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CONTENTS



IN THIS ISSUE

4 EDITOR'S COMMENT
George Malim fears he's been given a dumb meter

5 COMPANY NEWS
Wireless Logic Group acquires Mdex for encrypted communications, Verizon launches connected vehicle brand

6 MARKET NEWS
Accenture and Tomorrow Street collaborate to help late stage start-ups, fog computing market to be worth US$700m by 2024

7 PRODUCT NEWS
Soracom announces pay-as-you-go Sigfox connectivity, SAP Predictive Engineering Insights enables digital asset management

8 PARTNER NEWS
Harman and Groupe PSA work together on cybersecurity, British Army recruits Software AG to improve troop readiness

9 THE CONTRACT HOT LIST
A round up of the latest Internet of Things contracts

10 TALKING HEADS
Vodafone IoT chief says automotive and insurance services will lead mega-scale IoT deployment

14 LoRa
Peter Dykes assesses why developing markets are engaging in large scale LoRa deployments

16 INTERVIEW
Tata Communications' Anthony Bartolo says cost, power consumption and ease of design are behind his company's selection of LoRa technology in India

20 AGRICULTURE
Tracy Hopkins tells tales of the ubiquitous connected cow

24 INTERVIEW
Sara Brown says that the range, cost and power optimisation advantages of LPWA are opening the door to new classes of IoT apps

27 IoT NOW INSIGHT REPORT – SMART AGRICULTURE
In the latest of an ongoing series of specially-commissioned, independent, analyst-written Insight Reports Fredrik Stålbrand, a senior analyst at Berg Insight, explores how the agriculture industry is focusing on yield maximisation and cost efficiency enabled by the precision technologies of IoT

36 INTERVIEW
Stéphane Dejean details how private low power wide area networks are providing enterprises with turnkey connectivity

38 CASE STUDY
Inside Kerlink's LPWAN deployment at the Grand Paris Metro

40 SMART FACTORIES
Annie Turner assesses just how smart factories have become

42 CASE STUDY
Eberhard Klotz explores how to prove Industry 4.0 initiatives can provide payback on investment

45 eUICC SPECIAL REPORT

46 INTERVIEW
Stream Technologies' Mohsen Shakoor and Robert Shah explain how eUICC is eliminating the need to manage multiple contracts and orchestrate underlying systems

50 eUICC
Beecham Research's Robin Duke-Woolley asks who needs eSIM for IoT?

53 INTERVIEW
Aeris' Evan Whitelock tells George Malim how eUICCs can provide organisations with greater flexibility and control of their connectivity

56 eUICC ADVANCES
Peter Dykes assesses what is standing in the way of eUICC development

59 ANALYST REPORT
Tobias Ryberg, a co-founder of Berg Insight, reports on narrowband-IoT (NB-IoT) developments and says now is the time to generate business from the technology

64 EVENT DIARY
Where to go and what to see

vodafone

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The smart meter experience has not been electrifying – bring on the robots



Slap in the middle of the UK's planned roll-out of smart energy meters to every household, I have been blessed with the installation of a smart meter, writes George Malim. The problem is it doesn't do much and isn't integrated with any of my other smart home technologies

The UK jumped in, along with many other nations, and embraced the concept that smart meters would be highly valuable to consumers as they seek to control their energy costs and gain previously unavailable visibility into their bills. The £11bn project has been specified to see every home have a smart meter in a four-year installation phase running from 2016-2020 – however that has been subtly downgraded to every home being 'offered' a smart meter by 2020. Inevitably some commentators say the project is lagging behind but installations are projected to peak next year with 20 million smart meters being installed between 2016 and 2018 – so plenty of homes will have the new meters.

As the lucky recipient of one of those 20 million devices, I'm a little bewildered. This is a huge and expensive project but my experience has been relatively smooth. My energy provider offered me a smart meter I accepted and a few weeks later my traditional meters were replaced and I'm apparently now smart. However, while it was interesting to glance at my near real-time energy consumption for a few days after the installation, the cheap, black and white screened device doesn't seem to do very much.

Knowing I'm burning gas and using coal in the form of electricity doesn't help me to reduce consumption or be more green and the fact that I have this meter doesn't make me an adopter of other smart home technologies that would enable me to run my home more efficiently. Instead, I've got more data about my habits but no means to do anything with it.

I can only conclude that the lofty aspirations of the smart meter project will come to fruition in a future phase and utilise the expensive infrastructure that is being put into homes to aid green initiatives and help consumers manage their bills. If not, that £11bn, which will ultimately be passed to consumers by their energy providers, will not have been money well spent. In fact, this type of incompletely thought through project makes it easier to understand why, in analysis of the findings of a recent survey by Mindshare, Reboot Digital Marketing found that 25% of Brits would elect robots to positions of power in favour of human politicians.

Enjoy the magazine!

George Malim

Contributors in this issue of IoT Now

We are always proud to bring you the best writers and commentators in M2M and IoT. In this issue they include:



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Wireless Logic acquires German encrypted data communications specialist Mdex

Wireless Logic, a European IoT connectivity platform provider, has announced the acquisition of **Mdex**, a German M2M and IoT service and solution provider for encrypted data communications via mobile networks, DSL and satellite.

The Hamburg-based organisation, founded in 1997, delivers a broad range of IoT and M2M secure network solutions including network components such as routers, SIM cards, IP services and encryption. Mdex's own data centres provide highly-secure and high-availability solutions for a growing user base with roots in energy, building technology and production. A key service is the translation and interpretation of machine data, visualised through a tailor-made platform, for multiple uses including system monitoring and predictive maintenance.

Mdex has in excess of 4,800 customers with a portfolio of ready-to-operate packaged solutions for a wide range of application scenarios and vertical sectors.

Wireless Logic Group has acquired Mdex for an undisclosed sum. However, it expects that Mdex will contribute revenues to the group in excess of €8m with EBITDA of €1.25m in the financial year 2018/2019. The acquisition is Wireless Logic's fourth since its secondary management buyout supported by **CVC Capital** in 2015. Most recently, the group refinanced existing debt facilities backed by an underwritten £115m stretched senior financing package provided by a combination of banks including **SMBC**, **Park Square Capital** and **HSBC**.

Commenting on the Mdex acquisition, Oliver Tucker, the chief executive of Wireless Logic Group, said: "Welcoming Mdex into the group enables us to significantly strengthen our product and services offering across Europe. Mdex brings exceptional levels of technical ability and commercial experience within Germany and is a highly regarded brand in its field. The 32-strong team will complement our existing Munich-based operation and together will cement our position as the leading IoT connectivity platform provider in Europe."

Verizon launches new connected vehicle brand

Verizon has launched **Verizon Connect** which completes the integration of its existing connected vehicle division with two recently acquired fleet and mobile workforce management software companies – **Fleetmatics** and **Telogis** – under a single, combined brand. Verizon Connect is the culmination of more than US$5bn (€4.05bn) in investments and offers customers a one-stop approach to connected vehicle software and services.

Verizon Connect provides the connectivity and data insights to enable its customers to be more informed about vehicle and worker location, efficiency, safety, productivity and compliance. Verizon Connect customers also benefit from the combined experience of 3,500 dedicated professionals and nearly 20 years of telematics, mobile workforce and fleet management expertise.

"One of the things we're most proud of at Verizon Connect is the potential our current and future technologies have for massive societal impact," said Andrés Irlando, the chief executive of Verizon Connect. "We're working with customers to maintain cold chain integrity and keep perishable items safe during transport, routing customers' vehicles more efficiently to reduce emissions, monitoring vehicle diagnostics to improve fuel efficiency, and providing a gamification app that helps customers recognise and reward their safest drivers, just to name a few [examples]."

The Verizon Connect portfolio of solutions and services includes comprehensive fleet and mobile workforce management software platforms, embedded original equipment manufacturer (OEM) hardware, and Hum by Verizon, a connected vehicle device that helps create a safer, smarter and more connected driving experience for consumers.

NEWS IN BRIEF

Total invests US$50m to become a founding partner of Cathay Smart Energy Fund

Total Energy Ventures (TEV), Hubei High Technology Investment Guiding Fund Management Co. (Hubei High Tech) and **Cathay Capital** have signed a Heads of Agreement to launch the Cathay Smart Energy Fund, an investment fund dedicated to China's energy sector. The fund will focus its investments on emerging technologies and new business models of the Chinese energy sector, notably renewable energy, energy internet, energy storage, distributed energy, smart energy and low carbon activities. It will allow Total to explore new opportunities in China and identify new business models and technologies.

TEV and Hubei High Tech will invest around RMB300 million in the fund (US$50 million) each. Following the first closing, other partners will join the fund with a target final volume of capital of over RMB1.5 billion (around US$250 million).

Patrick Pouyanné, the chairman and chief executive of Total, said: "China is at the forefront of 21st century energy technologies. Through this investment, we are delighted to become a part of the innovation ecosystem of the Chinese energy sector, benefiting from the knowledge of the Chinese market that Cathay Capital brings to us. We believe that it represents a significant growth and innovation potential in areas of new energies and sustainable development and resonates with Total's ambition to become the responsible energy major."

TT Electronics completes acquisition of Stadium Group

TT Electronics has completed the acquisition of **Stadium Group**. Stadium is a supplier of design-led technologies with product capabilities including connectivity solutions, power supplies, human machine interface (HMI) and electronic assemblies. Stadium designs and manufactures products for a wide range of applications including the smarter home, industrial robotics, medical equipment and aircraft cabin controls, working with significant customers in the industrial, aerospace and defence, medical and transportation sectors.

NEWS IN BRIEF

Smart home surveillance camera market to surpass US$9.7bn by 2023

Cameras with full software and service feature sets at sub-US$200 (€162.39) price points will fuel growth of the smart home surveillance camera market according to recently published research by **Strategy Analytics**. The firm forecasts the global market to exceed US$9.7bn (€7.88bn) in consumer spending by 2023, with security service providers such as **ADT**, **Alarm.com** and **Vivint**, and independent camera vendors such as **Amazon**, **Netgear** and **Nest** set to take the reins.

The report, 'Smart Home Surveillance Camera Market Analysis and Forecast' presents Strategy Analytics' assessment of market trends, analysis of the competitive landscape, and market forecasts of consumer spending and unit sales by device type and price band through to 2023. It provides insights into the impact of technology advancements and product trends for companies seeking to capitalise on opportunities in this market.

"Our research and analysis of the smart home surveillance camera market has identified the market's hot spots," said Jack Narcotta, a senior industry analyst in the firm's Intelligent Home Practice. "We expect spending on video doorbells, the fastest growing segment, to reach US$1.4bn (€1.14 bn) by 2023, up from US$500m (€405.98m) this year."

Fog computing market will be worth over US$700m by 2024

The size of the fog computing market is set to exceed US$700 million (€567.51 million) by 2024; according to a new research report by **Global Market Insights**. The report states that increasing penetration of cloud computing platforms is fostering fog computing market growth.

Over the past decade, cloud computing has emerged as a driving force in the IT ecosystem. It is estimated that approximately 80% of enterprises are utilising the capabilities of the cloud computing platform in their businesses and the number is further anticipated to increase in the future.

As cloud computing platforms offer computing, storage and networking services across all the business sectors, it frees customers and enterprises from the specifications of various details, which may result in issues for latency sensitive applications in sectors such as healthcare, energy and utilities.

Accenture and Tomorrow Street collaborate to help late stage start-ups

Accenture and **Tomorrow Street**, **Vodafone**'s innovation centre, are to collaborate to help growth stage innovators become successful businesses. Working with the Tomorrow Street management team, Accenture will help the start-ups accelerate product development, providing support in the areas of the internet of things, security and artificial intelligence. The collaboration will also provide the start-ups with direct exposure to communications industry executives, enabling them to gain insights into the needs of the industry on a global scale – which is fundamental to the success of the start-ups' products and services.

"The introduction of new, leading-edge technologies is critically important to ensure that the communications industry continues to flourish," said Gene Reznik, a senior managing director at Accenture who leads the company's Technology Ecosystem & Ventures practice. "We have partnered with many growth-stage companies developed through our Accenture Ventures organisation, strategically investing in the most promising innovations in the market. We are



Warrick Cramer, Tomorrow Street

confident that together with Tomorrow Street, we can create the right conditions for innovation to develop at the rapid pace the industry requires, helping to accelerate and scale innovation in Europe."

Warrick Cramer, Tomorrow Street's chief executive, added: "Accenture and Tomorrow Street both recognise the importance of innovation and the role start-ups have to play in driving it. Accenture's innovation programmes, deep technology and industry expertise, combined with the Tomorrow Street ecosystem, will be a huge advantage in helping to make the startups within the programme a success."

GlobalPlatform and IoT Connectivity Alliance sign MoU to develop and support industry-wide standards for IoT security

A Memorandum of Understanding (MoU) has been agreed between industry associations **GlobalPlatform** and the **IoT Connectivity Alliance (ICA)**. The two technical bodies will work to develop and promote a standardised approach to Internet of Things (IoT) security based on secure component technology. This will reduce the cost and streamline the development of large-scale consumer and industrial IoT deployments.

The ICA is committed to promoting the establishment of an open, interconnected and secure ecosystem for the global IoT market which, according to the **McKinsey Global Institute**, is expected to reach US$11 trillion (€8.96 trillion) by 2025. One of its key priorities for the year ahead is the development of secure authentication for IoT devices and cloud services, to tackle the issue of IoT security fragmentation in the Chinese market.

GlobalPlatform standardises two secure component technologies, Secure Element (SE) and Trusted Execution Environment (TEE), both of which address various functional and security requirements in IoT, including the protection of authentication services, device attestation and cloud enrolment. Collaboration between the two associations will foster the adoption of GlobalPlatform SE and TEE standards as security baselines for IoT devices, and simplify their integration. This work will enhance interoperability and reduce the cost and complexity of secure IoT deployments.

Fang Qiang of the Security Standard Work Group at ICA, said: "It is expected that the market scale of China's commercial IoT will grow from US$2,155bn (€1755.01bn) to US$3,610bn (€2939.95bn) by 2020. However, the security incidents that we have seen recently have resulted in fragmentation of the IoT market and its related technology. To solve this problem, the standardisation of IoT security mechanisms is desperately needed."

Cloud-native IoT platform delivers Sigfox LPWAN connectivity across borders on per-use basis



Kenta Yasukawa, Soracom

Soracom, a provider of a cloud-native platform for the Internet of Things (IoT), has announced the availability of a pay-as-you-go, pay-as-you-grow service for the **Sigfox** global low power wide area network (LPWAN). The Sigfox network, available in more than 45 countries and territories, is used to connect millions of objects collecting and transmitting IoT data.

Soracom currently provides more than 9,000 customers worldwide with over-the-air connectivity designed specifically for IoT applications. These customers now have the ability to centrally manage both GSM/LTE and Sigfox connectivity across regions from a single user console, with the benefit of centralised connection management and billing. All pricing for the service is provided on a pay-as-you-go basis. For customers in the early stages of development, this offers a low-cost path to release. Customers already at scale benefit from simplified and predictable global billing and management.

Charges are calculated daily based on location, uplink and downlink volume, with several tiers available based on usage and volume discounts applied automatically depending on number of active devices. A typical scenario such as a GPS tracker deployed in France and reporting its location 50 times a day would see daily charges as low as €0.0127 (US$0.016).

"Soracom was created to give developers and enterprises around the world access to self-service, cloud-native, pay-as-you-go service for IoT," said Soracom co-founder and CTO Kenta Yasukawa. "This global Sigfox offering lets them worry less about connectivity and focus squarely on creating new services and experiences."

SAP Predictive Engineering Insights enables digital asset management



Hans Thalbauer, SAP

SAP has introduced SAP Predictive Engineering Insights, a cloud-based system that creates virtual equivalents of physical assets to provide real-time, intelligent analysis based on sensor feeds.

Powered by SAP Leonardo, the offering replaces the need for physical inspections with ongoing, live digital inspection and analysis. It combines a standard engineering methodology for calculating forces, stresses and fatigue based on sensor data with a high-performance 3D engine to provide visualised engineering insights.

Customers can increase operational efficiency by connecting real-time engineering insights both to core business processes and to other SAP Leonardo–based asset management solutions, including SAP Predictive Maintenance and Service and SAP Asset Intelligence Network.

"This solution delivers on our Industry 4.0 vision for a network of digital twins to help our customers predict and improve asset performance and reliability with engineering insights," said Hans Thalbauer, the senior vice president for IoT and Digital Supply Chain at SAP. "We are enabling a virtual network for secure and distributed systems of record, real-time collaboration across the digital supply chain, new business model delivery and advanced analytics."

NEWS IN BRIEF

Horizon Robotics unveils AI embedded smart camera

Artificial intelligence (AI) start-up **Horizon Robotics** has introduced a new HD smart camera with embedded AI that is capable of facial recognition at up to 99.7% accuracy. The smart camera HR-IPC2143 is a first of its kind with applications in public security for the real-time detection of potential suspects, and in retail for identifying VIP customers as they enter a store.

"The smart camera is a reflection of Horizon Robotics' mission – to provide high-performance, low-power and low-cost products utilising cutting-edge artificial intelligence technology," said Dr. Kai Yu, the chief executive and founder of Horizon Robotics. "Other companies can only deliver a portion of the equation, but we are able to integrate all these form factors to create a complete business solution rather than just a stand-alone camera."

Antenova ships high performing 3G and 4G/LTE antennas

Antenova, a manufacturer of antennas and RF antenna modules, is now shipping its two newest antennas: Integra and Inversa. These new chip antennas are designed specifically to perform in 3G and 4G diversity applications with very small printed circuit boards (PCBs).

At just 3.3mm high, the antennas are ultra-compact, so they can be used in slimline devices that will be unobtrusive in use. The antennas perform efficiently with a small ground plane, and can even be used on PCBs as small as 65mm. Where the PCB is smaller than 75mm, Antenova provides an additional active tuning circuit to overcome bandwidth reductions.

NEWS IN BRIEF

Sierra Wireless completes digital transformation of 1.9 million smart vending machines

Sierra Wireless, a provider of integrated device-to-cloud solutions for the Internet of Things (IoT), reported that the **International Vending Alliance (IVA)**, the largest global network with 1.9 million vending machines in more than 70 countries, has selected Sierra Wireless' Smart SIM and AirVantage IoT Platform to support its vending service delivery.

100 million customers interact with IVA vending machines daily, but the vending experience has remained largely unchanged for the last 25 years. IVA's smart black box solution, powered by Sierra Wireless IoT Services, is transforming the vending industry by enabling new business models and customer experiences, including cashless payment, touch screens, targeted advertising, online monitoring and more efficient management.

Buoy Labs enters strategic relationship with Delta Faucet Company

Buoy Labs, creators of the Buoy single-point, artificial intelligence (AI)-powered smart home water management device, and **Delta Faucet Company**, the manufacturer of Delta, Brizo and Peerless products, have announced a strategic relationship to advance smart home innovation. With category expertise and insights, Buoy Labs and Delta Faucet will work to elevate connected home water experiences, from whole-home water management to water savings and usage.

"Success in consumer hardware often relies on the strength of an organisation's partnerships," said Keri Waters, the co-founder and chief executive of Buoy Labs. "To find a partner in Delta Faucet Company with over 75 years of experience as a global leader in the home water industry and a start-up's drive toward rapid innovation, is a tremendous gift."

Harman and Groupe PSA collaborate on cybersecurity for next gen vehicle architecture



Yuval Weisglass, Harman

Harman International, now a wholly-owned subsidiary of **Samsung Electronics**, focused on connected technologies for automotive, consumer and enterprise markets, and **Groupe PSA**, the second largest car maker in Europe, has announced the companies are working together to build a comprehensive cybersecurity strategy for Groupe PSA's next-generation connected and autonomous vehicles platform. The announcement marks a two-year joint work relationship between the two companies, spanning across multiple projects–from analysing potential threats, through security design, to a feasibility study of advanced Intrusion Detection Systems for ADAS, Autonomous and Next-Generation vehicle network architectures.

"With more connectivity and technology advancements in the car come incredible safety enhancements but also potential cybersecurity risks," said Eric Dequi, senior expert on EE Architecture and Cybersecurity for Connected Cars at Groupe PSA. "Groupe PSA has been focusing on cyber for the last five years, launching a partnership with the Harman Automotive Cybersecurity team to use their expertise and define the necessary cybersecurity measures for Groupe PSA's next generation architecture."

"We have focused on implementing and evaluating Harman's ECUShield solution on a Peugeot Car to establish an Intrusion Detection System proof-of-concept," he added. "This level of collaboration has been important and essential for Groupe PSA since 2013 and we will continue to incorporate cybersecurity technologies into the whole lifecycle of our products."

Yuval Weisglass, vice president, Harman Automotive Cybersecurity, added: "To protect semi-autonomous and ADAS systems against various types of cyber threats, now is the time to adopt a security-by-design approach, developing unconventional detection and protection capabilities. We're honoured that Groupe PSA consistently selects Harman as its cybersecurity partner – a strong testament to Harman's understanding of the intricate concerns and ultimate cybersecurity solutions required by the automotive industry."

British Army recruits Software AG to support readiness objectives



Software AG is part of a consortium supporting the British Army

Software AG has been selected by the British Army to improve the way it shares critical information needed to prepare its forces for operations. The vendor is a technology partner of a major multi-vendor open consortium that is improving the Army's understanding of the readiness of its troops and equipment before any deployment, helping to save millions of pounds.

Like many organisations, the British Army is saddled with a number of overlapping legacy technologies, with information siloed in many different systems and databases contracted to system integrators. This can lead to long delays in gaining access to data and making changes to the application functionality.

The Army has been on a journey to decompose large monolithic internal developed applications to loosely coupled services, designed to be externalised. The Army required an application programme interface (API) management platform to enable governance, monitoring, securing and support of the APIs. The Army also required a technical solution to be able to integrate with large defence applications to expose reference data and services.

Software AG was chosen to spearhead the Army's digital transformation strategy and create an API management platform that will securely connect systems and data and enable integration with legacy systems. The Army's strategy is based around two key technologies: Software AG's webMethods integration platform and CentraSite, the API catalogue and services registry.

"Without effective data and services, it's very difficult for planners to understand our forces' state of readiness, or to create much-needed services for our soldiers; this is where the Software AG API suite is adding real value," said Lt. Col. Dorian Seabrook, head of operations at **Army Software House**.

IoT Now January and February 2018

It's free to be included in The Contract Hot List, which shows the companies announcing recent contract wins, acquisitions or deployments. Email your contract details to us now, marked "Hot List" at **<j.cowan@wkm-global.com>**

Vendor/Partners	Client, Country	Product / Service (Duration & Value)	Awarded
Airgain	McLaren Technology Group, UK	Multi-year partnership agreed for Airgain to build on its expertise in high performance antenna systems within the automotive sector	2.18
AT&T	Caterpillar, 155 countries	Deal for AT&T to provide global SIM card and IoT management services to help track, manage and deploy asset connectivity for Caterpillar heavy machines	2.18
AT&T	Waterbit, USA	AT&T selected to provide secure connectivity for automated irrigation system provider	1.18
Digi International	Zamboni, US	Deal to develop customised application for connected ice resurfacers	2.18
GE	Noble Drilling, global	Partnership to create Digital Rig for drilling operations based on Noble's drilling vessel and enabled by the GE Predix platform	2.18
Gemalto	Transatel, global	Selection of Gemalto remote subscriber management platform by mobile and IoT connectivity provider	2.18
Haltian	Lindström, Europe	Multi-million Euro deal to supply more than 100,000 devices and a managed IoT data layer service to towel dispensers	2.18
Italtel	Rold Elettrotecnica, Italy	Agreement to collaborate with household appliances manufacturer on Industry 4.0 initiatives	1.18
Nokia	EDF, France	Nokia chosen to test performance of LPWA networking technologies for French power utility's research and development unit	2.18
PTC	Colfax, US	ThingWorx Industrial Innovation Platform selected manufacturing and engineering technology company to align IoT efforts and accelerate development	2.18
PTC	BMW, Germany	PTC Windchill selected as product lifecycle management backbone for production and sourcing of bills of materials	1.18
Quortus	e-BO Enterprises, Belgium	Collaboration to provide secure computing and LTE connectivity for offshore wind farms	2.18
Sequans	Wagz, US	Deal for Wagz connected dog collars to be connected to IoT with LTE enabled by Sequans chips	2.18
Sierra Wireless	Intellinium, France	Safety shoe maker selects Sierra Wireless modules for development of smart safety footwear	2.18
Sierra Wireless	Girbau, Spain	Sierra Wireless device-to-cloud IoT system selected to transform commercial laundry machines	2.18
Sierra Wireless	XSun, France	Sierra Wireless device-to-cloud IoT system chosen for solar-power, autonomous drones	2.18
Software AG	Trackerando, Germany	Software AG's Cumulocity IoT platform selected to help Trackerando with accurate monitoring and tracking of vehicles, assets and people	1.18
Thin Film Electronics	Campari America, USA	Utilisation of Thin Film's near field communication and smart packaging capability as part of marketing campaign	1.18
Vodafone	Mango, Spain	Deal to support digital fitting rooms for high street fashion retailer	2.18

Sealed Air to use PTC ThingWorx connectivity to link factories and gain digital insights

PTC has announced that **Sealed Air Corporation**, a global provider of food and product packaging solutions and services, has selected PTC's ThingWorx Industrial Innovation Platform to improve operational efficiency across its entire value chain.

With production facilities around the world, Sealed Air serves an array of end markets, including food and beverage processing, food service, retail, healthcare and industrial, and commercial and consumer applications. It offers food servicing and food processing industries extended shelf life and enhanced productivity by reducing downtime and conserving energy and other resources. The company also provides product safety to help customers reduce costs associated with damage, restocking, and reshipment. This helps reduce the environmental impacts of additional wasted energy and emissions.

Sealed Air prides itself on delivering innovative products with a key focus on sustainability principles and looks to technology to continually improve how it develops and brings those products to market. This philosophy led Sealed Air to choose ThingWorx to serve as the information hub across its enterprise, connecting plant assets with ThingWorx Industrial Connectivity and monitoring key performance indicators, such as machine efficiency and capacity potential across individual lines and entire plants.

"Sealed Air is a knowledge-based, market-driven company centred on offering innovative solutions that enable our customers to increase growth, while conserving the planet's natural resources," said Marc Hamer, corporate vice president, Customer Experience, Global CIO and chief digital officer, Sealed Air. "Internally, we also strive to continually improve the efficiency of our operations to become best-in-class, as well as lower our environmental footprint. PTC's ThingWorx will be essential in support of such initiatives."



Jim Heppelmann, PTC

Jim Heppelmann, the president and chief executive of PTC, added: "Around the world, in dozens of use cases, ThingWorx is helping companies improve efficiency, while reducing resource consumption. We're delighted now to be helping Sealed Air fulfil its growth plans and conservation ideals."

Automotive and insurance services set to lead mega-scale IoT deployment

As global director of Vodafone IoT, Stefano Gastaut leads the mobile operator's Internet of Things (IoT) business unit and is responsible for driving its IoT growth, business strategy, products and profit and loss at a global level, including for the Vodafone Automotive business. Prior to this role, Gastaut was chief executive of Vodafone Egypt, which provides services to more than 40 million customers. In this position he improved net promoter score (NPS) amongst consumer and enterprise customers, driving revenues and market share from 40% to 45% in two years.

Earlier, Gastaut was chief executive of Vodafone Partner Markets where he was responsible for forming strategic alliances with local operators around the world to extend Vodafone's reach. Gastaut joined Vodafone in 2004 and has held a number of senior positions in both consumer and enterprise in Vodafone Italy and Vodafone Ireland.

