas Synergy™ Platform

The fast-moving IoT market forces developers to re-evaluate traditional development approaches. The Renesas Synergy™ Platform, is a game changing platform that is truly complete, fully tested and qualified, systematically maintained and supported so you can start your application software development immediately at the API level without worry. A comprehensive product that integrates software, a scalable family of microcontrollers plus all development essentials enabling you to innovate and deliver differentiated products at an accelerated rate. At its heart is the Synergy Software Package (SSP) that integrates Express Logic ThreadX® RTOS plus stacks, libraries and utilities such as NetX Duo™, USBX™, GUIX™, and FileX® with a rich application framework and drivers – all supported on feature and pin compatible 32-bit ARM Cortex®-M series MCU families. For IoT developers the benefits are clear: you can sidestep common development concerns, allowing you more time to innovate your product. **www.renesassynergy.com**

SIERRA WIRELESS™
Distributor

Accelerate your time to market with a range of Sierra Wireless IoT solutions

A range of IoT products available from Sierra Wireless offers customers the ability to build smart solutions that are simple scalable and secure. Sierra Wireless provide a variety of open hardware and software platforms with embedded modules that include an application processor to run your entire device. These include gateway solutions that connect the enterprise to remote workers and assets for mission-critical applications and Cloud connectivity services that can connect to global wireless networks. By addressing the fundamental building blocks that all IoT solutions employ - applications, analytics and systems; operational applications; Cloud data platform; connectivity; and connected device - and by offering solutions from the design stage, through to mass deployment, time to market can be slashed and overall system complexity reduced by partnering with Sierra Wireless.

SEMTECH

SX1276MB1xAS

SX1276 mbed Component Shield
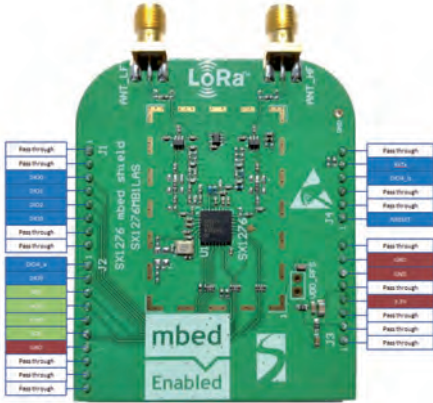
The SX1276 transceiver features the LoRa™ long range modem that provides ultra-long range spread spectrum communication and high interference immunity whilst minimising current consumption. Using Semtech's patented LoRa™ modulation technique the SX1276 can achieve a sensitivity of over -148dBm using a low cost crystal and bill of materials. The high sensitivity combined with the integrated +20 dBm power amplifier yields industry leading link budget making it optimal for any application requiring range or robustness. LoRa™ also provides significant advantages in both blocking and selectivity over conventional modulation techniques, solving the traditional design compromise between range,

interference immunity and energy consumption. The device also supports high performance (G)FSK modes for systems including WMBus, IEEE802.15.4g. The SX1276 delivers exceptional phase noise, selectivity, receiver linearity and IIP3 for significantly lower current consumption than competing devices. The SX1276 is intended for applications over a wide frequency range and is covering all available sub-GHz frequency bands (168MHz, 434MHz, 470MHz, 868MHz and 902MHz). The SX1276 really offers the possibility of two modems in one single package and complies with both ETSI and FCC regulatory requirements. **https://developer.mbed.org/components/SX1276MB1xAS/**

SILICON LABS

BGM11x Modules

Simplify Wireless Development with Bluetooth Low Energy Technology

The Silicon Labs Blue Gecko BGM111 Bluetooth® Smart module integrates the next generation wireless SoC with a complete Bluetooth Smart software stack and antenna to provide a complete, pre-certified plug-and-play Bluetooth Smart solution. It solves one of the major customer roadblocks for fast time-to-market as it integrates antenna, software and RF certifications, saving months of engineering effort and testing. The BGM111 Bluetooth® Smart module is Bluetooth 4.2 compliant and is equipped with an ARM Cortex-M4 with FPU up to 38.4 MHz microcontroller. The integrated Bluetooth® Smart Software enables up to eight simultaneous connections and is upgradable. The BGM111 Bluetooth® Smart module also convinces with its low energy consumption.

