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IoT NOW

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TALKING HEADS

Microtronics' Stefan Pfeffer explains how businesses are focusing on enabling new revenue streams



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[3] NB-IoT technology where available and LTE-M planned for 2019

CONTENTS



IN THIS ISSUE

4 EDITOR'S COMMENT
George Malim hopes innovators keep wasting their bus fares

5 COMPANY NEWS
China Telecom and Tata Communications target Chinese IoT, PTC and Digital Catapult launch London Lab

6 INDUSTRY NEWS
Low power networks gain traction across the globe, says new research, V2X communications technology to be worth US$1.2bn by 2022

7 PRODUCT NEWS
Netcomm launches new Industrial IoT router, Telit introduces OneEdge software suite for IoT modules

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

10 TALKING HEADS
Stefan Pfeffer explains how customers can focus their strategies to ensure their IoT deployments enable new businesses

14 ANALYST REPORT
Our six-page analyst report, sponsored by Flexera Software, reveals how device manufacturers that have not yet moved their products towards being connected can transform to become digital industry leaders. Success in this new, digitally transformed landscape hinges on selecting the right software to support software monetisation

20 INTERVIEW
Martin Hodgson tells Robin Duke-Woolley how accurate monitoring means more effective management of IoT infrastructure

24 CASE STUDY
Inside the deployment of Paessler's PRTG monitoring system at the UK National Museum of Computing

26 IoT EVENTS
Where to go and what to do

27 IoT NOW INSIGHT REPORT – TRANSPORT
In the latest of an ongoing series of specially commissioned, independent, analyst-written Insight Reports, Rickard Andersson, principal analyst at Berg Insight details how telematics is achieving optimal performance for large and small fleets

37 The IoT NOW ENTERPRISE BUYERS' GUIDE TO IoT PLATFORMS 2019

38 HOW TO CHOOSE AN IoT PLATFORM
Beecham Research's Bill Ingle reveals what enterprises should look for in an IoT platform

41 INTERVIEW
Cyril Hullin and Robin Duke-Woolley discuss enterprises' platform priorities

45 THE IoT PLATFORMS TO WATCH IN 2019
Beecham Research explores what's hot in IoT platforms this year

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Innovators, please keep wasting your bus fares



A new breeze is blowing through the corridors of IoT and it's bringing with it a climate of considered, measured activity that's symptomatic of a real business finding its feet, writes George Malim. This is in contrast to the IoT that, in some respects, has resembled the temper tantrums of a teenager oscillating between premature adulthood and being a child wanting to play with its toys

We've heard the foghorned assertions of mega-trillion dollar revenues by next Tuesday and how what amounts to little more than a connected sensor is going to 'completely flip the business model on its head, man.'

We've indulged the developers as they've laboured on apps to streamline processes and make lives easier when the outcome has been convolution and confusion. That wheel didn't need re-inventing after all.

We've listened to vendors' arguments that their approach is better than their competitors, isn't it always, while knowing that a tiny variance in performance or price for an essentially commoditised product or service isn't really worth a hill of beans.

And our reward for this is we're suddenly in a proper industry. One where revenues and even profits are being generated; where robust, resilient products are being brought to market and finding customers in volume; and where players recognise the need to co-operate alongside the need to compete.

This new maturity is what IoT needs to move it on from being the zany little brother of internet services and to foster the understanding that actually, applying the internet to the things is the real game.

I suspect I'm one of the few who will miss the early days when it was quite acceptable for an executive to stand on a stage and project short-to-mid-term revenues in the billions for a milk bottle monitoring device, while lacking the funds to get home after the event. I enjoyed the sheer delight and excitement of early steps being taken into a new opportunity, along with the naivety that goes with that.

Now IoT has grown up it will be a more sober, more successful industry but deceptively low barriers to entry mean we'll still get start-ups and innovators who will meld established technology with leftfield ideas to provide the far-fetched futurology I've so enjoyed reporting on. IoT is so vast that someone, somewhere will always find their bus fare to put forward a crazy notion of the future and long may that last.

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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China Telecom and Tata Communications launch global IoT service for Chinese market

China Telecom Global and **Tata Communications** have announced they are working together to launch a global Internet of Things (IoT) service in the Chinese market. The partnership aims to enable companies to deploy and manage IoT devices easily and cost-effectively within China and internationally across multiple industries.

Tata Communications' MOVE service uses the company's relationships with more than 600 mobile network operators worldwide to ensure that a new IoT-enabled wearable device or automotive system, for example, can be instantly connected, anywhere in the world. With access to this platform, China Telecom Global will be able to enhance the global reach of its IoT offering and address the needs of both Chinese and overseas corporations.

According to the China Economic Information Service, China's IoT industry achieved a compound annual growth rate of more than 25% between 2009 and 2017, and by the end of 2018, the organisation's Annual IoT Industry Development Report of China valued this market at an estimated CNY 1.5 trillion (US$222.6bn).

"We want to grab our share of the rapidly growing Chinese IoT market," said Deng Xiaofeng, the chief executive of China Telecom Global. "China Telecom Global is working closely with Tata Communications to pave the way for innovative and advanced IoT solutions across industries. We're able to offer our customers the borderless, reliable and affordable network connectivity they need for their different IoT devices."



Anthony Bartolo, Tata Communications

Anthony Bartolo, the chief product officer of Tata Communications, added: "The very nature of IoT in areas like automotive infotainment and air travel means that these things require borderless, secure and scalable connectivity to allow businesses to capture, move and manage the valuable information they generate on a global scale. Through our Tata Communications MOVE platform and this partnership with China Telecom Global, we look forward to helping to eliminate the complexities that businesses may face when deploying new IoT devices, and accelerate the time-to-market for new innovative IoT-enabled services in Mainland China, Hong Kong and Macau." ■

PTC partners with Digital Catapult to launch the Future Networks Lab in London

PTC is partnering with **Digital Catapult** to launch its Future Networks Lab, a London-based facility dedicated to network and IoT technologies. The new Lab is designed to make use of advanced digital technology to drive early adoption of solutions that can make UK businesses more competitive and productive to grow the country's economy.

The Future Networks Lab is one of the first facilities in Europe specifically designed with a focus on IoT, 5G and low power wide area network (LPWAN) technologies. The facility will offer a place for start-ups, corporations and network platform providers to collaborate and utilise technical expertise, innovation support and advanced digital infrastructures.

PTC, which chose to partner with Digital Capital for its IoT and augmented reality expertise, will contribute its ThingWorx connected Bosch Rexroth Cytropac unit to demonstrate the benefits of a device that has been engineered as a smart connected product, with connectivity from the edge to the cloud.

Companies who visit the Future Networks Lab will be able to observe the device as it performs through a tablet driven by PTC's Vuforia augmented reality experience – viewing sensor feeds, sales information and a service procedure showing the replacement of a filter unit.



Jeremy Silver, Digital Catapult

Jeremy Silver, the chief executive of Digital Catapult, said: "Today's companies need modern, efficient and resilient technological infrastructure. Digital Catapult's new Future Networks Lab will provide some of the key building blocks to help unlock that developing infrastructure and the new services that will run on it. We are helping companies of all sizes access the latest IoT-enabling technologies, developing collaboration opportunities and running programmes that will bring all sorts of experts together in an inspiring space." ■

NEWS IN BRIEF

HCL Technologies buys Strong-Bridge Envision to strengthen consulting services

HCL Technologies has acquired **Strong-Bridge Envision** (SBE), a consulting firm for digital transformation with offices across the US. Post- acquisition, SBE will become part of the global and analytical business of HCL.

"HCL and SBE share the same vision of offering innovative solutions and services for digital transformation with a primary focus on excellent customer experience. This is why we see HCL as our ideal partner," said Renea Rayner, a managing director for sales, delivery and operations at Strong-Bridge Envision. "Our customers will continue to receive first-line care and support of added value along with solid product and service offerings from HCL." ■

Orange and NTT sign strategic R&D deal

Orange and **NTT** have signed a strategic research and development (R&D) framework agreement lasting until 2022 to mutualise research findings in several key domains. These include 5G, network transformation, artificial intelligence (AI), Internet of Things (IoT), cybersecurity, cloud services, smart cities, sports, tourism and culture.

Both organisations believe that greater alignment and cooperation on R&D topics will accelerate digital and network transformation, and lead to more innovation and the development of new products and services that can be used across the Asia Pacific region covered by NTT, and Orange's geographical reach across Europe and Africa.

Stéphane Richard, the chairman and CEO of Orange Group, commented: "As Europe embarks on its own 5G journey, our collaboration with NTT will be very precious. Both parties share a commitment to continuous learning and cultural exchange, which I fundamentally believe is essential in today's global environment." ■

5G market set to boom, but clarity is needed, says IHS Markit



Francis Sideco, IHS Markit

In its latest white paper, The Promise and Potential of 5G, business information provider **IHS Markit** concludes that 5G is helping set the stage for incredible change, but it remains a confusing landscape, with varied and sometimes conflicting interpretations of what 5G is and what to expect from it. This confusion is impacting not just consumers but also complicating the industry's ability to measure itself against a standard set of 5G expectations and requirements.

According to the white paper, 5G will improve existing services and enable new use cases, such as driverless cars, immersive entertainment, zero-delay virtual reality, uninterrupted video and no-latency gaming. On the industrial front, 5G will be key to expanding and realising the full promise of the Internet of Things (IoT), with the technology's impact to be felt in smart homes, smart cities and smart industries.

"The marketplace implicitly understands 5G represents an unprecedented growth opportunity, with the initial smartphone rollout set to generate record shipment volumes," said Francis Sideco, vice president, technology at IHS Markit. "However, fewer people understand the iterative nature of major technology rollouts such as the one we are going through now with 5G - a process involving multiple major updates that will add new capabilities in the coming years. With each of these updates having the potential to significantly disrupt the market's competitive dynamics, it's critical for companies to clearly understand the implications of each rollout or risk falling behind the competition."

"This next phase of implementation and rollout will trigger a race among mobile network operators to meet and take advantage of these performance enhancements," Sideco added.

NEWS IN BRIEF

V2X communications technology to hit US$1.2bn by 2022

SNS Telecom & IT's latest research report indicates that global spending on V2X (Vehicle-to-Everything) communications technology – based on both IEEE 802.11p and C-V2X (Cellular V2X) standards – will reach US$1.2bn annually by the end of 2022.

Commonly referred to as V2X, vehicle-to-everything communications technology allows vehicles to directly communicate with each other, roadside infrastructure, and other road users to deliver an array of benefits in the form of road safety, traffic efficiency, smart mobility, environmental sustainability, and driver convenience.

With an initial focus on road safety and traffic efficiency applications, **Toyota** and **General Motors** have already equipped some of their vehicle models with IEEE 802.11p-based V2X technology in Japan and North America. Among other commercial commitments, **Volkswagen** will begin deploying IEEE 802.11p on volume models in Europe starting from 2019, while **Geely** and **Ford** plan to integrate C-V2X in their new vehicles by 2021 and 2022 respectively. A number of luxury automakers – including **BMW, Daimler**, Volkswagen's subsidiary **Audi**, and **Volvo Cars** – already deliver certain V2X-type applications through wide-area cellular connectivity and supporting infrastructure such as appropriately equipped roadwork trailers.

Low power mobile IoT networks gain traction across globe

Two industry bodies, **GSMA** and **GSA**, have reported rapid uptake of networks designed for IoT applications. GSMA reported in February 2019 that mobile IoT or low power wide area (LPWA) networks are now globally available in licensed spectrum in 49 markets around the world. This follows 93 launches by 50 different mobile operators across both LTE-M and narrowband IoT (NB-IoT) technologies.

Coverage is now expected to reach approximately 93% of the world's largest IoT markets by Q2 2019. According to **GSMA Intelligence** forecasts, by 2025 there will be 3.5 billion cellular Internet of Things connections, including 1.9 billion licensed LPWA connections.

"The speed with which these networks have been standardised and deployed around the world is staggering," says Alex Sinclair, the chief technology officer, GSMA. "They are now available in every major IoT market encouraging the development of innovative new products and services across a wide range of sectors. The market clearly sees the benefit of solutions in licensed spectrum that offer flexibility, adaptability, security and lower cost. They are also future-proofed for the 5G era and will support and co-exist with other 5G technologies."

In March, Global mobile Suppliers Association (GSA) reported that 102 operators in 52 countries have now either deployed or launched at least one of the NB-IoT or LTE-M technologies, illustrating the pace of adoption. Of these, 20 operators in 19 countries had deployed or launched both NB-IoT and LTE-M. To date there have been 68 NB-IoT launches in 45 markets and 25 launches of LTE-M networks in 19 markets.

"The global momentum behind LPWAN deployments is testament to the revenue opportunities which operators are racing to win and monetise in a diverse range of new IoT applications. Significantly, it can also be seen as a precursor to operators replacing legacy M2M services such as GPRS-based trackers and preparing the ground for the eventual switch-off of their 2G networks," said Joe Barrett, the president of GSA.

IoT to boost secure credential and embedded security market by 63% to $8.5bn by 2022, says P.A.ID

P.A.ID Strategies has launched its new Digital Secure Solutions: Credentials, Embedded and IoT Devices market intelligence service to clients. The firm found that the market for secure credentials and embedded hardware for connected devices increased in value by 15.4% in 2018 and is forecast to rapidly grow by a further 41% by 2022 as emerging applications in the IoT implement security and digital credentials are introduced alongside existing smart cards.

Traditional credentials, such as smart cards, will continue to account for the majority of market volume although the ability to create, access and share digital credentials, plus securing connected devices, will drive adoption of higher value solutions.

Combined, these trends will see demand jump from 14.2 billion units last year to 18.8 billion units in 2022 for a combination of authentication ICs, embedded secure elements (eSEs), embedded SIMs (eSIMs), hardware security modules (HSMs), secure microprocessors, smart card ICs, secure access modules (SAMs), trusted execution environments (TEEs) and trusted platform modules (TPMs).

"Smart cards have been a proven and trusted solution for 20 years although adoption has been unsteady, even in established sectors such as banking and government," said John Devlin, the principal analyst at P.A.ID Strategies."We expect that the same will happen in these new IoT applications; it will not be even and steady despite there being a recognised need to implement security."



Els Baert, Netcomm

NetComm launches new Industrial IoT router for medium bandwidth apps

NetComm has expanded its Industrial Internet of Things (IIoT) portfolio with the launch of its 4G LTE Category 1 Industrial IoT Router (NTC-220) that will deliver reliable and secure medium bandwidth connectivity using universally available LTE networks.

The introduction of medium bandwidth IIoT connectivity via the NTC-220 – offering speeds of a few Mbps – will enable faster deployment of IIoT applications in the market. In addition, the use of widely used LTE Category 1 technology in the NTC-220 will also provide near ubiquitous network coverage which will enable greater IIoT deployment. The medium bandwidth capability provided by the NTC-220 enables machines to send data over the network faster while also still ensuring an optimised battery life, thereby increasing the performance lifetime of the product.

Els Baert, the director of marketing and communications at NetComm, said: "Companies around the world are really starting to wake up to the significant productivity gains made possible by embracing IIoT applications with Gartner forecasting that the global IIoT market will be worth US$123bn by 2021. The NTC-220 will enable connectivity right across this fast-growing sector from vending machines to security cameras to agriculture sensors and so much more."

Telit introduces OneEdge software suite for IoT modules

Telit has unveiled OneEdge, a new initiative to speed Internet of Things deployments and reduce the time required to monetise the digitalisation of businesses.

OneEdge is a software suite that is claimed to enable solutions for a new generation of Telit's cellular low power wide area (LPWA) IoT modules. With integrated, secure, easy-to-use tools, Telit says the suite dramatically simplifies design, deployment and management of IoT products and solutions, enabling a leap ahead into the new 5G super-connected world.

The suite aims to solve long-standing challenges related to integration, scalability, management and costs that solution architects and their enterprise customers face as they implement IoT to transform their businesses. It is designed to accelerate solutions to market in an industry that is expected to scale to more than three million new cellular connections per day by 2023.

"With OneEdge, we are simplifying all aspects of IoT implementation for our customers by saving them time and money, reducing their risks and speeding time to revenue by easing deployment. OneEdge-based products are born IoT-ready to connect, to interact and to deliver the next wave of productivity through successful, beyond-the-hype digital transformation," said Alon Segal, the senior vice president of Software and Services at Telit. "OneEdge utilises Telit's vast experience and pioneering work in IoT, delivering intelligence at the edge for a more connected and secure IoT."

NEWS IN BRIEF

Gemalto unveils 5G SIM with enhanced protection against hacking

Gemalto is claiming an industry-first for its 5G SIM which it says offers improved data privacy and seamless 5G global roaming imposed by the latest standards while also being the first to add enhanced protection against hacking to anticipate future requirements.

By 2024, 5G network coverage is expected to reach 40% of the global population, and will account for 1.5 billion subscriptions. The benefits of 5G mean key use cases of the new SIM are set to include enhanced mobile broadband, massive IoT applications, and critical communications infrastructures. The Gemalto 5G SIM will be available in all SIM form factors during the first half of 2019.

Semtech announces availability of LoRa Cloud Geolocation service

Semtech, a supplier of high performance analogue and mixed signal semiconductors and advanced algorithms, has announced the availability of LoRa Cloud Geolocation, a new cloud-based geolocation service that is compatible with the LoRaWAN protocol and almost any network server. The geolocation service can be easily integrated to provide a low-cost, performance-optimised solution, and is the first of a variety of cloud services and products that Semtech will be offering to support IoT application development.

"Semtech's new cloud-based geolocation service, accessed by a cloud application programme interface (API) call, will simplify and democratise access to geolocation for all LoRaWAN-based devices," said Richard Lansdowne, the senior director of LoRa coud services within Semtech's Wireless and Sensing Products Group. "This is the first of a new breed of fully supported commercial LoRa Cloud services from Semtech that we will be providing as part of our overall strategy to simplify the development of Internet of Things solutions."

January and February 2019

It's free to be included in The Contract Hot List, which shows the companies announcing major 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
Aeris	Roambee, USA	Deal agreed for IoT supply chain and enterprise asset visibility specialist, Roambee, to utilise the Aeris Mobility and Connectivity Platforms	1.19
AT&T	OneLife Technologies, USA	AT&T LTE-M connectivity chosen for Smartwatch health solution for chronically ill and elderly patients	2.19
Comarch	SCSK, Japan	Comarch selected to enhance system integrator's portfolio with IoT device management and monetisation capabilities	1.19
Cubic Telecom	e.GO, Germany	Cubic chosen to connect e.GO electric cars across Europe	1.19
Cubic Telecom	Skoda, Europe	Contract signed for pan-European, end-to-end connectivity enablement for Skoda drivers	2.19
Cubic Telecom	Microsoft, global	Cubic Telecom to be first provider to enable global connectivity for Microsoft Connected Vehicle Platform	2.19
Ericsson	China Unicom, China	Deployment of smart harbour system to build on successful, six-month technical solution verification project	2.19
Ericsson	Telstra, Australia	Connectivity management services from Ericsson's IoT Accelerator Solution integrated into Telstra's IoT offering and mobile network	2.19
High Mobility	Mercedes-Benz, Germany	Verification of third party automobile services and applications provided via the High Mobility connected car platform	1.19
IBM and Sigfox	Groupe PSA, France	Deployment of track and trace system for container tracking that utilises Sigfox's international network and IBM Watson technology	2.19
Iteris and Cisco	City of Las Vegas, USA	Applied informatics specialist partners with Cisco's Connected Roadway system for deployment of edge processing IoT solution in Las Vegas	1.19
Orange	Groupama, France	Insurer collaborates with Orange to create Protectline, a home telesurveillance offering for the French market	1.19
Panasonic Automotive	Harley-Davidson, USA	Panasonic selected to connect LiveWire, Harley-Davidson's first electric motorcycle	1.19
RealWear	State Grid, China	Deployment of RealWare voice-controlled, hands-free wearable computers to aid safety compliance	2.19
Semtech	Orion System, Kazakhstan	Integration of Semtech LoRa devices into smart metering solutions to monitor water, gas and electricity usage data plus smart lighting	2.19
Semtech	Transco Industries, USA	Implementation of Semtech LoRa devices and radio frequency technology into Transco's conveyor belt applications for safety monitoring and cost reduction	2.19
Sequans	Orange, France	Sequans modules selected to simplify IoT device deployment as part of Oranges' Live Booster programme	2.19
Sequans	Daatrics, UK	Sequans Monarch SiP module selected to operate Daatrics' Neebo wearable baby monitor	2.19
Sierra Wireless	Mann and Hummel, Germany	Predictive maintenance platform provider selects Sierra Wireless to support offering for industrial and agricultural vehicle fleets	1.19
Sierra Wireless	Nimb, USA	Sierra Wireless Ready-to-Connect modules chosen by personal safety wearables maker	2.19
Sierra Wireless	Unimar, USA	Selection of Sierra Wireless device to cloud system, including gateways and SIMs managed via the AirVantage IoT platform for obstruction lighting provider	1.19
Splunk	Zeppelin, Germany	Deployment of Splunk Enterprise to reduce the risk of factory shutdown and enable predictive machinery and equipment maintenance	1.19

Telecom Egypt and Nokia to build cloud infrastructure for IoT roll-out in Egypt



Ankur Bhan, Nokia

Nokia and **Telecom Egypt** have announced they will build the first cloud infrastructure in Egypt exclusively for Internet of Things (IoT) services. Telecom Egypt will use Nokia's Worldwide IoT Network Grid (WING) as-a-service as the platform to launch IoT services for enterprises later this year.