At Mobile World Congress 2018, Gastaut shared his vision for Vodafone IoT and his views on the markets short to medium term development with George Malim, the managing editor of IoT Now ▶

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IoT Now: You've recently taken up your new role leading IoT within Vodafone. What attracted you to this position?

Stefano Gastaut: It's an area in which we have clear leadership and therefore a business in which Vodafone can have a say. This is a relatively new business in Vodafone with new challenges but big opportunities as well. We can be at the forefront of those and I find that stimulating.

The other attraction is that this sector is going to go through rapid change. I'm sure that in five years, when we look back, we'll say we thought IoT would be x and instead it's y – that's going to be an exciting environment to work in.



Stefano Gastaut, Vodafone

There are probably three verticals in terms of simple connection volumes that will be big but then I'd add some services as well

IoT Now: Which verticals do you see as having the greatest short-to-mid-term potential?

SG: There are probably three verticals in terms of simple connection volumes that will be big but then I'd add some services as well. The three verticals are utilities, automotive and healthcare. We see those three today and in the next three years as the dominating verticals on the connection side of IoT.

However, when I look at services in addition to pure connections, the clear industry leading the way is in the automotive sector. A second, less obvious market, is insurance with insurance services based on IoT presenting an enormous opportunity. We really think insurance will be profoundly changed by IoT and it's important to recognise that I'm not talking about this change happening in ten years but in the next two or three years.

The key reason for this is that the core business of insurers is pricing risks. The more information you have available to do that, the better at it you become. For example, with motor insurance the charge used to be based on the main driver's demographic details and driving history. However, being able to charge based on each user's driving style and duration is clearly more powerful. IoT gives insurers access to a huge pool of data to enable them to price more accurately.

This could easily extend beyond automotive to home, travel and health insurance – in fact, anywhere you see the possibility to provide specific, individualised data as opposed to generic information is where insurers will be able to generate value. The number of connections might not hit the same volumes as for utilities but in insurance the use cases offer great value to the insurer.

In contrast to the automotive sector in which service providers are adding hardware and data traffic and hoping to build services on top, in insurance, you're replacing a traditional, existing business with a new approach where you can be more accurate so it's an easier transition to make. In the insurance industry some of the players have really figured this out while others are reluctant to accept the destiny of the industry. I think those that are going full speed towards IoT-enabled insurance will be proved to be right.

IoT Now: Now that IoT is moving out of the pilot project and test phase and entering the mainstream in many sectors, how do you see the market developing?

SG: There are several layers to this question. First, our customers are expecting that we provide them with predictability and that means devices and solutions backed by service level agreements (SLAs). We're moving away from pricing IoT in terms of the quantity of data and moving to agreed levels of service. Customers realise how important it is for specific quality of service to be provided to enable effective delivery.

Another model we're starting to see is pricing based on outcomes. This involves a service that generates €x value remunerating a service provider with a percentage of that value. The second point is that technically solutions are more standardised. In the past it was acceptable to have a unique and distinct project per customer. The development of more standardisation will mean new customers will become more comfortable deploying IoT solutions.

Finally, the increased maturity of IoT places new demands on us to adopt more mature processes and behaviours. Part of the strategic review I'm



The largest and foremost trend for all IoT technologies is that everything becomes a service. The moment you accept everything decentralises and is a service, you need a direct connection. In automotive, it's evident that's going to happen.

doing now is to identify how to do this effectively. Today, we really see chief executives of our customers getting involved, as well as chief technology officers and procurement people. However, five years ago, IoT was championed by advanced technical personnel but now it's chief executives who realise IoT presents an opportunity for them to change their businesses.

IoT Now: Obviously you have connectivity but what wider role do you see Vodafone having in the development of IoT?

SG: Connectivity in itself is and will remain core to what we do. However, how we provide it will change because instead of providing 3G and 4G connections we'll also provide Narrowband IoT (NB-IoT) and any other technologies that are needed to serve our customers.

We're building the machine network but it's not one thing that will be the same – with the arrival of 5G it will change again. The delivery technology will therefore change continuously.

We won't just provide connectivity. In some verticals we've decided to play a major role in the service side of IoT. In the automotive industry we play this role and insurance is another area in which we're already providing services beyond connectivity and will scale up our activities. I believe that in five years we will have a big IoT connections business but one that is more complex in terms of connection technologies. In addition to that we'll have a substantial services business serving two or three more industries in addition to automotive and insurance.

IoT Now: What do you see as the key IoT trends in the next few years?

SG: The largest and foremost trend for all IoT technologies is that everything becomes a service. The moment you accept everything decentralises and is a service, you need a direct connection. In automotive, it's evident that's going to happen.

The second trend to highlight is that there will be multiple layers of technology and it won't be an either/or question of whether NB-IoT or 5G is best. There will be many different technical options coming down the line.

IoT Now: What can we expect from Vodafone IoT in the coming year?

SG: Obviously I can't mention specific plans but in general terms you will see some really clear investments in strengthening our leadership presence in connectivity. We already have some NB-IoT coverage in nine countries and we will build more of that for sure.

Another area we're focusing on is evolving smart capabilities to our connectivity platform. We will be building on our analytics and device management capabilities as the marketplace wants.

You're also likely to see some activities in the services parts of the automotive and insurance industries from us. An industry is in the making here and we'll pursue the opportunities along internal and potentially external lines to achieve leadership.

The final aspect to mention is Vodafone's commitment to the IoT market. Digital transformation is not possible without IoT and we see our leadership in this technology as a valuable catalyst for growth not just at Vodafone but for the sector as a whole.

www.vodafone.com/business/iot



LoRa gets a boost from the developing world

Much has been written and said about the progress of LoRa in the world's developed economies, but the technology is also gaining rapid acceptance in the developing countries as well, with large scale deployments in places such as India, Africa and South America, writes Peter Dykes

Perhaps one of the most ambitious deployments is on the Indian subcontinent. VS Shridhar, senior vice president and head of Industrial IoT (IIoT) at **Tata Communications** says, "India is seen as a high-growth potential market for IoT and it has recently taken the lead in global smart cities development. Tata Communications is building the foundation for IoT in India – building the world's largest LoRa network, spanning nearly 2,000 communities and touching over 400 million people in total. In 2017, the company had already deployed LoRa network in 38 cities in India, with many more cities planned in 2018. The initiative will bring together devices, applications and other IoT solutions to create an India-wide IoT ecosystem."

He adds that a tangible example of an IoT network which has been rolled out in India by Tata Communications is the LoRa network. Recently, Tata Communications partnered with **MOTWANE** to deploy 300 smart street lights for **Jamshedpur Utilities and Services Co**. (JUSCO), India's only comprehensive urban infrastructure service provider, using LoRaWAN technology. The system enables smart features such as switching the lights on and off or dimming them remotely from a central command centre. The lights can be adjusted in clusters depending on need in each location, which helps reduce manpower costs and energy consumption further.

Indeed, Tata recently announced a tie-up with digital infrastructure provider **Mahanagar Gas Limited** (MGL), one of India's leading natural gas distribution companies, to deploy 5,000 smart gas meters in Mumbai. The company says the



VS Shridhar,
Tata Communications



Arnab Das,
Aricent



Iain Stevenson,
Comsol

new smart meters will give households and businesses unprecedented visibility and control over their gas usage and enable MGL to enhance operational efficiencies. Tata predicts that the global smart gas meter market is set to grow from around US$1.59 billion in 2016 to US$2.27 billion by 2021 and it expects that there will be around 130 million smart meters across India in the next three years.

But there is more. Arnab Das, the vice president and global business leader for Service Line-IoT Offerings at **Aricent**, says, "The [Indian] market is on the cusp of significant growth in low power wide area network (LPWAN) deployments with several operators and technology firms are forming various alliances to address the service infrastructure availability. There are indications that a net is being created of LoRa WAN coverage that includes up to 50 cities across India. A significant number of use cases that can drive IoT application uptake are in trial phase using LoRa technology. The software and deployment and support service providers have also scaled up their readiness to provide trained personnel and innovative software driven intelligent services."

Elsewhere, LoRa technologies are also gaining traction. In in 2017, South African wireless connectivity provider **Comsol** launched an open architecture LoRa LPWA network nationally in 2017. Backed by **Cisco** and **IBM**, the company claims it is the largest IoT network in Africa and was deployed on the back of Comsol's R1.5 billion (US$122m) Open Access Layer 2 National network investment. It services all the major metropolitan networks in South Africa.

"IoT offers solutions for smart cities, smart businesses, and even many of the challenges we face as a society, for example managing scarce resources like water. By enabling smart tracking, smart perimeter control, smart agriculture, smart buildings, as well as smart city applications like metering and manhole cover monitoring, IoT is already fundamentally changing how we live. We are proud to introduce the network that is going to empower African utilities, businesses, and individuals to gain the benefits the IoT offers," says Iain Stevenson, the chief executive of Comsol.

In South America, LoRa is also gaining rapid traction. In 2017, Argentina-based telecoms and technology player **Inversiones Condor** (ICondor), also launched its IoT network using LoRaWAN based on Semtech Corporation's LoRa devices and wireless RF technology. ICondor, which created what is now the Movistar network and also the Claro (America Móvil) network. The company is now working to create an Argentine and South American nationwide IoT LoRaWAN network which it began in Buenos Aires and Rosario. The company is aiming to cover the whole country by July 2018. ICondor says it will serve many of the typical markets for IoT including asset tracking, metering, smart city and smart home applications and smart agriculture.

The other hot market in South America is Brazil. Following the release of new technical requirements for radio frequency (RF) communication devices enabling the operation of LoRa devices and technology throughout Brazil by Anatel, Brazil's National Telecommunications Agency, **Semtech** says it is ready to roll out a LoRaWAN nationally. According to Frost and Sullivan, by 2021, the IoT market for applications and hardware is set to generate US$3.29bn in Brazil.

"The recent actions taken by the telecommunications regulatory agency for the largest country in Latin America have facilitated the immediate rollout of a LoRaWAN network in Brazil and, likely, the continent," said Marc Pegulu, vice president and general manager of Semtech's Wireless and Sensing Products Group. "Citizens of the eighth largest economy in the world will soon benefit from low power wide area networks (LPWANs) powered by Semtech's LoRa Technology in a variety of exciting applications, including cities, building, supply chain and logistics, agriculture and metering."

It is becoming quite clear that the major drivers behind the rollout of LoRa in developing regions of the world include smart cities, utilities and agriculture, the latter being particularly important in those countries with agro-based economies. While IoT alone cannot feed the world, it could potentially make agriculture a far more efficient undertaking. Similarly, by creating efficiencies in areas such as energy management, it could be an important part of developing nations' strategies for growth without the attendant pollution experienced by the industrialised countries.

"IoT offers solutions for smart cities, smart businesses, and even many of the challenges we face as a society"

Cost, power consumption and ease of design and configuration see LoRa selected for Indian IoT connectivity

Tata Communications has recently started to roll-out LoRa technology for its low power wide area network (LPWA) across India. Here, Anthony Bartolo, the digital infrastructure provider's chief product officer, details the needs of developing markets and the Internet of Things (IoT) applications that are driving adoption. He also explains why Tata Communications has chosen LoRa in preference to narrowband-IoT (NB-IoT) technology

IoT Now: Most industry forecasts place the developing economies very much in the forefront of IoT adoption and usage – why do you think this is?

Anthony Bartolo: There are a number of factors at play. The developed economies by definition already have quite well-developed infrastructures, which is something that many developing economies do not have. IoT can be perceived as a way to overcome infrastructure challenges and drive innovation to address challenges around areas such as water management, agriculture, population growth and others.

For this reason, governments and local municipalities in developing countries are very open to encouraging investment and use of IoT. A combination of national and regional government support along with local enthusiasm for technology adoption plays an important role in IoT growth rates in developing countries. GSMA Intelligence recently published an interesting set of statistics in its 'IoT: the next wave of connectivity and services' report. This indicates that while the Asia-Pacific region will continue to be the largest regional market for IoT connectivity, this is fuelled by industrial IoT rather than consumer IoT adoption. Therefore the charge is led by enterprise adoption of IoT for a range of use cases including smart manufacturing and Industry 4.0 adoption, logistics, transportation, agriculture, smart city services, public utilities and associated uses. GSMA Intelligence indicates that Asia-Pacific, Middle East and Africa combined will contribute around half of all global IoT connections by 2025, with all three regions demonstrating ▶

significant growth up to 2025.

IoT Now: What sort of common challenges do organisations face, when they are embarking on a new IoT project?

AB: IoT-related projects usually demonstrate positive results in the proof-of-concept (PoC) phase. However, in some cases an organisation may not be ready to immediately scale up the project. One of the reasons for this can be that an IoT project often touches multiple organisational processes and boundaries and there is no single owner to help take advantage of the benefits without encroaching on someone else's turf. Hence, IoT projects can get caught up in internal struggle of ownership and this issue can have significant impact on the actual implementation of the project, when going beyond the PoC phase.

IoT projects can also be subject to the bureaucracies of large organisations, and it can take time to administer a way around the procedural obstacles. Partnering with an ▶



Anthony Bartolo,
Tata Communications

We assessed a number of low power wireless technologies, including LoRa, NB-IoT and others

organisation that has already enabled IoT solutions many times can help enterprises navigate these issues. Ultimately, taking advantage of significant benefits associated with IoT outweighs the occasional organisational tangle.

IoT Now: With all the technology options available, why focus on LoRa for LPWAN? What about NB-IoT?

AB: We assessed a number of low power wireless technologies, including LoRa, NB-IoT and others. We identified LoRa technology as fulfilling our requirements across a range of criteria, including cost, power consumption, ease of design and ease of configuration. We selected LoRa not only for its range and low power consumption advantages, but also for the success of the LoRa Alliance in developing and promoting the LoRa ecosystem with several hundred technology companies and service providers adopting the technology around the world.

LoRa can be used for both fixed and mobile devices. Its bi-directional communications capabilities support multiple classes of device, thus unlocking use cases requiring faster application reaction time for network initiated transactions. LoRa is robust to local signal interference and it is relatively easy to densify network coverage if required.

LoRa provides excellent indoor and underground coverage, so coverage can be augmented with femtocells, to cover specific areas – for example indoor car parks or underground metro transport systems. The final but important reason is to do with IoT security. In this area, LoRa presents a secure option. The LoRa protocol uses a combination of device, network and application level encryption, making it a highly secure technology.

IoT Now: Why is an ecosystem approach important in order to enable specific services? Could strategic partnerships be an alternative to engaging with a wider, open ecosystem?

AB: While our aim is to become a core enabler for connected devices in India, we understand that we will need to work with a number of partners in a broader ecosystem to achieve this. Our customers have indicated a range of challenges – from technology fragmentation to needing help with how to derive value from IoT data. Hence, it will be easy for these customers if they could avail a range of services by engaging with a single ecosystem.

This will enable seamless proliferation and adoption of IoT across sectors. Being able to work with a single source for connectivity, hardware sourcing, applications, data analytics, consulting, maintenance and managed services will enable enterprises to focus on their core business and not worry about engaging with different service providers for all-round connectivity solutions.

IoT Now: How is Tata Communications engaging with the market in support of IoT?

AB: We started deploying our IoT network in Mumbai, Delhi and ▶

Bengaluru – which have all had live networks since June 2016. Since then we have been constantly developing and expanding our network coverage. We now provide coverage across 38 cities and industrial areas, each having a population of more than one million people.

Our network coverage extends along seven major industrial and logistics corridors in India, including Mumbai-Ahmedabad-Delhi-Kolkata-Chennai-Bengaluru. By mid-2019, we aim to expand our network to include more than 16,000 macro gateways and 50,000 femtocells, covering a population base of around 400 million people, making it the largest LPWAN in the world.

We recognise that the true value of IoT lies in developing solutions for real world challenges, not just in providing a network and connectivity. Hence, we are working to provide a scalable, pan-India solution platform and a complementary deployment platform, facilitating device plug-and-play and supporting multiple applications managed on a single platform for developers to work with. Our unified IoT platform encompasses device and service management, analytics, business and operating support system (BSS/OSS) infrastructure, a data service cloud layer and network inter-working.

The platform supports multiple applications and use cases. In addition to our network roll-out and platform development, we are building up a local ecosystem of designers, application developers, hardware and technology partners. There are a number of ways to engage customers, such as through provision of connectivity application programme interfaces (APIs) in the cloud, with which our customers can develop their own applications. We are also engaging with some of the top technology colleges in India to get their engineering students interested in the potential of IoT. In February 2018, we published our inaugural 'India IoT Report' which can be viewed here: **www.tatacommunications.com/wp-content/uploads/2018/02/IoT-Report.pdf** . The report is a consumer survey that revealed how Indians believe that IoT-enabled automation at work and in households can help them.

IoT Now: How do you see IoT developing in the coming 24 months? Do you see developing markets continuing to lead adoption and usage of IoT?

AB: We expect growth to continue to be driven by the developing economies. In the case of Africa, for example, growth is predicted to exceed all other regions, albeit from a small initial base of connectivity. The Middle East region is also expected to witness double-digit growth in connectivity.

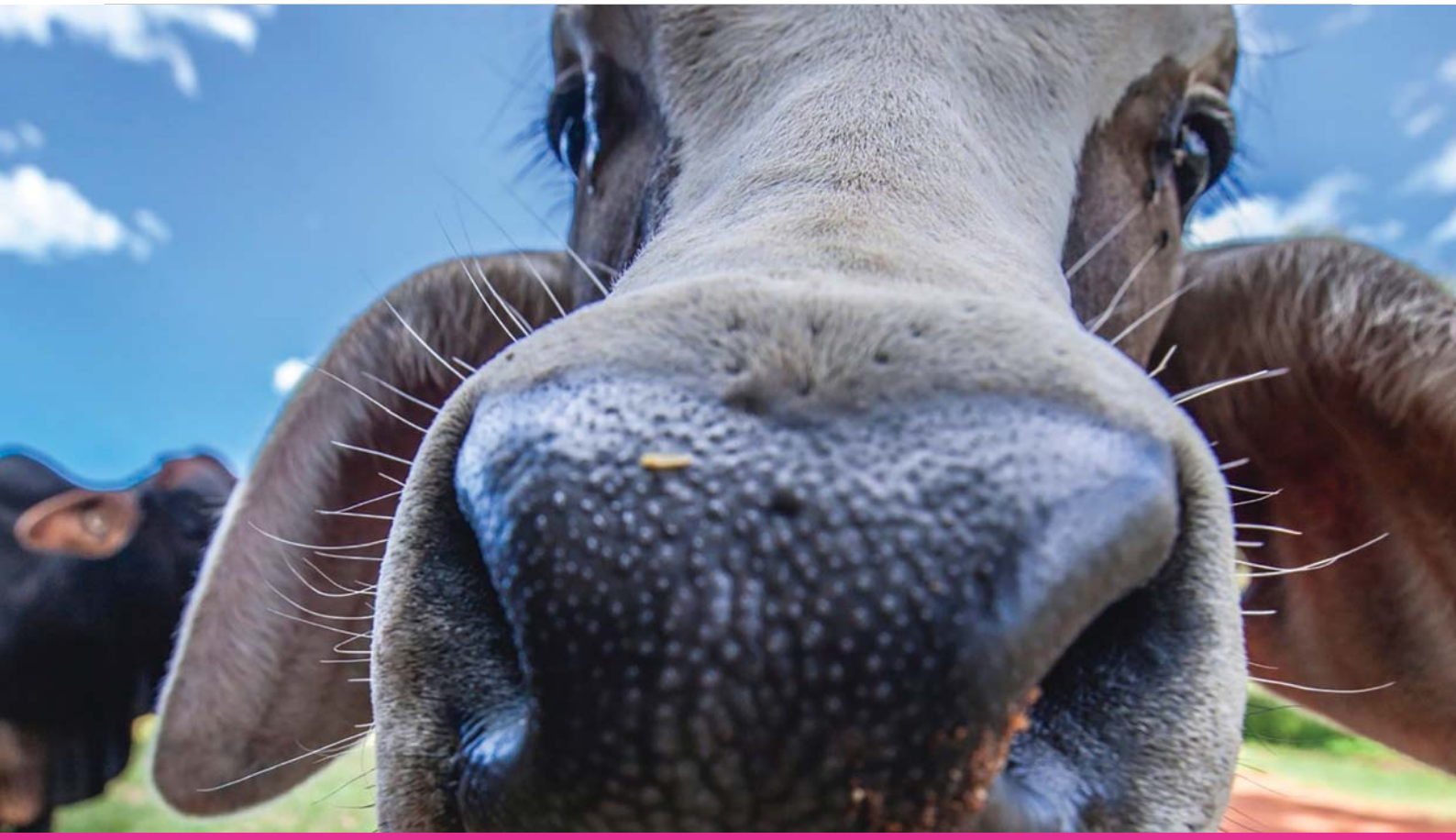
The Asia-Pacific and South Asia markets represent an already significant and established developing economic and industrial region for IoT. Growth and scale in these regions will be a significant factor driving overall, global adoption of IoT technology and usage. In the coming years, we expect increasing proliferation of use cases, more proof of concept trials and a continuous movement towards higher volume based, commercial deployments.

While the private sector plays a significant role in IoT adoption rates, government initiatives will nevertheless have an impact. We are already seeing this in India with the Indian government's smart city initiative, as well as AIS-140 intelligent transportation, IoT enablement for public service vehicles.

Innovative technologies including cloud, artificial intelligence, analytics and robotics are required to blend with IoT in order to truly transform businesses. Increasing interest in and adoption of Industry 4.0 initiatives along with making the manufacturing industry in particular and associated segments in general more efficient will also provide impetus for IoT adoption. With reports predicting industrial IoT as a driver for growth in developing markets, it is apparent that IoT growth will become a part of a broader trend for new technology adoption over the next two years and beyond. ■

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We expect growth to continue to be driven by the developing economies. In the case of Africa, for example, growth is predicted to exceed all other regions, albeit from a small initial base of connectivity



IoT in agriculture tells tales of the ubiquitous, connected cow – and other connected things

As I sit writing this article with a fabulous glass of viognier I can taste the irony, we are all intellectually aware that the world needs to produce much more food and wine, of course, writes Tracy Hopkins the chief marketing officer of Everynet. Emissions modelling suggests that agriculture-related emissions alone will take up almost 100% of the world's carbon budget by 2050. Meat and dairy production are especially carbon intensive, making livestock farming a key component of total agricultural emissions

According to the World Economic Forum: "The dominant paradigm of global food security is that humanity needs to increase food production by 50% to 100% by 2050" but dramatically increasing total global food production in not the answer. To sustainably feed a planet of nine billion we must find ways to produce food far more efficiently, optimise the supply chain, waste less food and be much kinder to the environment.

The Internet of Agriculture

There are many new initiatives to make agriculture smart. These include the work of the Climate-Smart Approach (CSA), the Food and Agriculture Organization of the United Nations, the commercial drivers pushing the farming landscape to evolve from the historical micro-farms run by families to large scale macro-farming operations, precision and urban faming. Innovation in farming technology in the late 19th century gave us tractors and harvesters while today much new innovation is focused on the IoT of which the common denominator is data, data and more data.

The smart factor however is not simply about the data, it is about the insight that can be gained from the data, and how, when this insight is combined with context or situation awareness, it can drive both local actions and enable intelligent business decisions that are relevant at that specific time. Farming will not ▶

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A key challenge for using the IoT in agriculture is connectivity, getting the data from sensors deployed in the field as cost effectively as possible

need to be dependent upon a rain man, traditional methods and the fluctuations of climate to be more efficient.

A key challenge for using the IoT in agriculture is connectivity, getting the data from sensors deployed in the field as cost effectively as possible. Traditional communications network infrastructure is focused on people and converge is predominantly centred around them and does not extend far into rural areas in many countries as the cost model doesn't work for the mobile network operators (MNOs) or fixed line providers. A flexible, long range option that offers different deployment models and a very low connectivity cost per sensor is essential. The sensors themselves also need to be very low power or even disposable because a truck roll to change or charge batteries invalidates any business model due to the cost sensitivities in some applications.

LoRaWAN low power wide area networks (LPWAN) are being used in several continents to get data from the field across many application verticals because of the technology's inherent low power and long range capabilities. As it is an open communications standard there are many deployment and business model options available from simple Farm Only private networks to Agriculture-as-a-Service offerings.

The ubiquitous connected cow

Historically it had always been the connected fridge that epitomised the IoT or M2M in its previous guise, now it is always the connected cow, I will call her Daisy.

There are over 1,467,548,724 heads of cattle in the world according to Beef Market Central.

- 63% of the world's cattle are in Brazil, India and China
- 368,469,907 are in South America and 211,764,292 in Brazil alone
- 10% are lost or rustled annually at a cost of US$34,771,696,746
  - Based on average price per cow of US$1645
  - A loss of US$160 annually per cow

LoRaWAN low cost tags can be used to simply identify where the cows are, the livestock manager can use the LoRaWAN network to effectivity geo-fence the cows and send event driven only notifications if the cow is not within the boundary. This simple use case could offer massive savings as illustrated below.

- The tracker, connectivity and service costs US$3 per month, US$36 per year on a three-year contract per cow, and a basic tracker costs US$30
- Cost per cow to track is US$36
- All 211,764,292 cows in Brazil would cost US$7,623,514,512
- Return on investment (ROI) in Brazil yields a US$27,148,182,234 saving annually

However, there are more complexities. LoRaWAN network infrastructure needs to be available and the cows can't all be tagged overnight. The point is that to make IoT viable, the cost per cow needs to be significantly less than the loss and be relevant to the needs of the application.

In New Zealand the livestock market profit per animal is all publically available per farm at **https://beeflambnz.com/data-tools/sheep-beef-farm-survey** . With some farms only making US$100-US$200 per animal, unless there is a high risk of loss or theft, a high cost to track will leave poor Daisy lost.

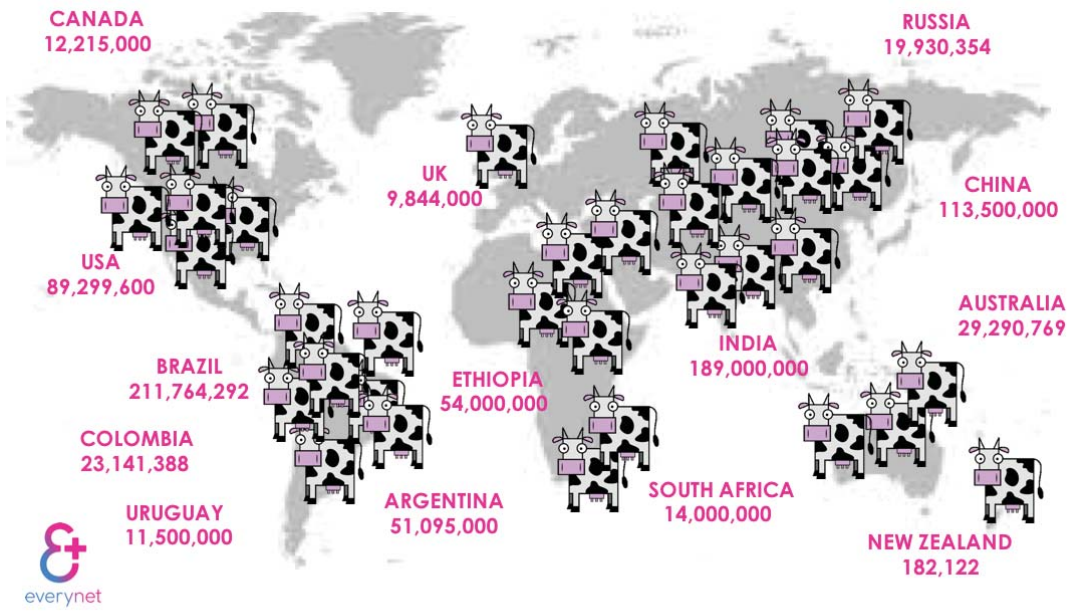
There are many other ways IoT can significantly help with livestock management, there are sensors that can detect when Daisy is ready for a visit from the bull, real world trials have already demonstrated that temperature and pedometer devices can detect estrus in cows more efficiently. The average insemination success has been improved to 1.58 attempts from 2.0-2.5 attempts and the average calving interval was shortened to 354 days from 402 days and the female cattle birth ratio increased. As a result, an increase of US$645 per head per year is predicted and production milk yield increased. Sensors can also detect when Daisy is about the give birth, traditionally famers would carefully watch the pregnant animals now they can be remotely alerted, the cost of losing a cow and a calf during the calving process can cost a farmer in excess of US$2,000, depending on value of the cow.