ST life.augmented

SCTW100N65G2AG

SiC Power MOSFET for automotive applications

The SCTW100N65G2AG silicon carbide Power MOSFET device from STMicroelectronics has been developed using ST's advanced and innovative 2nd generation SiC MOSFET technology. The main features of this product include remarkably low on-resistance per unit area and very good switching performance. The variation of both RDS(on) and switching losses are almost independent from junction temperature. The automotive silicon carbide Power MOSFET (650 V, 100 A, 22 mOhm), in a HIP247™ package, offers a tight variation of on-resistance vs. temperature and a very high operating temperature capability (Tj = 200 °C). Designed for automotive applications, the SCTW100N65G2AG can be used in traction for inverters and DC-DC converters applications.

TD next
A division of Telecom Design

TD1205

A high-end module for a faster and easier geolocation

TD next's TD1205 devices are high performance, low current SIGFOX™ gateways, RF transceiver and GPS receiver with integrated antennas. The combination of a powerful radio transceiver, a state-of-the-art ARM Cortex-M3 baseband processor and a high-efficiency GPS receiver achieves extremely high performance while maintaining ultra-low active and standby current consumption. The TD1205 device offers an outstanding RF sensitivity of –126 dBm while providing an exceptional power radiated from integrated antenna of up to +14 dBm. The TD1205's versatility provides the gateway function from a local Narrow Band ISM network to the long-distance Ultra Narrow Band SIGFOX™ network at no additional cost. The fully integrated on-board GPS receiver combines outstanding sensitivity with ultra low power which allows you to achieve excellent accuracy and Time-To-First-Fix performance.

Windows 10

Microsoft's Windows 10 IoT

Enterprise offers embedded developers an operating system with all the performance, familiarity and security their customers expect

The Windows 10 IoT Enterprise operating system is a full version of Windows 10 that powers a range of industrial devices, offering the ability to perform specialized functions reliably, securely and efficiently to meet mission-critical demands. IoT Enterprise runs on 32-bit and 64-bit x86 chipsets with support for Universal Windows Platform (UWP) apps as well as Classic Windows applications. The ability to use one toolset, on a common application platform and a single deployment, management, and servicing system allows customers to easily integrate Windows 10 IoT into their existing environment. Furthermore, enterprise-grade security ensures the device, in addition to any data that the device collects and manages, is protected from the next generation of threats. A secure connection to the network and the guarantee that only certified apps will run on the device, prevents unauthorized access and provides advanced malware threat resistance. **More Information: msembedded.biz**

Windows Azure

Cloud Infrastructure

Microsoft Azure offers enterprise customers, developers and IT professionals, and small independent customers an intuitive and secure cloud infrastructure

Azure offers a route to cloud computing that enterprises can adopt with confidence. It is built on the same technologies as other Windows products, meaning that the move between virtual applications and the cloud is seamless. Azure's integrated tools, unified services, and proven solutions help you build enterprise, mobile, web, and Internet of Things (IoT) apps faster, for almost any platform or device. Microsoft draws on its experience of building enterprise software and running some of the world's largest online services, to create a robust set of security technologies and practices. These help ensure that Azure infrastructure is resilient to attack, safeguards user access to the Azure environment, and helps keep customer data secure. Microsoft Azure provides a unique cloud strategy spanning private cloud, public cloud (IaaS and PaaS), and Software as a Service (SaaS), granting users innovative storage offerings with global datacenters.