Nokia WING enables operators to offer IoT services to enterprises on a global scale. Telecom Egypt will be able to tap into the growing IoT market rapidly and cost-effectively because of the Nokia WING one-stop model, which includes worldwide IoT infrastructure-as-a-service and a pay-as-you-grow business model. WING enables Telecom Egypt to provide global IoT service at almost local prices as opposed to more expensive roaming prices.

As part of a Memorandum of Understanding (MoU), Nokia and Telecom Egypt will also explore joint marketing initiatives and will work to accelerate the development of an IoT partner ecosystem in the country. A number of IoT use cases drive automation, which will help enterprises cut their operational expenses, enhance productivity and bring new services to market faster.

Adel Hamed, the managing director and chief executive of Telecom Egypt, said: "We are excited to collaborate with Nokia for this IoT initiative. We have worked with Nokia in the past and we are confident that Nokia WING will enable us to bring world-class IoT use cases to our enterprise customers in Egypt and later in the region."

Ankur Bhan, the head of the WING business at Nokia, added: "We are pleased to announce this collaboration with Telecom Egypt to enable next generation IoT services for Egypt and the African market. Our cloud-native IoT proposition and pay-as-you-grow business model makes it possible for Telecom Egypt to move fast to address the vast IoT market opportunity in Egypt."


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LIFE IS FOR SHARING.

Technology must come together with processes, skills and strategy to ensure IoT business benefits are realized



Stefan Pfeffer is the chief financial officer and a founder of Microtronics Engineering, the provider of complete IoT solutions consisting of hardware, software and services. Microtronics develops and operates customised Internet of Things (IoT) applications based on its rapidM2M technology, which enables easy development and convenient management of IoT projects throughout their entire lifecycle.

With more than ten years of experience in IoT, Pfeffer has a deep understanding of how to create value from IoT projects. As a finance professional, business performance is always important to him and his focus is on how customers benefit and the value that is created from IoT deployments. Here, he tells George Malim how customers can focus their strategies to ensure their IoT deployments enable new businesses that earn money and enable new revenue streams to be opened up ▶

SPONSORED INTERVIEW



George Malim: Are the strategic and management challenges of IoT starting to outweigh the technical issues organisations face as they start to scale up their IoT activities?

Stefan Pfeffer: Microtronics has been in this field for more than 12 years so we have a lot of experience bringing real, live IoT projects to the market. Based on that, we've been using IoT technologies for many years and technology is not the issue anymore. The issue is how to manage the changes in your company that are connected to implementation of IoT technologies.

You can use technology off the shelf but when you do that, you have to ensure your organisation and procedures can manage the change the technology will bring. You might need new employees, skills, processes and strategies. These elements are very important for success and it's vital to make sure you've prepared these in advance of IoT deployment. Success is dependent on the culture of the entire company.

GM: What, beyond technology specification, do you see as the greatest challenges facing organisations as they roll-out IoT services to their customers?

SP: It's the non-technical transformation. For example, traditionally you have very clear sales structures within a company and you typically sell through different channels so, as a manufacturer, you're not familiar with your end customers. This is handled by a dealer or distributor network.

With IoT, though, you get direct access to your end customer and for many organisations this could be for the first time. You therefore may not be used to managing customers and serving them directly and this is capability that you will have to think about. Servitization of a product, for example, means you have to consider how you will sell the service, how you will support customers and how you will maintain the equipment.

Some will need to learn these skills and part of that will involve managing wholesale and retail partners. Consider how your deployment will impact relationships with these and your end customers. For instance, will you need a support line to handle the new requirements?

These considerations are challenging and there is a big risk to organisations in moving to having direct contact with customers. This is offset by the value in the direct information organisations will gain which is typically a very good thing for their businesses.

GM: How does Microtronics' rapidM2M technology help organisations manage IoT projects from early start-up through to maturity and beyond?

SP: rapidM2M is the perfect combination between already solved challenges and the necessary flexibility to realize your own IoT project. You can totally focus on your application and benefit from the fully developed technology.

For example, there are mature over the air update mechanisms which is important when you have a thousand or more devices in the field. Furthermore, the rapidM2M runtime environment makes sure, that you cannot break down the device with your own script. The predefined data structure supports you with error messages, for example, according the connectivity.

There are three types of fully managed connectivity which handle synchronisation with the cloud. You do not have to send the data immediately and can store it temporally on the device. ▶

When it comes to considering scalability this situation gets even more complex

All those features are easily implemented with libraries. That's how you can focus completely on your application and let rapidM2M do the dirty work.

GM: Does the end goal have to be identified before the project begins?

SP: It's important to have a clear vision of what your expectations are before you start in order to avoid drifting in an unfocused way and starting projects that never end. Think big, start small and smart is the motto. Have the scalability in mind, but start with the minimum viable product (MVP) and gain first quick wins.

Microtronics is able to help with this because we have a lot of experience – we've completed approximately 300 projects across industries in over 60 countries in the past and this has given us a lot of knowledge. We know how to support our customers and how to bring their deployments to fruition in a defined timeframe.

GM: To what extent is it possible to have a system that encompasses requirements that have been proven to be necessary for success as well as one that provides the flexibility to fit the myriad requirements of different IoT use cases and business models?

SP: On one side, the issue is still technical and our experience helps customers progress. However, operational issues are increasingly hampering organisations deployments. We take on lots of projects in the field which are ongoing. Customers get stick at a point where they can't go any further and we can bring in a prospective strategy to get them past this point. Ultimately, a successful IT solution works with a strong business case behind it. Finding that whether it's about substantial cost savings or an exciting new business opportunity usually stimulates progress.

Therefore, it is important that the customer can focus on his core business. He is the expert in the application. He does not need to be technical expert too. That's why we solve all the deep technical issues for our customers and offer defined interfaces which enables them to easily build their solution on a strong fundament.

GM: Microtronics' offering brings together hardware, software and services. How important is it that all of these are encapsulated in a holistic IoT solution?

SP: Have you ever tried to share a document with different users via various end devices, operating systems and software tools? It sounds so easy, but can result in ugly designs and many more problems. That's the same with data. A lot of converting work has to be done. For example, you have to convert data from hex to decimal or take care of different time formats. You have to push bits around and make sure that in the end each part from the field to the visualisation on the server works smoothly together.

When it comes to considering scalability this situation gets even more complex. An integrated device and lifecycle management out of the box is needed to understand what happened to the devices. I need to know the different hardware, firmware and software versions, have defined update mechanisms to guarantee functionality. That are just a few advantages from a holistic approach. ▶





GM: Please can you share some examples of how customers are using rapidM2M to achieve their IoT goals?

SP: Our customers have different goals and they range from start-ups to SMEs and corporates. All use the same foundational technologies so it doesn't matter how big a company is, you can bring the idea to market from a technical point of view. Thinking big and starting smart is the quick way to a successful IoT project.

We are working, for example, with a start-up offering parking management in cities for short-time renting of existing, private parking garages. We also work with SMEs which have embedded our IoT solution in their products in order to connect them and get data for maintenance but also to build new services for their customers. The opportunities go up to a massive steel company managing its production facilities. Domestic robotics, artificial intelligence and a raft of consumer-oriented products will lead to even more opportunities in the IoT sector.

I am sure there are potential IoT customers in every business.

GM: 2019 looks to be a tipping point in which IoT moves on from trials and pilots and into the mass market. What indicators of this are you seeing?

SP: While we have been in this field for more than 12 years, in the last three to five years we have seen a lot more companies working intensively on their IoT deployments. The indications are that, from a business perspective, companies already have the budgets for digitalisation and IoT so it's now a case of recognising the importance of being prepared for making these projects a reality. The technology is available and companies have been playing around for a while now. Their first steps and their initial proof of concepts have given them trust in the solutions. They see the potential and are now ready to play the game seriously

On top of this, governments are taking an important role in pushing digitalisation and IoT forward. As a consequence, there is very good awareness of IoT and digitalisation.

www.microtronics.com

How to become a digital leader in IoT

Device manufacturers who have not yet moved their products towards being connected are facing an increasingly challenging future. Not only are they losing out on the high value software and data-driven service opportunities that connectivity creates, but they are also positioning themselves to lose market share to their competitors who have made this move and are now offering connected product and service packages as part of an ongoing IoT strategy. There is now no doubt that, for these manufacturers, connecting their products unleashes a whole new range of opportunities and competitive advantages that are transforming traditional product markets. Those that do not are taking an increasingly large risk of their products becoming disrupted and uncompetitive in the future, write Robin Duke-Woolley, the chief executive, and Bill Ingle, a senior analyst, at Beecham Research

Yet making this move creates a new set of challenges that manufacturers are often not familiar with. Monetising new services closely associated with their products requires significant changes to current operations of the business. Decisions also need to be made about what to include in the new service package and how to charge for these – what business model to use? This is where Flexera Software's award-winning and full-featured software monetisation platform, based on more than 30 years of experience in software licensing, entitlement management, software delivery and updates, is perfectly placed to assist.

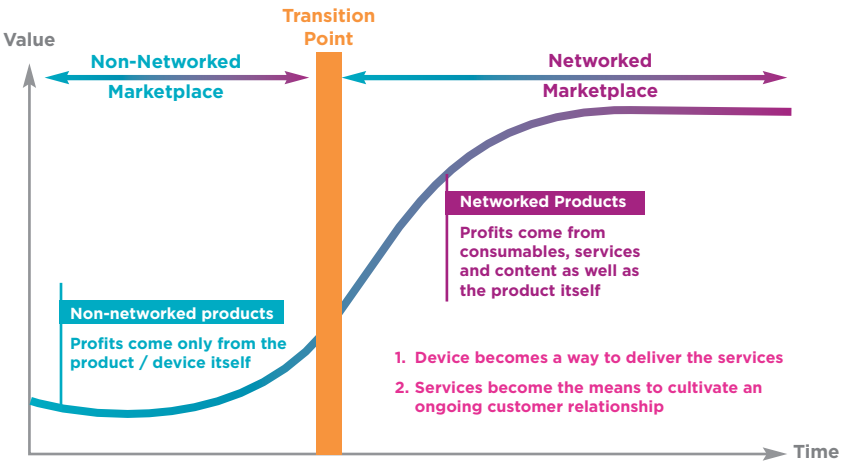


Figure 1: Connected products create more value than unconnected ones

Source: Beecham Research

Towards a digital transformation

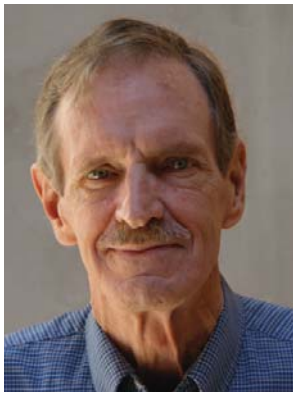
As **Figure 1** shows, a product that is not connected stands or falls by the product offering itself. While even a disconnected product can be updated and provisioned with new features, (See panel, p16) the product cannot generate data and interconnect with other devices or applications that easily. It can quickly lose its competitive position in the market compared with others that are connected and offer ongoing value. More than this, an unconnected product cannot be remotely maintained, and its performance in the field cannot be assessed. 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.

Manufacturers in all sectors – buildings, consumer, energy, healthcare, industrial, retail, security/public safety and transport – must now navigate this digital transformation and develop service strategies for their offerings in order to compete in their own future market. By doing so, they can expect to:

- **Bring new offerings to market that enable business growth**. This allows them to move away from a hardware base that is likely to become increasingly commoditised and into a market for software and data-driven services that offer faster growth.
- **Tap into new markets**. Digital offerings and services often enable hardware companies to ▶



Robin Duke-Woolley,
Beecham Research



Bill Ingle,
Beecham Research

bring to market offerings with a lower entry barrier for potential customers. Rather than selling an expensive device upfront – which is a high entry barrier – they can start offering subscription and usage-based models and services that are more attractive to customers.

- **Develop offerings that open up new opportunities for adding value for customers**, such as data analytics, artificial intelligence (AI) and remote control.

These represent a new path towards becoming an IoT digital leader.

Transforming the business

This type of transformation touches on all parts of a manufacturer's business and the extent of this is often not fully recognised. Within the business as a whole, the following areas will be directly impacted:

- **Customer relationships become much closer and must be actively managed**. The success of a service model depends strongly on customer satisfaction and a continuous customer relationship.

- **Processes and systems, both internal and external, must evolve**. For example, any company offering software and services needs to manage customer use rights - entitlements - very closely to ensure that customers receive the services and software access they paid for while compliance gets managed as well. For this reason, manufacturers need to manage entitlements in a purpose-built system and implement licensing in their software applications to control compliance and measure usage.

- **Financials need to accommodate the change in business model**. With a wider service offering, device manufacturers move to a recurring revenue business. The expense is usually an operational expense for their customers, not a capital expense. This often means an initial dip in revenue for the manufacturer, as one-off product sales decline and recurring revenue streams start to ramp up. This needs to be closely managed by the organisation's finance department.

- **Business metrics need to change to accommodate the wider offering**. With that shift, companies need to report on new metrics like annual recurring revenue, revenue retention and churn to truly understand the success of their digital business.

- **Sales and compensation must move to a new basis**. It's both a cultural and a compensation change when hardware sales teams get trained on selling software and services. Their sales cycle changes, the value proposition changes and, lastly, compensation models need to accommodate the recurring revenue stream.

In order to achieve these changes successfully, manufacturers need to have the right stakeholders on board, they need to think about customer requirements and how these will be accepted, and they need to get the right processes and systems in place. This means manufacturers moving to a digital business model need to:

- Have executive alignment

- Bring all relevant internal stakeholders on board, for example:
  - C-level (CEO, CFO), to support the new go-to-market approach
  - Product management and strategy teams to build and implement the new business model
  - IT and software operations, to run and execute the new processes ▶

- Gain customer buy-in:
  - Overcome resistance from existing customers to move to a recurring revenue model
  - Be able to show the additional value that software and data-driven services offer
  - Find monetisation models – subscription and usage based – that are compelling and transparent
  - Continuously deliver new value throughout the product and customer lifecycle

- Get the right systems in place to achieve the move towards monetised services.

Developing the product and service package

Apart from providing the means for checking performance of a product in the field and monitoring consumption, for example, what else can a connected product offer that an unconnected one cannot? There are many examples. Products that use consumables – such as printer toner or ink, nitrogen for cooling or even coffee cartridges – can indicate when they are getting short of supplies and initiate re-ordering to prevent downtime. In the Industrial IoT (IIoT) market, data collected from connected products is used for preventive and, at a higher level, predictive maintenance to reduce or even eradicate the risk of downtime in operations and the high costs associated with that. In fact, introducing connectivity to a product enables a hierarchy of potential software and service offerings, each layer offering greater value, with the top layer being product as a (monetised) service.

There are an increasing number of examples in the market of products being offered as services. Tractors and construction vehicles are now increasingly being paid for on a time-used basis: when the vehicle is started up, monitoring commences, and the transaction completes when the vehicle is switched off. Jet engines on aircraft are being paid for on the basis of thrust produced over a period, avoiding the capital outlay of what is otherwise a large fixed asset. A classic case is magnetic resonance imaging (MRI) scanners in hospitals and clinics. These scanners are large and expensive physical assets that need constant maintenance, upgrades and replacement of consumables. This represents substantial capital outlay and technical resources support for a hospital. However, by connecting them and unleashing the software for monetising the service opportunities, manufacturers now offer them as a service. Hospitals pay for their use on a per scan basis, which in turn can sometimes be passed on to the patient and their insurer. So what was a straight capital cost is now an operating expense and can even become a profit centre.

Do all products have to be connected?

While connectivity provides manufacturers with a lot more possibilities to integrate into ecosystems and build new business models there will always be products that should not directly connect to the internet, especially in the medical and industrial space. For security and safety reasons some products will continue to be offline. But even those need to get updated and provisioned with new functionality. Flexera's Monetization Platform includes a smart edge server, FlexNet Edge, that provides that capability, enabling suppliers to keep their products up to date, to deliver new functionality and to patch security issues.

Successful IoT companies utilise new products and services. They bring solutions to market that let customers make use of the data retrieved from their devices and they offer new product packaging options that enable customers to only pay for what they need and to upgrade and change their products on demand. To be able to do that, IoT companies need to truly understand how their products are being used. Based on these insights they can build new offerings that fulfil their customers needs. An IoT monetisation platform will then help them to both understand product usage and to build new offerings without the headache of creating different product lines.

The key steps for running a successful digital business based on products and services are then typically as follows:

1. **Set your business up for change**, taking into account the impact on financial systems and processes, on sales and on product development. Many companies choose to start with one product line, or one region, rather than disrupting their business altogether with the shift to recurring revenue models. That enables them to fine-tune step by step.

2. **Understand your market** and build an offering that is valuable for your customers while providing you with enough room to grow profitable business lines. Ultimately, the pricing and monetisation models defined for digital offerings need to align with the perceived customer value. Delivering customer value is not a one-off, it must be an ongoing effort that is top of mind for the whole company.

3. **Understand in detail how your products are used**. Before starting to find new pricing and packaging options, know what your customers love and hate about your products and build a new offering accordingly. ▶

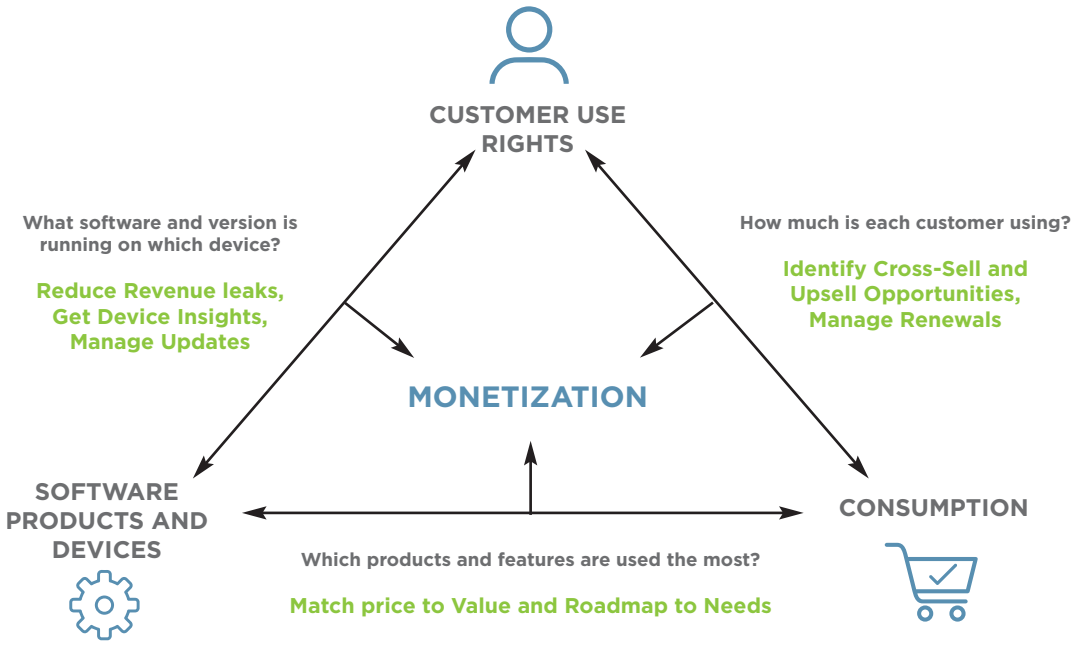


Figure 2: Data and insights to execute the business model

4. **Use data and insights**. The value of data and the actionable insights it creates is growing constantly, while the standard hardware business is becoming increasingly commoditised. Building new offerings that provide customers with insights and transparency and enable both users and producers to make smarter decisions is a very promising way forward for many device companies.