Other connected things

Water and fertiliser are two crucial ingredients for crop growth, too much or too little can have a derogatory effect on the quality of the yield, potatoes and cotton are sensitive to over watering but strawberries and tomatoes are water hungry. Intelligent IoT irrigation systems offer the ability to monitor and adapt and can provide guidance at a glance.

Sensors measure soil conductivity which can tell you how much moisture and fertiliser is in the topsoil, if the sensors are distributed through the fields or greenhouses the right time to irrigate can be determined saving both water and energy. LoRaWAN IoT devices are delivering a 20-30% yield improvement in vineyards in Italy and are enabling the reduction of fertilisers and chemicals. ▶

Connected cows will aid farm profits



Many large scale trials are now underway across the world and within the next few years we will see this happening

Palm oil plantations have an issue with the heavy tree canopies where wireless signals struggle to penetrate but LoRaWAN sensors have successful been put to the test for irrigation, for pest control using simple traps that only let the relevant pests in, send alerts when the sensor weighs a certain level – indicating a specific number of pests. The palms can then be treated to ensure a major infestation does not occur. Sensors are also being used to notify of potential fires in the plantations which can be a serious risk.

The insights that the operational data from all of these sensors contains can be further utilised globally, the type of soil will have characteristics as to how it reacts to water, the amount of fertiliser needed to maximise yield will vary with climate and crop variety and infestation will be dependent upon a multitude of criteria. If all of this data was centralised, categorised and available it would offer famers the opportunity to determine what type of crop they should plant for maximum yield in any given country taking into account climate and soil conditions.

Many large scale trials are now underway across the world and within the next few years we will see this happening more and more, convincing farmers to use technology for smart agriculture will be key as they need to invest now and wait for an entire season to see if the technology delivered the ROI. If the cost of ownership is low enough, the end-to-end system is simple enough and the farmer is able to roll out in stages it will become mainstream.

Everynet has been involved with the deployment of smart agriculture in many countries and is now focusing on Latin America and the Asia Pacific regions with Everything Everywhere, a LoRaWAN business model that enables low cost wholesale connectivity to meet the cost demands required by farmers. With the EveryTHINGZ partner programme, simple end-to-end solutions for the farmers including the sensors and the applications can be provided by third parties, offering maximum choice and simple interoperability straight out of the box.

Smart agriculture is just beginning, cold chain monitoring, food waste optimisation and the power of big data that will turn precision farming into predictive farming and give financial institutions and governments the ability to monitor production versus consumption on a global scale. These will all be crucial in ensuring that we can produce enough food for the world. For now, proving that the business models work in large scale deployments and that they deliver the efficiencies and cost saving required to make connected Daisy really ubiquitous is a leap in the right direction.

www.everynet.com

About Everynet

Everynet is a leading low power wide area (LPWA) technology pioneer and network operator with networks around the globe including in the Americas, EMEA and APAC. In geographies without existing LoRaWAN Networks, Everynet builds and operates IoT networks to enable MNOs and enterprises to rapidly enter the IoT market using the company's Low Cost Wide Area (LCWA) technology. Outside of its network footprint, Everynet licenses its technology to anyone in the LoRaWAN ecosystem including technology providers, network operators, platform companies, and device companies.

connect your world with industry leading LPWA intellectual property, a flexible, intelligent platform and a world leading Partner IoT eco-system

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every device | every person | every service



every country | every interaction | every thing

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Range, cost and power optimisation – how the benefits of LPWA opens the door to a class of new IoT applications



Recent years have seen a proliferation of technologies and standards centred on low power wide area network (LPWAN) communications, resulting in a highly diverse market landscape. Fredrik Stålbrand, senior analyst at Berg Insight, interviews Sara Brown, senior director of marketing at MultiTech, talking about the company's approach to LPWA and applications in the agricultural sector

Fredrik Stålbrand: There is a high level of diversity with regards to the LPWA market. Could you share your view on the current state of LPWA technologies?

Sara Brown: LoRaWAN seems to be by far the most mature of the LPWA technologies having come from an experimental stage back in 2014, to commercial hardware in 2015, to adopter proof of concepts (PoCs) in 2016, to enterprise pilots in 2017, and now deploying at scale. It has been some years already since the cellular carriers began promoting licensed LPWA options, but their networks are not yet mature, although we are seeing an uptick in demand. I expect Cat M1 to scale more quickly in the US and narrowband-IoT (NB-IoT) to scale more quickly in EMEA. These licensed networks are still really in the PoC stage as deployable hardware becomes available and network infrastructure scales.

Ultimately, we believe that these are very complimentary technologies, each with its own sweet spot in the IoT ecosystem. That's why we have commercialised LoRaWAN-based hardware as well as Cat M1 and NB-IoT to join our portfolio of 2G, 3G and 4G cellular products, many of which also incorporate other communications technologies including Wi-Fi and Bluetooth as well as wired protocols like Ethernet, serial and USB.

FS: What are the key points that companies need to consider when it comes to investing in LPWA technologies?

SB: What's really exciting about these new LPWA technologies is that they are opening the door to a whole class of applications that simply didn't make business sense before due to cost, range or power requirements. In addition to these big three – when it comes to choosing between options there are a couple of factors that rise to the top of my list of considerations: ▶



Sara Brown,
MultiTech



Fredrik Stålbrand,
Berg Insight

- **Tolerance for latency and possible packet loss** – even small amounts of data may need to be truly real-time in, for instance, medical monitoring or emergency response scenarios, others, may not, for example, soil moisture content is not likely to change significantly if you have to wait five minutes.
- **Spectrum management to avoid interference** – in unlicensed LPWA solutions, there are ways to prevent interference, but may require some additional effort beyond dedicated/licensed spectrum solutions.
- **Where are your end points** – do you require deep in-building penetration?
- **Financial models** – do you prefer to finance the project as a capital expense or as operational expense; from a risk perspective, what kind of service level agreement do you require/are you willing to pay for?

Of course, if you're looking for high bandwidth to move a lot of data, such as in video streaming applications, you probably shouldn't be looking at LPWAN.

FS: What are the main challenges at the device level and how should they be addressed?

SB: Today, the principal challenge at the device level is the availability of what I call consumable edge devices. Here again LoRaWAN is ahead of licensed technologies by simple virtue of time – with more than 100 certified devices. Nevertheless, this year will be particularly important for vertical market specific edge devices to be certified, manufactured and marketed at scale. I think we're still a few years away from that kind of adoptability for NB-IoT. There are certified modules, but, as we all know, it takes time to integrate a module into a finished device.

FS: Which vertical markets have been leading the adoption of these technologies?

SB: We have seen a lot of activity particularly in the smart cities and smart buildings space, as well as agriculture. Other areas include energy and utilities, medical and even transportation.

FS: How does LPWA address the requirements of agriculture?

SB: All of LPWA's big three benefits – range, cost and power optimisation – are particularly well-suited for the needs of smart farming. Farmers tend to operate on razor thin margins, which makes the cost to deploy a sensor monitoring solution critical to its success. In the case of LoRaWAN, it's important to note that a significant portion of farmland is operated in remote areas, many of which may not have access to cellular technology. LoRaWAN technology enables farmers to build their own network, covering miles of farmland, and backhaul to the internet using their local Wi-Fi or Ethernet connection.

FS: What type of applications do MultiTech's solutions enable in the agricultural sector and what are the impacts for farmers?

SB: MultiTech is rapidly growing its footprint in the agriculture space, with devices monitoring all sorts of things from animal location and behaviour, generators, feeders, soil and leaf moisture, weather, irrigation systems, waste water and pest control, as well as environmental contaminants, as it is particularly important to know if toxic gas is present in barns, grain silos and other locations.

Ultimately, the impact is providing the information farmers need to make better decisions in order to optimise their costs, safety and, most importantly, yield – which is critical to a farmer's own bottom line, and to addressing what the Food and Agriculture Organization of the United Nations refers to as a growing food crisis.

FS: Will agricultural solutions be deployed on public LPWA networks or will large commercial farms and cooperatives prefer private LPWA networks?

SB: I think we'll see a combination – in fact we already are. Some of our customers in the agriculture market are looking to utilise both licensed and unlicensed LPWA technologies to create their own last mile networks to extend public cellular coverage – aggregating the data from the LoRaWAN network and transmitting it back to the internet using the nearest Cat M1 or NB-IoT tower.

Ultimately, I think geography will be a critical factor in this particular space, as it will still be at least a year before the cellular carriers are able to offer ubiquitous LPWA network coverage. Historically some excellent farmland has been left out of range.

All of LPWA's big three benefits – range, cost and power optimisation – are particularly well-suited for the needs of smart farming

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A new wave of IoT solutions leads the way to more sustainable farming

Global demand for agricultural products is on the rise. By applying advanced technologies in agricultural production, farmers are able to measure and manage the variability of crops in the fields and animals within the herds. Connected equipment, sensors and controllers are being deployed across farms worldwide to increase yield in order to meet the growing demand for food driven by population growth and urbanisation. According to analyst firm Berg Insight's latest research in the space, the agricultural sector is significantly underpenetrated by IoT technologies but set to experience a wave of technology adoption, writes Fredrik Stålbrand, a senior analyst at Berg Insight

Growers have known for a long time that variations in their fields exist, modern technologies have however enabled detailed measurements of such variations. The introduction of global positioning system (GPS) technology in the mid-1990s marked the advent of precision agriculture, as it allows for precise positioning of agricultural machines driving in the field. Today, farmers utilise sensors mounted on GPS-guided equipment along with satellite imaging, soil sampling and in-field sensor systems to collect a wide range of data from their fields. The collected layers of geocoded data form a digital representation of their crop fields and are used for decision support.

Every growing season, farmers have to make about 40 to 50 decisions about each individual field. Across large farms this can easily amount to several thousand decisions per season, which makes it very challenging to stay informed when making those decisions. Farm management software enables analysis and visualisation of field data and is also used to create prescription maps that describe how much product to apply at specific locations across a field. Telematics systems in tractors and combine harvesters allow for seamless wireless data transfer of field and machine data to and from the machines. ▶

Figure 1: Global agriculture in numbers
Source: Berg Insight, 2018



Advanced technologies enable far greater precision in agricultural tasks

One of the most widely adopted solutions in arable farming comprises auto-guidance systems, which have the capability to automatically steer the machine across the field according to a preselected pattern. Auto-guidance systems allow machine operators to focus on the task performed rather than the steering operation. The technology provides greater accuracy and reduces overlaps compared to manual steering, leading to a reduction in fuel consumption, working hours and use of inputs.

The use of precision farming technologies and practices aims to optimise the application of seeds, fertilisers and crop protection chemicals according to conditions in specific zones of the field. For example, it is estimated that uniform application of fertilisers across a field leads to over-fertilisation of roughly 40% of the area, while also causing a reduction in yield by 10%. In precision fertilising operations, higher application rates are used in parts of the field where nitrogen run-off occurs, while lower application rates are employed in other areas. Thus, farmers are able to reduce the consumption of fertilisers as well as increase yield by 10–15%.

Huge range of new sensing solutions

Software and services built on top of sensing hardware have attracted the attention of venture capital firms and input manufacturers which are investing heavily in the space.

According to AgFunder, companies in the farm management software, sensing and IoT segment received US$464m in funding in 2017, up 28% from the previous year. These companies mainly focus on providing solutions for measuring and modelling various conditions in the field to monitor for example weather, soil moisture content, crop performance, diseases and pests.

Historically, farmers have primarily relied on regional weather forecasts from airport weather stations that were infrequently updated. Modern in-field sensor systems can measure weather, soil and crop conditions from more than 40 environmental data parameters at frequent intervals. Local weather monitoring may for example provide insights into fertilisation timing, as heavy rainfall can wash away the applied fertilisers. In addition, weather data can be used for crop management, yield forecasting and disease modelling.

Another area targeted by a number of start-ups comprises remote pest monitoring. Agricultural pests are responsible for significant losses to the world's annual crop production. Traditional pest management is typically a labour-intensive undertaking as it requires manual scouting throughout the crop fields. Moreover, satellite imaging is typically also insufficient due to its infrequency. Modern solutions utilise connected insect traps and data modelling for risk evaluation to time the application of pesticides. ▶

Figure 2: Major smart agriculture applications
Source: Berg Insight, 2018

Machine management
- Remote diagnostics
- Maintenance planning
- Transport management

Precision agriculture
- Guidance and automated steering
- Yield monitoring and mapping
- Precision seeding
- Precision fertilising
- Precision spraying

Remote sensing
- Satellite imagery
- Drone imagery

Remote monitoring and control
- Weather monitoring
- Pest monitoring and control
- Irrigation management

Precision livestock farming
- Cattle monitoring
- Herd management
- Performance monitoring

Machine uptime critical in forestry operations

Forestry shares many of the characteristics of agriculture but differs from crops because of its multi-year lifecycle. The industry encompasses a range of activities including forestry management, harvesting and forest planning and the tasks often require specialised machines such as harvesters, forwarders, bunchers and excavators. Therefore, machine uptime is one of the most critical factors to ensure productivity and profitability.

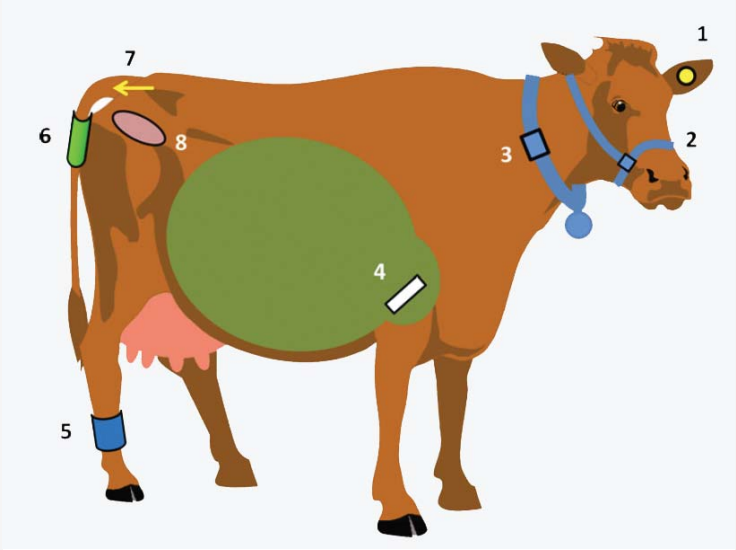
Modern forestry equipment integrates telematics systems that provide functionality for remote diagnostics and maintenance planning. The attachment rate of telematics systems in forestry equipment is markedly higher compared to that of agricultural equipment. Many of the industry incumbents are also active in the construction equipment market and have offered their systems as standard on their range of equipment for many years.

Farm consolidation drives technology adoption in dairy farming

Increased demand for meat and dairy products has resulted in larger herds per farmer, making livestock management and manual observations challenging. In large-scale dairy operations, the ratio of cows per worker is often greater than 200. Large farms have typically made necessary investments in barn infrastructure, automation and radio frequency identification (RFID) to create a stress-free environment that supports larger herd sizes and reduces the need for manual labour.

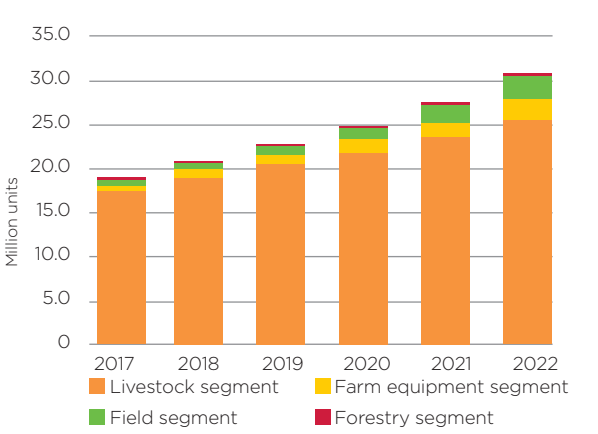
In dairy operations, precision livestock farming technologies are used to optimise the milk yield from each animal. Apart from keeping the herd healthy, a high fertility rate is crucial to maximise efficiency as a large number of non- ▶

Figure 3: Wearable devices for cattle monitoring
(1) ear tag, (2) halter, (3) neck collar with counterweight, (4) reticulorumen bolus, (5) rear leg pedometer, (6) upper tail ring, (7) tail head inject and (8) vaginal bolus



Source: Caja, G., Castro-Costa, A., & Knight, C. (2016). Engineering to support wellbeing of dairy animals. Journal of Dairy Research. 83. 136-147.

Figure 4: Installed base of wireless devices for applications in agricultural production



Source: Berg Insight, 2018

lactating cows results in lower production volumes along with high costs of feed and other inputs. Each additional day a cow remains dry can cost a dairy producer up to US$6 in reduced profitability.

Body-mounted sensor systems together with herd management software are used to achieve satisfactory herd health and timely insemination when a cow is in oestrous. A wide variety of wearable technologies are commercially available to measure a range of parameters in individual dairy cows. The devices can be used for monitoring of behaviour, lameness, mating, calving, rumen function and position.

The installed base of wireless IoT devices in agriculture reached 18.8 million in 2017

Berg Insight estimates that the installed base of wireless devices for applications in agricultural production amounted to 18.8 million connections worldwide in 2017. Growing at a compound annual growth rate of 10.6%, the number of connections is expected to reach 31.1 million in 2022. Wireless sensor systems fitted on livestock account for the vast majority of all connections due to their wide adoption in dairy cow monitoring applications. For data transmission, these systems typically employ 802.15.4-based network technologies, while cellular networks are used in some niche applications. The main application areas for cellular communication comprise telematics and in-field sensor systems. Among the network technologies, LPWA technologies are expected to achieve the highest growth rate and realise a significant market position in the remote monitoring and control segment.

All major equipment manufacturers have initiatives related to precision agriculture and telematics

Most high horsepower machines are today standard fitted with global navigation satellite system (GNSS) receivers and field computers. Yield monitors which collects data on crop yield and moisture content are furthermore present in almost all new combine harvesters. Deere & Company became the first manufacturer to launch a telematics system in 2002 and a number of manufacturers are today offering factory-fitted telematics systems as standard on new agricultural machinery. Telematics has however a long way to go before it becomes mainstream in the industry.

Leading vendors of precision agriculture solutions include the world's largest manufacturer of agricultural equipment Deere & Company, followed by the US-based precision technology vendors Trimble, Topcon Positioning Systems, Raven Industries and Ag ▶

Figure 5: Major vendors active in smart agriculture



Source: Berg Insight, 2018

Leader Technology. Hexagon holds a strong position in the positioning segment through its subsidiary NovAtel. Among the top agricultural equipment manufacturers, AGCO and CLAAS have also developed proprietary solutions, while CNH Industrial and SDF collaborate with third-party companies to integrate precision technologies into their range of agricultural equipment.

Manufacturers of agricultural inputs such as seeds, crop protection chemicals and fertilisers have expanded their software offerings notably in recent years, predominantly through acquisitions. The market for data-oriented applications and agronomic services are also targeted by a host of start-ups. Major providers include the Monsanto subsidiary The Climate Corporation, Canada-based Farmers Edge and the newly formed DowDuPont with its Encirca services.

A group of companies have emerged as leaders on the nascent market for in-field sensor systems that are used for remote monitoring applications. These include Davis Instruments, Pessl Instruments with its METOS brand, Semios, Hortau, AquaSpy and CropX. Although shipment volumes in this segment is still low, the pace of adoption of sensor systems has increased significantly in recent years, predominantly in the specialty crop segment. While the specialty crop segment is small on a per hectare basis, on a value standpoint the segment is very large. The return on investment of remote monitoring solutions has thereby proven to be high.

Dairy equipment manufacturers partner with specialist sensor providers

The traditional dairy equipment original equipment manufacturers (OEMs) including DeLaval, GEA Group, Lely and BouMatic offer comprehensive portfolios of milking robots and feeding systems that enable farmers to scale their milk production through process automation. In order to sell technology to dairy farms, local presence is a necessity and the large manufacturers are supported by distributors and local sales representatives in markets worldwide.

Most OEMs have chosen to partner with smaller, specialised companies to provide advanced sensor technology along with their milking equipment and farm infrastructure solutions. An exception is Swedish DeLaval, which provides a comprehensive portfolio of integrated remote monitoring solutions for herd management along with its dairy equipment. Important providers of sensor systems for herd management include Netherlands-based Nedap and The Allflex Group subsidiary SCR which both sell their systems to a number of leading dairy equipment manufacturers and ▶

genetics companies. Other significant players include Fullwood, Dairymaster and Afimilk which acquired Silent Herdsman in February 2016.

The traditional industry boundaries in the agricultural sector are beginning to blur

Partnerships and consolidation among agricultural equipment manufacturers and precision technology companies marked the theme of the last decade. Alliances are now expanding in scope among agricultural equipment manufacturers, input producers, software companies and agronomic services providers. These relationships take many forms, ranging from transactional agreements based on application programme interfaces (APIs) to more formal and complex relations involving contracts and service-level agreements. Trimble has for example a long-standing technology partnership with CNH Industrial, but also has integration agreements in place with additional OEMs such as AGCO and Deere & Company as well as the input manufacturer DowDuPont.

Moreover, input manufacturers are actively investing in agricultural technology ventures through their corporate venture capital arms. These investments are predominantly driven by strategic objectives rather than financial. With extensive knowhow in plant biology, input manufacturers are positioned to become important providers of crop modelling and prescription maps by incorporating farm management software as part of their offering.

By partnering with companies with complementing capabilities, leading players aim to transform from selling equipment and inputs to selling complete yield optimisation solutions to farmers. Berg Insight is of the opinion that groups of companies working together in ecosystems will be able to capture the most value from precision farming data. Investments in APIs and microservices along with an open IT architecture will be key to the development of technical platforms that can support the flexibility needed in the digital ecosystem that is emerging within the agricultural industry.

The agricultural sector is significantly underpenetrated by IoT technologies

Most farms are still family-run businesses and often employ an informal style of management. The adoption of precision farming solutions and software is demanding growers to learn new farming practices and become more organised. In addition, the increasingly complex ▶

technological environment that farmers operate in demands dealerships to offer a greater extent of services to integrate and support the range of technologies that are utilised in precision farming. This is increasingly addressed by established precision technology companies such as Deere & Company, Trimble and Topcon Positioning Systems that are actively investing in their channel partners to offer enhanced support for their precision farming portfolios. Berg Insight expects that the on-going of farm consolidation trend and increased professionalisation of the industry is likely to continue and result in stronger focus on yield maximisation and cost efficiency, which are proven advantages with using precision technologies.

Fredrik Stålbrand
Berg Insight



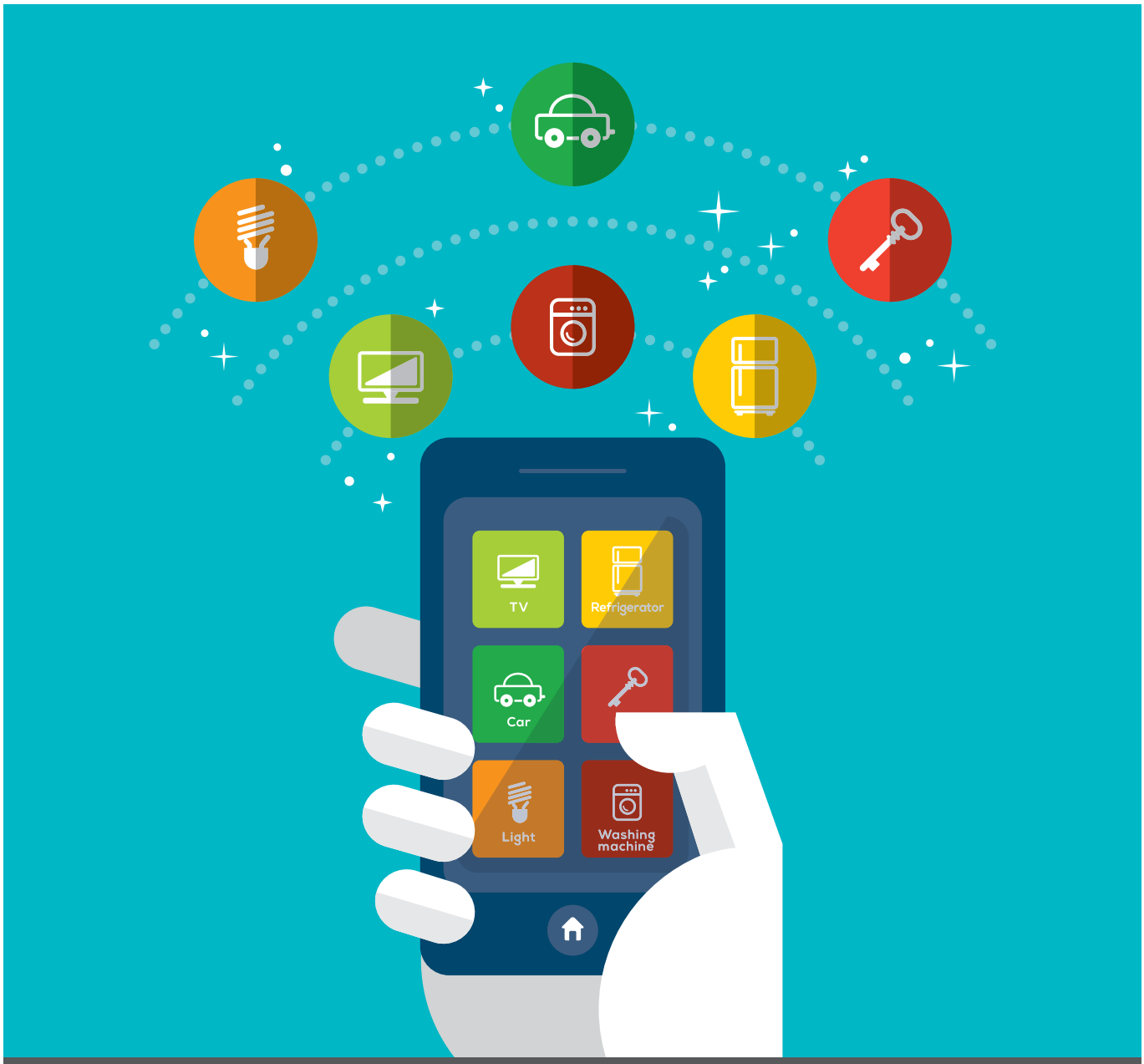
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Simplify and accelerate IoT network design, deployment and operation with end-to-end turnkey solutions

Stéphane Dejean, the chief marketing officer at Kerlink, tells Fredrik Stålbrand, a senior analyst at Berg Insight, about Kerlink's evolving positioning as a Network-as-a-Service (NaaS) provider and its activities in the market for private low power wide area (LPWA) networks

Fredrik Stålbrand: Could you start by giving us an introduction to Kerlink and outline your offerings for the LPWA market?