# TEXAS INSTRUMENTS

Sub-1 GHz CC1310

Wireless microcontroller (MCU) LaunchPad™ development kit

The SimpleLink™ Sub-1 GHz CC1310 wireless microcontroller (MCU) LaunchPad™ development kit is the first LaunchPad kit with a Sub-1 GHz radio, which offers long-range connectivity, combined with a 32-bit ARM® Cortex®-M3 processor on a single chip. The CC1310 device is a wireless MCU targeting low-power, long-range wireless applications. The CC1310 wireless MCU contains a 32-bit ARM Cortex-M3 processor that runs at 48 MHz as the main processor and a rich peripheral feature set that includes a unique ultra-low power sensor controller. This sensor controller is ideal for interfacing external sensors and for collecting analog and digital data autonomously while the rest of the system is in sleep mode. **www.ti.com/tool/ launchxl-cc1310**
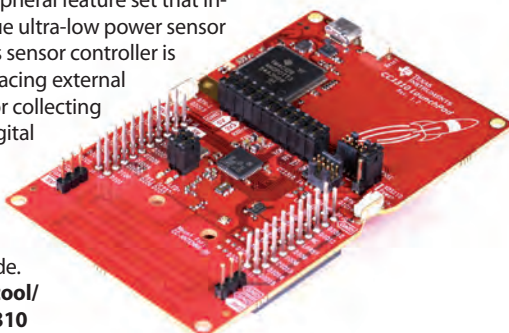
XILINX
ALL PROGRAMMABLE™
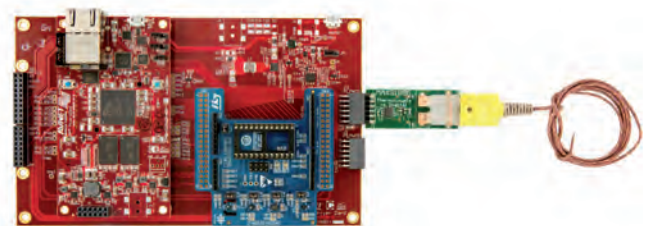
MicroZed Industrial IoT Starter Kit

The Avnet MicroZed™ Industrial IoT Starter Kit supports designers' edge-to-cloud development of Internet-connected solutions and includes all the necessary building blocks for developing a production-ready, IoT-enabled, industrial processing system. The platform is based on Avnet's MicroZed™ System-on-Module (SoM) with Zynq®-7000 All Programmable SoC from Xilinx and pluggable sensor solutions from Maxim Integrated and STMicroelectronics.

The kit integrates the IBM Watson IoT agent on top of a custom-configured, certified image of the Wind River® Pulsar™ Linux operating system. The provided out-of-box example design uses a standard MQTT messaging protocol to communicate with Watson IoT, which enables registered, secure connection to additional cloud services and applications, including the IBM Bluemix® portfolio. Bluemix® provides a rich palette of composable services to enhance IoT solutions with cognitive capabilities rapidly. **www.avnet-silica.com/xilinx-IIOT-starterkit**

SMART PRODUCTS

Camera surveillance made easy

Panasonic has launched a new mobile surveillance camera with integrated 3G/4G connectivity that can be setup within seconds. With built in motion detection, infrared vision, wide-angle-view and hook-up to an external power source it can be used almost everywhere. The HD-Videos can either be streamed to a mobile device or uploaded to a cloud service to be watched later. The device will ship in Europe this spring at a price of 349 Euro.

www.nubocam.com

Sensuss

Sensors for more safety in sports

Sensuss is a device that combines athletics and g-force indication. The case is attached onto the helmets of participants in various sports. The sensor is calibrated to each sports helmet and in turn will respond to g-force indication. The lightweight case is waterproof and can withstand up to 300 G's of impact. In case of an accident the sensor will provide information on how heavy the impact on the head has been. This will make it a lot easier to decide, if medical treatment for a concussion is advisory.

www.sensuss.com

Deepfield Robotics

More and better aspargus

Deepfield Robotics, a daughter of Bosch Group, is focusing on the development of systems to enhance agriculture. They have created an intelligent system that could be very helpful to farmers cultivating temperature sensitive crops such as aspargus. Sensors measure the temperatures in different depths in the loom and transmit them several times a day via cloud. The farmer can regulate the temperature with the help of different types of foils. In pilot projects the system has proven to be very effective in increasing harvests and lowering waste.

www.deepfield-robotics.com

Qgo
No more waiting

As everybody knows the other waiting lines in a shop or a ticket booth are always faster. The Austrian company Qgo has found a way to dodge this ancient adage: they have developed a system that enables users to quickly find out the current waiting times for different ski lifts online. Based on this information clients can choose the route that will give them maximum skiing and minimum waiting time – a competitive advantage for the lift operator. The system will also be available for amusement parks and events. Supermarkets can't be far behind.