5. **Execute on your digital business**, It is very important to have the data needed to run a digital business model and to implement and enforce that model. This requires a monetisation platform that manages the data and automates all related processes, including entitlement management, licensing and fulfilment, software delivery and updates, and usage analytics.

What monetisation models to use?

Choosing the right monetisation model is crucial, but deciding on the right one, finding the right metric and building a licensing and compliance policy that enforces the new business model is challenging. **Figure 3** gives an overview of some of the most popular monetisation models and the differences regarding time limited models, which centre on how long customers have access to the software or service, and the impact on ongoing maintenance, payment options and revenue recognition. Service-based offerings are usually monetised based on a subscription, usage volume or even an outcome-based model.

Companies that rely on a central monetisation platform to build their new digital offerings are often ahead of their competitors because they know how their products are being used. They can strategically grow recurring revenue by implementing and adjusting their monetisation models over time. They can also truly understand product usage and build on that knowledge to adjust products to market needs and to align price with value. ▶

Model	Time Limit	Maintenance Included	Payment	Revenue Recognition
Perpetual	No	NO-Additional Purchase	At Delivery	Up Front (except Maint,)
Subscription/ "as-a-service" (on-premises or Saas)	1,2,3 year	Yes	Periodic	Ratable
Usage (pay per use)	Yes	Yes	Periodic & Arrears	Ratable
Outcome	No	Yes	At Outcome	At Outcome (Repeatedly)

CONSUMPTIVE MODELS WITH RECURRING REVENUE

Figure 3: Alternative revenue models

How device manufacturers can innovate their business models and grow

Robin Duke-Woolley (RD-W) interviews Brent Pietrzak (BP), the senior vice president and general manager of the Supplier Division at Flexera Software



Brent Pietrzak,
Flexera Software

www.flexerasoftware.com

RD-W: How does Flexera help companies build a digital leadership position?

BP: Manufacturers and original equipment manufacturers (OEMs) that stand out in the market with an innovative business model and approach put their customers front and center and rely on a software and services driven approach to continuously provide value and flexibility. We give them the data and processes they need to implement, run and analyse their monetisation models. We enable them to automate, and hence go to market faster and to make better decisions based on data and insights.

RD-W: Why should companies consider a central monetisation platform?

BP: They really need a holistic view on their digital business. Companies that run products in silos and use different technologies or homegrown solutions for critical business processes like licensing and entitlement management turn a blind eye on the overall health of their business and don't have a 360-degree view of their customers. Plus, they might be losing money and wasting time on inefficient processes and duplication of efforts between different product lines.

RD-W: What is the core value of a monetisation platform?

BP: In the past, say 10 or 15 years ago, monetisation was all about licensing and IP protection. Today the core value is driving recurring revenue and increasing customer satisfaction. Delivering seamless processes for customers as they consume software, offering self-services and providing transparency and insights is at the heart of every customer-centric organisation, which makes software monetisation a strategic value driver.

RDW: Why should companies rely on a standard system like yours rather than developing something themselves?

BP: There are three very obvious reasons. First, they want to use the time and experience of their teams to develop their core products and services. Second, they will likely underestimate the time and effort needed to build and maintain functions like licensing, entitlement management and software/firmware updates and third, no homegrown system will provide the business model flexibility that companies need and that customers require. ■

Implementing Flexera's Software Monetization Platform – some practical examples

ThingWorx

ThingWorx - PTC's market-leading Industrial Innovation platform - delivers tools and technologies that empower businesses to rapidly develop and deploy powerful Internet of Things (IoT) applications and augmented reality (AR) experiences. It makes solution development simple, time-to-market fast and solutions built on the platform more compelling. ThingWorx has been growing fast as PTC continuously adds more partners who choose its innovative platform to develop and connect their IoT solutions. In preparation for this growth, PTC needed a robust, flexible and scalable solution for monetisation and compliance management and chose Flexera.

PTC implemented Flexera's Software Monetization platform, using FlexNet Operations as a central entitlement management back office and FlexNet Embedded as the flexible licensing technology integrated in ThingWorx. The Flexera Integration Framework was used to create seamless integration with PTC's existing back-office workflows to manage customer entitlements. Flexera's Monetization Platform supported all of PTC's outlined needs right out of the box in a standard setup. And throughout the entire process - from strategic planning, to design and implementation and training - Flexera Global Consulting Services fully supported and aligned with the PTC team. The result of this collaboration was a first-pass success with zero business downtime.

Schneider Electric

Schneider Electric, a global specialist in energy management, selected the Flexera Monetization solution to reduce costs and increase flexibility - in turn delivering more value to customers.

In this rapidly changing market, Schneider Electric needed a software monetisation solution that would give the company flexibility to quickly adapt and take advantage of new business opportunities such as the Internet of Things by standardising software licensing, entitlement management and delivery onto a single, consolidated platform across its traditional and digital software business.

Siemens Building Technologies

Siemens Building Technologies Division, based in Zug, Switzerland, is the world leader in the market for safe and secure, energy-efficient and environment-friendly buildings and infrastructures. The company offerings for safety and security as well as building automation, heating, ventilation and air conditioning (HVAC) and energy management.

Siemens Building Technologies searched for standardised licensing technology which would enable it to monetise all software and improve the licensing and order process as well as the customer experience. Itchose to partner with Flexera and implement its Software Monetization Platform. Siemens Building Technologies Divisions' License Management System provides complete integration between Flexera's FlexNet Operations back-office entitlement management system and their instances of enterprise resource planning (ERP) and their business intelligence (BI) system. The License Management System provides the following key benefits to Siemens Building Technologies Division:

- Assurance that all software is protected and monetised with standard licensing technology
- Improved and automated operating and ordering processes—previously they had to ship hardware dongles to customers, now they simply provide a license key which simplifies the ordering process and eliminates manual processes
- Ability to adopt new business and licensing models when selling software and services to customers

Empirix

Empirix is a recognised leader in end-to-end network performance monitoring and analytics. Empirix solutions provide a holistic view of end-to-end user communications and behaviors across networks, emulating real world transactions to deliver functional/regression testing, performance testing and proactive monitoring.

Empirix improves customer loyalty through real-time, end-to-end visibility of customer experience, service performance, network performance, device management, and location based services. As a software provider, Empirix works with telecoms service providers as well as companies in the financial, retail, healthcare and utilities industries.

As network functions become virtualised, there is a demand for more flexible business models. Empirix saw the need to move from feature-based to usage-based monetisation models. With this came the need to understand exactly what customers were using and charging appropriately, while maintaining an excellent customer experience.

Flexera's Software Monetization Platform enables Empirix to move to new business models and better understand its customers' needs and usage of their products, leading to informed business decisions about monetisation, product packaging and end-of-life (EOL).



Accurate monitoring means more effective management of IoT infrastructure

Network monitoring specialist Paessler AG, based in Nuremberg, Germany, and IoT services and low power wide area network (LPWAN) connectivity provider Sigfox, based in Labege, France, announced a partnership agreement in October 2018. The agreement includes the delivery of Paessler's PRTG Network Monitor for IoT solutions that will enable monitoring data from Sigfox-enabled IT infrastructure sensors and other devices equipped with Sigfox connectivity, which includes Sigfox's dedicated network that combines its LPWAN and Sigfox Cloud services. Robin Duke-Woolley, the chief executive of Beecham Research, interviewed Martin Hodgson, the country manager for UK & Ireland at Paessler AG, to find out more about the company and its PRTG monitoring platform

Robin Duke-Woolley: What is PRTG?

Martin Hodgson: PRTG stands for Paessler Router Traffic Grapher. It is a monitoring platform now used by more than 200,000 system administrators worldwide. It started out and still is used extensively in the traditional IT space, monitoring both infrastructures, physical and virtual – operating systems and apps – and in effect the whole stack, so that system administrators can see exactly the health and performance of their systems from a single

SPONSORED INTERVIEW



PRTG is completely agentless; we use standard monitoring techniques and protocols to extract the information from these devices and processes

dashboard. Over time we've built on that solid foundation to extend it into the emerging requirements of IoT.

RD-W: Do you see the requirements for IoT as different to what you've been measuring to in the IT space?

MH: I'd say that they are both not different and completely different. What's not different is that there's still a requirement for an insight into the health of the devices, their ability to deliver whatever that function is, but what's different is they require an entirely different set of tools and techniques.

RD-W: What do you see as the main challenges of dealing with IoT?

MH: It mirrors where IT monitoring was maybe 15 or 20 years ago, where you had to use a vendor's monitoring technology for a vendor's product. If you had a HP server, you had to buy HP hardware and software to monitor it – and the same again for each of the brands you had, so you ended up with multiple monitoring solutions for your entire IT infrastructure. Our approach is to tap into the available interfaces. PRTG is completely agentless; we use standard monitoring techniques and protocols to extract the information from these devices and processes. We use the same technique with IoT as we have with traditional IT and that ability to tap into vendor siloes such that you have a unified solution for your whole stack.

RD-W: So that's the similarity. Where would you see it as being completely different with IoT?

MH: In the IT world, we're used to the concept of always on – our expectation is that all our devices are always on – but in the world of IoT there are many very good reasons why devices aren't on. Whether we're

Martin Hodgson,
Paessler AG





looking at something that is currently in flight that doesn't transmit or whether it's for power consumption or bandwidth consumption reasons, they are not on-line. So that is one of the things that is significantly different in the IoT world.

RD-W: How long has PRTG been active in the market?

MH: This will be Paessler's 22nd year. PRTG has existed for fifteen years and evolved over that time. It started out as a dedicated network monitor. Our founding father, Dirk Paessler, tried out a number of techniques and potential products and as part of one of the projects he needed a network monitor and he couldn't find a good one, so he built one. That's what became PRTG and that's still the cornerstone of what we do.

RD-W: The data you extract is still real-time information, in the same sense that you were doing in IT days?

MH: It certainly can be. Monitoring can be wildly different based on the particular use case and that's where the administrator is alerted by whatever levels are appropriate for his environment. The administrator, or user, sets thresholds. We can also specify at what point to escalate beyond those and use



a different method of alerting at the point of escalation. You may start by sending an email to the network administrator when there's a problem with the network, but then you might send a text message to a manager if that hasn't been resolved in a given timeframe.

RD-W: How does PRTG scale?

MH: You can start out with a smaller instance and grow over time or start with a larger instance; you can also combine multiple instances of our product into a single pane of glass – two ways you can get to a very, very large scale. We have a free version of our product with the same features we sell to customers, but you can only connect up to 100 sensors or things on that. Beyond the free version the number of licensed elements, or bundles of sensors, is in theory unlimited.

RD-W: What other unique features does PRTG include?

MH: We have our own database technology. We designed a database for PRTG that gives us a huge range of advantages. It means that we're not compromised by having to fit our tables into a general purpose database, so our data is stored in its original form. While it's completely user configurable based on available storage and performance, for most of our customers we store the data in its original form for up to 12 months. There are some sensor types that are very data rich which we tend not to store for such a long period and a good example would be flow information – management information from a switch might not be something that you need to keep for such a long period.

RD-W: Does that mean you can store huge amounts of data but you can actually get to that data and sort that data quite quickly?

MH: Yes – absolutely. We designed our database for monitoring. Most of our competition in the traditional monitoring space use general purpose databases.

RD-W: What advantage does that give you?

MH: We would say that because it's specific for purpose, we get better performance from it. It also means that the end-user of the system doesn't need to buy something else or employ a database administrator (DBA), because it's self-tuning.

RD-W: Does this enable lower cost or more responsiveness?

MH: Yes of course lower cost, plus quicker time in terms of the installation. PRTG is up and working within about 10-15 minutes but by having a simpler stack and consistency there's less for the administrator of the system to deal with – it's one less thing to patch, one less thing to go wrong. Also, it's built for purpose. If you think about how a database could be used in a wide variety of different remits and has to cope with variable table size, number of records and other factors, we know that in monitoring there are going to be tiny fragments of data and there's going to be lots of them.

www.paessler.com



Robin Duke-Woolley,
Beecham Research

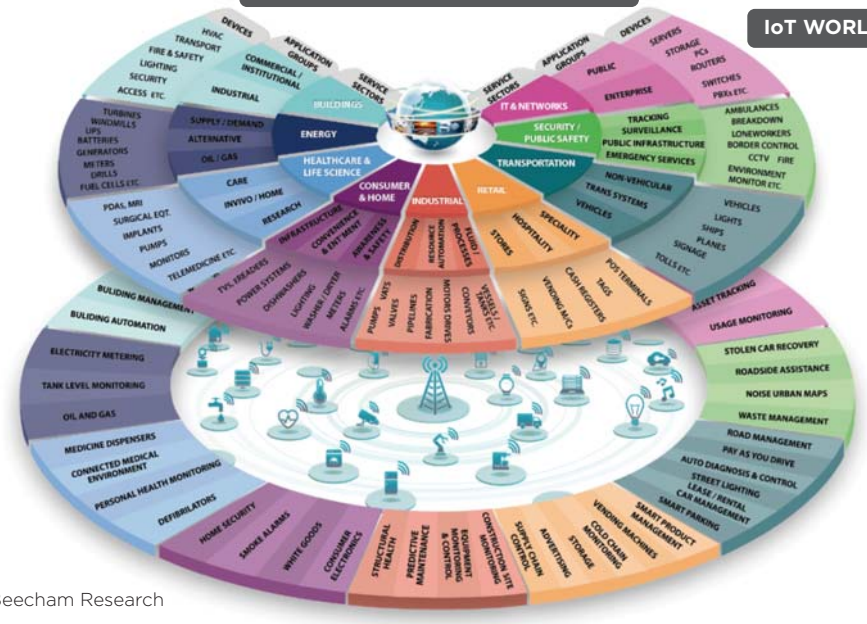
Inside Paessler's partnership with Sigfox

As part of Paessler's move into IoT, the company has partnered with Sigfox to help their customers more effectively monitor and manage their critical IoT infrastructure and assets. Through the partnership, Paessler's Router Traffic Grapher (PRTG) can monitor and visualise the functionality and measurement data from Sigfox-enabled IoT infrastructure sensors, as well as from other objects, devices and machines that are equipped with or have adaptive Sigfox connectivity. This combines a proven and efficient monitoring solution with low power wide area (LPWA) connectivity technology designed for very large numbers of devices generating very small amounts of data. This opens up a very wide range of potential new applications

The Internet of Things (IoT) will be everywhere and include even the smallest things. So long as they have useful data, they can be connected so that data is shared and used to create new value. That includes meters of all sorts, white goods, sensors in public parking spaces, in street lights, in waste bins and many more. The vast majority of IoT applications that generate small amounts of data are monitoring applications, so ideal for Paessler's PTRG, and there are literally billions of them.

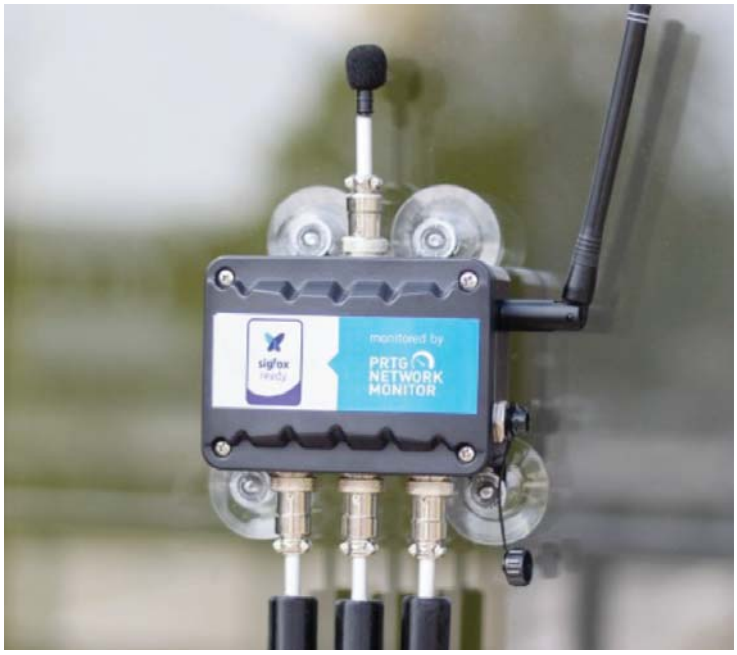
One of the challenges in the IoT market has been to collect these small amounts of data using traditional methods of connectivity. To do this effectively, wireless connectivity is absolutely essential and these wireless connections may need to be over long distances. They may be underground, in remote locations and often inaccessible once installed. That means they must have their own power and that must last for years. At the same time, they must be reliable. If the data is used as part of a business process or a commercial service, it is often vital that it is reliably received. Service revenue and customer relationships often depend on that. The connectivity needs to be low cost and easily deployed. Ideally, it needs to be a fraction of the cost of the thing it is connecting and it needs to be available anywhere and everywhere. LPWA network technology has been designed to meet these challenges, with Sigfox's LPWA connectivity being at the low end of data usage, with long range and long battery life. The figure below shows the extent of application opportunities for LPWA, with the upper segment showing general IoT application sectors and the lower segment showing examples of IoT applications that Sigfox LPWA connectivity, among others, is enabling. ▶

LPWA APPLICATIONS AS PART OF IoT WORLD OF CONNECTED SERVICES



Source: Beecham Research

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The Sigfox-ready Paessler PRTG monitoring solution combines with the Sigfox's 0G network connectivity to provide a complete hardware, software and connectivity solution to monitor the environment and warn the museum staff if thresholds are reached

The National Museum of Computing

An example of the new Paessler/Sigfox partnership is already in use at The National Museum of Computing (TNMOC) on the famous Bletchley Park estate, near Milton Keynes in the UK. From the Second World War codebreaking Colossus to the world's oldest working computer (WITCH), these legacy machines are still in operation at the museum and need to be closely monitored at all times. According to the museum, Colossus can get hot enough to melt its own solder. Rather than installing air conditioning, which would not be true to the staff who worked on these machines in the war, factors such as temperature, humidity and UV light levels need to be closely monitored to avoid damage. The museum has a duty of care, which means these machines must remain fully functional for the next 100 years.

The Sigfox-ready Paessler PRTG monitoring solution combines with the Sigfox's 0G network connectivity to provide a complete hardware, software and connectivity solution to monitor the environment and warn the museum staff if thresholds are reached. This compares with the previous, manual process employed by staff and allows for much more precise monitoring to proactively manage and mitigate risks to the machines. As part of that, the environment data from the 14 rooms monitored in the museum is transmitted in real time and is available 24/7. The combination of Sigfox technology and PRTG is not only collected securely but is also visualized in a single view. PRTG also detects if the sensors stop working – essential for the overall management of the museum's environment.

A further advantage of this approach is the museum can now offer relaxed openings to accommodate children on the autistic spectrum, where the museum opens outside of normal opening hours to ensure sensory overload for such children is at a minimum. PRTG monitors the sound levels in the rooms and helped build a traffic light dashboard to visualise this, so visitors can map their visit accordingly.