Stéphane Dejean: Kerlink was founded in 2004 by two engineers with strong expertise in radio frequency (RF) communications for the M2M market. The business was originally dedicated to addressing two IoT use cases – fleet management and smart metering, but Kerlink has continuously added new solutions to its portfolio. The company launched the world's first LoRaWAN gateway in early 2014 and co-founded the LoRa Alliance together with partners in 2015. Today, we are one of the largest providers of infrastructure equipment for LoRaWAN IoT networks. We ▶

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recently also enhanced our portfolio with value-added services to streamline network operations and to support innovative business models and monetisation of opportunities in the IoT domain. In addition, Kerlink has been listed on the Euronext Growth Paris Stock Exchange since May 2016. We have quickly built a strong track record of LPWA deployments and serve many leading telecoms operators, as well as private network operators worldwide.

FS: During 2017, Kerlink organised its operations into two business units. What are the focus areas of these new business units?

SD: The evolution of our organisation was a strategic decision that we took to maintain Kerlink's agility. We have separated our activities to accelerate our business transformation around services and applications. Kerlink Infrastructure Solutions now covers the portfolio of carrier-grade network-related infrastructure, management solutions and professional services. Kerlink Advanced Services focuses on designing and deploying our reference design, device management and geolocation solutions. The portfolios of these business units are complementary, but the solutions can also be sold separately. For example, our geolocation solution can be deployed on top of a third-party LoRaWAN network. Openness of our solutions and interoperability are key for us.

FS: Have you added any products to your portfolio in the past year?

SD: On the infrastructure side, we extended our portfolio with the core network management solution Wanesy Management Center and an indoor gateway. The Wanesy Management Center is a very modular and complete solution that provides comprehensive tools for network monitoring and control via self-service portals and Application Programme Interfaces (APIs). The platform supports Kerlink's Wirnet series of gateways, but is also compatible with third-party gateways. On the services side, we have added solutions for device management and geolocation, as well as the Kerlink reference design offering, which is a package of hardware, software, development tools and guidelines. These solutions help service providers and developers to design, bring-to-market and efficiently manage their fleets of connected objects. Geolocation is a strategic focus for Kerlink and we are convinced that it can add a lot of value to enterprises in a range of vertical industries.

FS: Kerlink has set an aggressive revenue target of €70m for 2020, compared to about €25m in 2017. What is the company's strategy to reach this target?

SD: It is built on a mix of increasing our global reach, adding value-added services to our portfolio, crystallising the appropriate ecosystem of partners like application-enablement platform providers, and targeting new types of prospects and segments. For example, the Kerlink reference design solution targets companies that are interested in integrating LoRa connectivity in their devices. We are also developing a partner programme and actively recruiting value-added resellers and system integrators to strengthen our sales channels. This will also enable Kerlink to better address the needs of local and regional partners. Over the past five years, the company has achieved a compound annual revenue growth rate of 62%, so we are confident of reaching our 2020 revenue target.

FS: How do the requirements differ between the two major customer groups that you serve – public telecom operators and private network operators?

SD: Let me start by clarifying the distinction between these two groups. Public operators comprise traditional mobile network operators such as KPN, Proximus, Orange and Tata Communications that we are supplying, but also newcomers, like cable operators and tower companies that are using this new technology to deploy networks and make the service publicly available. Since the technology uses unlicensed bands, companies don't need a licence to deploy the network, which lowers the barriers to entry. Private network operators typically include large utilities and industrial companies and smart cities that are more focused on specific applications and use cases. While public telecoms operators require carrier-grade solutions along with robust network management services, private network operators deploy simpler solutions with a straightforward user experience.

FS: What solutions does Kerlink offer for private network operators?

SD: Kerlink's one-stop-shop value proposition for private network operators encompasses turnkey IoT network solutions that enable companies or cities of all sizes to design and deploy their own IoT networks and manage their operation. We also offer professional support to help customers model and design scalable IoT networks, which significantly accelerates activation. In addition, our network management solution, Wanesy Management Center, supports multiple deployment options, including on-premises and SaaS. We have also formed a partnership with Microshare, a US-based IoT data management company, to complement Kerlink's network offering with a highly scalable data collection, enrichment, storage and sharing solution that allows businesses to securely monetise their data.



Stéphane Dejean, Kerlink



Fredrik Stålbrand, Berg Insight

Kerlink's one-stop-shop value proposition for private network operators encompasses turnkey IoT network solutions that enable companies or cities of all sizes to design and deploy their own IoT network and manage its operation

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Kerlink helps Grand Paris Metro Project realize its tunnel vision with LoRaWAN connectivity

When Worldsensing, a Barcelona-based Internet of Things (IoT) and operational intelligence technology provider, needed to create an edge-based, connected computing infrastructure to support tunnel construction for the Grand Paris Metro construction project, it turned to Kerlink to provide its low power wide area network system

Worldsensing provides smart cities and industrial customers with tools to understand the performance of distributed infrastructure, improve efficiency and make predictions

Worldsensing's technology required low-power connectivity on nodes placed 20 metres underground in Parisian tunnels. To achieve the required operational performance Worldsensing selected Kerlink to provide LoRaWAN gateways and support services. With Kerlink's help, Worldsensing created a low-touch, high quality solution that is set to last for at least eight years, well beyond the Grand Paris Metro completion date in 2022.

Worldsensing provides smart cities and industrial customers with tools to understand the performance of distributed infrastructure, improve efficiency and make predictions.

Worldsensing pioneers IoT deployments

The Grand Paris Metro project is one of the largest, urban, public transportation projects of the 21st century. According to the Société du Grand Paris, the project will culminate in a new metro for the capital of France, providing connections to developing neighborhoods, three major Parisian airports, business districts and research centres.

The Grand Paris Express will serve 165,000 companies and transport two million commuters daily, creating vast new opportunities for economic development.

By using Industrial IoT (IIoT) communications technology, Worldsensing needed to create nodes for the Paris Metro project that could gather data from sensors installed deep in metro tunnels. These critical sensors are needed to measure tunnel structural data including changes in incline and positioning, load, structural strain and structural deformation. The safety of construction workers and the citizens of Paris can be enhanced through carefully aggregated and analysed real-time data from these sensors.

To achieve these goals, Worldsensing needed a communications infrastructure and services partner that could supply a high quality, reliable, wireless solution that would also minimise node power consumption, as the node batteries needed to last through to 2022.

Kerlink was able to provide the answer with a Low power wide area network (LPWAN) IoT solution, deploying a solution with a set of gateways and support services. The combination of Kerlink Wirnet Stations and network design support was the right set of hardware and services to power Worldsensing's 400 Loadsensing nodes.

"Our solution for the Grand Paris Metro project needed end-to-end quality and monitoring, from sensor to node to gateway," said Juan Perez, the product manager for Loadsensing and ▶

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"Our solution for the Grand Paris Metro project needed end-to-end quality and monitoring, from sensor to node to gateway,"

Worldsensing. "Kerlink's LoRaWAN and Wirnet Stations filled an important gap for us."

The technology solution from Kerlink will support longevity and safety requirements of the nodes, provide deep indoor coverage and offer bi-directional node communication for remote maintenance, diagnostics and software and firmware updates.

"Kerlink's design and attention to detail made interactions with Kerlink exceptional," added Perez.

Worldsensing believes that IoT solutions will continue to drive its business growth. In the future, Worldsensing is looking at additional LoRaWAN-powered solutions for other applications including above ground bridge repair, construction site monitoring, mine monitoring, smart parking and asset management. Worldsensing knows that having accurate, real-time smart city construction and monitoring data helps services companies meet timelines, lower costs and maximise personal safety of workers and citizens.



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How smart are smart factories now?

There was a lot of talk about Industry 4.0 and smart factories in 2016. Since then the cost of connectivity – through the efforts of the LoRa Alliance and developments in the cellular technology NB-IoT, for example – and of sensors have fallen dramatically. But how much progress have we made towards those goals? What have we learned and where are the roadblocks, asks Annie Turner

At the IoT TechExpo Global 2018 in mid-April in London, the consensus was companies are concentrating on how IoT can improve productivity and efficiency

Let's recap: Industry 4.0 describes the next era of industrialisation also known as the fourth Industrial Revolution. The first revolution was the beginning of mechanisation, powered by steam. The second was the transformation electricity brought to manufacturing and the third was the impact of IT and the start of automation. The fourth is envisioned as having more intelligence, connectivity and computing to create smart factories.

According to the author and speaker Bernard Marr, manufacturing must include the following to qualify as Industry 4.0:

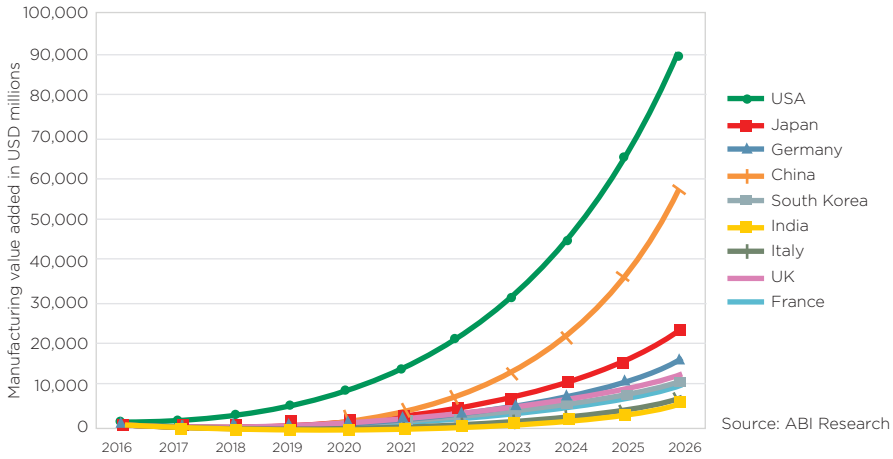
- have machines, devices, sensors and people connected and communicating;
- the systems creating a virtual copy of the physical world, based on data from sensors to put information into context;
- systems supporting humans in making decisions and solving problems, and especially with tasks that are too difficult or dangerous for people; and
- the cyber-physical systems learn as they go along, allowing them to make simple decisions and become as autonomous as possible.

This is about operations, not the business case which has proved a stumbling block for many. Now, after many pilot schemes, only some of which were successful, expectations about what can be achieved and how quickly have become more realistic. Perhaps the biggest example of this realism is that the initial exuberance of **GE** – that most famous cheerleader for IoT and industrial digitisation – has worn off. The chief executive who launched GE Digital and declared the company's aim of being a global top ten software developer by 2020 is gone. His successor acknowledges the importance of digitisation but has cut GE Digital's budget by a quarter and shifted its focus to outcomes from specific applications – like asset tagging and managing field forces, which are hardly revolutionary – rather than grand designs, and more advanced uses such digital twins, which are here to stay, but making only steady progress – see graph opposite.

At the IoT TechExpo Global 2018 in mid-April in London, the consensus was companies are concentrating on how IoT can improve productivity and efficiency – evolving what they do already, rather than new business models and disruptive innovations. As Maciej Kranz, the vice president of Strategic Innovation at **Cisco**, says, "The real payoff from IoT comes down to automating existing processes that have a large labour or time component and streamlining the related process in one way or another."

The big questions are how and when. Bernd Gross is the senior vice president for IoT and Cloud at **Software AG**, which last November teamed up with Siemens to promote Siemens' ▶

Manufacturing value added due to digital twins
54% of condition-based monitoring connections will feed into digital twins by 2026



Source: ABI Research

MindSphere – a 'cloud-based open Internet of Things (IoT) operating system for industries'. He says that there has been enough activity, "to identify certain patterns for successful projects." These are the critical steps he outlined:

- the first stages are data-driven actions. Gross stresses, "The key is not to integrate before you stabilise or you could just have a different point of failure. If you implement too fast and change processes, they can become unreliable and you have end-to-end failures." Gross advises companies to start with discrete applications such as alarm management.
- step two is about integrating the data-driven processes and moving to real-time to achieve new levels of efficiency.

- step three is when you should look to implement machine learning and artificial intelligence. Gross warns, "Too many projects look to do this before they've completed the other two steps. It can take 18 months before you have viable machine learning for your projects."

He advises, "Take your time, develop your plans, enhance your capabilities, and learn about your new world at the integration part."

How to balance this with the need for speed? Andreas Geiss, a vice president at **Siemens**, says, "Start the first step fast – now – and remember that success is not about the technology, but about having a data-centric business strategy."

The **Harley-Davidson Motor Company** is a good example of starting with the problem to devise an IoT strategy. It was facing intense global competition. At the same time, its core market was aging and its products weren't appealing to younger people. The firm's labour costs were too high, production did not align with IT and there were islands of incompatible data everywhere, according to Cisco's Kranz.

It's success story started by a handful of key people talking to their opposite numbers in teams that in industries everywhere are known for being poor at cooperating and coordinating their efforts – operational technology (OT) and IT. The instigators asked more people to join and then formed a team charged with communicating their thinking to the wider teams and other business units about gaining as many efficiencies as possible from IoT.

Kranz says that some employees went so far as to swap jobs for a while to really understand the other's issues. Now triage and troubleshooting, which used to create huge delays, are typically sorted out in a morning. The operational improvement from this alone has dramatically improved efficiency, productivity, flexibility and agility, according to Kranz.

Further, the strategic business outcomes from the changes wrought by IoT include:
- 80% percent faster decision making due to enabling the workforce;
- dramatic reductions in costs and set-up times;
- continuous asset management, enabling better decision making;
- 6.8% increase in production throughput due to asset tagging;
- 10 to 25 times improvement in build-to-order cycle times – down from 18 months to two weeks; and
- a 7 to 12% increase in equipment use, driven by IoT-enabled automation.

In combination these improvements – from just one factory – led to an increase in the company's profits of between 3% and 4%. Of course, the company's other plants are keen to emulate and expand these developments.

Nothing breeds success like success, and as confidence grows in the outcomes IoT can deliver along with a better understanding of what makes a successful deployment, factories will become increasingly smart, ultimately with the smartest of all making a successful move from evolution to revolution. ■



Maciej Kranz,
Cisco



Bernd Gross,
Software AG



Andreas Geiss,
Siemens

The Harley-Davidson Motor Company is a good example of starting with the problem to devise an IoT strategy

How to prove payback on an Industry 4.0 project

There's a lot of excitement and interest surrounding Industry 4.0 and the potential it has to improve profitability and productivity. However, even though it's early days for the concept Industry 4.0 is already making contributions to the booming automation technology sector, writes Eberhard Klotz, the head of the Industry 4.0 campaign at Festo

As industry changes amid the drive towards digitalisation, organisations are looking to achieve real business results from their engagement with new technologies. Marketing hype detailing theoretical benefits of an IoT-enabled future is no longer enough, companies want to see returns on investments in new technologies. Industry 4.0 is doing exactly this because it is backed up by specific projects, products and services.

Festo, for example, not only implements IoT functions and services into its product portfolio but also adds training and consulting for students as well as professionals, using the latest technology in its Technology Factory at Scharnhausen, Germany. Festo is a member of the Industry 4.0 platform advising the German government; it develops basic and further training concepts and measures for new career paths, and carries out visionary research in the Bionic Learning Network with autonomous and self-controlling systems such as BionicANTs or the prototypes of interactive, collaborative, pneumatic 7-axis robots like the BionicCobot.

Festo is already delivering some real automation technology products for the fourth industrial revolution

Industry 4.0 products: from the mechanics up to the cloud

Festo is already delivering some real automation technology products for the fourth industrial revolution: integrated drive packages, modular valve terminals with open platform communications (OPC) universal architecture (UA) and IoT gateways, decentralised CODESYS controllers and autonomous mechatronic subsystems with IP20 or IP65. In addition, there are IoT driven apps and services, valuable dashboards for some products and complete subsystems. Festo is able to provide consistent connectivity from the mechanics up to flexible and multiple cloud concepts.

Festo, in contrast to consultancies, has the advantage that it can draw on a wealth of user experience from pilot production projects in the Scharnhausen Technology Plant. This includes topics such as energy management and optimisation as well as innovative one-piece-flow concepts based on standardised networking, mobile maintenance with tablets or automated, flexible test systems for individual products. This experience is also incorporated into Festo's own products.

Big data analytics figure out bottlenecks to reduce cycle time by 15%

The example described below refers to a significant 15% improvement in performance and quantity output of a new assembly line enabled by big data analytics. It highlights, how Festo's new automation platforms with IP20 and IP65, IoT gateways and a direct link to a cloud can be basic ingredients to this success.

In this example, a large assembly line is designed to operate mass production as well as lot size 1. Current customers demand lot size 200-2,000. The volume each year adds up to 1.2 million at a cycle time of 13 sec.

The change of the batches is done by SAP ME/order management, but inside the machine radio frequency identification (RFID) at each work station triggers all parameters per station.

The technical basics of this assembly line are mechatronic subsystems in all machine cells, which are operated by decentralised control concepts for the electric and pneumatic drives and actuators. All stations provide all data relevant to operate and maintain the line in a unified digital format, and are networked with all testing stations and quality systems. Data which is relevant for the machine operation is processed locally in real-time. All data from around about 400 IP addresses in total is gathered, condensed and provided via OPC UA to either support motion control, or analytics by a PC or a cloud-based solution.

Such a concept generates first of all a mass of data. That requires different machine personnel ▶

Figure 1: Big data and cloud analytics help to raise overall equipment effectiveness (OEE). Festo proved a 15% increase in productivity after a successful big data analysis highlighted bottlenecks which could then be overcome.



After two years in operation a first big data analysis was executed and turned out to be highly valuable

with additional skills for the data analytics that are possible –and necessary. You need data scientists to get the most value out of your data in this scenario as illustrated in **Figure 1**.

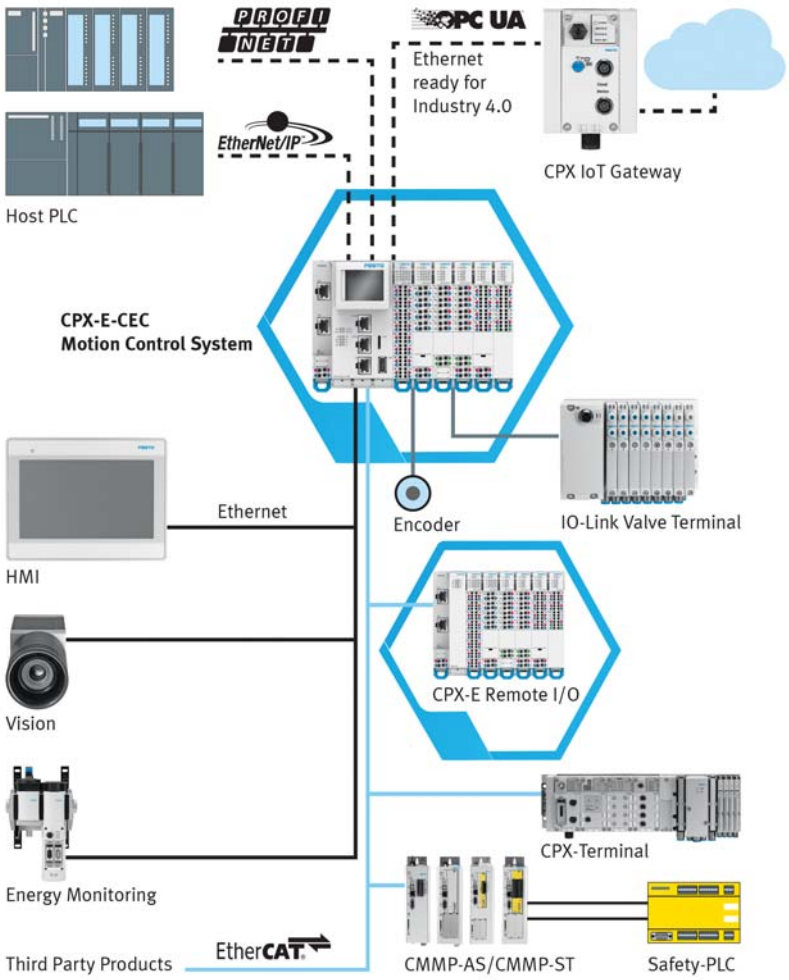
After two years in operation a first big data analysis was executed and turned out to be highly valuable. Typical patterns could clearly be found and bottlenecks were identified. It was possible to find a concept to overcome these bottlenecks and to optimise an even new machine's cycle time by 15% – from 13 to ~ 11 seconds. The changes made include modifications inside the test cells and their procedures, the work stations trigger the cell in advance and thereby save time for booting the test routing and its connectors. Other bottlenecks required a stronger central processing unit (CPU). Without data transparency, without the value of data, such an optimisation would not have been possible at all – or only after little more than guess work and trial and error approaches. This example really proves how to turn or transform a measured value into an added value.

It has to be pointed out that this example may look to some to be outstanding and exceptionally successful – and, for sure, it is because the payback period is less than one year. However, even though another example may show a much smaller effect and a payback period of two or three years: that outcome would still be highly valuable for many industries.

Automation solutions for mechatronic subsystems in Industry 4.0 environments

To get all the relevant data out of a machine and all its mechatronic subsystems, you need several ingredients. Depending on your production system, it could include seamlessly connected and integrated drive solutions in electric axes as well as pneumatics. Vision sensors, quality inspection, tracking information, energy monitoring, connection to logistics and order management/MES. A possible Festo system configuration is shown in **Figure 2**: The CPX-E system is a high-performance control system for factory automation. The system consists of individual function modules that can be used to create a modular, compact and thus very flexible (sub)system. Depending on the module combination, the system can be used as a purely remote I/O system or as a (centralised or decentralised) control system for factory or process automation.

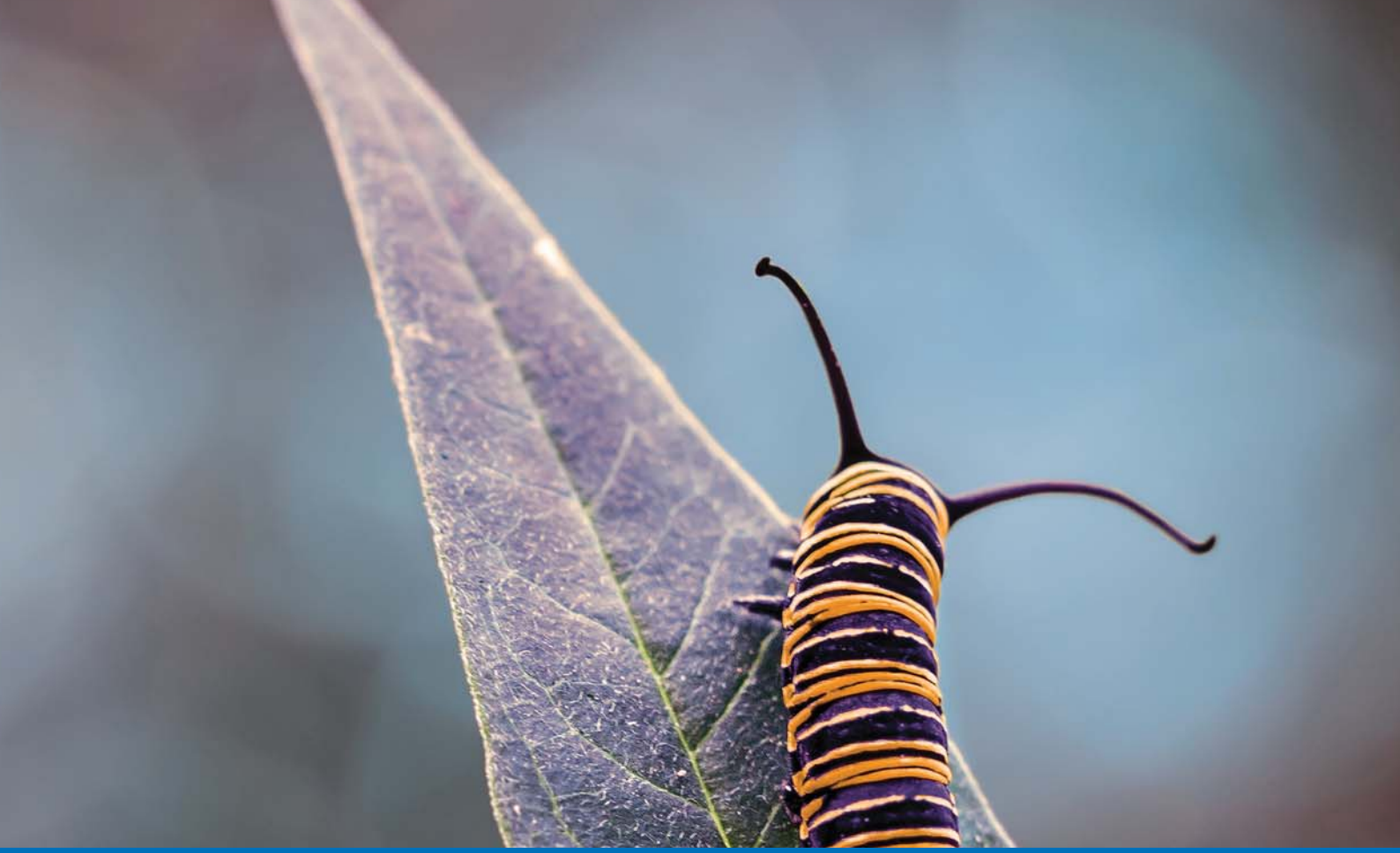
System configuration and integration



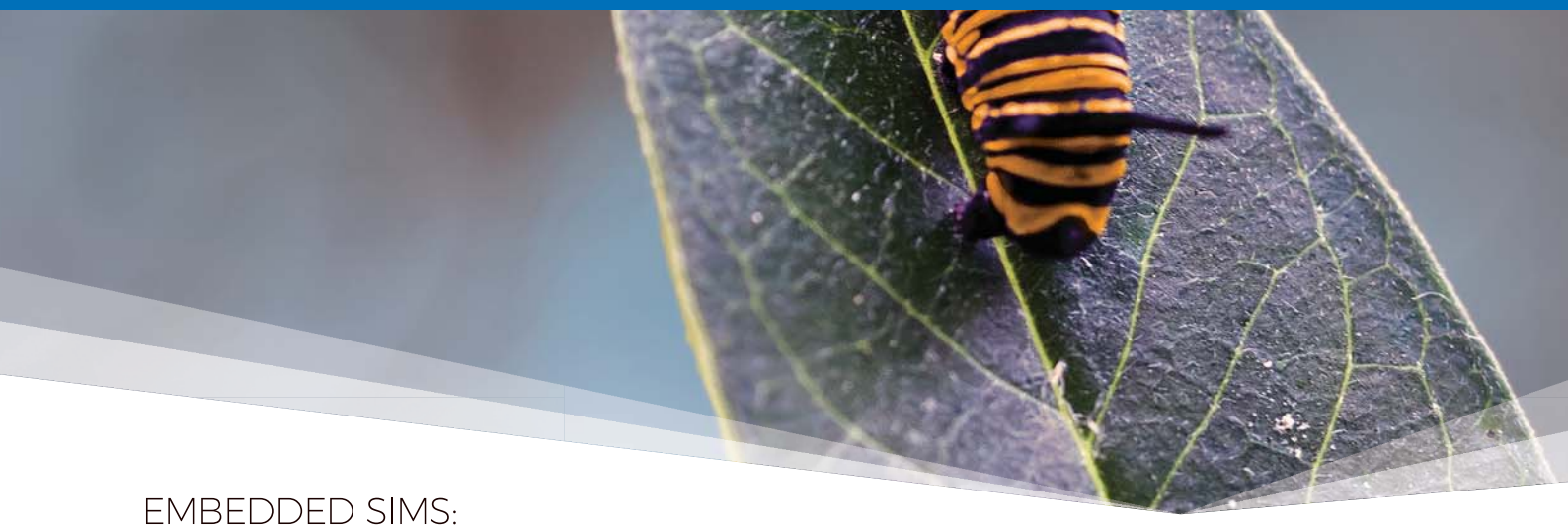
Festo can thus offer a consistent portfolio for the decentralised automation of sub-systems and small machines/installations with IP20 (CPX-E platform) and IP65 (CPX platform), all in line with a flexible Industry 4.0 host environment including the CPX-IOT gateway, which is coming soon, and the first customised dashboards in the clouds of Festo, Siemens MindSphere or Rockwell FactoryTalk. What we use as a success factor in our own production environment we also share with our customers: Together, we are the engineers of productivity.