www.queue-go.com

Näraffär
A supermarket minus the staff

„Necessity is the mother of invention" – another proof for this saying can be found in the innovative shop Näraffär in Viken, Sweden. When it's founder Robert Ilijason ran out of food for his small child and all shops were closed or too far away, he decided to start this new concept: in the small self-service shop people scan the products they buy via smartphone-app and the bill gets paid by credit card. This allows clients to get all things necessary for everyday live 24 hours a day.

http://viken.naraffar.se
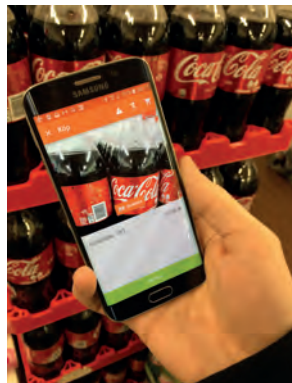
Gillette Box
Cutting-edge razor blade distribution

The times when traveling salesman used to bring razorblades to your door are long gone. But they might return in a much more modern way: owners of the new Gillette Box can simply push a button when the stock of sharp blades runs low, thus automatically placing an order on the company's web shop. A new package of blades will then be sent out to the customer by mail. Tests in Germany with this system have already demonstrated its feasibility, and the company plans to widen its scope to include other replaceable items such as diapers.
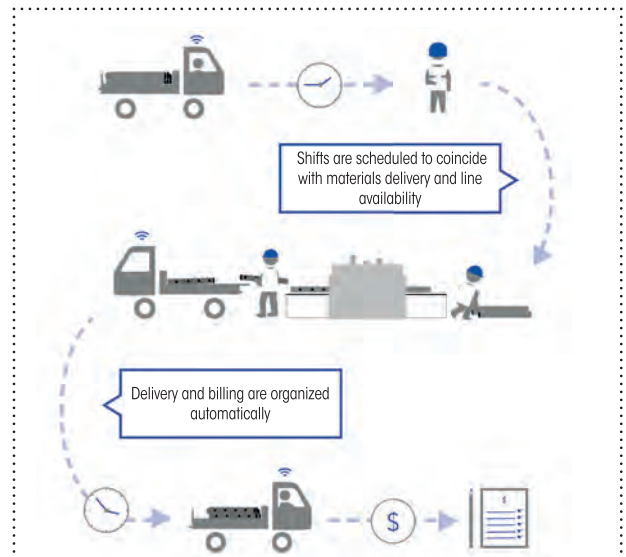
www.perfect-shave.de/gillette-box

Aldebaran
An robot shows its emotions

In human interaction emotions are important, but what about robots? This automaton goes by the name of "Pepper", and it is capable of interpreting a smile, a frown, the tone of voice, as well as non-verbal language such as the angle of ones head, for example. Pepper was designed to make his interaction with human beings as natural and intuitive as possible. The robot may be used as a companion for home, but also as an attraction at points of sale – the French railway SNCF has already made use of that. Developers may add new functions to the ones that were given to Pepper by its french creators at Aldebaran.

www.aldebaran.com

Shifts are scheduled to coincide with materials delivery and line availability

Delivery and billing are organized automatically

Evertracker
Locating in real-time

When things are being delivered to recipients, it is often very important to be able to tell exactly when they will arrive. The German startup Evertracker develops devices and services that give very precise information on the current position of a shipment. Founder Marc Schmitt says: "Evertracker can make process chains completely transparent for every enterprise. Our system is able to integrate the autonomous communication between things deeply into existing structures of enterprises."

www.evertracker.com
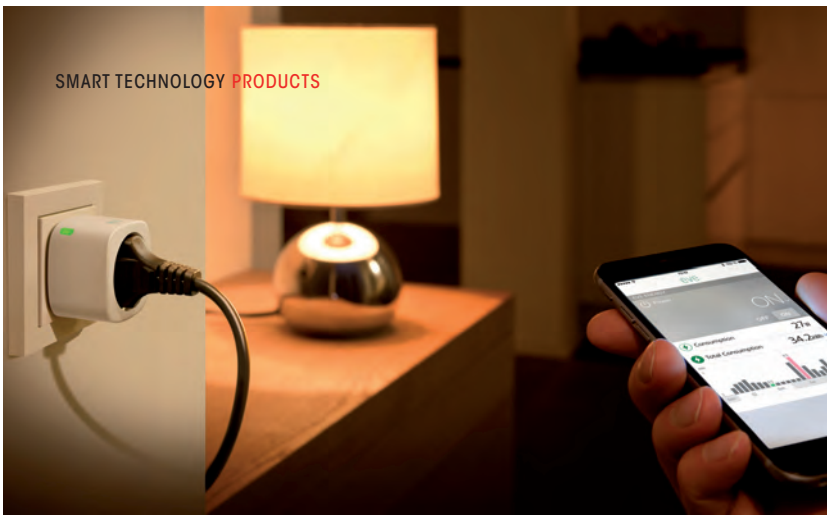
Apple
Home, sweet home