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IOT NOW ANALYST REPORT



TRANSPORT

How telematics is achieving optimal performance in fleets of all shapes and sizes



ANALYST REPORT

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BERG INSIGHT

Telematics is key to achieve optimal performance in fleets of all shapes and sizes

There are a wide variety of fleets in operation across the globe, ranging from small fleets of flower delivery vans to the largest transportation companies operating tens of thousands of heavy trucks and trailers. Some fleets such as specialised airport ground support equipment are confined to very limited areas, whereas the other end of the spectrum includes intermodal containers that move from ships to rail to trucks as part of global supply chains. Massive fleets of rental vehicles are managed by major players active across multiple continents. Increasing attention is also directed towards new mobility service concepts such as carsharing which offers members access to a fleet of shared cars. IoT-enabled technological advancements are increasingly used for optimisation purposes and to enable new value-added services across all types of fleets, writes Rickard Andersson, the principal analyst at Berg Insight

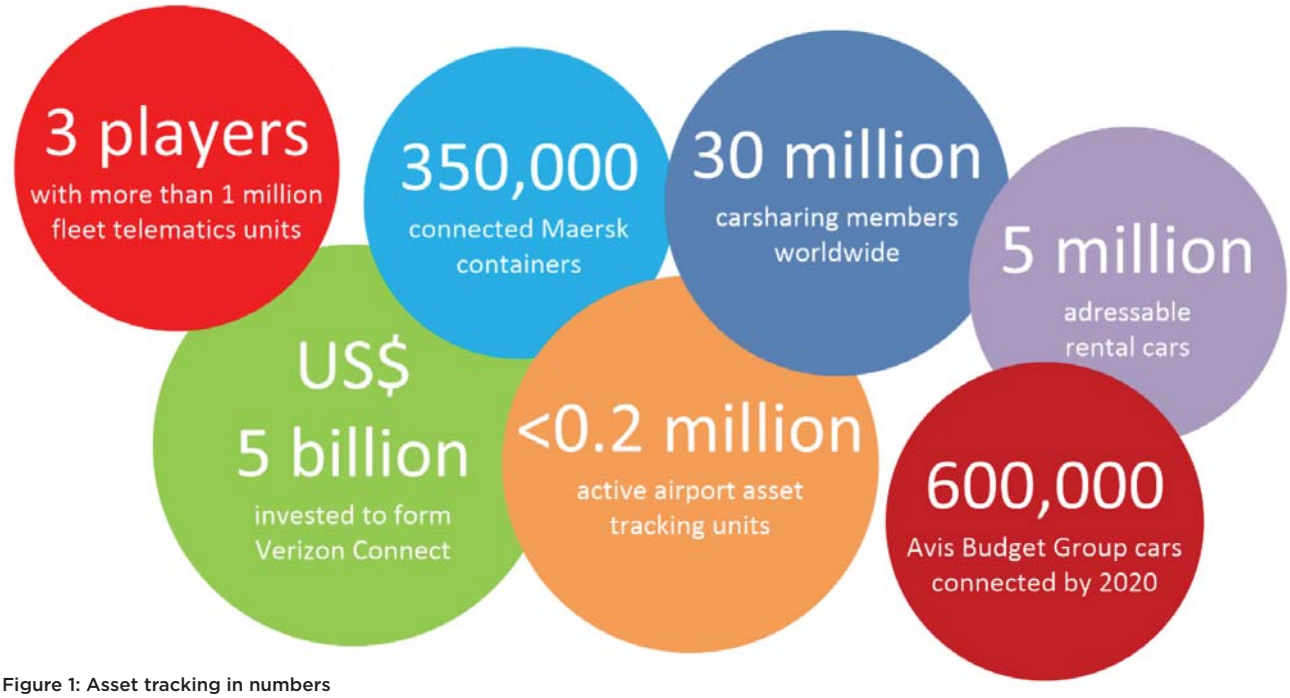


Figure 1: Asset tracking in numbers

Source: Berg Insight

Commercial vehicle telematics and fleet management is in many respects one of the pioneering IoT verticals, representing an early application area of M2M/IoT technology dating back to the 1980s. The once ground-breaking fleet telematics vertical is still a high-pace IoT market favoured by several positive developments including regulatory developments such as the electronic logging device (ELD) mandate in North America and market-driven trends such as factory-fitment of original equipment manufacturer (OEM) telematics offerings, either in-house developed by vehicle manufacturers or – to an increasing extent – powered by telematics partners. Berg Insight anticipates that the partner strategy will continue to grow in popularity among the commercial vehicle manufacturers at the expense of in-house telematics development efforts.

Industry consolidation has led to the emergence of global telematics giants. Numerous vendors today have more than half a million active fleet management subscribers globally and the milestone of one million subscriptions has now been surpassed by three solution vendors. ▶



Rickard Andersson, principal analyst, Berg Insight



Verizon Connect, launched in 2018 by the major US-based mobile operator Verizon, is the culmination of more than US$5bn in investments, combining three fleet and mobile workforce management software companies including Verizon's existing connected vehicle division and two recently acquired companies – **Telogis** and **Fleetmatics** – under a single combined brand. Verizon Connect is today the largest telematics business in the world, serving commercial customers including both enterprises and SMBs in various verticals as well as the consumer market, with revenues in the billion-dollar range - US$958m in 2018 - and an installed base estimated to exceed two million active fleet management units. Other players which have surpassed the million mark in terms of fleet management subscribers include the Belarus-based software provider **Gurtam** and **Geotab** which is headquartered in Canada.

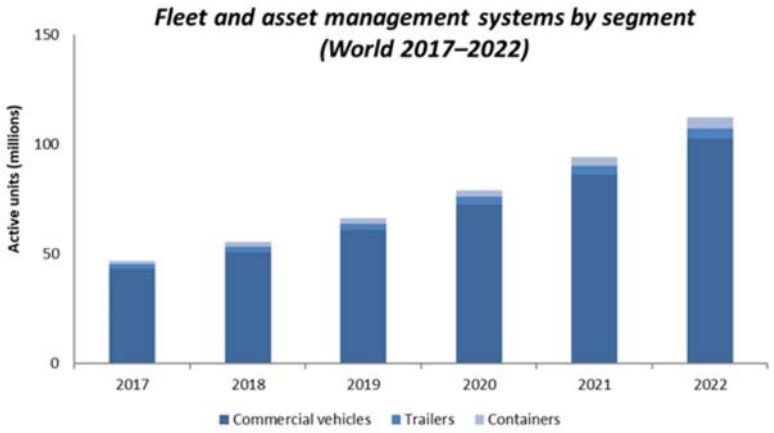


Figure 2:
Active units 2017-2022

Source: Berg Insight

Container and cargo tracking enables unprecedented transportation visibility throughout the supply chain

An adjacent segment to commercial vehicle fleet management is telematics solutions for trailers and containers. A fair share of the truck fleet management players similarly offer telematics solutions for the trailers used in the heavy transportation sector and some also support container tracking. From the perspective of a telematics supplier, trailers and containers share many common characteristics such as the need for battery-powered hardware. **ORBCOMM** is a leading provider of tracking solutions for both trailers and containers, boosting its real-time asset tracking offering through notable acquisitions such as **PAR Logistics Management Systems, Euroscan** and **WAM Technologies**. The latter was involved as a subcontractor for the Maersk/AT&T project to roll out a system for real-time tracking of Maersk's entire fleet of refrigerated containers, at the time representing one of the largest cellular-based industrial IoT deployments of its kind. Maersk's fleet of connected refrigerated containers today includes over 350,000 units. The containers are connected to the AT&T network and monitored using ORBCOMM's software.



Smart pallet with embedded low-cost tracker based on NB-IoT

Source: Deutsche Telekom

Berg Insight anticipates that there will be a strong focus on increased supply chain visibility and transport security in the coming years. Tracking of trailers, intermodal containers and rail freight wagons is increasingly common and technology advancements allow for ever-smaller logistics units such as individual pallets or cargo boxes to be tracked at a reasonable cost. The European Pallet Association (EPAL) has for example in 2018, together with partners including Deutsche Telekom, introduced smart pallets with embedded tracking technology. Another special ▶



application is air cargo tracking, typically enabled by specifically designed tracking devices which switch off automatically during flight. Tracking devices approved by airlines for use on board aircrafts have been introduced by vendors such as **OnAsset Intelligence, Sendum Wireless, Emerson, Roambee and 7PSolutions.**

Airport asset tracking set to drive change in a slow-moving sector with great potential for efficiency gains

Air transport has transformed the world like few other industries by providing rapid connections between distant places across continents, enabling globalisation and shaping modern supply chains. The aviation ecosystem includes a range of stakeholders where the main ones are the airports, airlines and service providers. The service providers include a wide range of players involved in diverse activities such as catering, maintenance and ground handling. The latter refers to servicing an aircraft while it is on the ground and comprises all services required by an aircraft between landing and take-off. Ground handling typically involves the use of a number of different specialised assets such as ground support equipment (GSE) including powered as well as unpowered assets. While the air transport industry is in many respects largely characterised by a resistance to change, various types of asset tracking solutions are today increasingly used by companies operating ground support equipment at airports. This enables them to effectively manage the equipment fleet, improve operational efficiency and reduce costs.



TractEasy autonomous electric baggage tractor

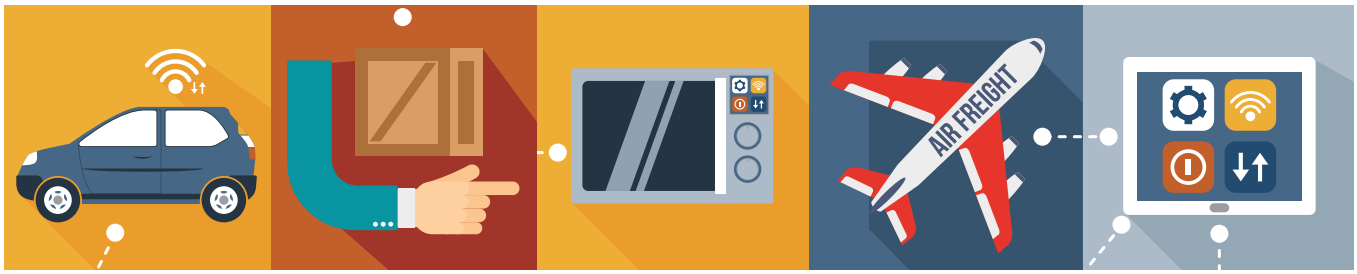
Source: EasyMile/TLD

The airport asset tracking market is still relatively small – the global installed base is estimated to be the less than 0.2 million units – however, it is forecasted to more than double in the next five years. The market is served by a number of different types of players, ranging from specialists focused exclusively on tracking and management solutions for specific airport assets to more general telematics players that also serve other industries. Berg Insight ranks **Undagrid** (GSEtrack), **Quantum Aviation Solutions** and **Resonate MP4** (XOPS) as the leading vendors of airport asset tracking solutions in terms of installed base. Both Undagrid and Quantum have reached more than 10,000 active units respectively. Current trends in the sector include implementations of unmanned systems ranging from semi-autonomous and remote-controlled GSEs all the way up to fully autonomous operations on airports which are expected to become increasingly prevalent in the coming years.

Rental and leasing segment attracting attention from telematics players

Various forms of rental and leasing arrangements represent alternatives to conventional vehicle ownership. Simply put, vehicle leasing is more long-term than vehicle rental, but there also are several other aspects to take into consideration, and there are forms of vehicle rental that are similar to leasing from a purely time-related perspective. Telematics is adopted by a range of rental and leasing companies and this segment is targeted by various aftermarket telematics players including **Geotab, MiX Telematics, TomTom Telematics, Targa Telematics, Octo Telematics** and **Spireon**. TomTom Telematics has a dual offering including the NEXTFLEET connected car offering for car rental and leasing companies, as well as the flagship fleet management solution WEBFLEET for the leasing companies' fleet customers. In February 2019, The French leasing and fleet management specialist **ONE Lease** opted to implement the TomTom Telematics connected car solution across its entire fleet to improve vehicle management and customer service.

In December 2018, the leading car rental player **Enterprise Holdings** – the parent company of Enterprise Rent-A-Car, National Car Rental and ▶



Alamo Rent A Car – partnered with **General Motors** to add 100,000 connected cars in 2019. Previously in 2017, Enterprise Truck Rental, a service of Enterprise Rent-A-Car, launched Enterprise Telematics for commercial trucks powered by Geotab. **Avis Budget Group** is also taking advantage of both OEM and third-party solutions. **I.D. Systems** has a long-standing technology collaboration with Avis Budget Group dating back to the early 2000s. Notable developments in recent years include deployment of I.D. Systems' proprietary wireless rental fleet management systems in 50,000 Avis Budget vehicles following an agreement in 2017, with a new order to deploy 75,000 additional units received in late 2018, planned for delivery starting in Q2-2019. New agreements with Toyota, Peugeot and Ford will furthermore add more than 50,000 new OEM-enabled connected vehicles for Avis Budget Group. In October 2018, the company for example teamed up with Ford to enhance the car rental experience, aiming to connect 35,000 **Ford** vehicles in the Avis Budget Group fleet in the US by the summer of 2019.

Avis Budget Group also works with **Continental** and an expanded collaboration was announced in January 2019, whereby 50,000 vehicles in Europe and the US will be equipped with Continental's enhanced Key as a Service (KaaS) technology. Avis Budget Group surpassed the milestone of 100,000 connected cars in total in 2018 and has committed to operating a fully connected fleet by 2020. Positioning itself as a mobility services provider, connected car technology not only streamlines the rental experience for the customers but at the same time allows Avis Budget Group to drive operational efficiencies. Overall, most of the leading global car rental companies are exploring new mobility service concepts for corporate and consumer customers alike.

Company	Revenues 2018	Rental fleet	Carsharing initiatives
Enterprise Holdings	US$ 24.1 billion	2,000,000	Enterprise CarShare, Enterprise Car Club
Hertz	US$ 9.5 billion	687,000	Hertz 24/7, Hertz BilPool, Flexicar
Avis Budget Group	US$ 9.1 billion	650,000	Zipcar
Europcar Mobility Group	US$ 3.5 billion	316,000	Ubeeqo, Bluemove, GoCar, E-Car Club
Sixt Group	US$ 3.5 billion	270,000	SIXT share

Figure 3: Major car rental companies and associated carsharing initiatives

Source: Berg Insight

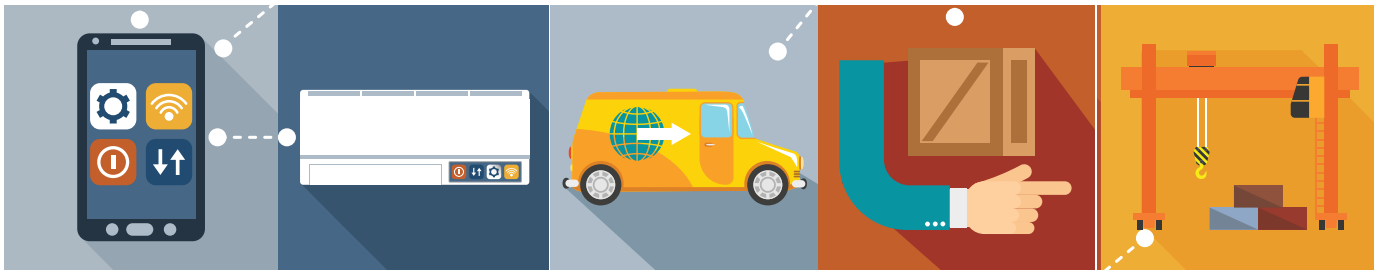
Automotive OEMs bet on mobility services such as carsharing

The concept of carsharing refers to decentralised car rental services focusing on short-term rentals that supplement other modes of transports (such as walking, cycling and public transport), aiming to provide an alternative to individual car ownership – without restricting individual mobility – through affordable access to cars. Berg Insight forecasts that carsharing membership will exceed 60 million globally by 2022, with front-running markets including Germany, Italy, the US, South Korea, China and Japan. Carsharing services are commonly offered by specialist carsharing companies, public transport operators, carmakers and car rental companies. Given that carsharing is essentially a form of on-demand rental, it comes as no surprise that the major rental players including Enterprise Holdings, **Hertz**, Avis Budget Group, **Europcar Mobility Group** and **Sixt Group** all have launched carsharing initiatives.

DriveNow was launched by Sixt and **BMW** as a joint venture in 2011, though BMW Group later in 2018 acquired Sixt's stake in DriveNow. **Daimler** similarly acquired Europcar's stake in **car2go Europe** in 2018. In the same year, BMW and Daimler agreed to merge their mobility service business units. Most recently in February 2019, it was announced that the two automotive OEMs are investing more than €1bn to develop and more closely intermesh their offerings, establishing five joint ventures including REACH NOW for multimodal transport services, CHARGE NOW for charging, FREE NOW for ridehailing, PARK NOW for parking and SHARE NOW for carsharing. Sixt similarly in February 2019 launched a mobility platform combining car rental (SIXT rent), carsharing (SIXT share) and ridehailing/taxi (SIXT ride), all bookable and payable via the SIXT app.

Competitive landscape altered as players diversify

Recent years have seen countless examples of telematics players diversifying into adjacent segments, making the lines between the different competitive battlegrounds increasingly blurred. Some simply apply their competencies from one telematics market into another segment, thus ▶



nurturing a new field of expertise. **Targa Telematics** has for example utilised its capabilities for markets such as carsharing in the aviation sector, offering airport asset tracking systems for motorised ground support equipment. Other players choose to extend their competencies through mergers and acquisitions which can open up new possibilities. The leading trailer and container tracking player ORBCOMM is an example, having acquired 12 companies since 2011 including **Inthinc** and **Blue Tree Systems** in 2017.

Many of the most prominent vendors are driven by growth strategies combining selective M&A activity and high-pace organic growth. I.D. Systems, traditionally most successful with telematics solutions for forklifts and trailers, has diversified into adjacent fields including fleet management for commercial vehicles, connected cars and to some extent also airport asset tracking, using a combination of organic diversification and acquisitions. The US-based assets of **CarrierWeb** were acquired in late January 2019, enabling I.D. Systems to sell complete bumper-to-bumper telematics solutions covering both the truck and the trailer. Most recently in March 2019, I.D. Systems entered into an agreement to acquire **Pointer Telocation** in a deal valued at around US$140m, creating a combined company with more than 0.5 million subscribers. Berg Insight foresees continued consolidation and diversification on the fast-moving telematics arena in the coming years.

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Evaluating the market potential & practical benefits of V2X communications technology

Commonly referred to as V2X, vehicle-to-everything communications technology allows vehicles to directly communicate with each other, roadside infrastructure, and other road users to deliver an array of benefits in the form of road safety, traffic efficiency, smart mobility, environmental sustainability, and driver convenience. In addition, V2X is also helping pave the way for fully autonomous driving through its unique non line-of-sight sensing capability which allows vehicles to detect potential hazards, traffic, and road conditions from longer distances and sooner than other in-vehicle sensors such as cameras, radar and light detection and ranging (LiDAR)

Although legacy vehicle-to-infrastructure (V2I) technologies are currently in operational use worldwide for electronic toll collection (ETC) and relatively simple V2I applications, advanced V2X systems – capable of supporting vehicle-to-vehicle (V2V), V2I and other forms of V2X communications – are beginning to gain broad commercial acceptance with two competing technologies vying for the attention of automakers and regulators: the commercially mature IEEE 802.11p/DSRC (dedicated short range communications) standard, and the relatively new 3GPP-defined C-V2X (Cellular V2X) technology which has a forward evolutionary path towards 5G.

With an initial focus on road safety and traffic efficiency applications, **Toyota** and **General Motors** have already equipped some of their vehicle models with IEEE 802.11p-based V2X technology in Japan and North America.

However, momentum has lately swung in favour of C-V2X with a number of demonstrations and field trials – supported by the cellular industry as well as a growing number of automakers including **Ford**, **SAIC**, **Geely**, **Daimler**, **BMW**, **Audi** and **Jaguar Land Rover**. In fact, even early adopters of 802.11p – most notably General Motors – have expressed willingness to invest in C-V2X technology. Nonetheless, staunch DSRC proponents such as Toyota are pushing ahead with their plans to roll out 802.11p.

In terms of other publicly announced commercial commitments, **Volkswagen** plans to deploy IEEE 802.11p on volume models in Europe starting from early 2020, while Geely and Ford plan to integrate C-V2X in their new vehicles by 2021 and 2022 respectively.