Figure 2: Possible system configuration and integration: seamless connectivity from the mechanics up to the cloud with electric and pneumatic drive technology from a single source.

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eUICCs (embedded SIMs) offer users the ability to shed old, locked-in connectivity profiles and switch service providers with over-the-air (OTA) updates, without needing to physically change the SIM card itself.

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How enterprises and mobile operators can harness the power of eUICCs and eSIMs to simplify and gain flexibility for their IoT connectivity



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Stream's managed end-to-end eUICC connectivity service eliminates need to manage multiple contracts and orchestrate underlying systems

As embedded universal integrated circuit cards (eUICCs) and embedded subscriber identification modules (eSIMs) begin to be rolled out enterprises and mobile network operators are being freed from the constraints of having to manage contracts with multiple providers in different countries in order to support IoT deployments. Mohsen Shakoor, who leads strategic partnerships at Stream Technologies, and his colleague Robert Shah, a product manager at the company, tell IoT Now how eUICC is transforming the IoT connectivity landscape

IoT Now: How can Stream Technologies help global enterprises take advantage of eUICC?

Mohsen Shakoor: As a global M2M/IoT connectivity provider and enabler since 2000, Stream has historically simplified global connectivity for enterprise customers, providing a single platform to orchestrate connectivity whilst also providing competitive global wholesale connectivity across multiple mobile network operators (MNOs) and geographies. eUICC is an innovative and cutting-edge technology presenting and promising tremendous benefits for enterprises, and is a natural evolution and fit with the functionality of the Stream IoT-X platform.

As global enterprises enter the fragmented eUICC and connectivity arena, they are rapidly realising ▶



> ***The true opportunity that eUICC presents for global enterprises is to simplify logistics and reduce costs***

the complexity of the overall solution which requires orchestration of a multitude of inter-related elements, which includes the inherent restrictions of underlying platforms such as legacy connectivity management platforms.

The true opportunity that eUICC presents for global enterprises is to simplify logistics and reduce costs. There are many ways that Stream provides these benefits to the enterprises to enable them to truly take advantage of the opportunity presented by eUICC. Stream provides a managed end-to-end eUICC connectivity service, eliminating the need for the enterprise to sign contracts with multiple parties and develop infrastructure and systems to orchestrate the underlying systems. In short, we enable the global enterprise to insert, or integrate eUICC SIMs into their devices anywhere, and deploy anywhere; ensuring that devices have access to the appropriate eSIM profiles and wholesale rates - drastically simplifying supply chain processes and reducing costs.

Proprietary multi-international mobile subscriber identities (IMSI) and traditional roaming solutions would still result in the enterprise establishing and maintaining separate processes for devices that would eventually be deployed in different regions and inevitably have contact with multiple CSPs and require managed connectivity across multiple platforms. Stream's eUICC solution streamlines the enterprise's logistics resulting in significant cost savings. Furthermore, Stream unlocks new revenue streams through IoT-X's ability to enable global enterprises to re-sell connectivity to the market with competitive rates that Stream has established to date and continues to strengthen through its global commercial reach.

IoT Now: How does Stream simplify this process for large scale enterprises connecting globally?

Robert Shah: Whilst the market is fast realising that the adoption of eSIMs is inescapable, it was not foreseeable. As a result, many platforms provided by traditional vendors have limited support for eSIM and will continue to be restricted by their heavy technical approach. Naturally, this impacts the capabilities of the individual MNOs that subscribe to their services, leaving the enterprise with multiple providers and systems to maintain their connectivity. In contrast, IoT-X's agile network, infrastructure and integration methodology truly simplifies the process for enterprises to adopt and scale with eSIM.

Since its inception, Stream has provided standards based multi-MNO approach, coupled with cutting edge IoT network infrastructure and management ▶

> ***Stream acts as a single provider of global eUICC connectivity and orchestration for the global enterprise***

technologies via IoT-X. This has historically simplified connectivity at any scale for enterprises. eUICC truly lends itself to the existing capabilities provided by Stream which, coupled with recent enhancements, distinguishes Stream as a leading player. Through a single contractual relationship with Stream, enterprises can access multiple eSIM profiles to meet different needs, ranging from local in-country profile/connectivity to regional and global roaming profiles.

Stream continues to invest in the development of its footprint, which can be utilised by enterprises even if the new profile is on-boarded a year after the device has been deployed. This flexibility removes the historic vendor lock-in issue that has prevented enterprises from deploying effectively at a global scale. Through a single platform and underlying network infrastructure, enterprises can orchestrate and monetise their connectivity whether it is or not eSIM based, across multiple MNOs, geographies and technologies. From a commercial perspective, Stream eliminates the need for enterprises to agree contracts directly with multiple MNOs, instead Stream acts as the single vendor for global connectivity with competitive rates that enterprises would not typically have access to directly with MNOs.

IoT Now: What are the unique features that help drive this and what are the benefits of managing eSIM with IoT-X?

MS: IoT-X simplifies the fragmented eSIM and IoT connectivity ecosystem, resulting in several benefits for anyone seeking to adopt IoT-X, be it a global enterprise, original equipment manufacturer (OEM), MNO or mobile virtual network operator (MVNO). The approach enables zero touch provisioning and automation to meet sophisticated needs per individual user. From an internet protocol (IP) infrastructure perspective, all networks that are integrated to IoT-X are done so in a unified manner whereby the traffic is routed over Stream's global access point name (APN), a gateway that ensures secure data transit for any connection.

This approach results in the APN setting remaining consistent even when the eSIM profile changes from MNO A to B, enabling a hassle free and seamless swap in MNO service. Users of IoT-X can manage eSIM profiles manually via a graphical user interface (GUI) and application programme interfaces (APIs); as well as automating the profile swap based on business rules such as location. As a result, if a device goes from country A to B, the eSIM profile can dynamically swap per the pre-defined rules.

The automation extends to the rate plan on the subscription. Users do not need to manage their connectivity via the platform but can be assured that their subscriptions automate as per the specific rules configured on the platform. Regardless of which eSIM profile the subscriber connects to, IoT-X users have a unified experience both via UI and API, gaining access to deep analytics, billing, monitoring and lifecycle administration. Furthermore, IoT-X's capabilities are not just restricted to cellular connectivity, but any type of network, including satellite and low power wider area networks (LPWANs).

IoT Now: Why don't the enterprises do this themselves?

RS: The reality is that it is not so simple! The overall solution requires orchestration of various elements, that are core to the functionality of the solution. The global enterprise has a choice to either procure a managed service by a partner like Stream or invest in the development of their own systems. The latter would require significant up-front and ongoing investment, not to mention the slow time to market irrespective of the investment made.

A high level overview of the technical hurdles to overcome in order for the enterprise to do it themselves includes the need for the system that ▶

> ***There are two ways that the MNO can capture business from global enterprises via eSIM: directly and indirectly***

they develop to integrate with different types of network infrastructures from different MNOs and different platforms for connectivity management – that is, of course, if that MNO is one of the few who has a communication management platform (CMP), be it proprietary or such as that provided by Cisco Jasper or Ericsson. In addition, they will need an integration to multiple underlying remote SIM provisioning (RSP) systems such as those provided by IDEMIA, G+D and Gemalto. It becomes further complicated if the global enterprise is seeking to on-bill its own customers, which would result in the procurement or development of yet another system for IoT/M2M traffic rating and billing.

Stream acts as a single provider of global eUICC connectivity and orchestration for the global enterprise. Stream's unique infrastructure and IoT-X platform provides users with deep insight into their connectivity regardless of whether it is eUICC or non-eUICC based, regardless of operator type, regardless of underlying systems – CMPs and RSPs – and regardless of geography. Our unique infrastructure allows us to on-board and integrate new network operator partners in weeks.

In addition, Stream has a strategic footprint that has been developed since launching Europe's first cellular M2M tariff in 2002. This means the enterprise does not need to contract with multiple MNOs, but simply enter a single agreement with Stream to access a global footprint and competitive rates. Stream's commercial and technical agility also allows the enterprise to bring its own connectivity to be integrated to IoT-X.

IoT Now: What opportunity does eSIM present for MNOs and how does Stream help MNOs capture this?

MS: MNOs traditionally service their domestic customers by providing connectivity on their own network or roaming options for international connectivity which comes with several restrictions recognised widely by the market. MNOs are unable to service global enterprises, as they have a multi-geography multi-MNO requirement which is something typically offered by managed connectivity service providers – or IoT MVNOs; as a result they have and continue to win significant global contracts.

There are two ways that the MNO can capture business from global enterprises via eUICC: directly and indirectly. For the indirect approach, the MNO can make its eSIM profile available to the rare types of managed connectivity service providers like Stream which possess technology to orchestrate connectivity and eSIM profiles from multiple MNOs and provide an end-to-end managed service to the enterprise client. This is something that traditional MNOs resist, but local competing MNOs are capturing.

For the direct approach, MNOs have an opportunity to challenge the status quo for connectivity by truly taking advantage of eSIM and enabling themselves as a hybrid of an MNO and MVNO. This means that the local MNO partners use their international counterparts to re-sell their profiles and wholesale connectivity. This approach is different from existing agreements between MNOs, which are centred around traditional roaming. As described previously, the commercial aspect is not the only barrier that exists, it is largely the technology.

Consider an MNO which is one of the few that has a CMP. It is extremely likely that their existing CMP will at best only allow them to provide their customers with visibility of connections on the MNOs who also subscribe the that CMP. That is also assuming that the CMP has eUICC capabilities. Stream not only provides the MNOs with the technology to overlay underlying CMPs and orchestrate eSIM profiles from multiple MNOs, but also the wholesale rates meaning the MNO does not need to establish individual agreements with MNOs. ■

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Robin Duke-Woolley,
Beecham Research

Who needs eSIM for IoT?

Beecham Research has been researching and assisting with strategy development in the IoT market for nearly 18 years. In this article, chief executive Robin Duke-Woolley explores the opportunities and challenges of introducing eSIM and embedded universal integrated circuit cards (eUICCs)

The quick answer to this question is – everyone. The somewhat longer answer is . . . it depends. You need to look carefully at the teeth of any gift horse and eSIM is no exception. It pays to take care because the subject of SIMs is surprisingly complex. It is not just about technical solutions – the greater complexity actually lies with commercial issues.

Why is eSIM needed?

For product manufacturers (OEMs), there has never been a greater need or opportunity to connect their products to the Internet. As **Figure 1** shows, a product that is not connected stands or falls by the product offering itself. That offering cannot generate data for new services or be updated with new software features, so will quickly lose its competitive position in the market compared with others that are connected and can do these things. More than this, an unconnected product cannot be remotely maintained either and its performance in the field cannot be checked. The total value of an unconnected product resides in the product itself, whereas the total value of a connected product includes both the product and all the services created by it being connected.

In essence, that means a product that is not connected is likely to have an increasingly serious competitive disadvantage compared with a similar competitive product that is connected, and is therefore less likely to prevail in the longer term.

OEMs in all sectors – buildings, consumer, energy, healthcare, industrial, networks, retail, security/public safety and transport – must now develop service strategies for their offerings in order to compete in their own future market, unless they already have. That means they must include internet connectivity for their IoT products.

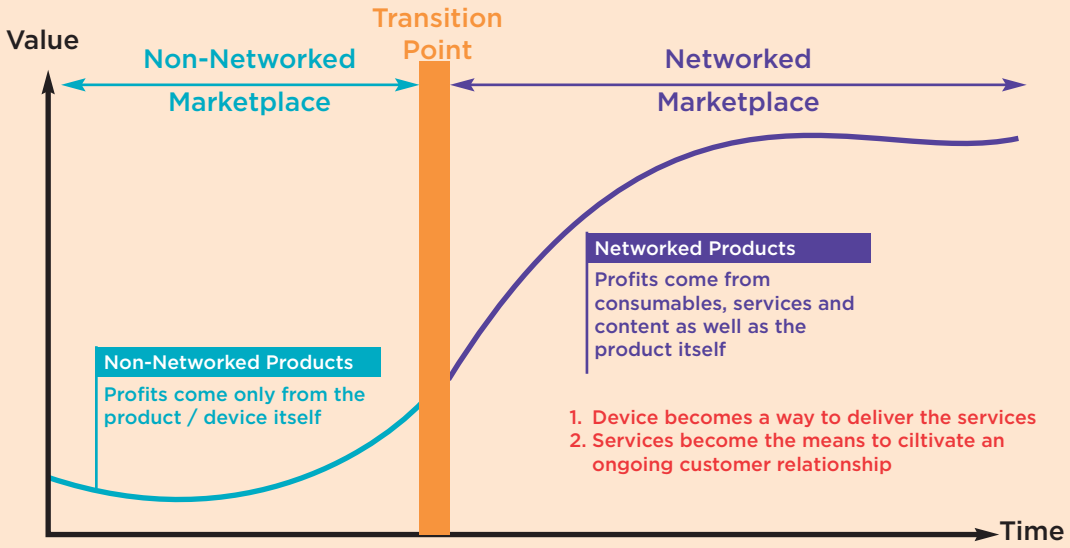
As this fact has become more widely understood, the means for connecting IoT products have become more critical. For mobile operators, the traditional SIM card is both a boon and a problem. A boon because it provides increasingly important security safeguards. A problem because, as the volume of connected IoT devices grows more quickly, the logistics of shipping so many SIM cards and matching them up with the right connected devices becomes ever more challenging and costly. Either the volumes get throttled by the logistical difficulties – which add potentially huge costs – or the SIM needs changing to accommodate them. This is one reason why SIM evolution is needed. Together with others it has led to both the multi international mobile subscriber identity (IMSI) and the eUICC forms of SIM.

Do we need both multi-IMSI and eUICC?

The difference between multi-IMSI and eUICC is quite subtle. The eUICC itself is a SIM capable of being remotely provisioned and comes in a range of form factors. eSIM refers to the whole solution ▶

Within a network profile are many IMSIs and a Multi IMSI approach provides the facility to change the IMSI that is active on a particular connection

Figure 1: Connected products create more value than unconnected ones



Source: Beecham Research

of providing a remotely provisioned SIM, including the hardware, software and subscription management system needed to deploy it. It is also the case that the technology for remotely provisioning a SIM has been commercially available for a few years, but initially in proprietary solutions. In response to the growing potential of this technology the GSMA, which represents the majority of mobile operators worldwide, has now created and continues to develop an eSIM specification for remote SIM provisioning that represents the industry's best approach for creating a standard. Remote SIM provisioning involves downloading a network profile and network key, which in turn requires the consent of the network operator that owns the network profile. To do a network swap requires two network profiles from different operators to be present in the SIM – the original one and the one being swapped to.

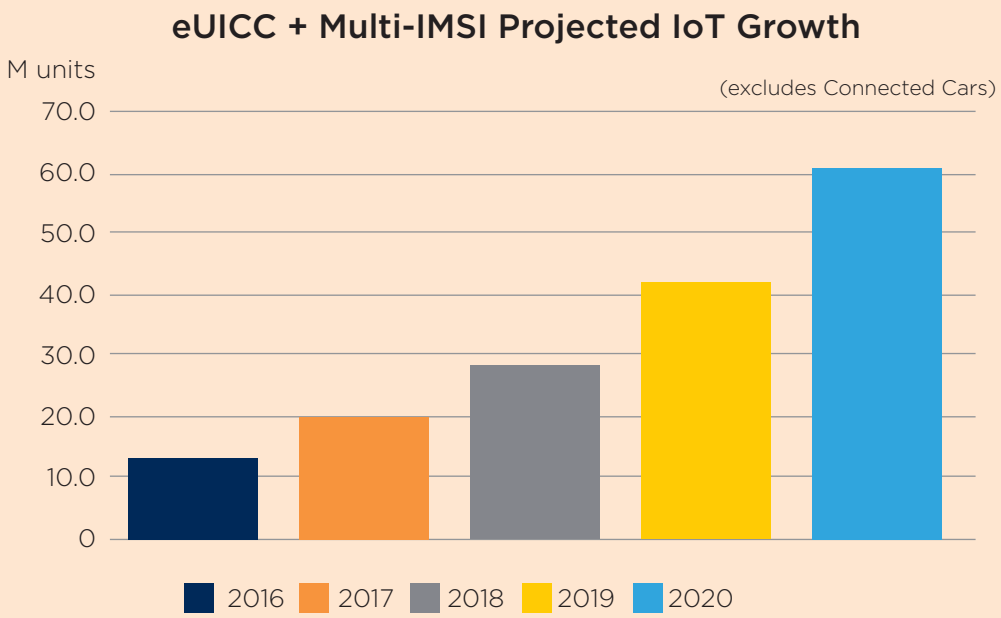
Within a network profile are many IMSIs and a Multi IMSI approach provides the facility to change the IMSI that is active on a particular connection. This can mean changing from one IMSI on one mobile network to another IMSI on another – in other words, a network swap similar in effect to an eUICC. In order to make that swap, at least two IMSIs need to be present on the SIM. Typically there is space on a SIM for several and some systems offer the facility to remotely download a new IMSI.

A key difference between the two approaches is that there are no standards for Multi IMSI – it is essentially proprietary. For eUICC there are both proprietary and standard – in the form of conforming to the GSMA Specification. It is worth noting that the GSMA is not in fact a standards-making body and does not profess to be, in the way that, for example, ETSI is. However, it saw a real need to develop a standard for eSIM to aid market development for mobile networks, particularly in the IoT space.

This development is being brought to market by a variety of market players, some new to the market and others who have helped to shape it over many years. In the latter camp is **KORE**, now a global IoT solutions provider with a long history of offering connectivity for M2M and IoT solutions. KORE in particular is working on the transition from Multi IMSI to eUICC and the GSMA version of eSIM with a particular principle in mind – what will create a rising tide that lifts all boats in the IoT market. With that in mind, proprietary is a retrograde step with true market development coming from aiding introduction of a standard as quickly as possible – even if that takes a little longer. The company has long experience of working closely with network operators and the GSMA and also with providing multi-IMSI, having been one of the pioneers introducing that to the IoT market.

Their view of this transition is therefore instructive and reflects their long experience in this market. For KORE, proprietary eSIM solutions ▶

Figure 2: eUICC and multi-IMSI projected IoT growth



Source: Beecham Research

do not provide a sufficiently significant step forward compared with multi-IMSI so the GSMA Specification of eSIM, which is still evolving, is their preferred approach. In addition, they argue that both multi-IMSI and eSIM are relevant for the future – they intend to continue offering both to suit different customer needs. Certainly, there is a real need for the market not to get sidetracked into proprietary versions of eSIM, of which there are several. Beecham Research created a GSMA paper explaining the issues of proprietary versions of eSIM, which can be viewed at this link: **http://www.beechamresearch.com/download.aspx?id=39**. This is also available on the GSMA site.

A further key issue with all of these solutions is mobile operator acceptance. Whether it is a network swap (eSIM) or IMSI swap (multi-IMSI), they can only be achieved with the consent of the network operators whose network profiles/IMSIs are involved. As often portrayed, eSIM is being introduced in the teeth of opposition from mobile operators and that they are doing all they can to slow it down. But is this really the case? Clearly, eSIM provides a much more streamlined and cost-effective method for provisioning mobile connectivity in a secure way. It lends itself to very large volume deployments in ways that traditional SIM cards could never hope to emulate. As a result, it is a certainty that introducing eSIM will substantially increase the number of connected devices on mobile networks at a much faster rate than in the past over time.

Of course, with this huge potential upside comes more risk. At contract renewal, the owner of a large number of connected devices gains the opportunity to switch mobile operator if they can secure a better deal with another one. In other words, so long as the eSIM technology and commercial undertakings – the willingness to share network profiles – operate as intended, the owner is no longer effectively locked in to their original choice of operator for the life of those devices in the field. The negotiation has a much greater chance of being a proper negotiation, which in turn means greater focus on issues other than just the cost of the connectivity – coverage, for example, and technical support. That way leads to real market development.

What is really of concern to operators is increasing the risk without the reward of much higher volumes. So, which comes first – opening up to greater risk or gaining the much higher volumes? Operators are trying to secure the second before accepting the first, because the other way round is clearly commercially unattractive. Essentially, that suggests the market for eSIM will take off initially through a series of large volume deals, rather than lots of small ones. That being the case, the continued requirement for Multi IMSI is evident.

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eUICC presents the next step towards multi-carrier, multi-platform IoT

The embedded universal integrated circuit card (eUICC) introduces a means for organisations to evade the traditional constraints of subscriber identification module (SIM) cards issued by mobile network operators under cellular connectivity contracts. These contracts have required organisations to replace operator SIMs if they wish to change provider but eUICCs enable organisations with greater flexibility and control. Here, Evan Whitelock, a product manager at Aeris, tells George Malim how eUICCs can provide organisations with greater flexibility and control of their connectivity, especially as volumes ramp up to mass scale

IoT Now: What do you see as key eUICC benefits?

Evan Whitelock: eUICC obviously is a hot topic in today's IoT world, especially around cellular connections. I think that's because of the potential the technology can deliver. The value to the customer lies in the incredible flexibility eUICC enables, which will manifest itself in different ways, according to the characteristics of specific deployments.

The most obvious of these is service assurance. In yesterday's world, you would take SIM cards from a provider and then, for better or worse, you would be locked in to that provider for, in many cases, the life of the device. Even though connectivity contracts typically are not as long as the expected lives of IoT devices, the cost of sending someone to go and switch the SIM card would defeat the purpose of changing connectivity providers. Put simply, the cost of changing a SIM outweighs any savings or service gain offered by an alternative provider.

A key eUICC benefit, therefore, is to be able to switch to an alternative provider with better service or rates and to not get locked in to an existing provider as rate reductions continue elsewhere. Don't forget there's a race to the bottom on price going on in the cellular market and no one should be committed to paying last year's – higher – price. It's also important to recognise that as more and more deployments grow to the point where real scale exists, organisations have greater buying power and can take advantage of lower cost connection rates. To take advantage of that, the flexibility offered by eUICC will be vital.

However, not all the benefits of eUICC are reality yet. This is a new technology and, while it is standardised, there has been hesitancy on the part of cellular carrier partners to dive into this. Sometimes, communication of the benefits has been overdone. For example, being able to optimise coverage based on which network has the best coverage at a given time in a given location is not quite here yet, although that capability soon will be available.

IoT Now: How are connectivity providers reacting to the emergence of eUICC? Do they fear the technology will disintermediate them?

EW: They absolutely will lose exclusivity and, for them, that's an understandable concern. The value of eUICC to customers is in the increased flexibility and control it enables. But this isn't just plucked out of the air. Operators will have to sacrifice a bit of control. It makes sense that there is some hesitancy because the subscriber numbers represented by IoT devices contribute to their total connections, and operators are very concerned about losing net additions of connections. eUICC means customers could move 50,000 units off an operator's network with a lot less effort than ever before.

Naturally, mobile operators will have some opposition to that. Also, there is the issue of ▶

eUICC obviously is a hot topic in today's IoT world, especially around cellular connections



Evan Whitelock, Aeris

The value of eUICC to customers is in the increased flexibility and control it enables

overlapping footprints between operators. Operators will be cautious about enabling customers to have control and the ability to switch back and forth between providers. Over time, this will work itself out and business agreements will be put in place to allow multiple profiles to be maintained on the eUICC. To me, it looks like the enablement of mobile number portability in the consumer cellular connectivity marketplace, and I think that's the direction eUICC deployment will take. However, the big difference is that IoT connectivity has become so commoditised and the volumes will be so large that everyone is moving to a multi-carrier approach for IoT connectivity.

Aeris is no different to any other provider in this respect as we've been working on eUICC for some years now. It's important to view eUICC as just the next big step towards a multi-carrier, multi-platform IoT. This is a traditional direction but it will be interesting to see how flexible mobile carriers are in comparison to mobile virtual network operators (MVNOs).

I think that MVNOs, for us as a carrier-neutral provider, will be more aggressive in creating the multi-carrier environment because, where possible, mobile carriers will want as much traffic as possible.

IoT Now: Do you think the benefits of eUICC are well understood?

EW: Customers absolutely should know about the concept. When you look at many of the solution creators in this market – whether they provide services or equipment – I think, traditionally, they have been experts on the challenges they solve in the world. For example, an original equipment

manufacturer (OEM) will be an expert on the challenges in their market while an application service provider (ASP) will be an expert on the service they provide. Connectivity is an afterthought and has been viewed as a necessary evil.

However, as the capabilities of eUICC become more widely available and better understood, these organisations can start to wrap their minds around what this technology can do for them.

My main concern is that there is slightly misleading information out there today that implies multiple carriers are available on a single SIM right now. We're not quite there yet but, as solutions are built around this technology, the functionality will become clearer and, if you fast forward a few years, eUICCs will become the norm. Broadly speaking, customers recognise that, as they make the next big leaps, the concept around creating an efficient, scalable, multi-carrier, multi-technology landscape will be fundamental to success.

IoT Now: Do the conflicting or inconsistent terminologies surrounding eUICC and eSIMs hamper market perception?

EW: I think so, especially because we're only now getting into the broader education of the market. I'm not very concerned about this in the long term because the message will become consistent, but today a lot of people are saying they're first to market and are bringing shallow information that can be misinterpreted.

It does seem now that you can search for eSIM or eUICC and get the same answers, and that creates a degree of confusion. In addition, there are some underlying difficulties. For example, without a subscriber management platform, you can't achieve many of the benefits of eUICC. Having said that, I really believe this is just a symptom of the introduction of any new technology. As the market place continues to be educated, everything will become much clearer.

IoT Now: Does eUICC really matter as we enter the era of over-the-air (OTA) upgrades and other flexible means of managing devices?

EW: We are in the middle of a fundamental shift in which everybody is moving towards an environment that creates flexibility. Both eUICC and OTA capabilities are part of this and, as the market is validated, will increase competition, which I view as a good thing.

The flexibility is both for the customer and the provider because it enables suppliers to broaden with whom they work and integrate. For example, greater flexibility means that deployments on another platform still can be managed by a different provider. This is where everyone is going and it is a direct reflection of the fact that no single technology or single global roaming SIM is good enough anymore.

The reality is that in order to provide the flexibility required by everybody, everything has to be on a platform and available. While eUICC is not a requirement for everyone today, in a few years it will be closer to a standard offering than a value-added one. It's an important capability, much like the security of OTA upgrades today, but it depends on the exact deployment scenario of a customer or owner of a solution as to how – and when – it will be deployed.

IoT Now: What is Aeris' approach to eUICC? What do you offer and how do you see the market developing?