Many different companies offer home automatization solutions but the variety of systems and standards can be confusing for customers. Enter Apple: to promote their hub for home automatization and remote control that goes by the name HomeKit the company has teamed up with vendors such as Elgato, Ecobee, Lutron, iHome and Insteon. This alliance hopes to lead to better acceptance of SmartHome-Systems in a broader community. Will Apple be able to repeat the success of the iPhone? Or will established companies more at home with this technology be the winners?

www.apple.com/ios/homekit/

tractive
Do you know where your dog is?

Many people have very strong feelings for their pets – especially dogs and cats. When animals are lost, they would go to great lengths to find them – but less than 20 percent of lost pets are eventually retrieved. This smart tracker from tractive will provide the current location of a pet via GPS-Signal, accessible in a smartphone-app. As long as the animal is wearing the tracker on a collar, it is very easy to find it's position. The tracker is available at 150 Euros, the App-service is about four Euros a month.

www.tractive.com

Liberty Mutual
Rewarding safe drivers

Current Subaru cars come with Starlink In-Vehicle technology which connects the car to a driver's smartphone in order to monitor driving habits, provide trip reports and offer tips to become a safer driver. A new app by insurer Liberty Mutual provides real-time driving assessment and coaching for Subaru owners based on their actual driving behavior. Depending on their performance, Subaru drivers will be eligible for savings through a usage-based insurance program that lets customers save on their auto insurance based on their driving habits. The service is only available in the US so far – but plans for expansion into various European markets are in the pipeline.

www.libertymutualgroup.com

Like a glove
Made to measure

One of the biggest obstacles for online-selling of clothes is that there is no way to try them on. But a solution may be at hand: like a glove, a company from Israel has developed what they call "smart leggings" that come with integrated sensors that measure the body dimensions precisely once it is put. The data is then transferred to an app that then finds brands, styles and sizes that fit perfectly. These "one-size-fits-all" leggings can be pre-ordered at a price of 65 Euros.

www.likeaglove.me

Salted Venture
These shoes aren't just made for walking …

For performance in sports, good footwork can be crucial. In golf for example it is impossible to perform a perfect swing when you are not standing in good balance. IOFIT, developed by Korean Startup Salted Venture in cooperation with Samsung, is a sports shoe that utilizes a combination of pressure sensors and a coaching app to improve its user's balance and body posture in order to enhance the player's fitness routine or golf swing. Currently the startup is actively seeking business opportunities with footwear companies for worldwide distribution.

www.iofit.co.kr
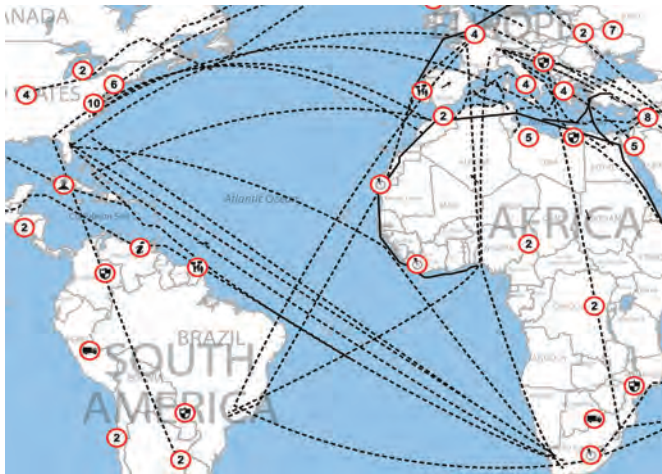
DHL
Less risk – more fun