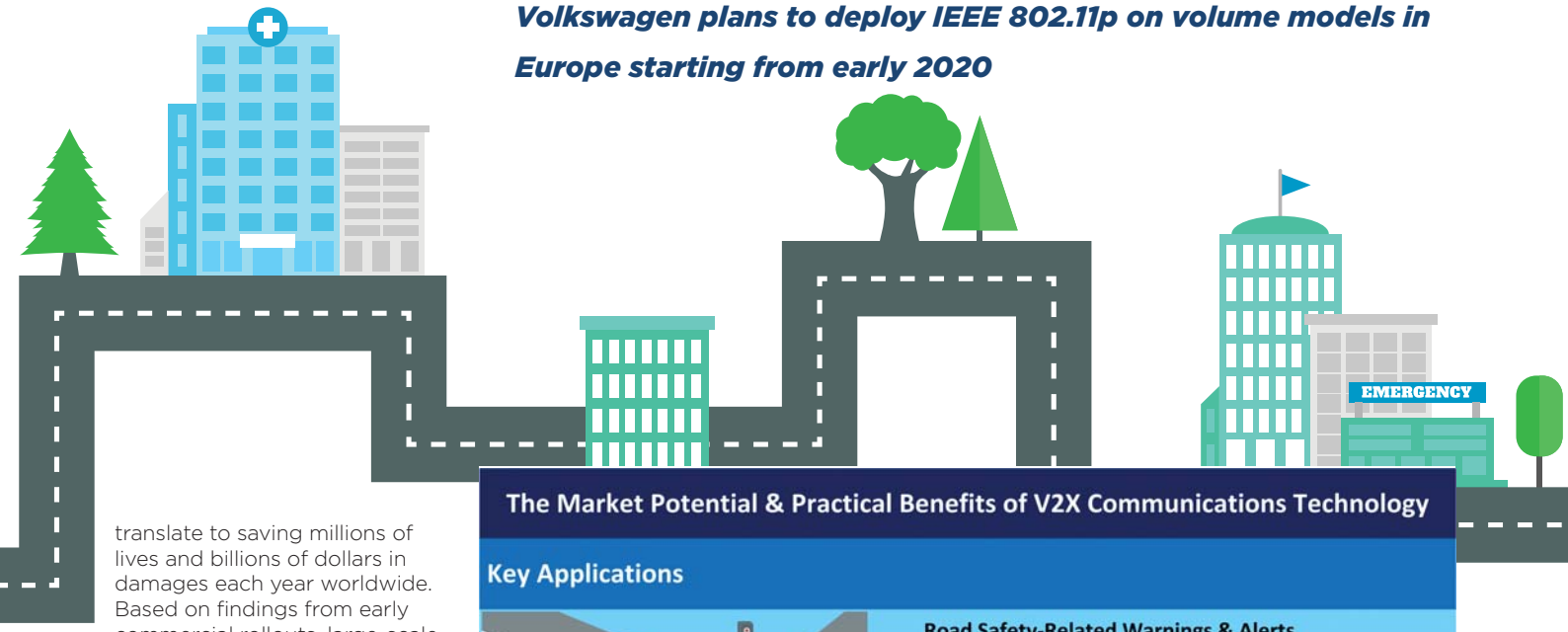
It is also worth nothing that a number of luxury automakers – including BMW, Daimler, Volkswagen's subsidiary Audi, and **Volvo Cars** – already deliver certain V2X-type applications through wide-area cellular connectivity and supporting infrastructure such as appropriately equipped roadwork trailers.

Despite the ongoing 802.11p/DSRC versus C-V2X debate, regulatory uncertainty and other challenges, global spending on V2X communications technology is expected to grow at a CAGR of more than 170% between 2019 and 2022. **SNS Telecom & IT** predicts that by the end of 2022, V2X will account for a market worth US$1.2bn.

However, this figure will appear relatively modest when looking at the practical benefits of V2X communications technology – which would ▶

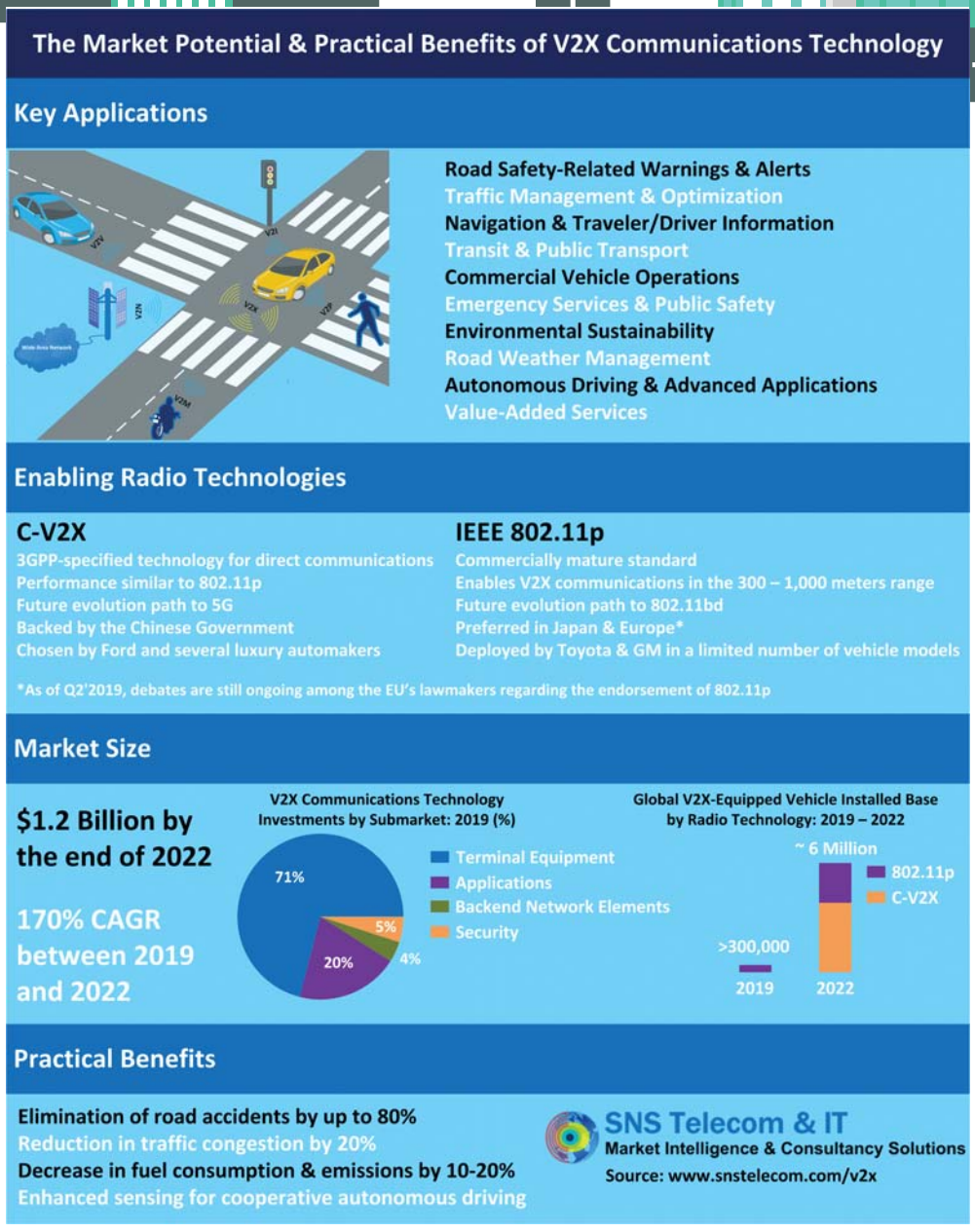
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In terms of other publicly announced commercial commitments, Volkswagen plans to deploy IEEE 802.11p on volume models in Europe starting from early 2020



translate to saving millions of lives and billions of dollars in damages each year worldwide. Based on findings from early commercial rollouts, large-scale pilots, and research projects, SNS Telecom & IT estimates that V2X can potentially eliminate up to 80% of road accidents; ease traffic congestion by as much as 20%; slash journey times by half; reduce fuel consumption and emissions by 10-40%; and significantly enhance sensing capabilities for autonomous driving.

These findings are part of SNS Telecom & IT's latest research report on V2X communications technology. The "V2X (Vehicle-to-Everything) Communications Ecosystem: 2019 – 2030 – Opportunities, Challenges, Strategies & Forecasts" report presents an in-depth assessment of the V2X ecosystem including market drivers, challenges, enabling technologies, application scenarios, use cases, business models, key trends, standardisation, spectrum availability/allocation, regulatory landscape, V2X deployment case studies, opportunities, future roadmap, value chain, ecosystem player profiles and strategies. The report also presents market size forecasts from 2019 till 2030. The forecasts cover four submarkets, two air interface technologies, 10 application categories and five regions. ■



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The IoT Now Enterprise Buyers' Guide to IoT Platforms 2019



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How to choose an IoT platform – the 2019 IoT Now Buyers' Guide

IoT platforms have existed since well before IoT gained popularity as an acronym. Even when platforms were known primarily as middleware – a software layer running on a private server at one end, connected to the internet and then, typically via wired ethernet to capital equipment on the other – the core application was some form of remote monitoring. This is still true today, writes Bill Ingle, a senior analyst at Beecham Research, remote monitoring remains the bedrock IoT application, enabled by an IoT platform. This is so in spite of major changes and developments in all related areas from sensors and processors – greatly reduced in size, cost and power consumption - to a proliferation of wireless technologies that enable mobile applications, increasingly prevalent use of the cloud, and a focus on dealing with large quantities of data, quickly, including varieties of data analytics up to and including artificial intelligence (AI) as well as processing data at the edge

Whether your goal is to reduce costs by remotely monitoring equipment, change part or all of your business from a product business to a service business, or implement a greater overall digital vision, you will need an IoT platform. An IoT platform reduces the cost and time of implementing IoT solutions by using existing components already used in other IoT solutions – there is no need to perpetually reinvent completely new solutions, although some customisation will always be required.

Hundreds of IoT platforms are available, including those offered by large software, hardware, cloud, industrial, and telecommunication companies. When business users or adopters are customers, this can be one place to start.

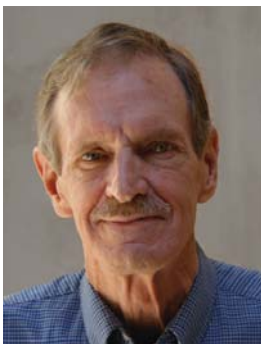
The long tail includes specialist IoT solution providers – successful incumbents with years of experience – and a continuing stream of start-ups featuring the latest technologies. One key question will be whether the company has expertise in your particular sector and/or vertical application area or works closely with a supplier who does.

IoT platform architecture

Nearly all IoT platforms have basic features or layers in common, but some are specialised, focused on particular features, while the situation is very dynamic with so much competition within an overall technology landscape that also continues to change, quickly. Larger providers offer ever larger toolkits, expanding already extensive offerings as smaller incumbents continue to add new features and microservices. An example is a provider that offers predictive analytics within a platform's communication layer. Machine learning on the edge? Augmented reality or digital twin-integrated IoT platforms? Platforms offering blockchain augmented solutions? These are all offered somewhere.

Yet an IoT platform remains, in essence, a software middleware suite that facilitates secure monitoring of field devices. Analysis of device and sensor behaviour may also include device control; the platform exists between devices and user applications. Thus two basic, primary components are managing physical connectivity to devices, including ensuring that essential data ▶



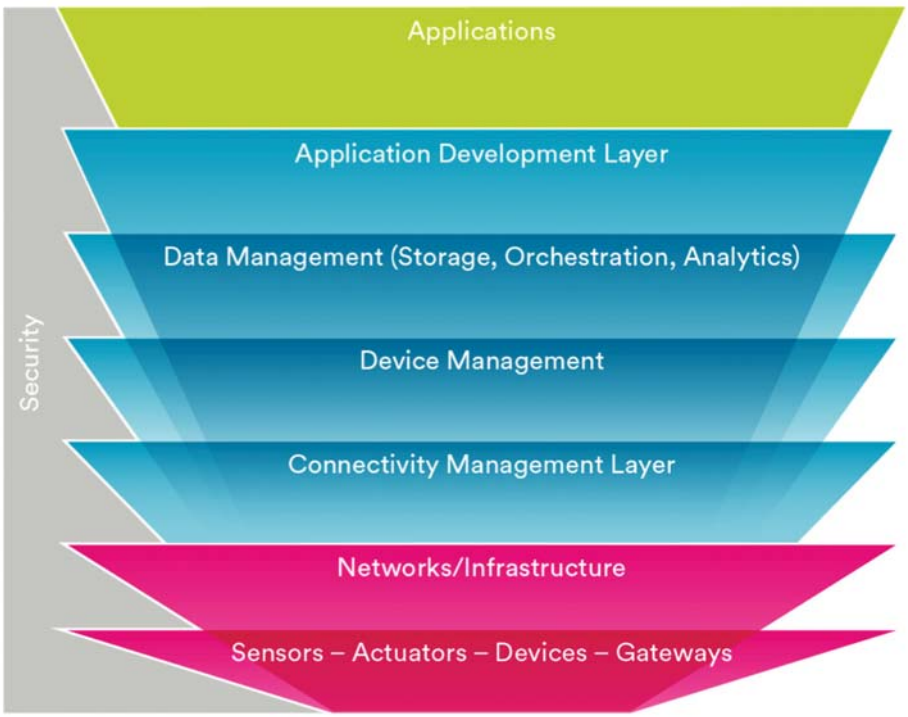


Bill Ingle,
Beecham Research

is collected, and processing the data. Both parts are required for a complete IoT solution, but can be provided by different vendors, reflecting their different areas of expertise.

This can be expanded to four layers: communication services, device management, data management and application development. Above those layers are the user applications themselves – the elements the user actually sees. Across all of these layers is security, which binds them together to ensure there are no weak points either within each layer or across the layers. Indeed, that security capability must also bind the sensor and network layers not included in the platform itself – a further crucial consideration in platform design. ▶

Architectural View of an IoT Platform



Nearly all IoT platforms have basic features or layers in common, but some are specialised, focused on particular features, while the situation is very dynamic with so much competition within an overall technology landscape that also continues to change, quickly



Major development is still underway in critical areas within the overall IoT Platform environment beyond the addition of new features and capabilities

While this describes how IoT platforms are structured, the vast majority of them do not cater for all layers, at least not yet. For example, providing communication services is a completely different task from application development or detailed analytics of device data. Each platform vendor has their own expertise. To get a sense of what they offer, Beecham Research has defined seven IoT platform categories, as follows:

1. **Communication centric** – offering a strong focus on connectivity management capabilities
2. **Device management centric** – offering a strong focus on device management
3. **Data management and analytics centric** – designed to provide strong data management, orchestration and analytics capability
4. **Application development centric** – enabling application development on different types of devices.
5. **Vertical centric** – designed to support the development of IoT solutions in specific sectors or sub-sectors - two of many examples include smart city, manufacturing
6. **Consumer IoT centric** – similar to vertical centric above, but with a strong focus on consumer IoT applications such as smart home.
7. **IoT developer centric** – offering solutions for IoT developers, both software and hardware

These categories are not mutually exclusive, so a vendor's offering may belong to more than one of these. To take one example, Living PlanIT is vertical centric because of its smart city solutions focus, but those solutions also include data management and analytics centric capabilities. As noted above, the IoT platform is an important starting point for adopters planning IoT solutions and there is quite a choice. In addition, platforms continue to develop, rapidly, with frequent updates, acquisitions and re-brandings. They are becoming increasingly sophisticated and more specialised even as more variations on the term IoT platform appear. Adopters today may come across terms like IoT data platform or IoT cloud platform in addition to Industrial IoT (IIoT) platform.

Major development is still underway in critical areas within the overall IoT platform environment beyond the addition of new features and capabilities – security remains a very important concern and one still not fully addressed. Communication possibilities associated with IoT platforms are not at all placid, with a variety of competing newer protocols, not least of which include licensed and unlicensed low power wide area network (LPWAN) protocols and, of course, 5G. 5G is one of the major current centres of attention but is still primarily in the future. In spite of that, anyone planning an IoT solution should look carefully at what 5G will offer and its potential for the business, for example the lower latency it promises to provide, with important ramifications for edge device and edge to cloud - and back - implications.

The technologies associated with the data that moves through platforms – and will move through solutions not yet in service but solutions that must be planned – are no less dynamic, as this is yet another highly competitive area associated with IoT platforms. Termed the data management layer, activities such as applicable data analytics, machine learning, and AI usage are all associated with this. ■

www.beechamresearch.com



Cyril Hullin,
Sierra Wireless



Robin Duke-Woolley,
Beecham Research

Sierra Wireless goes up an Octave for end device monitoring

As IoT matures, organisations are looking for a set of capabilities and microservices that encompass their cloud and connectivity needs from installation, through to device management, monitoring and location based services. They are increasingly looking for these functionalities packaged together and offered for a monthly rental fee, thereby simplifying management, enabling transparent cost control and aiding rapid IoT deployment. Here, Robin Duke-Woolley, the chief executive of Beecham Research, discusses with Cyril Hullin, the vice president of product marketing for Cloud & Connectivity Services at Sierra Wireless, the priorities organisations have and how the company is addressing them

RD-W: How has the Sierra Wireless Cloud and Connectivity portfolio evolved over the last year? What have been the main priorities?

CH: There are two dimensions to the evolution of our portfolio and our ambitions. On the one hand there are incremental evolutions on the AirVantage platform as a transversal platform for connectivity and SIM lifecycle management and also traditional device management. We are integrating more mobile network operators (MNOs) and there is also a specific focus in the US where we are integrating FirstNet for emergency blue light needs. We are also integrating Rogers in Canada for SIM lifecycle management, in addition to the list of MNOs we have communicated about in the past. In terms of device management, this continues to evolve for our modules. For our gateways, this is with our AirLink line-up under the service called ALMS – AirLink Management System.

RD-W: What do you mean by transversal platform?

CH: By transversal we mean that AirVantage is more and more being developed as a set of capabilities and microservices which we want to make available to all of our offerings. So in the past, our managed connectivity service (MCS) in ▶



the US relied on AT&T, Verizon and T-Mobile SIMs, a gateway which we service for end customers with a package including installation, monitoring, service level agreement (SLA) and other items all packaged in a monthly rental fee. This used to be deployed and operated as a standalone platform but is now integrated within AirVantage and is being operated via a set of microservices enabled by AirVantage.

RD-W: When you say a set of microservices, as opposed to a platform, what do you see as the difference between them?

CH: Billing, rating, provisioning, device management and location based services. All those are capabilities which are developed on AirVantage and which can be mashed up and offered to customers via a solution or offer, dedicated to an application or a vertical. These are a set of optional microservices as opposed to a platform where everything is included in the standard offering. This gives us very valuable flexibility for the creation of new solutions and offers.

RD-W: When you say integrating with more MNOs, what do you mean by integrating?

CH: In the same way that AirVantage enables the SIM lifecycle management for our SmartSIM - produced via our global MVNO capabilities, we integrate the provisioning application programme interfaces (APIs), Radius management and so forth for MNO SIMs. It means that a customer with a heterogeneous set of SIMs from legacy MNOs and our SmartSIMs can manage all these SIMs from a single pane of glass. With a unified set of APIs, they can provision, activate, re-rate and monitor consumption of all the various SIMs connected to the platform.

RD-W: So that means if your customer has connections to particular MNOs, you can integrate those into the platform so you can provide a single pane of glass across a variety of MNO connections?

CH: Exactly. That is very important because many if not most of our customers have a mix of SIMs and it is very convenient for them to work with a ▶



single pane of glass for all those management activities.

RD-W: So that covers the connectivity management level. What about the device management level? Is that specific to Sierra Wireless modules and gateways only?

CH: Yes and no. We are managing for major customers devices that are not our own hardware. More of our strategy does focus on our own modules, so the best in class service is provided using our own modules and gateways but we have a very important capability to provide device management for other devices as well. Such devices need to comply with mainstream standards and protocols.

RD-W: What does that higher level of integration with Sierra Wireless devices provide?

CH: This is a more sophisticated proposition we have been investing in, called Octave. This brings a lot more value to an integrated solution. The Octave platform is able to monitor the end device in a very intimate way. It is able to pre-crunch the data and pre-analyse it – we call this orchestration – at the network edge. This is valuable to do at the edge. We can then store this data, filter it at the edge level and use it at that level, as well as forwarding it to a centralised capability in the cloud. We send to the cloud the data that is most valuable at the right time and then post-crunch that data on the centralised part of the platform.

We refer to this as decentralised data orchestration, where there is an edge data processing capability and a cloud processing capability to really establish what needs to be transported between the edge and the cloud. The aim is to minimise this to what is really meaningful and valuable for the end customer to run their application. This is a primary area we have invested in. It goes way beyond what is normally meant by device management.

RD-W: Can you give an example or illustration of a particular application where this type of arrangement is particularly valuable for your customers? ▶

We have interesting ambitions to expand the spectrum of what AirVantage offers, in particular in the area of location-based services

CH: A good example is battery-constrained applications. One of these is a customer who provides chemical battery storage for cell towers in the telecoms market, among others. They basically provide backup power for cell towers. Those battery packs need to be regularly monitored for their chemical situation, charging level, temperature and other factors. In those assets, technical key performance indicators (KPIs) need to be monitored every hour or two, or five times a day, and then that data is in some cases averaged to be stored locally. Only once a day will the device be woken up and the data sent to the centralised application to graph the updates of those technical KPIs and report on the need for pre-emptive maintenance. It is a combination of smartly using the on-air link and only using the wireless connection once a day to send just the meaningful and valuable data. The aim is to minimise the payload to what is meaningful to be sent and stored centrally.