EW: We view eUICC as a tremendous opportunity and we're actively moving forward with our own eUICC capabilities today. We have the objective of building out an underlying framework to support our customers so, when customers with buying power can negotiate contracts without our help, we'll have the foundation for them to do that and future-proof their solutions. They may not wish to add a second profile for five years but they can do so then as the requirements of their service dictates.

eUICC is, therefore, a solution we're committed to and it directly compliments our view of where we want to take our business. We're excited by the prospect and we continue to find new use cases and value within eUICC. The long-term potential is enormous. ■

We view eUICC as a tremendous opportunity and we're actively moving forward with our own eUICC capabilities today

www.aeris.com



eUICC development continues but mobile operators guilty of dragging their feet

Embedded universal integrated circuit cards (eUICCs) are gaining a lot of attention because of the flexibility and control they offer but, amidst the hype, there is a degree of over-promising going on about the technology's capability today. In addition, there are distinct factors which are slowing development, for instance, the idea that eUICC enables devices to swap networks on the fly according to the best capacity available is not yet reality. So what's standing in the way, asks Peter Dykes?

"Today we're not really able to change profiles on the fly, due to performance and technical constraints"

Conformity to standards is key to the wider adoption of eUICC according to some in the IoT industry. Emmanuel Routier, the vice president of verticals for IoT and analytics at **Orange Business Services**, says that as things stand, original equipment manufacturers (OEMs) wanting to benefit from changing eUICC profiles can only do so at the beginning, or end of the contract – two use cases supported by Orange in IoT and that were tested intensively with other mobile network operators (MNOs) from the Global M2M Association. So at present, for a car manufacturer with eUICCs in its cars, using the standard implemented by Orange means they can only change profiles at the car delivery stage, or at the end of the contract.

"Today we're not really able to change profiles on the fly, due to performance and technical constraints," says Routier. "One important element that the telecoms industry needs to address to make eUICC a success, is to implement the standard specifications, particularly the latest releases. To be on top of these standards you need to engage actively at **GSMA** and the standardisation bodies level. Orange is currently working with the industry to actively develop the needed evolution in standards."

"At Orange we are committed to complying with standards, to enable our customers to get the maximum flexibility," he adds. "For example, we are currently in the process of implementing version 3.2 of the eUICC standard, which will enable a SIM profile change on heterogeneous architectures. Today, you need to make sure that all of the components from MNOs, SIM card manufacturers and management platform providers, are working together."

The problem is compounded by the fact that MNOs are reluctant to make their subscription profile widely available. This is particularly important because the OEM manufacturers are increasingly being seen as a major driving force behind IoT adoption. In a recent white paper, Robin Duke-Woolley, an analyst and the chief executive of **Beecham Research**, wrote: "The big volumes of connected devices in the future will increasingly come from OEM-based applications. It is also increasingly the case that products originally designed for after-market applications

Emmanuel Routier, Orange Business Services



Robin Duke-Woolley, Beecham Research



are being adapted by their manufacturers to have integrated connectivity. It is this OEM-based category of applications that will be the real growth driver for IoT and it is therefore this category that the eUICC and eSIM solutions have primarily been designed for."

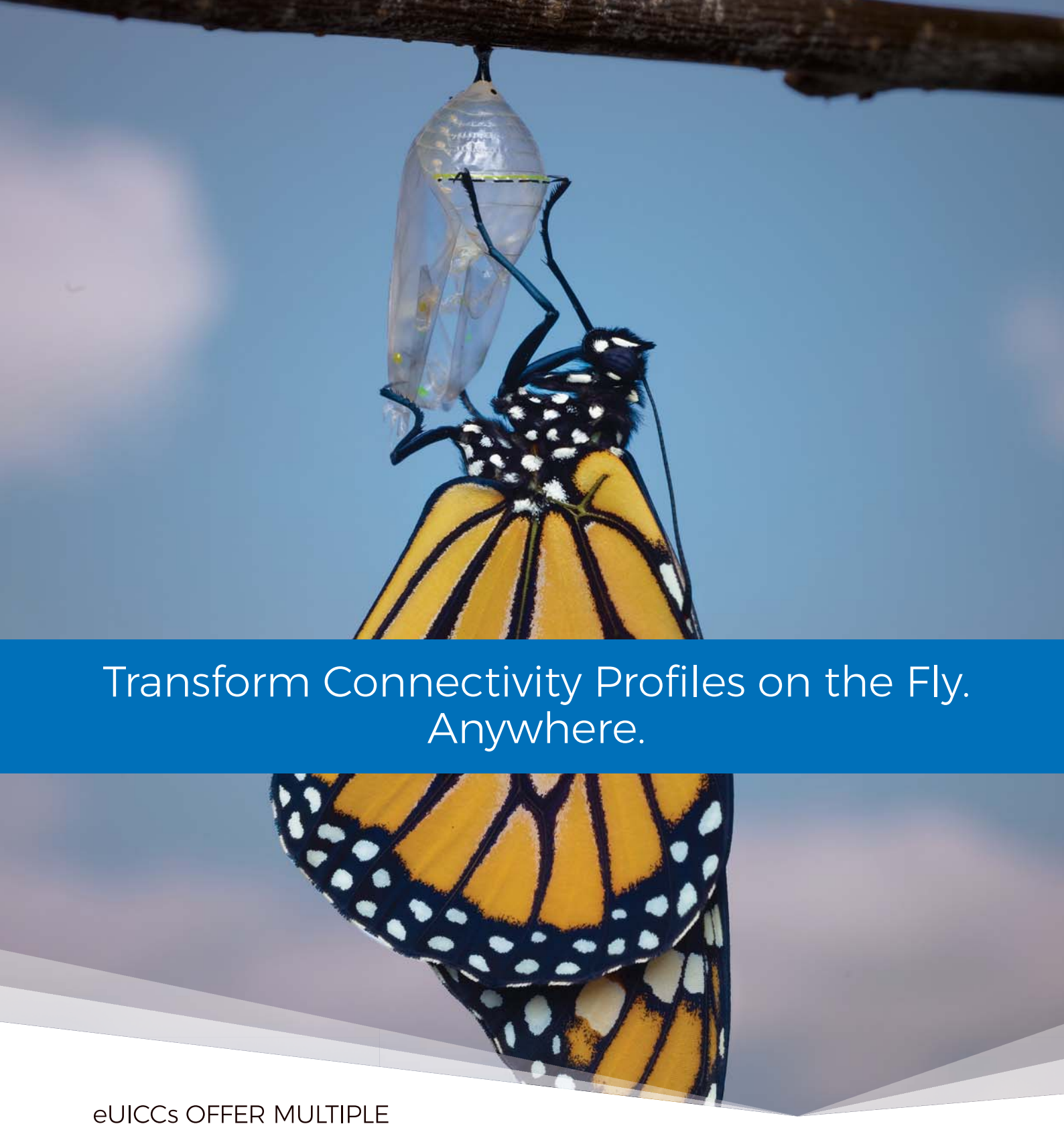
However, for the OEMs to come on board, two things need to happen, according to Evan Whitelock, senior product marketing manager for **Aeris**. First, there is the need for more education on the real capabilities of eUICC solutions and second, MNOs need to make their profiles more widely available. He believes there is a hesitation on behalf of SIM buyers today because the benefits, potential and costs of eUICC SIMs are not clear. "In many cases, inexperienced IoT solution builders are not aware of eUICCs and their potential benefit," he explains. "In other cases, the messaging in the marketplace has been slightly misleading and has caused confusion even for the more experienced IoT buyers. But as education continues to improve, and as IoT builders become more and more comfortable with eUICC SIMs, their potential benefits, and their actual value, we should see more traction over the next year."

He adds that much of what is being discussed – from many different types of industry players – focuses more on the potential capabilities such as the value proposition of coverage optimisation which is often presented as a benefit of eUICC solution. And while technically eUICC solutions can enable a coverage optimisation solution, where the strongest coverage profile can be dynamically selected at any given time – the industry does not yet have participation from the MNOs to enable such a use case.

"MNOs, largely, are still placing business restrictions around when/where/how their profiles can be used – preventing the coverage optimisation use case," adds Whitelock. "Where we see the need to continue education is around the actual value propositions that eUICC solutions can deliver today. In order for eUICC technology to reach the full potential of delivering value, MNO carrier profiles need to be widely available for enterprises to use – with limited restrictions. eUICC technology is still very new, and MNOs have yet to actively participate in what I'll call restriction-free eUICC solutions. MNOs are still looking to lock deployments onto their network, and eUICC solutions enable the mass migration of subscriptions off of their network – negatively impacting their net subscription reporting. It is difficult to predict exactly when the MNOs will begin to make their profiles widely available with limited restrictions; however, over the next two years we should start to see larger IoT deployments with buying power successfully negotiate profile control with some MNOs."

Even so, Whitelock is not optimistic about things changing overnight. "We would classify the current eUICC development stage as nearly-complete … from a technology standpoint. The technology, standards, platforms and others have all been created and specified and eUICC offerings are standardised in terms of the technology," he says. "What are still works in progress are the business rules around MNO profiles within an eUICC solution. There is still a lot of progress needed on this front before eUICC SIMs become the sole SIM for IoT. But we should continue to see progress over the coming years as eUICC deployments and demand grow."

"MNOs, largely, are still placing business restrictions around when/where/how their profiles can be used – preventing the coverage optimisation use case"



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NB-IoT networks are here, now it's time to make business

According to the Chinese zodiac, the Year of the Dog began on 16 February 2018. While the future is always shrouded in uncertainty, one of the most certain predictions for the year is that narrowband IoT (NB-IoT) will hit China's tech sector with full force. Huawei predicts 150 million NB-IoT connections by the time for next year's spring festival and China's Ministry of Industry and Information Technology (MIIT) has set a national target for 600 million NB-IoT connections by 2020, writes Tobias Ryberg, a co-founder of analyst firm Berg Insight

Elsewhere in Asia-Pacific, Europe and other regions, more than 40 mobile operators expect to see the first large-scale deployments of commercial applications based on the latest new addition to the 3GPP family of standards. The global roll-outs herald a new phase in cellular IoT with new opportunities and threats to the industry. Once the technology is in place, it is time to start making business. For hardware vendors and connectivity providers, the challenge is make sure volumes grow faster than the rate of price erosion. On the applications side, the key is to identify scalable business opportunities that appeal to large customer segments.

The next phase in cellular IoT begins now

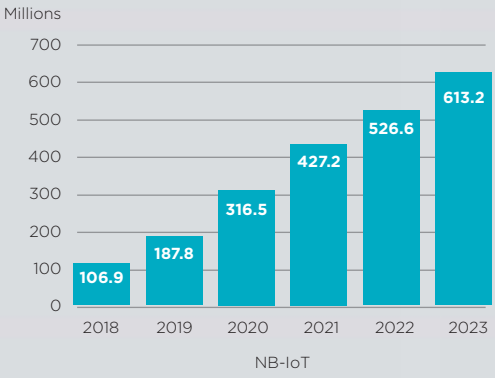
China is driving a major paradigm shift in the global cellular IoT industry. The country has embarked on one of the world's largest digital infrastructure projects that will result in billions of new connected devices in the coming five years. NB-IoT has been designated as the country's preferred low power wide area (LPWA) network technology and plays a key role in the national policies. The state-controlled mobile operators are deploying nationwide network infrastructure and subsidising hardware in a concerted effort to accelerate the transition from 2G to 4G in the already booming domestic cellular IoT market.

Similar changes are also happening at a slower pace in other parts of the world. In Europe, the leading mobile operators are making good progress towards ubiquitous coverage for NB-IoT. Vodafone has been among the leaders in the development of the standard and will roll out commercial services across all its networks until 2020. At the end of 2017, the operator had live NB-IoT services in Italy, Spain, Ireland and the Netherlands. During 2018, availability will be extended to Germany, the UK and Czechia. Deutsche Telekom launched in Germany and the Netherlands in Q2 of 2017 and plans to extend coverage to an additional six European countries.

Other European operators with live NB-IoT services in early 2018 included Orange, TIM and Telia. Telefónica will start deployments in Europe later this year. Adoption in North America is also starting to take off. T-Mobile USA switched on NB-IoT services in Las Vegas in February this year and Verizon has confirmed plans to build a nationwide network covering 2.56 million square miles by the year-end. Australia, Singapore, South Africa, South Korea, Turkey and the UAE ▶

are other examples of countries where rollouts are already underway. Supported by global network deployments, Berg Insight expects that yearly shipments of NB-IoT devices will grow at a compound annual growth rate (CAGR) of 41.8% from 106.9 million units in 2018 to 613.2 million units in 2023.

Figure 1: NB-IoT device shipment forecast (World 2018–2023)



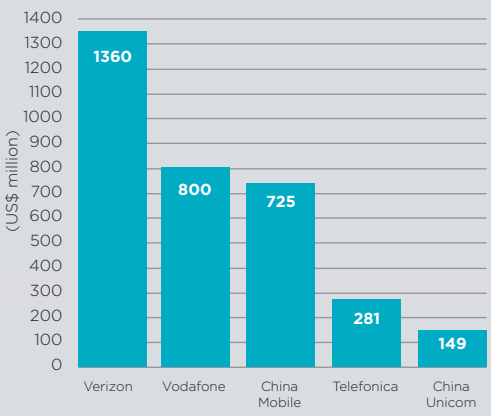
Source: Berg Insight

Turn volume growth into revenue streams

The next generation of cellular IoT networks can support an exponential increase of the number of connected devices. This capacity will be needed. China Mobile's annual report for 2017 revealed that the operator added on average ten million new cellular IoT connections per month during the year. At the end of the period the operator had 229 million connected devices. More connections do not however automatically translate into proportionate revenue growth. In the same period, China Mobile's IoT revenues increased by a more modest 44% to CNY 5.5 billion (US$725m). That is roughly half of Verizon's IoT business and less than Vodafone generated from an installed base of 67 million connected devices.

Calculated based on the average number of connected devices on the China Mobile's network over the year, the average revenue per device dropped by 48% from CNY 64 (US$8.4) in 2016 to CNY 33 (US$4.4) in 2017. There are two possible explanations for those results. Either the bulk of the new devices connected in the year generate extremely low ARPU, or else there is a significant share of non-revenue generating devices included in the operator's IoT subscriber base. There are indeed some question marks around the sustainability of the Chinese IoT market and its exceptional growth. Recent footage showing piles of smart bikes rounded up by city authorities to be discarded just a few months after they were put into use and that must be taken as a worrying sign. ▶

Figure 2: Mobile operator IoT revenues 2017



Note: Only operators reporting IoT revenues separately are included

The biggest challenge for traditional telecoms players in the next phase of the development of IoT will be how to turn massive volume growth into significant revenue streams. Typical NB-IoT use-cases with expected yearly revenue streams of US$1 per connection must be deployed at immense scale to generate meaningful cash flows. One way of achieving this will be to tap into new application areas where NB-IoT is an important enabling technology such as Industry 4.0 and connected consumer products. Verizon reported the highest public IoT revenue figure among the world's mobile operators of US$1.4bn in 2017, largely because it is the world's largest provider of fleet management services for commercial vehicles. The players who identify and monetise similar opportunities in emerging application areas like asset management and transport tracking will be well positioned to become future revenue leaders in cellular IoT.

Industry 4.0 gains momentum

NB-IoT and other LPWA technologies create new opportunities for intelligent networking and automation in the enterprise and consumer space. A web of connectivity reaching from the supply chain to the end consumer can reduce cost and improve the customer experience. Industry 4.0 is a name for the current trend of automation and data exchange in manufacturing technologies. From a cellular IoT perspective, the main implication of the concept is that the flow of raw materials, parts, components and finished goods will be networked. The networking requires the presence of communication technology in transport vehicles, pallets and parcels. Beyond the point of manufacturing, the same form of connectivity will be required in the distribution chain, across distributors, retailers and into home delivery.

Manufacturing companies are starting to develop Industry 4.0 concepts for their supply chains. Many consumer brands are experimenting with connected products. In between, transport and logistics companies have long experience of tracking goods and now look to the opportunities with real-time tracking on a resolution down to individual packages. Adoption in developed economies is mostly market-driven with enterprises going through cycles of pilots, evaluation and implementation based on return on investment (ROI) calculations. The process is protracted and complex due to the number of players involved in any value chain. China is taking a very direct approach, essentially mandating that the largely state-controlled enterprise sector must implement Industry 4.0 concepts as quickly as possible. It remains to be seen if the eastern or western approach will be more successful from an economic point of view. From a technology perspective, China's push will however certainly drive innovation and reduce the cost of communication technologies by creating massive demand.

Industry 4.0 will drive demand for LPWA connectivity especially in supply-chains. One of the main volume applications will be ultra-low-cost tracking devices. At some point, radio frequency identification (RFID) tags and barcodes will be replaced by active trackers. There is a growing consensus in the transportation industry that pallet tracking becomes economically viable at a unit cost around US$5. Active tracking of individual parcels is today economically viable on high-value products. Lower cost and infrastructure for recycling trackers will progressively lower the threshold. Technology innovations like printable RF chipsets and disposable batteries for one-time use will be key enablers for volume growth. ▶

Redefine consumer experiences through connectivity

The concept behind Industry 4.0 applies equally well to consumer markets. Post-sale, the digitised consumer brands of the 21st century will seek to build a web of connected products to build a stronger relationship to customers and offer improved customer experiences. The prime example is the smartphone, through which brands like Apple and Samsung interact with consumers on a daily basis. Many consumer products will increasingly resemble smartphones by becoming more dynamic and interactive. Whitegoods and other home appliances will be early volume segments.

One example of future trends can be seen in air conditioners. Leading Chinese brands are adding connectivity to their products for multiple reasons. It improves the customer experience by allowing the consumer to switch the appliance on and off remotely. The same capabilities can also be used to participate in energy management schemes where the local power utility can switch off loads to avoid demand peaks. On top of that, connectivity enables a new business model where cooling is sold as a service. In emerging economies with booming urban populations who live on low income, pay-as-you-go business models have already proven highly successful in the mobile industry. Applying the same model to consumer appliances has a great potential for generating growth. The early efforts of the bike sharing industry can provide a glimpse of the future.

Connected consumer products will become prevalent in all parts of the world. There will however be significant differences in how products are being networked. In developed economies with high fixed broadband penetration, smart home gateways and managed Wi-Fi/Bluetooth connectivity will be key enablers. In mobile-first markets, cellular is the only connectivity option. Therefore, connected consumer products will predominantly use ultra-low-cost cellular communication. The trend is starting in China and will eventually spread to other regions. NB-IoT is going to be the primary enabling technology, with 2G as an intermediary solution for early adopters.

OEMs versus aftermarket and the rise of new service provider categories

The Industry 4.0 technology landscape offers significant opportunities for new categories of IoT solution providers. General packet radio service (GPRS) enabled the rise of telematics service providers that today offer a wide range of applications for connected cars and fleet management. NB-IoT will similarly enable the rise of dedicated service providers in the fields of asset management and transport tracking. Just as in vehicle telematics, there will be both original equipment manufacturer (OEM) and aftermarket solutions available on the market. A key lesson learned from the telematics industry is that aftermarket providers are more flexible than OEMs and faster to market with new innovations. On the other hand, OEMs have an advantage in developing more advanced applications as they have full access to all data in their own products.

Asset management is an application area where aftermarket solutions have major advantages. Any organization that decides to network all of its assets will have to deal with a significant installed base where connectivity will be retrofitted. The biggest challenge of such a project is how to access more than just basic physical data like position, acceleration and temperature. The telematics industry was lucky to have the standardised on-board diagnostics (OBD2) interface available in all vehicles. Originally intended for engine inspection, it was able to provide rich data about the status and condition of the vehicle. Asset management solution providers would benefit greatly from a ▶

similar standardised interface for embedded systems. OEM solutions can provide higher value, but only for specific asset categories.

Transport tracking is even more open for third party solutions. Complex industrial supply chains involve multiple parties and modes of transport. The digital organisations that want real-time information about the flow of goods and products will be able to do that by keeping track of containers, pallets and parcels. The primary role of a transport tracking solution provider will be to make those objects intelligent and networked so that they can sense their contents, track their movements and report this information.

NB-IoT meets the technical requirements for container and pallet tracking, but not for parcels. Apart from the cost, the environmental aspect of disposable trackers is highly troublesome. A potential solution to the problem can be found in the beverage industry where billions of cans and bottles are being recycled through an extensive network of machines. An intelligent connected parcel, which can be recycled at the nearest convenience store, would revolutionise e-commerce. ■



Tobias Ryberg,
Berg Insight

BERG INSIGHT

About Berg Insight

Berg Insight is dedicated M2M/IoT market research firm based in Sweden. We have been specialising in all major M2M/IoT verticals such as fleet management, car telematics, smart metering, smart homes, mHealth and industrial M2M since 2004. Our vision is to be the most valuable source of intelligence for our customers. Berg Insight can offer numerous market reports, detailed market forecast databases and advisory services. We provide custom research tailored to your requirements including focused research papers, business case analysis, go-to-market strategies and bespoke market forecasting.

Our clients include many of the world's largest mobile operators, vehicle OEMs, fleet management solution providers, wireless device vendors, content providers, investment firms and venture capitalists, IT companies, technology start-ups and specialist consultants. We have provided analytical services to 850 clients in 70 countries to date. If you have any questions about our market report subscriptions and advisory services or simply want to understand how Berg Insight can help you, don't hesitate to contact us at **info@berginsight.com**

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Shanghai, China - 9-10 May 2018
info@industry-platform.com

Digital Transformation World 2018 – TM Forum
NICE, France - 14-16 May, 2018
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The Industrial IoT Event
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http://www.iiotevent.com/atlanta/registration.aspx

Blockchain 360
London, UK - 12-14 June 2018
https://blockchain-expo.com/europe/



IoT World Europe
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https://get.knect365.com/iot-world-europe

Connected Britain 2018
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https://www.terrapinn.com/conference/connected-britain/index.stm

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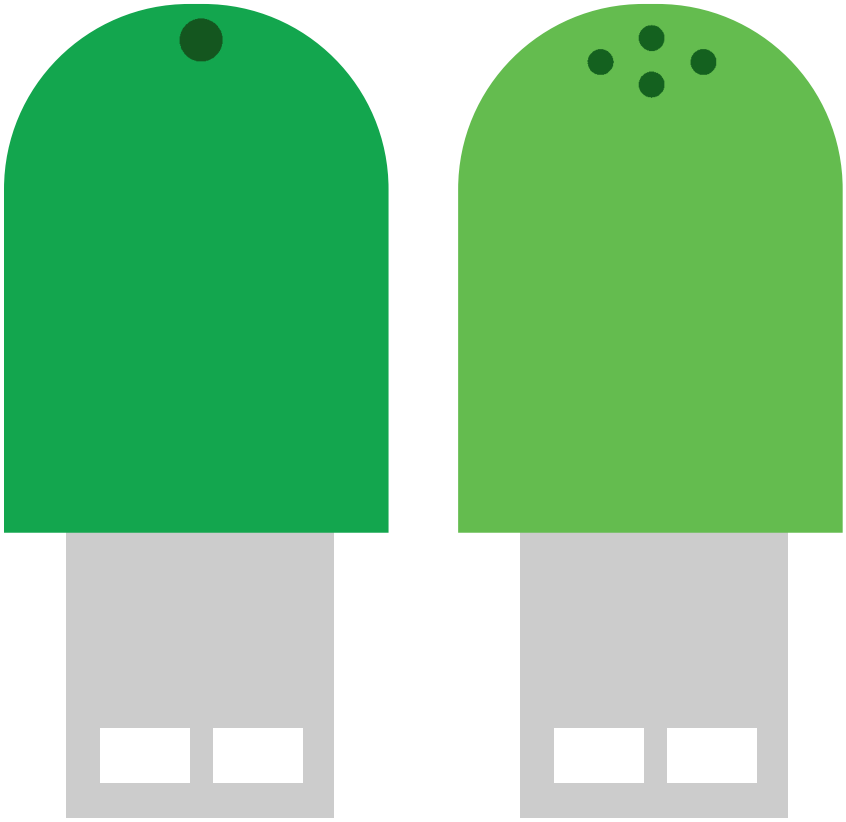


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IoT now

HOW TO RUN AN IoT ENABLED BUSINESS



Guide to Internet of Things World 2018

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Software AG's Bernd Gross says IoT success relies on rapid implementation, open platforms and security throughout

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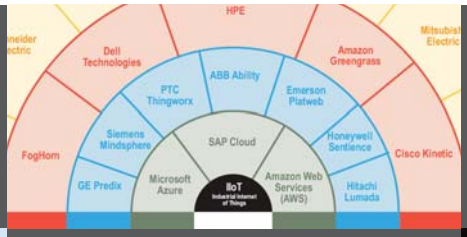
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S6 INTERVIEW



S14 IoT GLOBAL AWARDS WINNERS



S10 PARTNER SELECTION





S12 EVENT PREVIEW

IN THIS ISSUE

S4 NEWS
The latest from across the Internet of Things

S6 INTERVIEW
Software AG's Bernd Gross tells George Malim that rapid implementation, open platforms and security throughout make up the ingredients for IoT success

S10 PARTNER SELECTION
Annie Turner seeks out the tips and tricks for picking the right IoT partners

S12 EVENT PREVIEW
IoT Now provides its preview of this year's Internet of Things World conference and exhibition

S14 IoT GLOBAL AWARDS
The winners of the inaugural IoT Global Awards are announced

S16 FEATURE
Paul Hughes says in the search for IoT profits there's much that can be learned from your partners

S18 FEATURE
Alison Mitchell emphasises that IoT is for SMEs too

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IoT helps German researchers tackle North Sea plastic pollution



IoT is tracking drift patterns

SPOT Trace and **Globalstar** satellite communications are helping researchers at the **University of Oldenburg** in Germany better understand and combat plastic pollution in the North Sea.

A team from the University's Institute of Chemistry and Biology of the Marine Environment is studying the movement of floating plastic pollution to get a clear picture of the drift patterns. PhD student Jens Meyerjürgens explains: "We embed low-cost satellite trackers into floating buoys which provide a wealth of information on the movement of plastics on the sea's surface. This helps us understand how plastic debris moves and how it is affected by the complex interaction of wind, current and tides."

Buoys are fitted with a 7×5 cm SPOT Trace device which includes an integrated GPS receiver, simplex transponder and motion sensor. This Internet of Things (IoT) solution allows researchers to accurately track drift movement using the Globalstar LEO (Low-Earth Orbit) satellite constellation.

Using sophisticated modelling tools to analyse complex ocean currents at the surface, the team can study the movement of waste on the ocean. The University's 3D computer simulation programmes use the data from the SPOT Trace devices, including depth and wave height, to understand and predict surface drift behaviour as well as how debris travels in the water column and on the sea floor.

One of the most revealing discoveries so far has been the huge effect of wind, with some buoys beaching in as little as one month having travelled up to 700 miles: "It is clear that the influence of the power of the wind on the movement of floating particles in the North Sea is greater than we anticipated," said Meyerjürgens.

Mark O'Connell, the general manager for EMEA at Globalstar, added: "Global awareness of the gravity and scale of pollutants in our oceans is at an all-time high. We are proud that our satellite communications are helping the University of Oldenburg research team to better understand ocean behaviour, enabling them to deliver solid scientific evidence to stakeholders to tackle the pressing issue of plastic pollution."

NEWS IN BRIEF

Electric Imp and Microsoft partner to accelerate secure IoT connectivity

Electric Imp, a global provider providing secure edge-to-enterprise IoT connectivity, announced that it will offer Azure-based managed services on its IoT platform. Commercial and industrial users can take advantage of Azure IoT Hub and Electric Imp's scalable and secure connectivity platform to simplify retrofits of new and existing products for end-to-end IoT applications. The new offering expands Electric Imp's cloud options to include a public impCloudTM on Azure, enabling existing and new **Microsoft** customers to implement Azure-based IoT solutions.

"With access to Azure and Electric Imp's powerful IoT platform, Microsoft Azure users are gaining pre-integrated connectivity that virtually eliminates the complexities of deploying, commissioning, securing, and managing IoT devices at scale," said Hugo Fiennes, the chief executive and co-founder of Electric Imp. "Industrial and commercial customers can now easily and securely connect new and retrofit IoT applications to Microsoft Azure IoT Hub and fully realise the value of Microsoft's advanced data analytics, machine learning and other powerful tools."