DHLs incident monitoring platform Resilience360 enables real-time tracking of incidents like natural disasters, threats to productivity, operational and socio-political risks capable of disrupting supply chains. By monitoring lanes, nodes, plants, suppliers, shipments, ordered components and more it allows clients to remain flexible to react in the right way at the right time. The service provides an interactive map visualizing the global end-to-end supply chain from suppliers to customers and integrates with existing transport management systems to derive views on shipment and material level.

www.dhl.com/resilience

Tado
Warmth when it's needed

Buying a new and more efficient heating system is expensive – and almost impossible for people who are living in a rented flat. With Tado it is possible to make existing systems more intelligent and so save a lot of energy and money. The smart thermostat works together with 95 percent of all heating systems. It can be programmed to start heating as soon as an inhabitant comes close to the flat – the information is provided via GPS. And it also considers the current weather forecast to save energy. This can save up to 30 percent of heating costs!

www.tado.com

Unagrid
Managing fleets of trailers

Every big airport around the world operates thousands of trailer carts to move luggage and cargo to and from aircraft. A lot of work and time goes into locating each item getting it to where they have to be at a precise time. Schiphol Airport in Amsterdam now works with a system called GSETrack (GSE stands for Ground Support Equipment) developed by **Unagrid.** Every cart is equipped with a tracker which knows it's position by GPS. It broadcasts its location information to neighbored trackers that relay these messages in the same way. Thanks to this self-organizing network each trailer can be located anytime – saving the airport a lot of money and energy.

www.gestrack.com
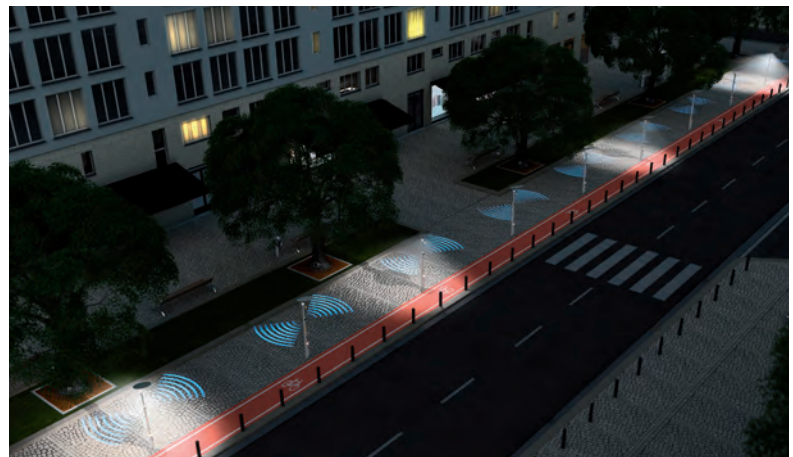
Continental
New Big Player in the field of intelligent streetlights

Experts are expecting that within 15 to 20 years almost all streetlights will be changed from classic bulbs and fluorescent lamps to LEDs that are much more efficient. This outlook has attracted companies to enter the market that were active in other fields so far. Continental, one of the largest manufacturer of car components has started developing systems that combine their competence with LED-production and car-technology. Soon expect to see streetlights that are able to communicate with cars passing by. Continental already has a field experiment underway in Toulouse, France.

www.continental-corporation.com

UNINTENDED CONSEQUENCES

The Internet of Things (IoT) / Internet of Everything / Industrial Internet is sizzling hot. Everywhere I go people ask me about it. Almost every single event I speak at, some of the biggest tech & IT companies in the world are talking about their plans for the IoT, and their billion dollar investments. So I figured this is a good time to set a few things straight, and lay out what I call the #OppChalls (opportunity –challenges) that lie ahead with.

Let's get one thing clear straight off: yes, the IoT's potential is mindboggling. The central premise of the IoT is simple: when everything gets connected, once data is being collected in real-time, everywhere, all the time, we can measure, analyze, anticipate and even predict events and 'truths' that were previously hidden under the surface. We can make things and processes much more efficient, save trillions of dollars in the process, and quite possibly solve tricky problems such global warming, too. By connecting everyone and 'everything' and deploying machine i.e. artificial intelligence and predictive analytics many of the huge, global IoT purveyors hope to achieve some kind of meta-intelligence through an exponentially increased ability to read, analyze and use data.