The second example is a case for heating, ventilation and air conditioning (HVAC) systems. This is particularly focused on low power wide area (LPWA) modules that offer long battery life. Technical KPIs and the health factors for the HVAC units that are meaningful for anticipating maintenance needs are sent just once a week. The calculations are carried out at the edge and only the data that is meaningful is sent at the right time to the centralised platform or to the customer's platform. This minimises the battery use.

RD-W: If only the minimum amount of data is sent to the central platform, with long intervals in between sending, then that clearly minimises the amount spent by the customer on the connectivity itself?

CH: Yes, it dramatically reduces the payload being transferred on the cellular link. It can be an order of magnitude less, so this can be seen as an issue for our connectivity offer but it brings a lot of value to the customer. It is really part of what we see that Sierra Wireless needs to bring to the customer – to put ourselves in the shoes of the customer. Yes, there is less airtime involved but on the other hand it enables use cases that would not have been possible otherwise. Even with the promise of narrowband IoT (NB-IoT) and Cat M1, the battery life is of critical importance. To smartly use the on-air link together with the processing at the edge is hugely important for this type of application. We then charge for the whole package.

RD-W: So you are monetising the edge processing, the connectivity to the cloud and the processing in the cloud as one package?

CH: Yes. In some cases, we even bundle all of that for a fixed fee related to our customer's use of that asset – collecting and processing valuable data at the edge so many times per month and then sending it to the centralised platform for further analysis. We model that and charge a set subscription fee per month which covers the edge treatment, the transport and the centralised treatment. We expose to the customer's application only when it is meaningful and we have done all the data orchestration for the customer up front.

RD-W: So there is quite a lot of configuration you need to do both at the edge and in the cloud to provide what the customer is looking for. Is that the case?

CH: Yes, we need to understand together with the customer their use case and the value of the data points that are meaningful to them, but the magic of what we have created is a platform that really can be easily tuned and adapted to the customer's use case. It is not something that is very heavy in terms of integration. In two days, we can collect the customer's data stream at the edge, store it and create a transmission pattern that suits our customer's needs. It is part of the magic of the platform that we can rapidly programme the data streams for pre-crunching and transport towards the cloud. Also, the language used for this solution is Java Script, so if there is a need to create new elements of the solution for particular customer needs, this can be done quickly and easily.

RD-W: So where are you heading with this in the future? Can you say something about your future roadmap?

CH: We have interesting ambitions to expand the spectrum of what AirVantage offers, in particular in the area of location-based services. This includes more sophisticated use of AGNSS capabilities in our modules. We are aiming to strengthen our ability to provide location-based services in our modules and as part of the SIM lifecycle management platform. Another big area for us is FirstNet in the US. We are one of the first, or even perhaps the first, to provide the FirstNet highly resilient connectivity offer to government agencies in an integrated way with gateways and with a single pane of glass view where our customer can manage all of their SIMs under one view. We are a one stop shop for FirstNet users and this is a very important part of our offer.

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The IoT platforms to watch in 2019

Here's a brief look, compiled by Beecham Research, at a small number of IoT platforms to watch out for amidst the more than 500 in the market. Most IoT platforms have something to differentiate them, so the choice is not easy

Number one cloud provider **AWS** continues to add features to its IoT Core managed cloud platform, part of AWS IoT; these extend from edge to cloud with integrated artificial intelligence (AI), currently focused on connected home and industrial IoT solutions. The colossus bears watching. Will it ultimately surpass its many big IT competitors?

Microsoft also continues to add features to Azure IoT - originally the Azure IoT Suite. Azure IoT is focused on discrete and process manufacturing, energy, transportation and logistics, extends from edge to cloud, and has a huge partner ecosystem. In 2018, Microsoft announced it would invest US$5bn in its IoT efforts.

Google Cloud IoT is a platform for intelligent IoT services currently focused on asset tracking, predictive maintenance, logistics and supply chain management, and smart cities and buildings. Google's 2018 acquisition of Xively, with its device management capabilities, is an interesting development.

ARM's Pelion IoT platform was announced after its acquisitions of **Stream Technologies** and **Treasure Data**, enabling a combination of connectivity and data ▶



Cisco's IoT Cloud business unit, formerly Jasper Technologies, is said to have more than 100,000,000 M2M/IoT connections over its Jasper Control Center Platform

management with ARM's mbed device management platform. Focus areas include smart buildings, utilities and logistics.

Cisco's IoT Cloud business unit, formerly **Jasper Technologies**, is said to have more than 100,000,000 M2M/IoT connections over its Jasper Control Center Platform, with more than 17,000 worldwide customers, including many major telecoms and original equipment manufacturers (OEMs). Control Center is a connectivity management platform. Newer IoT platforms focused on other platform areas may get more attention but 100,000,000 is a very large number.

Cellular module, gateway and router supplier **Sierra Wireless**' AirVantage platform, part of the Sierra Wireless Cloud and Connectivity Portfolio, continues to evolve and now offers the platform as a range of optional micro services that can be selected to meet particular customer needs. This is complemented by Octave that coordinates data processing across edge and cloud to maximise value for customers.

Like other platforms, **PTC**'s Thingworx Industrial IoT Platform continues to expand in terms of features, which include multiple connectivity options, application development tools, analytics, digital twins and augmented reality (AR). What's notable is the strategic partnership announced in 2018 by PTC and **Rockwell Automation**, including Rockwell's US$1bn equity investment in PTC.

Mesh Systems has been quietly growing for years and offers full solutions built around its MeshVista Platform.

Once upon a time, every company was a start-up:

Influxdata, creators of the open source time series database InfluxDB, now also offers its developer centric Modern Time Series platform, an IoT data platform optimised for streaming real-time IoT data for analytics and control.

TagoIO offers an end-to-end cloud platform enabling device management, data management, analysis and dashboards.

Hologram's Cellular IoT Platform relies on its One Global IoT SIM and has signed up some major customers.

Altizon Systems offers the Datonis Industrial IoT platform which is edge and analytics focused.

Speaking of Industrial IoT, **Litmus Automation**'s LoopEdge and Loop Software platforms enable data management and analytics at the edge and cloud connection.

Losant offers an application enablement focused enterprise IoT platform enabling rapid development of monitoring, analytics and data management.

About Sierra Wireless

Sierra Wireless is an IoT pioneer, empowering businesses and industries to transform and thrive in the connected economy. The company offers a device to cloud solution, comprised of embedded and networking solutions seamlessly integrated with its secure cloud and connectivity services. Original equipment manufacturers (OEMs) and enterprises worldwide rely on Sierra Wireless to deliver fully integrated solutions to reduce complexity, turn data into intelligence and get their connected products and services to market faster

Sierra Wireless is a leading promoter of embedded SIM (eSIM) solutions and offers a comprehensive IoT platform, named AirVantage. Also operating as a mobile virtual network operator (MVNO) worldwide.

Sierra Wireless has an extensive network of enterprise partnerships, including **Verizon**, **PwC**, **Google** and others, as well as various R&D partnerships with universities.

About the AirVantage platform

In 2008, Sierra launched AirVantage, its IoT/M2M cloud platform.

AirVantage is Sierra Wireless' connectivity and edge device management platform. Through this single point of management, users can manage the lifecycle of all the Sierra Wireless modules, gateways and SIMs, as well as the user's legacy SIMs issued by the third party operators. The platform offers a versatile set of services including: ordering, changing subscription options, updating edge device's configuration and embedded software. Several offers are customised to offer specific services, including location-based services and the integration to FirstNet for emergency blue light applications.

The platform also manages update of the Legato applications. Legato is an open sources application framework that runs in Sierra's programmable cellular modules and gateways.

Key areas of specialisation are the industrial and the automotive sectors, with great expertise in tracking, tank monitoring, safety and security applications. Other verticals of applications include retail with point-of-sale (PoS) systems and payments, Logistics with fleet management and cold chain monitoring, and the energy sector with smart metering deployments among others.

Key differentiators:

1. End-to-end IoT solutions include complete, productised platforms for device management, data orchestration as well as software development kits (SDKs) for device manufacturers
2. Sierra Wireless is particularly focused on original equipment manufacturers (OEMs) that operate in a number of verticals, providing them with the necessary tools to build their vertical solutions
3. Smart SIM proposition Sierra Wireless is a full MVNO and offers a smart connectivity service that extends globally in America, Europe and the Asia Pacific regions, currently deploying smart SIMs in more than 160 countries.
4. Ready-to-Connect proposition: with Ready-to-Connect, a Smart SIM profile based on the eSIM/eUICC specification is embedded into cellular modules and gateways that are then offered to customers in pre-packaged solutions
5. A new device management capability for closer integration of Sierra Wireless hardware (modules and gateways) with the platform is through Octave. This provides the capability to securely extract, orchestrate and act on data from assets at the edge to the cloud. The aim of this is to coordinate edge-based and cloud-based processing of device data to provide most value for end customers at lowest overall cost.
6. Superior support services for customers: Sierra offers all the necessary documentation to customers to develop their applications, as well as continuous support through integration and a consulting services throughout the deployments' lifecycle.

AirVantage Heat Map of Platform Services

Connectivity Management (coverage, protocol support, QoS, eSIM)	**Application Development** (API management, developer community, documentation)	**Device Management** (device oriented analytics, monitoring, updates, configuration, scalability)
Data Management (data integration and orchestration, analytics algorithms)	**Innovation and Partnerships** (patented technologies, innovation partnerships)	**Support Services** (training and consulting services, system integration, 24/7 support)

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The IoT Now Guide to Future IoT Connectivity 2019



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EDITOR'S COMMENT

As Rami Avidan points out on page S5, much of the initial though behind IoT was that there would be one bearer or network technology for IoT traffic. It's likely that many expected this to be a 3GPP standard, most likely 3G. However, as IoT – and network technologies – have matured, it has become clear that there will no single dominant bearer technology. Instead, the bearer will be selected according to the requirements of the app, the deployment environment and the value of the service delivered. Excitingly, with options ranging from low power wide area technologies, that offer lower bandwidth but benefits in terms of power consumption and cost, to ultra-low latency 5G or very high bandwidth satellite communications, there's connectivity on the market to fit most budgets, locations and service requirements.

However, this choice creates fragmentation and hardware and software will now have to contain the flexibility to support multiple bearers, enabling the best possible bearer to be selected once the device is deployed. The alternative is to create devices tailored for each bearer and, with the current starburst of options, that could means a versioning nightmare of upwards of six different configurations.

Sometimes too much choice can be bewildering but, sometimes, choice is what is needed to precisely address the complex and differing requirements of a market like IoT. After all, it's becoming abundantly clear that there is volume and space for each bearer in the ecosystem and they are vital enablers of next generation IoT.

We hope you enjoy this IoT Now Guide and it helps you in your bearer selections.



IN THIS ISSUE

S4 NEWS
The latest connectivity news

S5 TALKING HEADS
Rami Avidan details why enterprises are now focusing on strategies for the long term rather than specific technologies

S9 FUTURE IoT CONNECTIVITY
Jeremy Cowan assesses the impact of billions of deployed devices on the connectivity landscape

S11 INTERVIEW
Eseye's Nick Earl and David Thompson reveal their plans with hypercloud partner Amazon Web Services

S15 IoT ON TAP
Inside the eWaterPAY clean water service

S19 EVENT PREVIEW
In preparation for Internet of Things World 2020, the organisers reveal what keeps IoT executives up at night

S22 EVENT PREVIEW
As Internet of Things Europe 2019 approaches, seeing really is believing when it comes to IoT

T-Systems

Cover sponsor: With a footprint in more than 20 countries, 37,500 employees, and external revenue of €6.9bn (2018), T-Systems is one of the world's leading vendor independent providers of digital services headquartered in Europe. T-Systems is partnering its customers as they address digital transformation. The company offers integrated solutions for business customers. The Deutsche Telekom subsidiary offers one-stop shopping: from the secure operation of legacy systems and classical ICT services, the transition to cloud-based services, including international networks, tailored infrastructure, platforms and software, as well as new business models and innovation projects in the Internet of Things. T-Systems can provide all this thanks to its global reach in fixed-network and mobile communications, its highly secure data centres, a comprehensive cloud ecosystem built around standardised platforms and global partnerships, and the ability to offer top levels of security. Deutsche Telekom and T-Systems have spent billions on connectivity, cloud, IoT and security to ready themselves for the connected world. **www.t-systems.com**

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NEWS IN BRIEF

Sigfox unveils Canada's first coast-to-coast IoT network

Sigfox Canada, the Canadian network operator for the Sigfox Global IoT Network, has claimed to have launched the country's first national, low-bandwidth, IoT network.

Sigfox Canada is using its low-power wide area network (LPWAN) technology through an ecosystem of more than 700 different Sigfox IoT sensors that are live today and have the capacity to support the deployment of millions of IoT sensors from coast-to-coast throughout Canada. The combination of the national network and hundreds of devices will provide Canadian businesses simple and cost-effective connectivity to help drive efficiency in almost every area of their business.

The network is currently live as far east as St. John's, Newfoundland, and as far west as Vancouver, British Columbia, with coverage continuing to be added weekly. Sigfox Canada aims to build out a network quickly that will meet the demands of customers anywhere in the country.

Microsoft collaborates on cloud with Telecom Egypt

Microsoft and **Telecom Egypt** have announced their collaboration to extend Microsoft's cloud network to Egypt. Telecom Egypt will provide low-latency connectivity into and across Egypt to help enhance performance and increase reliability for customers of Microsoft services. The partnership will increase Microsoft's reach to the large Egyptian market in addition to improving connectivity across North Africa and the Middle East.

Microsoft's global network is one of the largest and most innovative in the world. It connects Microsoft's cloud infrastructure of more than 100 datacentres, 135 edge node locations and more than 100,000 miles of fibre and undersea cable systems to deliver Microsoft services to customers.

The new point of presence in Egypt will benefit from a direct connection to Microsoft's global infrastructure to enhance the delivery of numerous services for customers. Microsoft's network investment will increase capacity and use the latest in network optimisation for the delivery of Microsoft services in Egypt.

Semtech aims to simplify IoT applications with release of LoRa-based solution accelerators

Semtech has announced the launch of a platform of new LoRa-based solutions comprising developer building blocks, cloud services and manageable hardware.The new bundle of development accelerators have been designed to streamline and simplify the process of developing, deploying and managing LoRa-based IoT applications.

Semtech says the technological strengths of the LoRaWAN protocol combined with the fact that LoRaWAN is available to implement today means that solution providers can already build and deploy secure, scalable and manageable LoRaWAN based IoT solutions that deliver rapid ROI.

Further simplification of the process of developing solutions based on LoRaWAN will free up IoT innovators to develop solutions that meet the needs of their customers more quickly and with lower development overhead, said Alistair Fulton, the vice president and general manager of Semtech's Wireless and Sensing Products Group. "IoT solutions have the potential to change the world by delivering analytical insights which modify the ways in which we live, work and consume natural resources. Many developers and system integrators want to grasp this opportunity, but need easy to use accelerators that help them develop IoT applications more quickly. We believe that we can simplify the IoT solution development process by providing new products and services which make LoRa the easiest way to build and manage IoT solutions, enabling our customers to deliver higher value, more rapidly to the market."



Alistair Fulton, Semtech

Annexia International selects smart IoT connectivity service from Sierra Wireless

Annexia International, a specialist in ultra-low-power asset tracking devices, has chosen **Sierra Wireless**' Smart IoT Connectivity for global deployment of its NStar asset tracking and management solution. Sierra Wireless, is a Canada-based provider of integrated device-to-cloud solutions for the Internet of Things (IoT).

"Knowing the location and status of cargo in transit is key to ensuring that shipments arrive in the right place, at the right time and in good condition," said Kim Lim, the co-founder of Annexia. "Our data shows that every 1% improvement in asset utilisation generates an additional US$1,200 in revenue annually, per unit, from more efficient fleet operations, planning and inventory management. Sierra Wireless' IoT services enabled us to turn traditional equipment into connected, data-rich transportation assets that generate additional revenue for our customers, as well as deploy our solution globally without having to manage multiple carrier agreements."

Using Sierra Wireless Smart IoT connectivity, Annexia International is helping companies quickly convert existing container chassis and trailers into smart transportation assets. "By working with Sierra Wireless to transform traditional assets, Annexia was able to create new revenue opportunities and provide their customers with meaningful data and an improved service," said Marc Overton, the chief solutions officer at Sierra Wireless.



It's strategy not technology that challenges enterprises in IoT

Rami Avidan is responsible for the Internet of Things (IoT) business at T-Systems, Deutsche Telekom's enterprise customer unit. Having worked in IoT for around 20 years, he tells IoT Now, that, as the IoT market place develops, enterprises are focusing on strategies for the long term rather than specific technologies. Avidan is confident that network technologies and IT are now in place to enable most IoT use cases. The strategy and the evolution to a digitalised world are now the main challenges

IoT Now: IoT service providers often tell us their customers arrive having already experienced project failures in their IoT pilot projects. What are the common mistakes?

Rami Avidan: First of all, there has been an evolution in the market. When this concept of IoT started 20 years ago, we all came at it from a technological angle. We were playing with technology and trying to create value from that rather than from strategy. The players that fail today start off looking at IoT from a technical perspective but this is not a technology play. Anything you want to do today can be done with technology so the question is what do you want to do in your business. Therefore you need to focus on the strategy of what you want to achieve.

The other thing to remember with IoT solutions deployment is that they are going to be valuable in the long term but it takes time to get there. Organisations roll-out IoT in pockets of their businesses and expect immediate value but this is normally not the case. Therefore you need alignment in the boardroom of what the value is going to be and an understanding that this is going to be a long term process.

The definition of long term depends completely on what you want to achieve. If you're selling a service and it gains uptake rapidly, you'll have fast results but if you're digitising a factory, it's not a quick fix. Deploying sensors, linking them, optimising the data and changing the behaviour of machines is a long term process.

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I tell customers that you have to think very big and for the long term but you must start small. This is because it is not just about implementing technology, it's about educating people if you're going to change behaviour to fit the new model. This is not only about machines, people must go on a journey too.

IoT Now: How can enterprise users succeed with IoT from the start? Should they phase the introduction of IoT-enabled applications, then gradually scale up?

RA: It does depend on the type of business but I'd advise not going big immediately. It's vital to come at this from a position of what you want to achieve in the end and to do so in a way that is crisp and clear. If you have this clarity, it will be easier to measure the value that IoT does or doesn't bring.

Companies make the mistake of thinking they can go to a number of different suppliers and put solutions together themselves and this hinders scaling up. I always emphasise that companies need a partner or set of partners who can help them put all the pieces together. It's only in the last one or two years that we have seen systems integrators doing this effectively.

Similarly, companies make the mistake of thinking there's a single player who can deliver IoT for them on their own. You need chipsets,



sensors, networks, storage and applications and it's not realistic for one company to be an expert across all of these components. I tell enterprise customers that they need to engage with partners and suppliers who have built an ecosystem around themselves and have flexibility that allows customers to pick the partners they want to work with from within that ecosystem.

The successful players in deploying IoT have thought in-depth about their ecosystems.

IoT Now: Since data security isn't a bolt-on extra, how can IoT service enablers ensure that devices, platforms and applications are secure from the start?

RA: The industry as a whole has been late on the ball when it comes to IoT security but it is playing catch-up. The reason for this is that IoT security is very complex. It's not a system, it's a system on a system on a system and the more handovers you have between systems and the more differences in processes within the different systems, the greater the opportunities for security weaknesses to be exploited.

The priorities therefore are standardisation with clear rules of engagement on technologies for security. It goes all the way down to the protocols used and I'm pleased to see traction on security standardisation. It hasn't happened yet but it is going to cement itself.

Currently, security is something that comes in very late in the IoT deployment process but it needs to become something that's looked at during the ideas stage. The sooner you think about it, the easier it's going to be to ensure your solutions are secure.

Telecoms providers have focused on security for many years but we did this for our own sake. Now we need to extend this to our customers so they can reap the benefits of our deep security knowledge.

IoT Now: IoT is one of the biggest digitalisation drivers worldwide impacting almost all industries. What are the common challenges that industries face?

RA: I always challenge people that they can't mention a single vertical that isn't going to benefit from IoT. This is because it isn't a technology, it's a concept that is going to permeate into our society and nowhere in the world will be unaffected. The biggest challenge is not to get stuck in a technology conversation.