InterDigital to contribute to 5G infrastructure roll-out in Bath and Bristol

InterDigital, a mobile technology research and development company, announced that it has won a bid to participate in the UK 5G Smart Tourism project. The project is part of Phase 1 of the 5G Testbeds and Trials programme run by the UK government's Department of Digital, Culture, Media and Sport (DCMS) and will be led by the West of England Combined Authority following its success in securing £5m (€5.73mn) from the UK government to trial a superfast 5G network at tourist destinations in Bath and Bristol.

The trial will see 5G infrastructure put in place at the Roman Baths in the city of Bath, and in Bristol at the M Shed museum, in and around the We The Curious science centre, and in Millennium Square. InterDigital will join the consortium of 25 companies and organisations, made up of 5G network service providers, tourism and business support organisations, tech hubs, research bodies and others.

The announcement further reinforces InterDigital's key role in the development of 5G and adds to the company's portfolio of UK technology research and development projects. For example, in August 2017 InterDigital partnered with Bristol is Open (BIO) to showcase its FLIPS (Flexible-IP services) solution, the world's first successful Multi-Access Edge Computing (MEC) 5G network



Roman Baths will gain 5G infrastructure

architecture trial. The 5G Smart Tourism project will once again see InterDigital and BIO collaborate, with InterDigital's FLIPS solution delivering important improvements on key performance aspects, such as latency and throughput, for virtual and augmented reality use cases in the tourism space.

"Winning this bid is a perfect testament to the importance of InterDigital's research and development in the mobile technology space," said Alan Carlton, vice president, InterDigital International at InterDigital. "We are committed to helping towards the successful rollout of 5G in a way that will significantly change and enhance the way we live our lives. This is about much more than smart tourism: a successful trial will position the West of England as a leader in harnessing 5G technologies to connect citizens, homes, transport, businesses and organisations."

Telensa wins Whakatane District Council smart street lighting project



Whakatane will have smart street lights

Telensa, a provider of connected street lighting and smart city applications, has been selected by Whakatane District Council to deploy its PLANet intelligent street lighting system. The project, part of a New Zealand Transport Agency programme to convert existing road lighting to LEDs, will involve replacing Whakatane's 2,500 streetlights with wirelessly managed LEDs. The project is due for completion in June 2018.

Telensa PLANet is an end-to-end intelligent street lighting system, consisting of wireless nodes connecting individual lights, a dedicated wireless network owned by the city, and a central management application. The system pays for itself in reduced energy and maintenance costs, improves quality of service through automatic fault reporting, and turns streetlight poles into hubs for smart city sensors. With more than 1.5 million lights connected, Telensa PLANet claims to be the world's most popular connected streetlight system.

"Telensa PLANet will help Whakatane District Council reduce costs whilst improving our street lighting service," said Council Transportation manager Martin Taylor. "This project is a significant step forward in intelligent infrastructure and will deliver a safer, smarter, and more efficient service environment for District residents."

Will Gibson, the founder and chief commercial officer at Telensa, added: "Following our recent announcement with Wellington, we are delighted to be working with Whakatane to deliver a more efficient streetlighting service, one that can respond to the District's changing needs.We are also excited about the potential for low-cost smart city applications, enabled by the new lighting network."

TÜV Rheinland and SecurityMatters to harness next generation industrial control system cybersecurity solutions

TÜV Rheinland and **SecurityMatters**, a provider of operational technology (OT) network assessment and protection, have announced a strategic partnership aimed at helping worldwide industrial services clients such as manufacturing plant operators, energy and utility companies, transportation and transit system operators to rapidly detect and remediate the increasing cybersecurity threats targeting their operational technology infrastructure.

SecurityMatters provides critical infrastructures and industrial companies with best-in-class industrial cyber resilience technology which empowers asset owners with unrivaled visibility, threat detection and continuous assessment capabilities to control their networks. SecurityMatters' technology and TÜV Rheinland's Industrial Services experience will provide plant operators with the most complete set of services and solutions for functional safety and cybersecurity excellence.

"Combining our expertise in industrial services and operational technology (OT) security, we are one of the very few organisations that offer this level of deep expertise to our clients concerned about the safety and security of their operations," explained Frank Luzsicza, executive vice president, Information and Communication Technology, TÜV Rheinland Group.

NEWS IN BRIEF

Nokia opens Cloud Collaboration Hub in Singapore

Nokia is strengthening its cloud and data centre services with the official launch of the first Nokia Cloud Collaboration Hub in Asia. Based in Singapore, the hub is an execution centre where multivendor cloud services from strategy, design, execution and delivery are provided. It is one of three hubs in the world, with the other two located in Texas, US, and Reading, UK, offering innovative tooling and automation, as well as DevOps-based cloud development and delivery.

The Nokia Cloud Collaboration Hubs include a multivendor lab set-up with cloud services experts co-located to help operators visualise, develop and execute their plans. The global network of hubs reflects the growth of Nokia's portfolio of services and capabilities to address the increasing demands of operators looking to accelerate their transition to the cloud.

Arundo Analytics partners with Acteon Group to deliver subsea machine learning

Arundo Analytics, a software company enabling advanced analytics in heavy industry, has announced a partnership with **Acteon Group**, an integrated global provider of subsea services, to deliver machine learning models for subsea applications on the Arundo Enterprise platform.

"The Arundo Enterprise platform is able to rapidly deploy and manage machine learning models at extreme scale across multiple businesses and clients," said Cody Falcon, the vice president of product at Arundo. "These capabilities give Acteon a key advantage to quickly deliver value from advanced analytics to their customers."

Acteon uses its deep domain expertise in subsea equipment monitoring, data analysis and engineering insight to support customers with their engineering and cost challenges–both current and future–by providing efficiency-driven solutions. This partnership with Arundo will enable both companies to develop high-value analytics for operating companies supporting global customers through tools like machine learning and artificial intelligence to reduce the cost asset of ownership by 30%.

IoT success relies on rapid implementation, open platforms and security throughout

Bernd Gross is senior vice president of IoT and Cloud at Software AG. He was previously responsible for the IoT Business at Nokia Siemens Networks and chief executive of Cumulocity and has seen IoT develop from an exciting concept for the future into a market reality. Here, he tells George Malim, the managing editor of IoT Now, how organisations can establish sound foundations for the future stages of their IoT implementations by identifying their goals, selecting their partners and ensuring they have flexibility and security

IoT Now: What do you see as the main motivations for companies to deploy IoT technologies and what is accelerating uptake of IoT in general?

Bernd Gross: Typically, we categorise demand for IoT platform technology in three areas. Deployments either focus on lowering cost, increasing efficiency or supply side optimisation, and growing revenues. Lowering cost is an easy way to show the business case internally for organisations and it's often a first way in for IoT. Having an initial service that generates cost savings or efficiencies to the extent that return on investment in IoT can be established is an easy to understand way to gain organisations' commitment to investing in IoT.

The second way in is if a company wants to reach a new level of engagement with its customers. This might be if they are motivated to provide a better customer experience by improving a product's functionality or its interface. In this scenario, knowing how a product is used enables improvements to be made. This is very similar to how a web company does analysis on a browser to continuously improve usability. In IoT, this is the same concept but being applied by smart device makers.

In a traditional business, it's not easy to access data about how products are used but once the products are connected you get the data points that enable you to engage with customers in new ways and that's a compelling attraction of IoT for many organisations.

The third category is increased sales. It's obvious that having the ability to introduce a new business model such as providing an asset as a service or shifting from a capex to an opex model offers significant opportunities to organisations. This capability helps them to differentiate from their competition and extend the value they can deliver to their customers.

Such an offer might involve predictive maintenance capability to ensure machine uptime. This was not previously possible because the machines weren't connected but now it's possible ▶



Bernd Gross,
Software AG

to monitor the machine to ensure it is running well. This can be monetised, either by manufacturers or their distributor partners.

IoT Now: That seems a complex approach for organisations that are new to IoT capabilities. Which approach is motivating the market place the most today?

BG: Recently we have seen a lot of cost optimisation-driven initiatives, especially in industrial IoT (IIoT). For example, discrete machine manufacturers such as DMG Mori, the largest equipment makers in the metal working industry, or Homark, which makes machines for the furniture industry, are using our IoT platform technology. They've focused first on cost optimisation but now want to use IoT to grow their businesses with new revenue models.

These might, for example, involve introducing recurring revenue models instead of a simple one-time machine sale. In addition, companies might be able to use IoT to enable them to offer services to improve machine productivity or predictive maintenance packages. They can build new revenue streams while differentiating themselves from being purely makers of machines. As a machine maker your capability to differentiate has certain limitations imposed by the nature of the machine in questions. However, IoT can enable the performance of the machine to be maximised and its maintenance and support to be done in new and efficient ways. ▶

If you're using cloud, you have to make sure that the provider's multi-tenant concept separates the database

We see IIoT as the leading vertical in which companies are engaging with IoT to move from pure cost saving to new revenue generation and creating differentiation.

IoT Now: How is the ability to connect and analyse the physical world enabling new opportunities to be identified?

BG: As I said earlier, the capability IoT brings enables companies to act similarly to web companies that analyse how users interact with their products and services. These insights can then be applied to enable product enhancements. Once devices get online it's quite surprising that people out there are managing their businesses in the same way that they did 50 years ago. Of course, they've introduced IT in that time but they've only really digitised their back offices. We now see IT and business applications converging so companies can have a full understanding of their business that encompasses inputs from spare parts inventory to predictive maintenance. I believe we've only seen the tip of the iceberg in terms of innovation and the possibilities enabled by IoT. The fundamental thing is to have end-to-end transport in real-time available so you can gather data to predict and optimise and create a better experience.

IoT Now: What are the main challenges organisations face in order to implement IoT successfully?

BG: We think there are three key attributes to successful IoT deployments. These are the ability to deploy rapidly, the utilisation of open technologies and ensuring security.

The biggest challenge I've seen with companies entering into the IoT implementation challenge is that they try to do too much at once. They embrace the idea of introducing predictive analytics and maintenance before they've done the basics, which are to connect the machines and make sure that's working well. Having said that, a significant part of the challenge is to get services up and running and demonstrating their value. This is vital to maintain internal support for IoT investment.

IoT Now: Is there are need for organisations to move quickly but in a more focused way?

BG: A rapid start is very important to generate momentum but then apply an agile methodology. For example, taking a minimum viable product (MVP) approach could enable a company to start with a discrete IoT product. They could start with an app that is separate from IT and other processes such as remote alarm management for a fleet of machines. This would demonstrate value but remain self-contained. We recommend rolling out a separate app, learning to manage the new environment and ensuring it is up and running and works well for six to nine months before slowly improving capabilities with an agile methodology.

A second step would be to increase efficiency by integrating the new data insights you are now collecting with your existing process, such as supply chain management. Finally, the third step is to innovate around the new service offering and use artificial intelligence (AI), predictive intelligence and other technologies to enable new revenue generating services.

IoT Now: Why is it so important to use technologies that have open architectures?

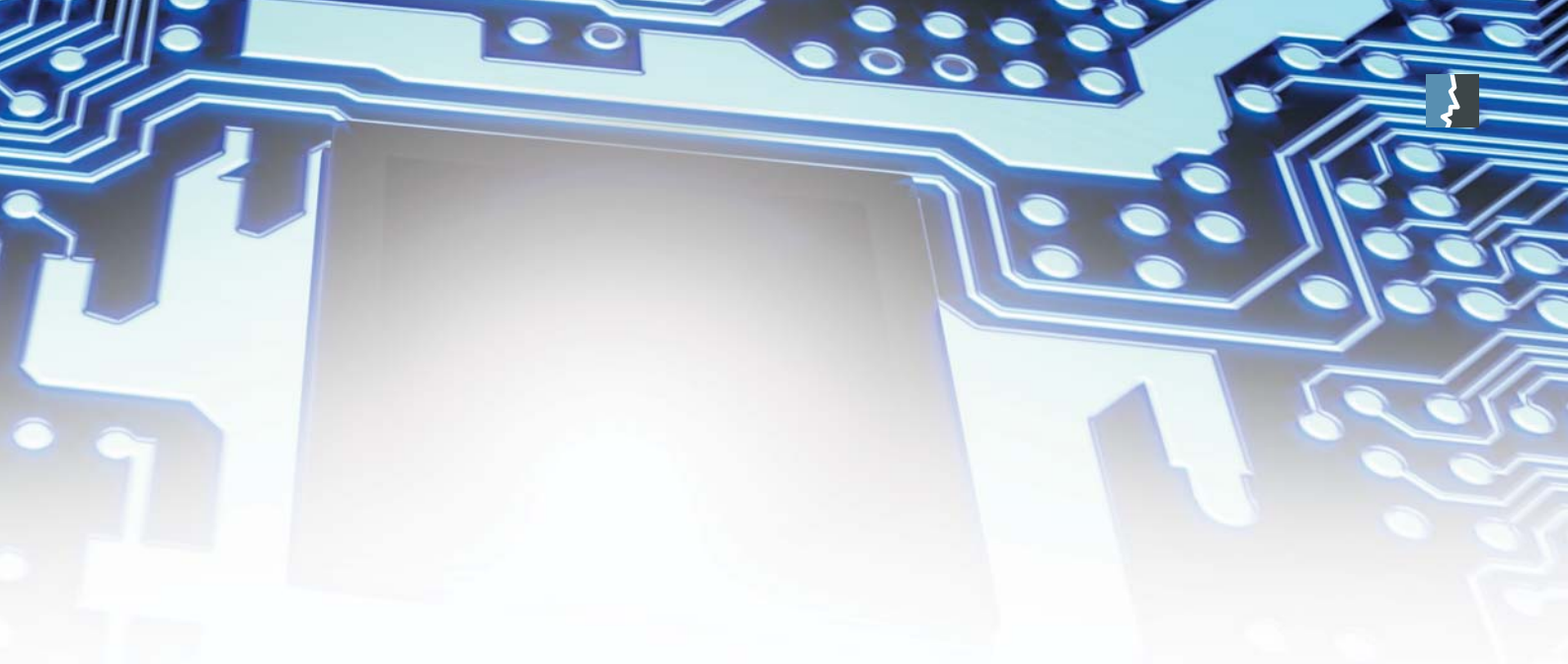
BG: Without doubt, openness will play a key role. Today, it's extremely difficult to foresee what will happen in two or three years so you have to ensure you have a partner that gives you complete freedom of choice in the future. You only get that with an open platform.

Maintaining flexibility is so important because although an early customer might require you to offer services based on Microsoft Azure, a future Chinese customer might want it based on Alibaba. Increasingly we are seeing organisations being required to comply with national regulations regarding data sovereignty so you need a platform that is completely independent in terms of the hyperscale cloud environment it uses. However, this is just one aspect, the openness of the platform is also important.

All the application programme interfaces (APIs) must be open to enable you to do what you need to in future. If only a few are open you may later find yourself limited in terms of what you can do. I would only select a provider with fully open APIs because you can't predict what will happen. A principle of the Cumulocity platform is we believe in fully open capabilities so all functionality is available through open APIs.

IoT Now: Everyone's aware of the security challenges facing IoT, how can organisations ensure they address this in the best way?

BG: Security and data privacy are massive topics ▶



for IoT platforms. Using the latest technologies to achieve end-to-end encryption from endpoint to cloud is very important. If you use the http layer, you can use high or low security encryption and there are specialist companies that will advise you on which is most appropriate to get your data safely into the data centre.

If you're using cloud, you have to make sure that the provider's multi-tenant concept separates the database. Do not trust a database that services multiple customers. However, if you truly separate and provision the database environment for each customer, there can't be leakage of data.

Another consideration is access to data. You need to consider who will be able to access the data and, because IoT is an ecosystem play, you need to be able to provide access to third parties. To do this, you need a governance model that provides access at specified level to the different types of partners and organisations you decide to allow access to you data.

IoT Now: You mentioned that IoT relies on an ecosystem to enable services and applications. How should organisations approach the ecosystem and their role within it?

BG: This is a highly strategic question for each organisation to answer before seriously considering an IoT deployment. For example a manufacturer of compressors that wants to make the most of IoT will have the immediate reflex of using IoT to improve efficiency. They will focus on cost optimisation even though the greatest value will come from revenue and differentiation via the enablement of the partner ecosystem.

For a compressor company this comes in the form of condition monitoring, alarm management and, in the future, predictive analytics to help the end customers and ensure the machine is always up and running. However, when you start thinking about what is specific to a compressor company you quickly realise that there is no generic ecosystem for a compressor company. It's a micro-ecosystem, it's not like iTunes, it's specifically around the machines and the ways in which machine information can be made available to partners and distributors. Many of these rely on aftersales as part of their business model so having the opportunity to make money out of service contracts or verifying the condition or age of a compressor enhances their business and grows loyalty to the compressor company.

This is just one example but it shows the complexity. Requirements are often very specific and very closely related to the business case so you need to develop your environment into an ecosystem. With IoT, it's the things that make the difference and define the ecosystem, not the internet.

IoT Now: Even with the right micro-ecosystem in place to support highly specific services, organisations still have strategic partners. What are the differences between strategic partnerships and being part of an ecosystem?

BG: From the smart equipment maker's perspective there's no real difference. The service company they use is a strategic partner but one level above that for us, as a platform player, it's different. We have hundreds of ecosystem partners all of which can add value to our platform offering. For instance, we have about 20 telecoms operator partners worldwide including Deutsche Telekom, Telstra, NTT Communications, KPN and Telia. They have our platform white-labelled so that when you deploy and app on our platform you can actually deploy it across various open cloud environments.

A strategic partner should therefore be selected based on if they are already present in a specific vertical and can add value. Strategic partnerships should be defined for a particular value proposition with the partners jointly participating in that area.

IoT Now: We're not talking so much about IoT in theoretical terms today because organisations are already making moves beyond introductory deployments. What has the market learned so far to make development of IoT happen more successfully?

BG: To move through the maturity steps from initial IoT deployments that generate cost savings, into the introduction of new services that generate differentiation and revenue, before engaging in innovation to go even further, organisations need to carefully assess their priorities. As I said before, it's not possible to know what will be needed in three years time but it is possible to ensure you engage with the right ecosystem to support you with the open technological platforms for the future. At the same, it's possible to put in place security to protect your IoT implementations and your customers. Finally, the right strategic partners can enable you to turn a concept into reality to the benefit of all involved.

It's a micro-ecosystem, it's not like iTunes, it's specifically around the machines and the ways in which machine information can be made available to partners and distributors

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The trick of picking the right partners for IoT apps

It is understood that no one can provide everything, end-to-end, for IoT applications, regardless of the sector. This means ecosystems of partnerships and platforms are not just unavoidable, but essential and choosing partners is difficult, writes Annie Turner. While the focus often is how easy and quick it is to onboard them, less attention is typically paid to how easy it will be to part company with minimal disruption to the business

With that in mind, a good place to start before looking for partners is gap analysis – what do you need to address your most pressing issues and what pieces are you missing before looking for who can best fill those gaps. One of the most common areas to choose are predictive analytics to avoid losing revenue through downtime.

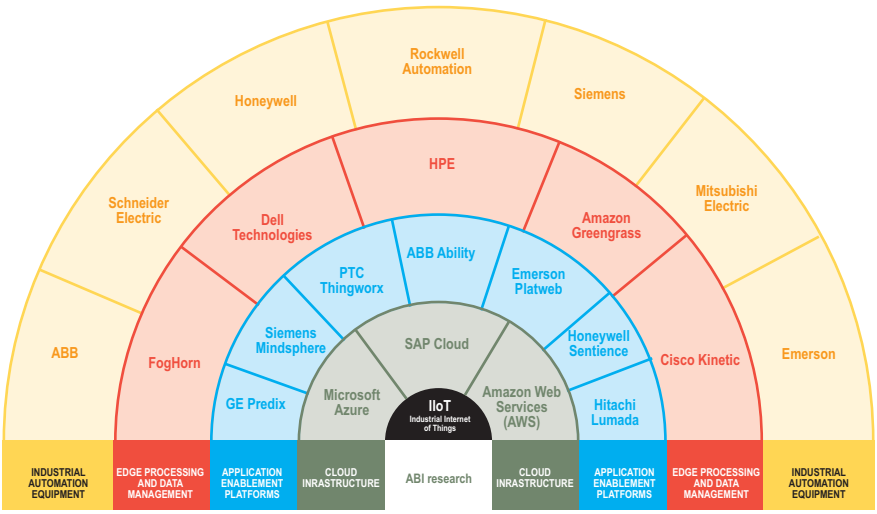
Pierce Owen, principal analyst at **ABI Research**, advises, "You should choose partners that will help you solve problems and accelerate innovation. This means partners who can help you connect your assets and extract useful analytics out of your data, but also partners who understand the next wave of transformational technologies. That means they are already experimenting with machine learning and artificial intelligence (AI), because there are companies that have skills in these technologies and receiving returns on their investment."

Maciej Kranz, the vice president of Strategic Innovation at **Cisco**, gives a great example of this. Goldcorp mines gold and typically lost US$2 million a day when a specialist vehicle broke down. The only way to recover the faulty vehicle was by using another one, adding to the expense. The company started using sensors for predictive maintenance and reduced the failure rate by 80% in the first three months. By adding AI, that has been cut by 95% using fully autonomous capabilities.

Recent research from ABI showed that the top desired outcome of applying emerging technologies to a manufacturing organisation was improved data outcomes, although the same survey showed a lack of skills and experience was in the respondents' top three inhibitors to embracing innovative technology. Clearly a great opportunity to pick a specialist partner.

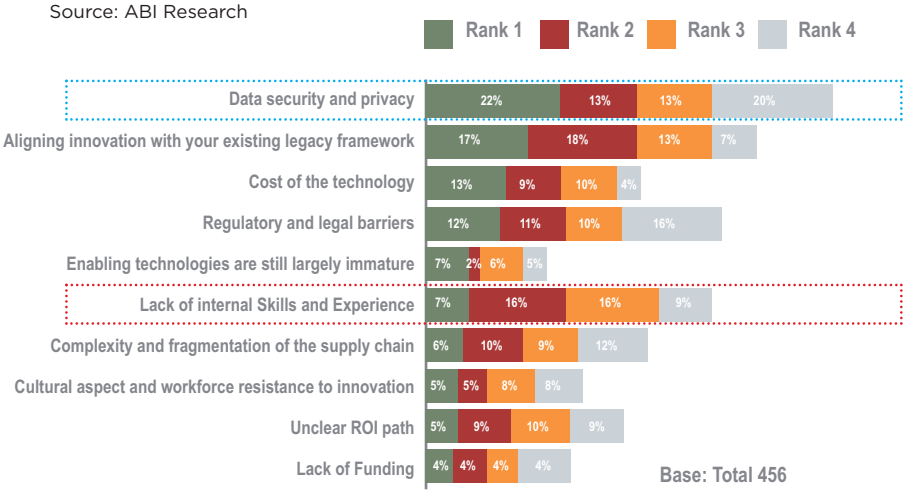
However, the subject of sharing and controlling data is a sticky one. Owen suggests that one of the reasons **GE Digital** has had to rethink its digital ambitions is that, "They set up partnerships, but then didn't let them get on with what they excel at – GE wanted control and other companies weren't happy to hand over control of their data to a third party. That was a big problem," he said. ▶

Partial IIoT ecosystem
Core to the edge



Source: ABI Research

Source: ABI Research



Technology Adoption: Inhibitors

What are the main barriers that could prevent your organisation from embracing innovative technologies?
(Rank 1 to 4 where 1 is most important)

Platforms in the B2C arena have proved the most successful and fastest way of growing a business that humans have ever devised. They bring together producers, sellers and buyers of goods and services who previously didn't and perhaps couldn't easily transact.

However, when choosing a platform partner, you need to think carefully about their business as well as operational model. The B2C platform business model puts the platform owners in a position of supreme power – the most successful are among the world's biggest, most valuable and most profitable organisations. Aside from taking their cut of each transaction, such as **Amazon** or **Apple**, much of that power comes from the data they amass, collate, analyse and use to constantly refine and develop their own products and markets, as well as, in some cases, selling data to third parties in the style of **Google** or **Facebook**.

And incidentally, it is important to consider geography and culture too: Bernd Gross, the senior vice president of IoT and Cloud at **Software AG** says, "Lots of clients have global rollouts and customers in China want [cloud] services on **Alibaba** not **Microsoft Azure** or **AWS**. Platforms must not have solution that will only integrate with one hyperscale platform."

So just how open and transparent is that platform? Who is benefiting from your company's data? Who has what control over which data and what they do with it, where and for whom? These are the big questions regarding platforms for reasons that stretch way beyond the regulatory. They are about protecting your business, your customers and your reputation too.

As partnerships become more prevalent and important, one solution for these concerns could be blockchain. Emmanuel Marchal, the managing director of **ConsenSys**, explains, "Using blockchain you can have multiple parties operating together and streamlining their processes together, but without giving control of their data to any third party."

Data security and privacy concerns are the top inhibitor to companies adopting innovative technologies (see graph below) according to recent findings by ABI Research, although, in all spheres most security breaches are due to basics being overlooked. Gross remarks, "Securing the platform is obvious but underestimated – people forget to secure the devices they attach – such as the one with the open Bluetooth connection."

Sometimes data security fears are given as good reasons to avoid connecting up systems, but this is flawed and short-term thinking. It's true that many manufacturing environments, for example, have dedicated systems for specific functions that were not designed to be linked into larger systems or ecosystems. Over time, they will become obsolete or evolve to become part of a data-driven environment through the use of standardised interfaces and protocols.

Beware of partnering with any company that is resisting the move towards open protocols and interfaces. As Andreas Geiss, a vice president at **Siemens**, says, "If their USP (unique selling point) is proprietary, it's definitely time to change. Moving away from that opens [them] up to competition, but standardisation increases overall market size and makes it more transparent and commoditised – that's the name of the game."

So a partner should have a clear plan of how to move towards developing standards to ensure they will be sufficiently flexible and interoperable in future, rather than locking their partners into expensive proprietary ways of working.

Standardisation and greater openness also means more security concerns. Somewhat ironically, securing IoT will only be possible through partnerships because no single company has the whole suite of skills and products. Keep an open mind here. Data security will bring many new and at first glance unlikely potential partners into the mix. For instance, don't overlook security service firms with experience in consumer markets for securing IoT connections. They understand the threats to and defences for standards-based and Internet technologies – the very things that will propel IoT into the widest possible range of applications and segments.



Pierce Owen, ABI Research



Maciej Kranz, Cisco



Internet of Things World 14-17 May, 2018

Head for Santa Clara to see IoT action from strategy to implementation to results

Internet of Things World, to be held on 14-17 May, 2018 at the Santa Clara Convention Center in California, USA, will celebrate the event's fifth anniversary by welcoming more than 12,000 attendees. This year's show features a comprehensive programme covering IoT and provides an opportunity for attendees to network and learn. Here, IoT Now previews the event

For 2018, Internet of Things World provides real world experiences from the growing number of IoT market implementations. With a deeper emphasis on solving practical challenges, each of the conference's vertical market tracks is expanded to two days. 16 May dives into strategy and 17 May builds further to deliver business critical information on implementation and operation. 15 May offers an Executive Keynote Day specifically aimed at senior IoT executives and an expanded workshop day on 14 May, featuring seven training sessions, networking functions and technical workshops.

This year, the organisers have announced four new features for the event. These include:

Expanded workshop day

On 14 May, seven workshops will run concurrently offering content designed for technical staff, IoT beginners, startups and more strategic level content for senior level professionals.