Nothing vast enters the lives of mortals without a curse, as Sophocles famously warned.
The IoT is bound to produce a host of unintended consequences. Not that all was peches and cream in the days of todays nice, old-fashioned internet where only some 2.8 billion people are connected. The ruthless commercialization of the Web has partly offset such benefits as the democratization and liberatio of information liberation created what some describe as "platform capitalism", in the process creating a global brand of 'California Ideology' which posits that technology will solve every single problem of humanity (and make us lots of money in the progress).

Let's imagine, if can, a not-too-distant world in which your connected car will communicate not only your vehicle's data (including every time you drive too fast!) in real-time to your insurance company (and conceivably to your local traffic cop); world where every single payments you make I stored on your smartphone because wallets and credit cards will be things of the past; a world where your doctor knows how much or how little you walked last week and how high your heart-rate was while you last slept on the plane; a world where we all become beacons generating and transmitting gigabytes of data for dozens of Watsons to examine through their tireless, self-learning digitals brains.

Efficiency would almost certainly trump humanity at every turn: welcome to a giant machine OS that literally feeds off our output.

Next, let's consider a very simple question: if we humans can't even agree on what the rules and ethics for an "Internet of people"; how will we every agree on something thousands of times larger and more complex?

Just who exactly is in charge? We already have guidelines or agreements on what is permitted in bio-technology and bio-engineering such as the 1975 Asilomar guidelines on recombinant DNA. We have NPTs (nuclear proliferation agreements) in place that actually work, as the recent U.S.-Iranian negotiations have proven.

But even though data is rapidly becoming the single most powerful economic driver in the world ("the new crude oil") we lack any kind of global treaty on we are allowed to do with the personal data of billions of Internet users, much less a treaty on cognitive computing or artificial intelligence.

The biggest challenge of humanity in the next 20-50 years by far will be the relationship between man and machine.

Instead, big data, AI and the IoT are largely unregulated spaces at the very same time that their power are surpassing everything that has come before. Who will make sure that 'Big IoT' will do the "right thing"? Epecially since the "wrong thing" would have potentially catastrophic results for humanity.

The technology industry's love affair with IoT we can´t afford this kind of risk.

What we need are a new kind of "humarithm", namely buffers and balancers that coded into the systems that comprise the Internet of Things and that will ensure truly human values are followed at all times. We need to apply a kind of digital-age precautionary principle to scrutinize and, when necessary, regulate the IoT; a way to make sure that this potential blessing will unintentionally turn into a curse.