There's a real danger that everyone gets drawn quickly into the how rather than the what. When I engage with enterprise customers, the last thing I talk about is technology. People quickly jump into technology conversations which are the wrong conversations to have. The real challenge is to focus on digitalisation.

Beyond this, the other main challenge in the drive to digitalisation is the systems of systems. Closed systems that don't work well with others have been deployed and not everybody is coping. We're moving from linear business models to circular ones in which your

When I engage with enterprise customers, the last thing I talk about is technology

Beyond connectivity, the more assets we connect, the more data we generate but this isn't free

customer is now your partner and your competitor is a customer.

The driver is digitalisation but the challenge players face is to understand that landscape. We're still in the space where it's not clear where people will co-operate.

The development of IoT is taking everybody on a journey that started with the arrival of HBO and Netflix. These have driven a change in how we consume, moving from capex to opex and from owning to sharing. All of this is in a big digital melting pot and it's not clear what it means yet. Certainly, it won't happen all in one go.

However, the servitisation concept will be adopted. The automotive industry has been doing this for many years through leasing but it's not the complete model yet. This will include things such as usage-based insurance plus in-car content. Instead of yearly insurance premiums, you'll pay as you go. This is the big shift and we're all citizens on this journey.

IoT Now: Several game-changing, IoT-enabled technologies are coming to market, including artificial intelligence (AI), machine learning, predictive analytics and augmented reality. How widely applicable are they today in Industrial IoT?

RA: All of these except augmented reality are widely deployed in many industrial situations. We're certainly doing most of these. There's this notion, though, that AI has popped up in the last two or three years but its been around for many years, just not as maturely as it is now. These technologies are widely applicable and we work with them a lot when it comes to helping our clients with innovative technology.

Augmented reality meanwhile is starting to mature. It's now much more complex and will create huge value in Industrial IoT as well as many other areas. In healthcare, for example, apps are mature and we're monitoring that area closely because of its huge potential.

IoT Now: The internet was originally all about linking billions of people in a network, but now it's the turn of billions of machines, devices and sensors. How will this change IoT connectivity services in the next few years?

RA: There are several different dimensions to consider here. Historically, when we first looked at this market, we thought this would be a one bearer service to connect all these devices but now I'm convinced there will be a diverse platform of bearer services. It's driven by the value you want to create and a whole array of technical and cost capabilities that need to be considered. These extend from capacity and coverage through to battery life and ruggedization.

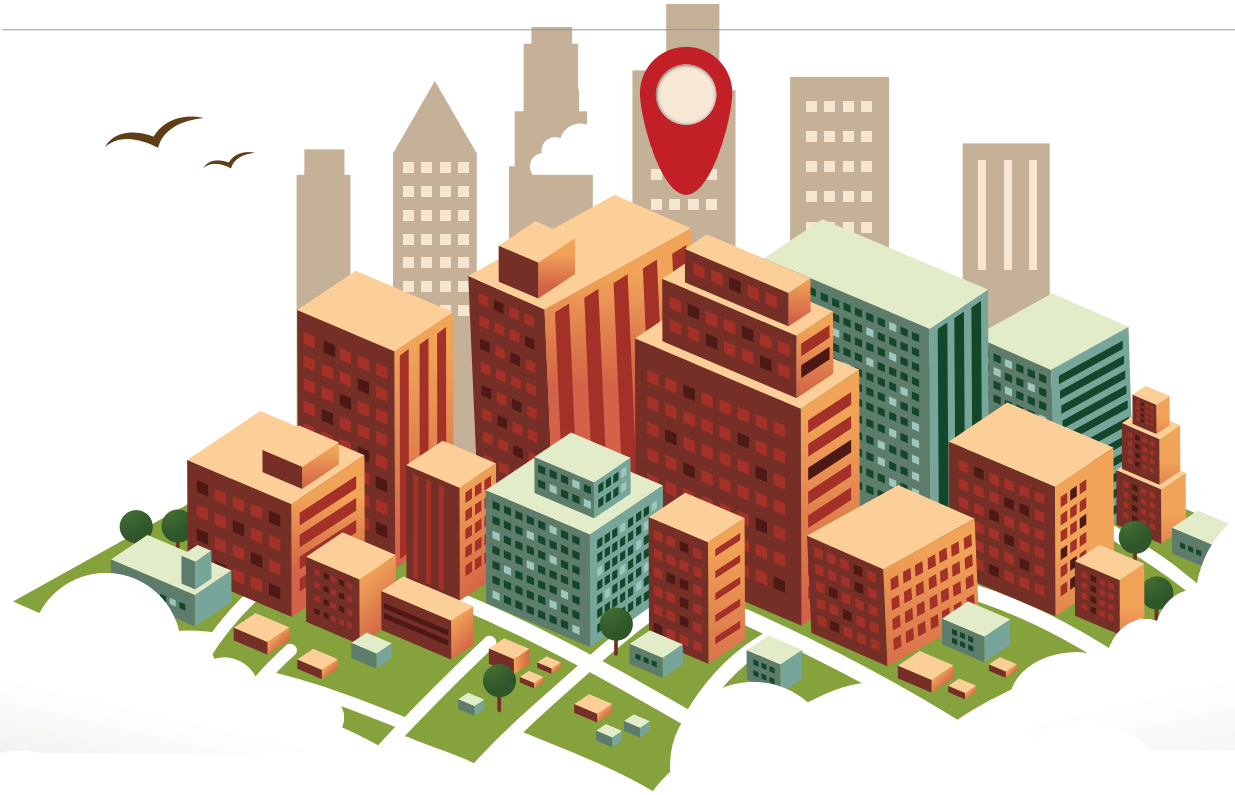
If you want to play in IoT for the long term, you are going to have to manage and control a wide variety of standards for connectivity. These encompass 3GPP, low power wide area (LPWA) networks, mesh networks, near field communications (NFC) and even satellite communications. From the communications angle, the players that can take that position for the long term and simplify it to say whatever you want, we can connect your assets will be successful.

Beyond connectivity, the more assets we connect, the more data we generate but this isn't free. If you look at the hyperscalers like AWS or IBM, the storage cost per terabyte doesn't look expensive but, when you're transmitting petabytes of data the cost of managing and handling that data is going to be absolutely massive. An area to focus on therefore is to simplify the process and try to make sure the cost of data is not too high for the business case. For multitudes of services this is going to be a fundamental consideration.

The next step is to improve harmonisation across the technologies. There's a whole layer of regulation that isn't helping us on a global scale so we have to work through these inconsistencies in order to operate IoT solution effectively, in a standardised way and globally.

For me, it's great to be able to wake up every morning and work in IoT. The potential is becoming reality and we are creating solutions and services that mean we are going to consume fewer resources, be more efficient in food production, improve care for the sick and elderly and enhance education. I don't mean to sound completely altruistic here – IoT is an enormous, attractive and ultimately profitable business, too.

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What's the future of IoT connectivity?

The Internet of Things (IoT) is predicted to connect billions of devices and sensors – that much the analysts agree on. But how will this affect the types of connectivity deployed in future? Here, IoT service and solution providers tell Jeremy Cowan what to expect

"While there is a great deal of excitement and hype around IoT, the reality is that it's going to take time before billions of devices and sensors are connected." So says Bruce Jackson, CTO of **Thingstream**, who adds, "This means that there isn't going to be a single solution that will be applicable to everything: Technologies will change over time, and different solutions address different use cases depending on factors such as bandwidth, mobility, power and latency. Ultimately, this will distribute the mass of connected devices across diverse connectivity technologies."

No silver bullet

Philip Rowlands, the software engineer heading design and development for warehouse automation innovator and warehouse management system provider **imio Software Solutions**, comments, "There is a rapidly growing market for IoT networking solutions with many in sophisticated stages of development. 5G networks will provide connectivity to billions of cellular IoT devices - 6LowPAN and Thread offer local area mesh networks to support lower energy devices for consumers and industrial devices, with services such as **SigFox** bridging the gap between local area and cellular communications."

Li-ke Huang, vice president of Wireless Technology, **VIAVI Solutions** agrees saying, "The ways in which IoT devices can connect is growing along with the diverse range of devices looking to connect."

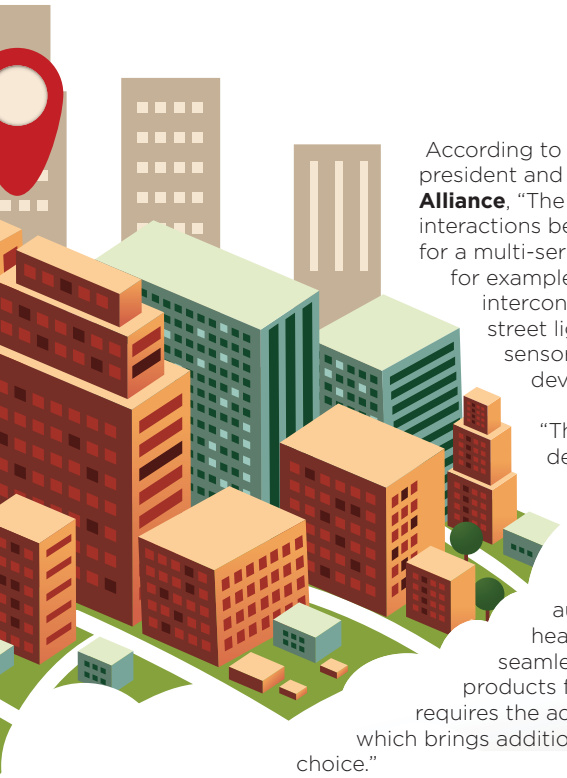
He adds, "Cellular, WiFi, RFID, Bluetooth, NFC and Ethernet are just some of the connectivity means available. While each option looks to maintain the characteristics of IoT devices, i.e. preserve power consumption, support wide range and allow variable bandwidth, the best option may not always suit the deployment scenario. For wireless transmission over great distances cellular proves best, for short distances Bluetooth or WiFi."

Smarter cities demand mass scale

Matt Bird, managing director of **InLinkUK** believes, "There are a number of reasons to expect smarter cities to be one of the first major ways in which IoT connectivity will be deployed on a mass scale. High population density, early 5G rollout, and the availability of fibre backhaul for superfast WiFi services all mean that cities are primed to take advantage of mass connectivity. While the precise use of IoT is still open to experimentation and innovation, the hyperlocal nature of IoT points towards efficiency, community, and inclusion as being keywords for the changes that will come from smarter cities initiatives."



Phil Beecher, The Wi-SUN Alliance: "Seamless interoperability between products from different vendors requires the adoption of open standards which brings additional benefits such as vendor choice."



According to Phil Beecher (pictured), president and CEO of The **Wi-SUN Alliance**, "The increasing diversity and interactions between applications calls for a multi-service network infrastructure, for example a smart city network with interconnectivity between a smart street lighting network, traffic sensors and management devices.

"These networks require devices to be interoperable enabling peer-to-peer connectivity, as well as supporting standardised methods for securing the network, such as device authentication and self-healing networks. This seamless interoperability between products from different vendors requires the adoption of open standards which brings additional benefits such as vendor choice."



Mikaël Schachne (pictured right) BICS: Ubiquitous connectivity is going to be paramount.

Ubiquitous connectivity

"To support the billions of devices and sensors predicted to make up the IoT ecosystem, seamless, ubiquitous connectivity is going to be paramount," says Mikaël Schachne, vice president of Mobility & IoT Business at **BICS**. "Whilst data-hungry devices will require high-bandwidth spectrum to support them, mission-critical applications need a highly reliable network infrastructure spanning 2G through to 5G.

"NB-IoT has also been central to the growth in the number of IoT connections, such as utility metres and remote tracking applications. These generally only receive and transmit small amounts of data over long periods of time, meaning their battery life is extended well beyond other devices," he adds.

Multiple IoT business models and uses

As Schachne points out, successful IoT deployment is therefore dependent on a number of factors. He says these range from network-agnostic and global mobile connectivity, to efficient network management and integration. "It must support multiple commercial models which may differ considerably," Schachne concludes.

A similar approach comes from Krakow, Poland-based Comarch which designs, implements and integrates software and IT services for customers including BP, Deutsche Telekom, Diageo, KPN, Orange, Telefónica, Unilever and Vodafone. Wojciech Martyniak, M2M/IoT product manager at **Comarch**, tells us, "The number of devices is just one factor in determining which type of connectivity will be deployed. Perhaps more important is the type and use of the device or sensor itself. For example, manufacturing needs low bandwidth, short range and high reliability for operations monitoring, while the utilities industry requires low bandwidth, long range and high reliability for asset tracking.

"The starting point therefore must be to understand the purpose of each IoT device first, before organisations can build reliable, cost-effective and faster connectivity around it."

Wireless Broadband Alliance has an IoT initiative with the LoRa Alliance and an IoT First Responder programme with Cisco and Aruba. WBA's general manager, Tiago Rodrigues, believes that because there are so many different use cases for IoT devices and sensors, with completely different technical requirements, the various forms of IoT connectivity will continue to co-exist.

"No single technology will solve every business case. Nonetheless, the key forms of connectivity will be Wi-Fi, cellular and unlicensed IoT technologies – these will continue to underpin everything. So, this means that interoperability becomes critical for long-term success. As an example," he says, "LoRa and Sigfox are working with the Wi-Fi industry to ensure that their technologies are interoperable and future-proofed."

Altran (formerly Aricent), provides IoT, AI and edge expertise for IBM, Amazon and Intel. Its VP of Global Service Line, Advanced Networking and IoT, Arnab Das, says operators will meet the massive connectivity requirements of IoT through MMTC and eMTC. "While operators can deploy both NB-IoT and LTE-M to support machine communication, NB-IoT likely will prevail. NB-IoT supports deeper coverage and higher security, as well as longer operational battery lifespan for devices. Furthermore, the cost of SOC modules that support NB-IoT is expected to decrease rapidly."

Das is convinced that operators also will use unlicensed LPWA technologies, including LoRA and Sigfox, for unique use cases, like stadiums and large retail spaces. Eventually, he says, 5G may drive consolidation of eMTC and URLLC, which will create a more homogeneous access technology for the Internet of Things.

The author is Jeremy Cowan, editorial director of IoT Now.



Is AWS about to disrupt the IoT connectivity market cloud-style?

In an exclusive interview with IoT Now, Eseye's chairman and CEO, Nick Earle and marketing director, David Thompson reveal their plans with their partner, hypercloud company Amazon Web Services (AWS). The plan? Nothing less than turning Internet of Things (IoT) connectivity services on their head. Editorial director, Jeremy Cowan reports

Nick Earle: We have several hundred thousand vending machines around the world. What companies want to have is a single global product SKU (stock-keeping unit) that they can roll out throughout the world, and just power it on and it connects. We connect to just over 500 now in 192 countries, but what you then can do is make one coffee machine. You may have to change the payment device, like QR codes for China, but essentially one product SKU in one factory and ship it all the way around the world. And the supply chain savings are absolutely enormous.

In the case of **Costa Express** (coffee retailer), and quite a few of our customers, it's the ability to work with Eseye for a single global product SKU which, when you take a contract out with a mobile network operator (MNO), of course you can't. MNOs can only offer coverage in certain regions; even with roaming agreements they only still have a subset of networks.

Cellular, ubiquitous, out of the box, network-agnostic, IoT connectivity is needed to get the promised business benefits of IoT. Secondly, it cannot be delivered by an MNO-centric solution. It has to be abstracted to an agnostic independent software switch or network switch, which then federates connectivity across multiple MNOs. So, it's a really fundamental market disruption; it's actually the primary reason why **AWS** selected us as their first global AWS Advanced Technology Partner for IoT. So AWS are disrupting the model.

Our average ARPU (average revenue per unit), per month is £1.00 (US$1.3) and that is for the data and the switching platform. That coffee machine costs Costa Express one cup of coffee per machine per week.

So, 'Is IoT going to grow?' Look at the top three impediments for IoT connectivity. A lot of projects start and then they hit the mud and stop. One of the most common reasons for them stopping is that the business case is not delivered, often because the device was not designed properly for the use case. A lot of people are thinking, 'This connectivity is really simple. I'll just whack a SIM card in there. How difficult can it be?'

Well, the answer is: Very. We've been in business 11 years, we have 1,400 customers, and 80% of all the projects we've seen in 11 years are customers who come to us with an existing failed IoT project.

Cellular, ubiquitous, out of the box, network-agnostic, IoT connectivity is needed to get the promised business benefits of IoT
- Nick Earle, Eseye



That coffee machine costs Costa one cup of coffee per machine per week

IoT Now: Eighty percent!

NE: Eighty percent. And the reason it's failed is because the device was not designed for the business case. That Costa Express coffee machine is a great example. You know, with lots of sensors. There's a lot of things that you have to say, if this happens, then what? How does it reboot? How does the firmware on the processor talk to the modem? What if the power or the network goes off?

Cellular IoT is primarily controlled by the MNOs. However, the regulator controls where they can have direct access. And each MNO, of which there are over 800, has a subset of other MNOs that form into a contractual-based set of roaming agreements. There is no commercial incentive for the major MNOs to transfer traffic seamlessly from one to another. There is no incentive or capability for seamless global roaming. It's still based on the model of the PAC code with a cell phone.

If you've got 50,000 IoT devices, a) you don't want to contact them 50,000 times, b) you don't want 24-hour turnaround and, c) you certainly don't want to have two sets of contracts.

Currently, cellular is about 21% of all connections growing to 40% driven by the fact that these things are going into more remote locations. Secondly, data prices are coming down and 5G's coming in so there's new use cases. So, let's look at it from the outside in.

What's it going to take to achieve the business goals of IoT? And the answer is ubiquitous, global, out of the box, zero-touch connectivity. That's the Holy Grail.

The only way to do that is to have a new model which involves a smart SIM and a cloud-based network switch. **Eseye** is trying to become the leading provider of a cloud-based, agnostic (we don't care who we're connected to) network switch that is based on maximising the service provision into the device. If we get to touch and design the device then we can deliver an average 99.75% connectivity through dynamic over the air, international mobile subscriber identity (IMSI) switching into the device.

The business case, which could be a single SKU, could be the ability to do proactive maintenance, we track and trace and you never lose it. But the really the fundamental bit is that you get straight line deployment. You don't get to 200 devices and then go, 'Oh, they don't work in Poland'. Once you start deploying these devices, you deploy them at the speed of your business case.

Like the **Bosch** automated lawnmower. They've got tens of thousands out there, selling more everyday through retail stores all around the world, people switch them on. And the data just appears in Bosch's cloud. It's zero touch for the user. None of this faffing around, connecting your lawnmower to your home Wi-Fi, nobody wants to do that.

The idea of connecting something to your home Wi-Fi is based on the weaknesses in the current system. It's the manufacturer trying to put the onus on the customer. You shouldn't have to think about connectivity. If you can get out of the box, single product SKU it's the Holy Grail. Technically we are there and this is what we do! We believe cellular IoT connectivity will move from a world where it's controlled by the major MNOs to a cloud-based network switching surface which will connect to all the MNOs.

We're trying to create the eye of the needle through which all the MNOs will connect. And that is why if you go to AWS Marketplace right now and type 'IoT cellular connectivity' it says one entry found; Eseye. A lot of people don't understand what AWS is trying to do.

IoT Now: I don't think they do.

NE: I was with **HP** for 17 years, I was with **Cisco** for 13 and ran the cloud and the managed services business with Cisco globally in the UK. And I was an investor in Eseye which I thought was an interesting company. Then they asked me to join the board about three years ago, and 18 months ago we had a board meeting.

Ian Marsden, who is the brains of the outfit, was giving an update to the board of directors in London. He said, 'Oh, and we've just been selected by AWS to create a new security solution for IoT.' And everybody looked at each other.

We went, 'Excuse me?'

He said, 'Yeah, I've been in Seattle and they invited all the people from the **Gartner** Magic Quadrant, including **AT&T**, **T-Mobile** and **Vodafone**. We've been selected and we're going to be building a new IoT security feature for them.'

The way it works now is that you have to send your security certificates to a third party manufacturing company, if you want to install them on the devices before they ship, which is a bit risky. Or you have to unpack the devices and touch them. Let's say it's a lawn mower or a coffee machine, you connect them to a separate portal, you put it in your product in China. But when the device lands in Nigeria, you have to connect to the cloud to download your certificate. So, you have to touch it.

Ian said, 'So we're going to build it with them so that you do the whole thing out of AWS. Then our technology in the device will work much more simply for AWS IoT customers.

The Board were saying, 'Well, why would they do that? Do they know we're only a small company?'