Enhanced vertical content

The new two-day structure for the vertical conference content includes one day of strategy and one day of implementation and operation. The event also offers expanded industrial content to include tracks covering smart buildings, smart construction and energy and utilities as well as continuing to cover consumer IoT.

Developers' conference

Advanced technical discussions within two tracks of education, covering topics, such as build and deploy, security, data, artificial intelligence (AI) and networking and connectivity.

Executive Keynote Day

15 May will showcase some of the world's most renowned pioneers in IoT including C Level representatives from Avnet, Boeing, UPS, Microsoft, Software AG, Verizon, City of Portland, City of San Francisco, T-Mobile plus many more.

Enjoy an exclusive 20% discount by using promo code: IOTN

IoT World speaker snapshot

The event welcomes speakers including:

Brett Bonner, vice president, R&D, **The Kroger Co**.
JoAnna Sohovich, CEO, **The Chamberlain Group**
Juan Perez, chief information officer, **UPS**
Kevin Burns, chief innovation officer, **City of Miami**
Russ Benson, vice president, IT, **Boeing**
Aru Bala, president, Europe, **Stanley Black & Decker**
Walter Stewart, vice president and chief research officer, **Sutter Health**
Virkum Aiyer, vice president of Public Policy, **Postmates**
Ashish Tajpuria, senior vice president and head of Emerging Payments and Commerce, **Bank of America**
Bret Evans, senior director IT Supply Chain, **Johnson & Johnson**
Gary Binstock, director of Technology - Strategic Innovation & Technology Alliances, **Colgate-Palmolive**
Barry Hooper, senior green built environment coordinator, **San Francisco Department of the Environment**
Maurice Henderson, chief of Staff, **City of Portland**
Michael Frost, vice president, **CBRE Group, Inc.**
Bob Bennett, chief innovation officer, **City of Kansas City, MO**
Angie Gibson, manager, Emergency Management and Public Safety, **PG&E**
Linda Gerull, CIO/director of Technology, **City of San Francisco**
Ryan Ciovacco, president, Connected Living & WallyHome, **Sears Holdings**
Steve London, senior manager, Business Development, Global Connected Consumer, **General Motors**
Jonathan Reichental, chief information/technology officer, **City of Palo Alto**
Ron Guerrier, CIO, **Farmers Insurance**
Rosa Akhtarkhavari, CIO, **City of Orlando**
Dr. Don Kinard, senior fellow, **Lockheed Martin**
Mirko Senatore, director Network Solutions & Excellence, EMEA, **Pfizer**
Mark Young, chief technology officer, **The Climate Corporation**
Maksim Perchinsky, chief data officer, **City of San Diego**
David Burns, director of Field Systems, **McCarthy Building Companies**
Harsh Patilsenior staff research engineer (IoT Security), **LG Electronics**
Robin Stennet, vice president of Emerging Market Strategy, **ADT Security**
Bill Bennington, national quality manager, **PCL Construction Enterprises**
Hamid Montazeri, director IoT Architecture & SW Engineering, **Stanley Black & Decker**
Herve Letourneur, vice president of product, **August Home**
Meg Goldthwaite, chief marketing officer, **NPR**
Eli Share, head of IoT & Mobile, **Bosch Tool Corporation**
Michael Sherwood, director of Technology and Innovation, **City of Las Vegas**
Laura Meixell, chief data officer and assistant director, Digital Services, **City of Pittsburgh**
Rajat Shail, senior director, Experience Design, **Honeywell**

New this year, the Developers' Conference is a two-day, two-track technical conference for developers, hardware engineers and architects working on IoT solutions. Attendees will be able to learn from the world's leading companies and open source projects which will present the information needed to lead successful IoT developments. Designed specifically for technologists, the IoT World Developers' Conference will bring together the technical leaders driving key innovations in the IoT marketplace, along with those seeking technical education, mentorship and collaboration to develop their careers.

Developer conference streams include:

Build and deploy
- Embedded systems development using modern software practices
- Containerisation and microservices in the world of IoT
- Zen and the art of predictive maintenance
- Design to deploy: IoT product development from inception to production

Security/data and AI
- Panel: Minimise cybersecurity risks in the IoT solutions
- Automation and AI to improve IoT security
- The inadvertent IoT platform: PostgreSQL
- Apache Spark and Apache Ignite: Where fast data meets the IoT

Architecture
- Design patterns/architecture maps for IoT
- Microservices design principles to build IoT devices at
- An end-to-end open source architecture for IoT
- Serverless and IoT

Networking and connectivity
- Dynamic security and connectivity: hardware's role
- Universal connectivity: possible or pipe dream?
- Case study: connectivity in air quality sensors
- Standards and interoperability: IoT standardisation and implementation challenges

In addition to these technical sessions, the event features strategic conference streams covering a wide range of verticals. Among the highlights of these are panel discussions involving the following participants:

Smart home
Voice Control / Voice Activation for Smart Homes
Moderator: Ronan de Renesse, practice leader, Consumer Technology, **Ovum**
Jeff Patton, general manager for Connected Home Product Management & Innovation, **GE Lighting**
Casey Newton, fead of Business Development, **Logitech**
Chris Kocher, co-founder and managing director, **Grey Heron Venture Consulting**
Sean Newton, applications engineering manager, **STMicro-electronics**

Smart construction
Using IoT to streamline the construction process
Matthew Rosenberg, founder & DEO, **M-Rad Architecture**
Nate Fuller, implementation manger, Office of Innovation, **Bechtel**
Misha Nikulin, head of IT Innovation & Emerging Technology, **Bechtel**
Chris Hansen, director R&D US, **Nordic Semiconductor**

Smart cities
Engaging in the Smart Cities Journey - Innovation in Technology
Moderator: Andrew Watkins, president and COO, **Marketplace.city**
Michael Sherwood, director of Technology and Innovation, **City of Las Vegas**
Lee Farrell, Manager, Frontline Services, **City of Ottawa**
Jennifer Sanders, executive director, Dallas Innovation Alliance, **City of Dallas**
Dan Evans, senior director of Product Management, **Itron**
Mobeen Kahn, AVP, AT&T IoT Solutions - AT&T Business Solutions, **AT&T**

Industry and manufacturing
Industry 4.0 - Capture the Value of Industrial IoT & Shape the future for the Industrial Digital Revolution
Moderator: James Brehm, founder and technology evangelist, **James Brehm & Associates**
Ravi Arikapudi, global programme manager, **Abbott Laboratories**
John Hajdukiewicz, director, User Experience, **Honeywell**
Erik Josefsson, head of Advanced Industries, IoT, **Ericsson**
Gaurav Malhotra, principal, Digital Supply Chain & Operations, Supply Chain Blockchain Leader, **EY**

Energy and utilities
How Legislation, Policy, and the Political Environment affect IoT Initiatives in the Energy/Utility Sectors
Karen Caraway, principal, **MITRE**
Jessie Denver, energy programme manager, San Francisco Department of the Environment
Bruce Edelston, vice president of Energy Policy, Southern Company
Dr. Sanjiv Malhotra, Department of Energy

Project Kairos for start-ups

Project Kairos is an exclusive start-up programme and community bringing together select investors and some of the most innovative start-ups on the tech scene. For start-ups it provides the opportunity to network with thought leaders, other innovative start-ups, leading solution providers and top media and investment communities. For investors, it provides the opportunity to connect with new, high potential start-ups from across the globe and discover the newest technologies transforming the market place.

The exhibition floor

Finally, no event is complete without a buzzing exhibition floor and Internet of Things World has takes over the entire Santa Clara Convention Center, collocating the event with Connected & Autonomous Vehicles. Exhibitors include some of the world's most recognisable technology brands alongside pioneering start-up businesses.

INTERNET OF THINGS WORLD IN NUMBERS

12,000+
Attendees

300+
Exhibitors & Start-ups

16+
Hours of Networking

For more information visit:
tmt.knect365.com/iot-world/

IoT Global Awards 2018 winners named at Smart IoT London

One sign of a technological concept coming to maturity is the emergence of a set of independently judged awards. For the Internet of Things (IoT) this has now happened with the inaugural IoT Global Awards, the winners of which were announced at Smart IoT London event in March. IoT Now reports



Judged across 12 categories, including CXO of the year, by a specially assembled panel of 12 IoT industry experts and insiders, the awards attracted 149 entries in their inaugural year. The awards were co-sponsored by IoT Global Network and CloserStill Media, organisers of Smart IoT London.

"I have been impressed by both the quality and quantity of entries to these, the inaugural IoT Global Awards," says Jeremy Cowan, the editorial director & publisher of IoT Global Network. "The shortlisted entries have been carefully assessed by our Judging Panel of 12 independent IoT experts. It's clear from the range and breadth of technical innovations, products and services that have won awards today that the future of IoT will continue to be characterised by ingenuity and immense practical skill in turning this enormous opportunity into a reality that transforms lives and businesses across the world."

Judging Panel Member, Robin Duke-Woolley, said: "The entries for the IoT Global Awards were of very high standard with well thought-out differences between the entries and some intriguing deployments. Judging them has been a real challenge not only because of the high standard but also because many entries are designed to address market needs in different ways. This illustrates clearly that vendors are keenly aware of the need to differentiate their offerings, which in turn is providing users with an increasingly wide and rich choice."

Judging Panel colleague Svetlana Grant, the IoT Programme Director at GSMA, added: "I was impressed by the quality and diversity of the Smart Home entries. My selected winners were distinguished by their creative approach to the design and implementation of their IoT products and services, taking advantage of IoT's efficiency and scale, and aiming to provide excellent value for both end-users and businesses."

Cowan concluded: "Thank you to all those who entered their IoT products, services and individuals into the awards and congratulations to our winners. I'd also like to thank our VIP Judging Panel for their careful consideration of this year's shortlisted entries which has resulted in a great selection of winners for these, the first IoT Global Awards."

About IoT Global Awards: The IoT Global Awards are co-sponsored by IoT Global Network (www.iotglobalnetwork.com) and CloserStill Media, the organisers of Smart IoT London. Our goal is to stimulate excellence in collaboration and innovation within the IoT industry. We aim to provide you with the tools and information to help usher in a new age of global connectivity.

THE WINNERS:

AUTOMOTIVE, TRANSPORT & TRAVEL
Product: **BSQUARE, DataV Software**
Service: **GEOTAB, Revolutionising Automotive IoT**

INDUSTRY & CONSTRUCTION
Product: **Globalstar, Smartone Satellite Tracker**
Service: **Sensolus, Scaling Industrial IoT**

RETAIL, MARKETING & HOSPITALITY
Product: **Designworks Windsor, O2 Digital Clothes Rail**
Service: **SMARTRAC Technology GmbH, Smartrac Experiences Solution**

BIG DATA, CLOUD & ANALYTICS
Product: **Enlighted, The Enlighted System**
Service: **Cybeats**

PLATFORM OF THE YEAR
Product: **Wind River, Secure Device Lifecycle Management Tool**
Service: **Aeris, Aeris IoT Solutions & Connectivity**

SECURING IoT
Product: **Flexera, Flexera IoT Monetization Platform**
Service: **Cybeats**

CONNECTED CONSUMER & SMART HOME
Product: **Switchee**
Service: **Softeq, Full-stack IoT Product Development**

RESEARCH & DEVELOPMENT OR NEW LAUNCH
Product: **RapidValue Solutions, Asseteze – Smart Asset Manager**
Service: **DevicePilot**

SMART CITIES, GOVERNMENT & UTILITIES
Product: **Amscreen, Collaborative Smart City Solution**
Service: **Gemalto, End-to-end Cybersecurity solution for smart Utilities**

CONNECTED HEALTH OR WEARABLE TECH
Product: **NuCurrent – Wireless power solutions**

START-UP, BUSINESS DEVELOPMENT OR ECOSYSTEM OF THE YEAR
SAP, SAP IoT Start-Up

CXO OF THE YEAR
Jim Heppelmann,
CEO of PTC



THE JUDGES:

Justin Anderson is a director in KPMG's Internet of Things practice, with a focus on Smart Cities including infrastructure, utilities and transport and Smart Agriculture (Food & Fibre).

Alain Louchez is the managing director of the Centre for the Development and Application of Internet of Things Technologies (CDAIT pronounced sedate), at the Georgia Institute of Technology, Atlanta, GA, United States.

Robin Duke-Woolley, the founder and CEO of Beecham Research, has nearly 40 years experience in the telecom/IT industry. Firstly, in commercial roles including Marketing Management, Sales Management and General Management in international technology vendor companies. Secondly in market analysis and consulting roles, as a director at several leading firms before founding Beecham Research.

William Webb is CEO of the Weightless SIG, a body standardising a new M2M technology and Head of Consulting at Webb Search. He was one of the founding directors of Neul, a company developing machine-to-machine technologies and networks, which was formed at the start of 2011 and subsequently sold to Huawei.

Sanjay Khatri is the head of Platform Product Marketing at Cisco Jasper, Cisco's IoT Cloud business unit. He is responsible for ensuring Cisco Jasper's service provider partners and their enterprise customers understand and take advantage of Cisco Jasper's IoT Services Platform to build and grow a successful connected devices business.

Dr. Chris Wasden is the executive director of the Sorenson Centre for Discovery & Innovation at the University of Utah, and author of the book "Tension - The Energy of Innovation", which outlines his approach to innovating technologies and business models.

Ansgar Schlautmann has over 20 years of consulting and project management experience in the fields of telecommunications, information technology, media and entertainment as well as the high-tech and automotive industries.

Svetlana Grant is project director for Future IoT Networks in the Connected Living programme at GSMA. She has over 15 years of experience in mobile industry and has been a part of the GSMA's Connected Living Program since 2009, working on the development of the Embedded Mobile Guidelines.

Phil Vann is the Connected Devices/Embedded Software practice lead at Accenture Mobility, part of Accenture Digital. He has 20+ years' experience in the mobile telecommunications and embedded software industry within multiple sectors based in London, UK.

Jenalea Howell is the research director of the IoT Connectivity team within IHS Markit Technology, as well a personal focus on Industrial IoT. She had more than 8 years of research and consulting experience covering industrial automation markets with a narrowing focus on Energy Efficiency, Industrial IoT and Smart Manufacturing before joining the IT & Networking team in early 2016.

Thorsten Schröer is responsible for IBM's global business within the companies Watson IoT for Manufacturing division across all industries.



Profiting from IoT – Look to your partners for success

The Internet of Things (IoT) as a new business offering has opened the door for the service provider community to embrace the upsides of new innovative consumer and enterprise service opportunities. However, let's face the honest truth … are service providers actually providing any true value on top of the connectivity? For most, says Paul Hughes, director of Strategy at Netcracker Technology, the answer is currently no

Connectivity is certainly an essential part of IoT, but the value chain extends well beyond just a simple binary on and off action of a sensor or the data collection and management of a smart city. With millions of customers already consuming traditional voice, video and data services, service providers have always been uniquely positioned in the ecosystem due to their existing customer relationships, expertise in providing end-to-end services to meet customers' ever-changing needs and having all the necessary infrastructure to enable, orchestrate, provision, deliver and bill for services.

One of the biggest challenges to date for IoT is the creation of an effective business model that ensures that IoT services are in fact revenue generating services. Take a close look at smart cities, connected cars, e-health services and other service areas and one things stands out … each vertically oriented service area is complex enough it itself that the service provider community likely will not have the resources, nor the domain expertise to support the complexities of each area.

Usage behaviour

Each IoT market will have unique characteristics around usage behaviour, service value, service evolution and roadmap, and long term market impacts. Thus, the traditional B2B and B2C models for IoT must be expanded to include a dedicated service centric partner that can provide management and expertise to ensure the services are effective.

Thus, the partner centric B2B2X model for IoT represents a more optimal fit because:

- It ensures domain expertise at the heart of the most complex areas of service management
- Partners with vertical IoT domain expertise will likely be much more nimble, can take on a distributed and shared risk, and in turn shared upside for service success
- The service provider can use its existing OSS/BSS infrastructure to support pricing and monetising opportunities.

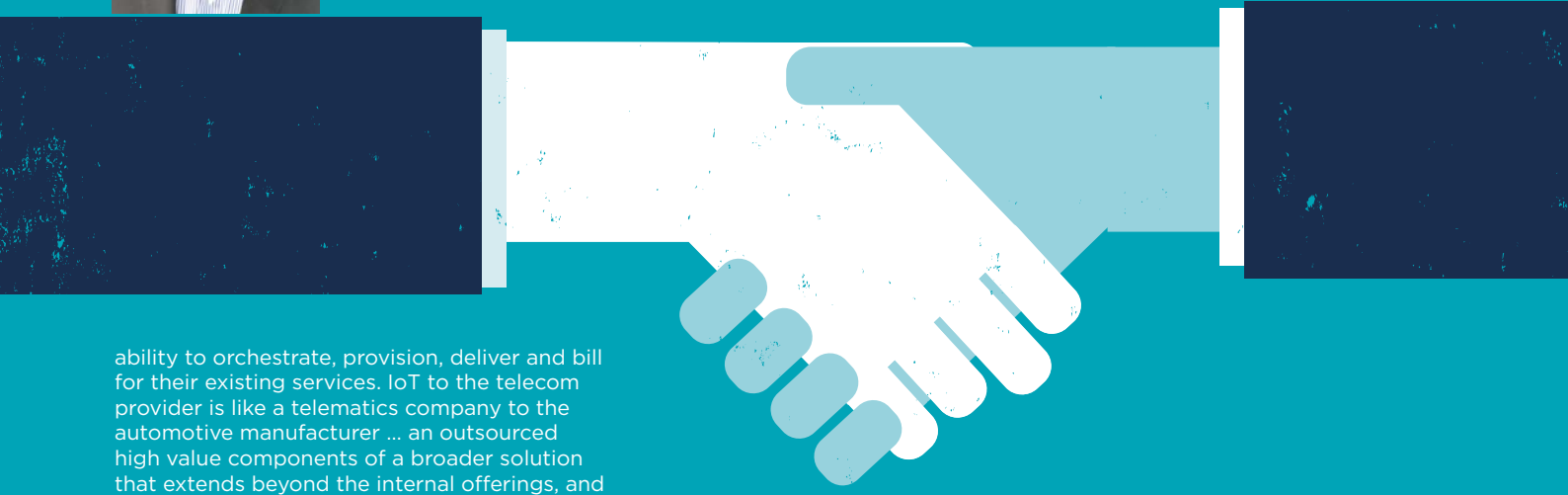
In the era of digitalisation, it is increasingly rare to find a single company that can provide a holistic solution to meet customer demands. Automobile manufacturers excel in manufacturing and delivering a vehicle that can get you from A to B but need a host of partners to extend beyond and deliver a connected car experience. Cable providers excel in laying fibre or copper to the home or premise and delivering customer experience but see over the top providers as providers of higher value services that extend beyond their existing offerings, and satisfy their customers demand.

As for telecoms providers? Their issues are exactly the same. They excel in network operations, customer management and the ▶

Paul Hughes,
Netcracker
Technology



IoT extends the service provider's reach into a new world of business and consumer- related products and services, and the potential of both new customers and new service revenues is only limited by the levels of creativity and technology capability



ability to orchestrate, provision, deliver and bill for their existing services. IoT to the telecom provider is like a telematics company to the automotive manufacturer ... an outsourced high value components of a broader solution that extends beyond the internal offerings, and can create new revenue generating services, either as a standalone or part of a larger bundle.

What does it all mean?

It means IoT services thus should be treated are like any other communications- related services, and therefore must effectively be orchestrated, provisioned, managed and monetised effectively properly and profitably to be economically successful. IoT service and business management assets must be aligned with a partner management process that ensures that the new IoT value chain and its end-to-end offerings can generate revenue from day one.

It means the service provider should use efficient BSS/OSS processes that can integrate seamlessly with in-field devices and gateways, network connectivity infrastructure, data collection, storage and analytics tools, application development and testing environments, as well as applications for various verticals.

It also means the service provider and partner must together have the ability to enable and disable services in real time, price and bill for services accurately and ensure that any market shifts are addressed without limitations from back-office infrastructure.

IoT extends the service provider's reach into a new world of business and consumer- related products and services, and the potential of both new customers and new service revenues is only limited by the levels of creativity and technology capability. Service and business enablement functions must become the primary assets that will allow service providers to extend their presence in the IoT beyond connectivity services, and actually enabling new partner enabled business models for B2B, B2C and B2BX.

Investing in a flexible IoT monetisation strategy helps to guarantee financial success of IoT as a business model, with enabling faster time- to-market and time to revenue, revenue upside for the provider and partners, and enough flexibility to ensure every service providers can generate revenue from the IoT business model from day one. ■

How SMEs can use IoT for business growth

The Internet of Things (IoT) refers to the billions of smart devices – anything from cars, to home appliances – that can connect to a network to collect and share data. In a time when Industry 4.0, or the fourth industrial revolution (4IR), is thriving, it's no wonder we are finding ourselves more and more immersed in the possibilities of IoT, writes Alison Mitchell, the executive director at Sensor City



Alison Mitchell,
Sensor City

In fact, according to **Intel**, by the year 2020 the IoT is expected to grow to a staggering 200 billion connected objects around the world. In a world where smart technologies are evolving faster than ever, IoT will continue to provide unprecedented opportunities that businesses, large and small, should be harnessing if they are to survive and thrive in their sector.

Despite this, statistics show that SMEs are not adapting new technologies and as a result, they are limiting their chances of success. Analyst firm **Analysys Mason** recently revealed that 51% of UK SMEs were either unsure or unaware of IoT, while 23% were not interested in it at all.

However, unbeknown to many SMEs, there are resources out there created specifically to help breakdown the barrier between new technologies and budding entrepreneurs. An example of this is LCR 4.0, a business support programme that enables companies in the Liverpool City Region to explore Industry 4.0 technologies and the business impact that they can have.

Drive business growth

Incorporating IoT into processes is essential for SME business growth, and data is a big part of that. Retrieving and analysing big data analytics allows SMEs to better interact with their customers and therefore improve efficiency, reduce operational costs, validate decisions and identify trends.

Incorporating IoT into processes is essential for SME business growth, and data is a big part of that

In addition, incorporating IoT will provide SMEs with the tools to ensure they are keeping up to date with the latest technologies, allowing them to develop their innovative ideas into a reality. But with so many benefits, why is it that only 12% of UK SMEs are embracing IoT?



Address the barriers

Whether it's their lack of resources, funding, awareness, or simply that they are slightly apprehensive about investing in something they haven't seen any tangible benefits from, there are countless reasons why some SMEs are falling behind in the uptake of IoT and Industry 4.0 technologies.

A common misconception amongst SMEs is that investment must come from within their company. There are plenty of resources out there to help SMEs, entrepreneurs and start-ups – you just need to know where to look.

At Sensor City, a collaboration between the University of Liverpool and Liverpool John Moores University, for example, we offer businesses – including start-ups, SMEs and established companies – specialist sensor and IoT related equipment, software and lab spaces, as well as business support. Support like this is crucial to exploring the potential of IoT technologies and developing concepts into market-ready solutions.

Aqua Running for example, is an innovative company housed inside the Sensor City building. Founded by former Liverpool FC player, Terry Nelson, Aqua Running manufactures body suits designed to provide highly effective, no impact training in water. Working with Sensor City and partner LCR 4.0, the company has been able to incorporate IoT technologies into these suits, which has led to substantial business growth. It now plans to add sensors and charging points into the suits to monitor users in the pool.

The future of IoT

It's inevitable that Industry 4.0 technologies are going to become more advanced and in time, will change the lives of many, if not all of us. Whether we're talking about integrating IoT into internal processes or across the supply chain, or making existing products smarter to drive bottom line improvements, it's clear that SMEs need to get on board.

While it won't happen overnight, there are steps that can be taken to ensure they are embracing IoT and are right there at the forefront of the latest technology. If SMEs are going to make the most of this opportunity and harness the potential for their business, there needs to be more education about the resources, like Sensor City and LCR 4.0, on hand to help.

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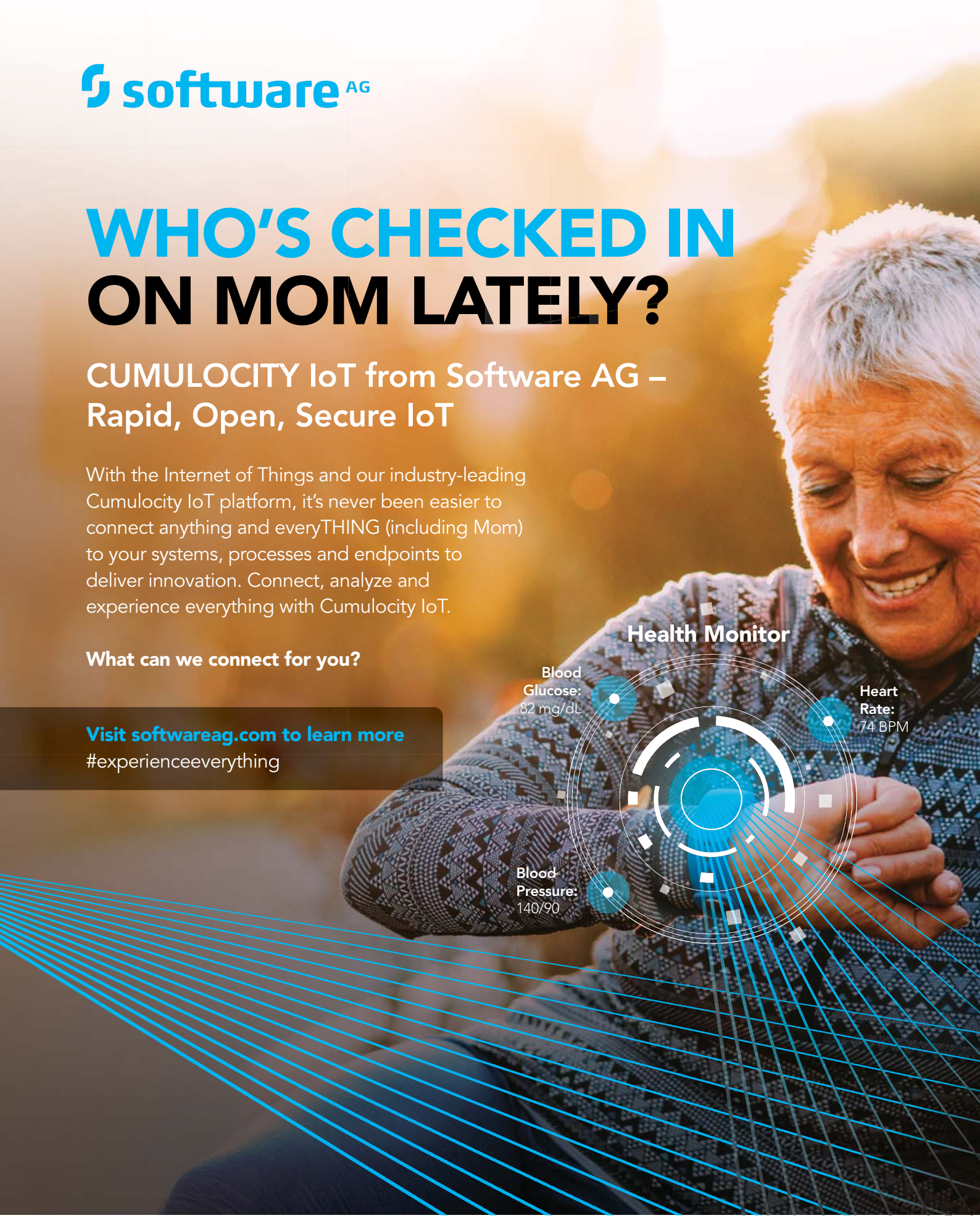
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