> "
> What we need are a new kind of "humarithm", namely buffers and balancers

Gerd Leonhard
is the founder and CEO of The Futures Agency. He is based in Zurich.
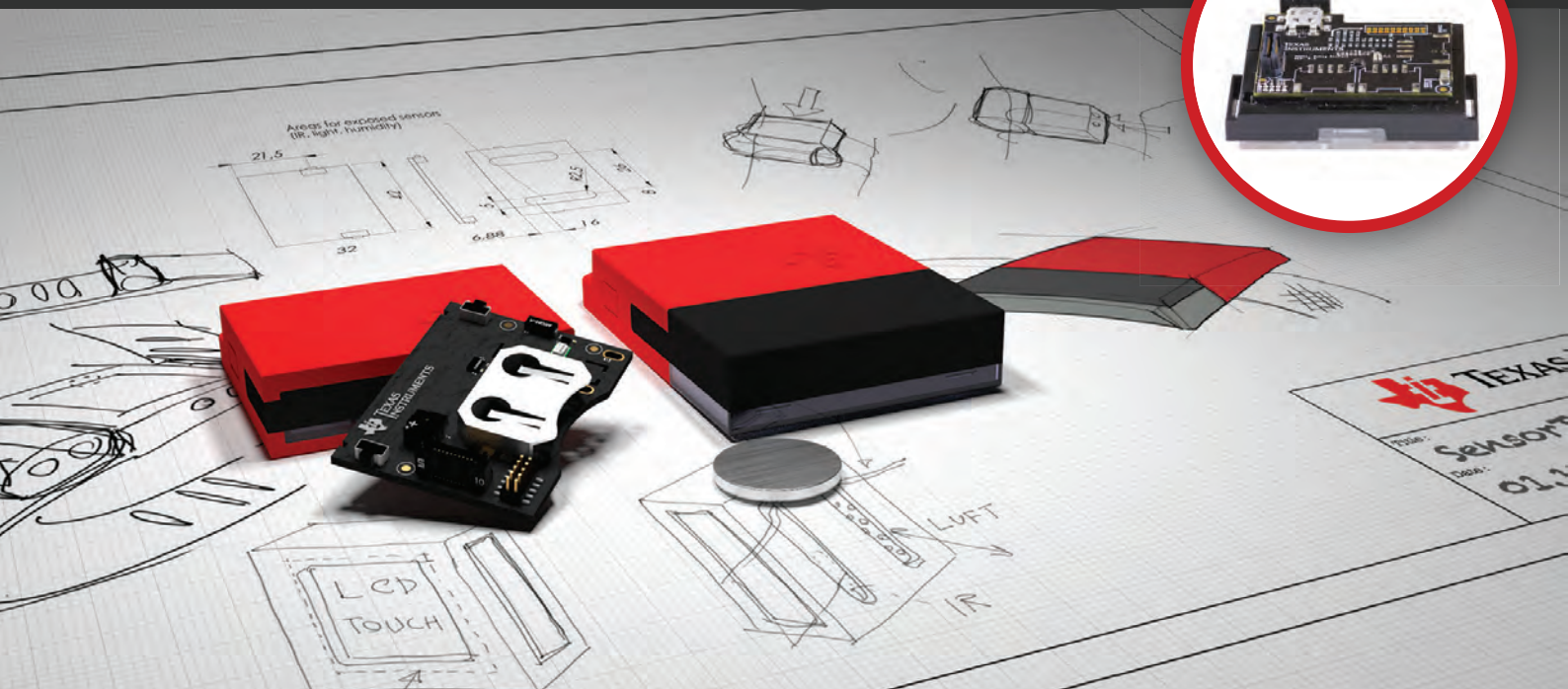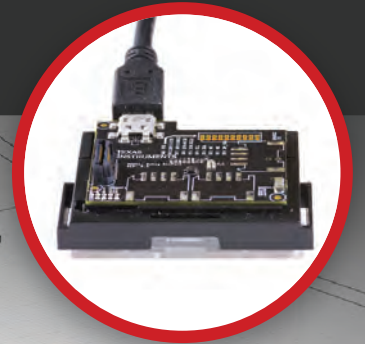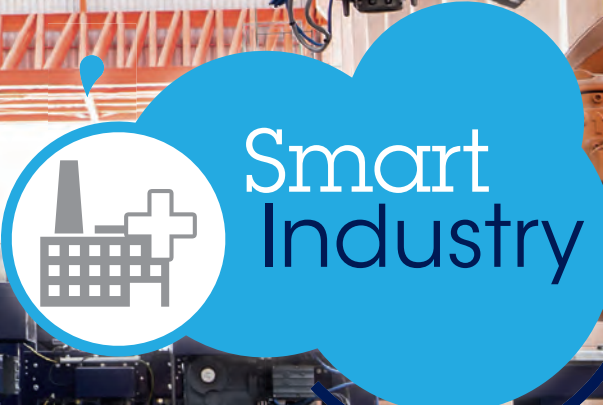
Smart Industry

ST is enabling smarter, safer and more efficient factories and workplaces

ST offers a comprehensive range of solutions for Smart Industry.

With more than 30 years experience in developing products for industrial applications, our deep application knowledge enables us to deliver optimized products and solutions.

So see what ST has to offer to help build your next smart industry project.

MICROCONTROLLERS POWER
POWERLINE COMMUNICATIONS METERING
OffLine Converters & Controllers
sensors
Linear & Switching Regulator
smart power WIRELESS COMMUNICATION
Protection CONNECTIVITY Analog & Digital inputs
Motor Drivers IO LINK Secure MCU
Digital Outputs Gate Drivers
Isolation
digital controller

For more information, visit www.st.com