I went, 'OMG. I think I know exactly what they're doing.' People looked at me, and said 'What are you talking about?' I'd spent two years studying AWS and trying to stop them from killing Cisco; that was my job for John Chambers and Chuck Robbins. For the first seven or eight years I was in Cisco people would say, 'Oh, cloud, that'll never affect Cisco. People will buy boxes till the cows come home.'

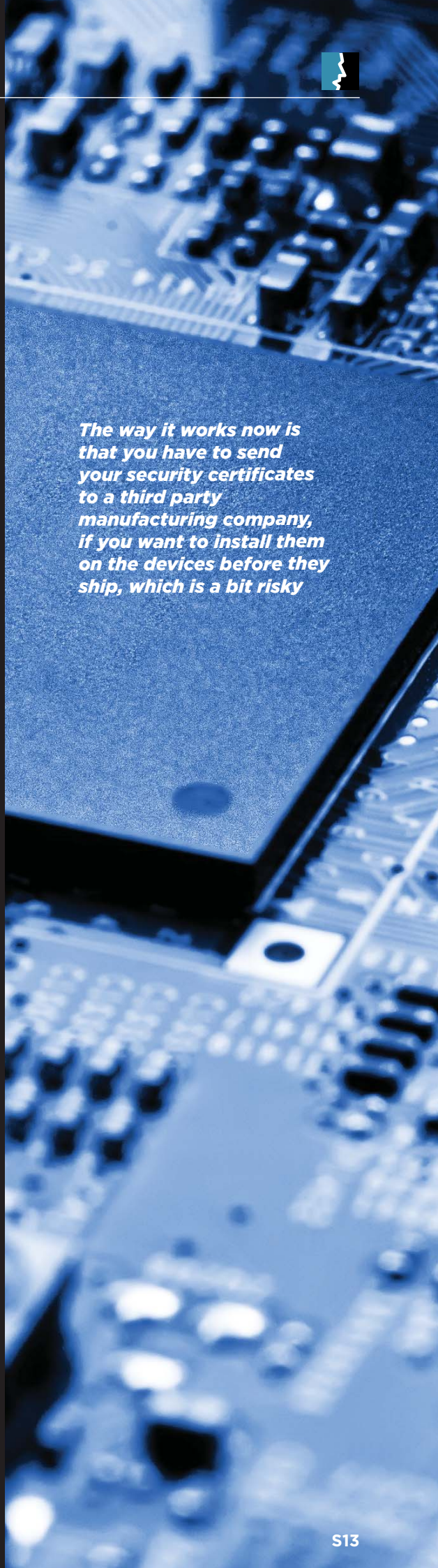
Eventually we said, 'No, they won't. You gotta realise what AWS do. AWS don't build a better product. Whenever Cisco has found a good company outside, if they were building a better mousetrap, we either bought them or threw engineers at it and built an even better mousetrap. This is the first company you've ever seen that is actually saying, 'What if there were no mice?'

They said, 'Of course, there's always mice.'

'No, but what if there were no mice. What if you never actually needed a computer?'

What AWS do is disrupt and simplify. All you need is a browser and a credit card and five minutes later you have access to a data centre in the cloud. For years, people completely misunderstood that, 'That'll never affect us.' Then look what happened to the data centre hosting business, and the hardware business.

Fast forward to today; 80% of data is going to the edge. AWS makes money from data. It doesn't take a brain the size of a planet to work out where AWS is going next. They're going to the edge. But I believe the light bulb hasn't gone on, people don't realise they're not just going to take today's model and implement it. They're going to do the same playbook.



The way it works now is that you have to send your security certificates to a third party manufacturing company, if you want to install them on the devices before they ship, which is a bit risky



Nick Earle, Eseye



David Thompson, Eseye



Jeremy Cowan, Editorial Director, IoT Now

It only has two chapters; one's called Simplify, and one's called Disrupt. What AWS want to do, and they're public about this, is to recommend a standard device architecture.

For AWS it's all about the device. If they can recommend the device architecture, they could make ubiquitous global connectivity available out of every device. That device automatically sends its data into AWS, not into **Azure** or **Google**, and that device is automatically secured. And if that device could be managed from within AWS for anomaly detection, device configuration, etc., and if you could pay for the whole thing, through your AWS Marketplace invoice, then you would have vastly simplified and automated the whole IoT process. And that is exactly the play book AWS used to become the world's biggest cloud company. So, in my view, it is obvious they implement the same strategy to be successful in IoT. Frankly, I don't think it's wise to bet against them.

It's like, 'Holy crap!' I honestly believe people don't know.

Now, AWS love mobile network operators. We love mobile network operators, they love us. But the fact is there's a disruption coming and it's as big a disruption as Apple did with the iPhone. **Apple** had tightly coupled software and hardware into the device to create a ubiquitous, seamless customer experience.

Which we now know is the iPhone and the App Store. AWS are saying, put this chip in your device and you get seamless connectivity globally. Everything to do with AWS is zero-touch. We're not a channel partner for AWS the way that they have 60,000 channel partners. We're a technology enabler of a business model change by AWS.

We have an intelligent SIM, it's basically a small server, and we can put IMSIs in and different bootstraps, and we are the eye of the needle. We federate connectivity across multiple MNOs and it gives us 500 options. You get a single invoice, single management portal, single support, so it's a one-stop shop.

IoT Now: How do you do it?

NE: The single most important thing is if you get the chip into the device, everything works. That allows you to do a single global SKU, a single lawn mower, single tracker or anything. When the product is turned on it bootstraps to a network and connects; you don't have to do anything as a user. Third step is it registers into AWS automatically.

The certificate is created within AWS and stored in the device. That's hugely important. You no longer have to ship security certificates outside your firewall, security certificates are created by AWS. Your security policy is a rules-based engine inside AWS and that's dynamic as well. We worked closely with AWS for AWS Device Defender and launched it on stage with them at the AWS Chicago Summit.

IoT Now: Why haven't Amazon bought you?

NE: If you're a $30 billion company growing at 50% and you come up with this great idea to simplify IoT then you don't need to own all of your partners, we're the eye of the needle through which all AWS IoT data flows. Because when this device gets turned on, it actually connects to us before it goes to AWS.

Of course AWS could decide to buy us, but for the moment what is important to both companies is that we execute on both models, to grow market share as fast as possible. It's a hands-off relationship, they just recommend us. Secondly, they still want to have relationships with the major mobile network operators. We're just the technology enabler of a simpler solution for them.

David Thompson: We've had conversations around things like customer support. If you're a connected lawnmower company with tens of thousands of connected lawnmowers, and some of them aren't working for some reason, AWS don't want to be dealing with those questions. It is better that specialist companies like Eseye are on the case for that company's brand.

NE: You're getting the business benefits. You've got one contract with AWS and one with Eseye. That is a disruptive business model. We won't be the only people who do it but we have been doing it for 11 years and we're proud of our close relationship with the biggest hypercloud client. Cellular IoT will require a model that is network switching-as-a-service, algorithm-based switching in the device (the device can switch without talking to the server) and algorithm-based switching in the network platform.

Clearly AWS believes that this model is what's needed for IoT. Because of the problems of delivering more than 80% connectivity through global roaming, if you want to get into the high 90s% you've got to have an abstracted, agnostic switching platform. That's what we're trying to build.

IoT Now: How much money are you raising for this?

NE: I can tell you in the last 10 months we've raised about £7 million (US$9.1m), which is about as much as we've raised in our previous 11 years. And we are likely to be raising more going forward.

IoT Now: Are the MNOs your friends or your frenemies?

NE: We absolutely believe that the AWS relationship increases our value to MNOs and we've tested that theory by launching the **AnyNet Federation**, like a Star Alliance for IoT. We're creating a network of preferred MNOs with a central clearinghouse called AWS. Network providers love this, because they now get a share of all IoT sold out of their host country. AWS send the invoice to the customer, the customer pays AWS and AWS distributes the revenue.



INTELLIGENTLY CONNECTED

Providing the ingredients of global IoT success

Companies that are new to the Internet of Things (IoT) often experience problems with their first IoT projects. Now one innovative UK-based firm, Eseye, is working with blue chip partners to smooth their customers' path to cellular IoT success

Difficulties in the Internet of Things might include too many technical steps involved, having to deal with multiple partners in the ecosystem, and the complexity of dealing with multiple mobile network operators (MNOs). Inevitably, the result is slower adoption of IoT and regular failures to deliver the promised business benefits.

As many as 80% of new customers arrive having experienced an IoT project failure, says Eseye's chairman and chief executive, Nick Earle.

So, what do IoT customers really need?

Eseye lists the following essential factors for success:

- A consistent global IoT service delivery model
- Global ubiquitous connectivity out of every device – manufacture once, deploy anywhere
- Future-proofing without restrictions
- Simplified management of the entire estate, and
- Quicker return of promised business outcomes.

SPONSORED FEATURE

Mobile networks were not designed or built for global IoT and as a result cellular service providers are unable to deliver the quality of service or infrastructure to enable better IoT services. There are numerous problems. One significant issue is major coverage gaps, with cell towers placed for cell phone for people not for IoT usage. For example in the UK, regulator Ofcom says that split by connectivity type – 4G, 3G, 2G and voice calling – 78% of outdoor spaces in the UK can be accessed from all 4 networks. This rises through roaming agreements, but there is a cost penalty. IoT devices may be in remote areas with no coverage, or have weak in-building coverage or be moving across regions and countries.

In the early days of IoT the solution was for customers to have multiple MNO contracts from the likes of Verizon, Vodafone and Telstra to achieve global IoT deployments, meaning multiple invoices, portals and support tools. If you add in the need to swop SIMs in the IoT device there is a delay and this manual intervention adds cost. Plus the customer ends up with two or more operator contracts.

Zigbee-style convenience

At least, that's what used to happen. Eseye's founders, Ian Marsden and Paul Marshall, are the creators of the Zigbee technology used, among other ways, in TV remote controls. They asked themselves why it was not possible to deliver the same out-of-the-box ubiquitous connectivity in the cellular space. Long story short, they developed AnyNet multi-IMSI SIM technology and Network Switching-as-a-Service (NSaaS) through the Eseye Managed Connectivity Platform. This has now been enhanced for AWS for whom they have added a new IoT security system (see article, pages S11-14),

Typically, for example, the device could be a coffee vending machine connected to AWS's hypercloud. Local to the machine, the company's firmware algorithm optimises coverage through the partner MNOs for the AWS enabled connectivity service. The multi-IMSI can be updated remotely or locally. The result, says Eseye, is up to 99.75% network connectivity globally.

The integration of Eseye onto AWS's IoT services is today unique. Customers open an AWS account. AWS Marketplace lists only UK-based Eseye, the smallest Gartner Magic Quadrant recognised firm's IoT cellular SaaS solution for its customers, (Eseye has approximately 70 staff now and expects this to rise to more than 100 this year). MQTT billing records are handled by AWS, with a single invoice in AWS Marketplace covering all the operators delivering the IoT connectivity service. Similarly, there's a single support team and a single security policy. Eseye's network is at the heart of the MNO partners; it is, says Earle, "the technology enabler" from which all the partners' IoT services flow.

"IoT enabled devices can be designed, tested and deployed in three months"

Developers can interface with AWS IoT Device Analytics (checking the health of the connected machine), with AWS IoT Device Management, and with AWS IoT Device Defender (a security programme launched and demonstrated by Eseye's Ian Marsden with AWS in Chicago last year).

What does that all mean?

The first benefit is rapid time-to-market. IoT enabled devices can be designed, tested and deployed in three months, sometimes less. At the start the customer's business requirements are mapped out, then there's a two-week phase for the initial design of a prototype device using Eseye Developer kits and off-the-shelf components.

Over the next two-three months a technical prototype is produced by a third-party PCB manufacturer, followed by field testing of up to 100 devices in target countries worldwide. Then the prototype moves to full production of the final PCB design and device, before full deployment of a single device stock-keeping unit (SKU) with global connectivity and full cloud integration.

And connecting the devices?

They connect automatically to AWS IoT when powered on. Registration, security and provisioning are all auto-enabled. All devices are then managed through the AWS IoT portal, and



Nick Earle, Eseye

billing is handled via AWS Marketplace. Of course, the IoT device must be designed to work with as many networks as possible and have the business logic, bootstrap, recovery rules and sensors embedded via a SIM or eSIM on the device PCB. It must also be able to be managed over-the-air (OTA) by a connectivity managed service platform.

How secure is this IoT model?

No discussion of Internet of Things is complete these days without mentioning the security of data, devices, and applications. Eseye has demonstrated its wide range of expertise by developing AnyNet Secure™, a managed secure connectivity solution for embedded Universal Integrated Circuit Cards (eUICCs).

It offers a multi-IMSI (international mobile subscriber identity) SIM, multiple networks ranging from Narrowband IoT to 5G, and over-the-air (OTA) management. The company says it offers amongst the largest number of route paths to maximise up-time. The IMSIs identify and connect to any cloud platform.

SIM cards can be supplied in industrial-grade embedded or standard form-factors. They are supported globally 24/7/365 by a real-time SIM location-based service, with real-time anomaly detection, billing alerts and cost management. The solution also meets all relevant global data regulations.

Reaching new partners: The AnyNet Federation

Announced at *Mobile World Congress* in 2019, Eseye has created **The AnyNet Federation**, a federation of regional mobile network operators who will be the preferred carriers in the region for AnyNet traffic. Devices sold by any Federation partner will be auto-switched to other Federation Partner networks.

The advantage to the mobile network operator is that all MNOs work together to drive global roll-outs and rapid device deployments. Eseye receives full interconnect, soft IMSIs, wholesale pricing rates and local regulatory compliance, while MNOs receive significant data traffic and a new revenue share.

The IoT business media reported a significant success for the federation in Q1, 2019 as, **MTN** joined the Federation bringing with it 17 leading local networks reaching right across Africa. ▶

"MTN joined the Federation bringing with it 17 leading local networks"



Case Study: eWaterPAY

Eseye's technology connects industrial, vending, banking and smart city customers globally, but how well does it work in practice? Well enough for even the most challenging environments and for **eWaterPAY** and Eseye to win the **Global Mobile Awards 2018** for the Outstanding Mobile Contribution to the **United Nations** Sustainable Development Goals

Eseye has enabled entrepreneurs to deliver a new business model for the provision of freshwater to remote villages in developing countries

Eseye has enabled entrepreneurs to deliver a new business model for the provision of freshwater to remote villages in developing countries. The business problem lies in remote villages, where there is no clean water supply and children have to walk to the local bottling plant to get water. Then they carry it home in plastic cans on their heads. All of which means the kids' schooling is interrupted because they're too busy carrying water.

Companies and NGOs have been putting taps into remote villages as, although there may not be springs or wells, often there are aquifers beneath the villages in Africa. There's water available and, using grants, engineers can put in a tap. This will work for a while, says Eseye's CEO, Nick Earle, but if there's ever a problem and the pump or tap needs maintenance there's no money to pay.

Here's the business model. There's a small plastic disk equipped with RFID tag. You put a small amount of money on the disk by holding it against your mobile phone – African network operators lead the world in providing mobile money and payment services. Tap users touch the RFID tag against the water charging unit for a small affordable fee and water is dispensed.

The children can go to school, and the revenue enables the tap to be continuously maintained. Because it is connected to the cellular network, the tap use is monitored, and if there is a failure a locally employed engineer can be sent.

Eseye created the APIs. From the AWS portal eWaterPAY can see if the taps are working or not. They train a network of engineers who can repair all the taps in the surrounding area. They alert them about any failure and they can be paid for making the repair. Micro payments are funding water distribution and helping children go to school. Much the same now applies for solar energy generation in parts of Africa. Eseye is helping to deliver water and electricity to hundreds of thousands of people in Africa, using ubiquitous IoT micro payments through mobile money applications. Once again the technology is there, it's about finding the right business model.



What's keeping IoT executives up at night in 2019

The promise of IoT is enormous, from reducing operating costs, to improving workplace safety; yet many organisations face hurdles when it comes to implementation. The top three concerns for IoT leaders in 2019 are execution, cybersecurity and initial purchase cost. These are the conclusions from a survey by the organisers of IoT World 2019, the largest IoT conference in the world taking place next year in San Jose, California 6-9 April, 2020, which surveyed more than 100 IoT leaders across a range of industries. Survey respondents included IoT leaders in manufacturing, telecoms, healthcare, retail, construction, supply chain and logistics, oil and gas/energy, government, transportation and agriculture

Implementation and security are the clear top concerns for IoT leaders across industries, with initial purchase cost rounding out the top three. Most decision makers are not concerned about ongoing upkeep costs, likely anticipating or already seeing ROI based on improved efficiencies. The full list of concerns ranks as follows:

1. Implementing the technology (34%)
2. Security (25%)
3. Initial purchase (17%)
4. Scalability (10%)
5. Business buy-in (8%)
6. Upkeep costs (3%)

Among those surveyed, 66% say their c-suite executives are supportive of their IoT implementation plans, but that support does not solve the challenges around effectively implementing the technology or ensuring ecosystem security. These top two concerns – implementation and security – go hand in hand. Before any enterprise can implement new IoT technology, companies must do their due diligence on potential security risks, their staff's readiness to support the new technology and how to properly deploy it.

At the front end of this challenge, 45% of companies say they are deploying IoT devices on a dedicated network to mitigate security risk. In ▶

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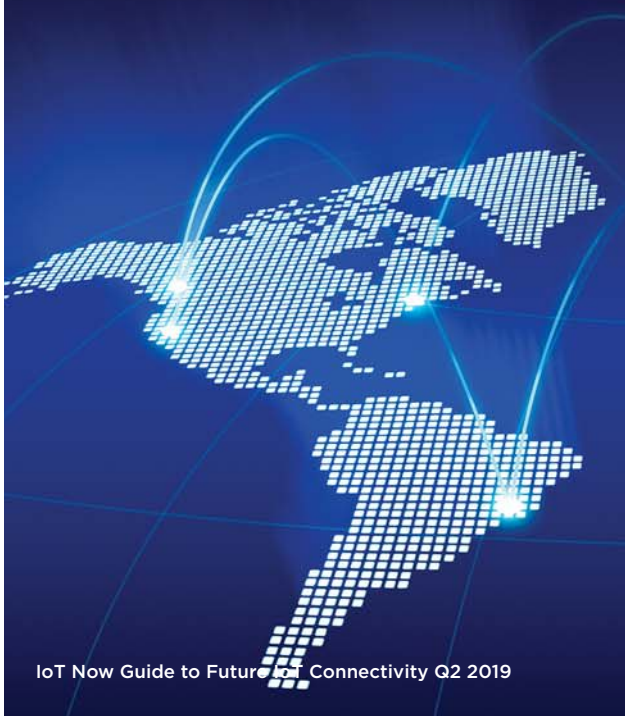
addition, 46% are introducing internal training systems for their entire workforce, which will improve the efficacy of the devices and limit vulnerability due to an oversight. Once the devices are successfully deployed decision makers are focused on maintaining security by doing all of the small things right:

- 68% are regularly updating firmware and software
- 44% are checking devices to see if physical access to the devices makes them vulnerable to hacking
- 35% are making data decryption a default
- 26% are shutting down devices when they are not in use
- 17% are using Blockchain to enhance security

Prepare for additional IoT implementation: Hiring and training

With additional IoT implementation expected, IoT leaders are focusing on training and hiring to support this growing ecosystem. In addition to 46% of companies focusing on internal training for their entire workforce, companies are also building out their roster of specialist:

- 64% plan on training current employees for new, more technical, roles
- 63% plan on hiring new employees
  - 33% additional data analysts
  - 30% a different technical role
- 10% plan to hire more remote employees



Blockchain and 5G networks

While organisations are building out their expertise and constantly exploring new technology, they are also being judicious in which technologies they are implementing. Although blockchain was a heavily discussed topic in 2018, IoT leaders were evenly split on how effective blockchain was as a tool to improving their ecosystem security. When asked the primary benefit of combing blockchain with IoT, respondents answered:

- IoT architectures that rely on centralised servers to collect and store data will be able to write local ledgers that will sync with other localised ledgers to maintain a single, yet secure copy of the truth (15%)
- Blockchain, due to its background in high-end cryptography, helps with IoT security (29%)
- Smart contracts can be applied to the data in the blockchain to enforce business conditions on the IoT interactions (13%)
- IoT transactions on the Blockchain will be timestamped, ensuring that they are available when needed (12%)
- I don't see a benefit (29%)

Although widespread 5G rollouts are not expected until 2020, many companies would be interested in utilising it this year if they had the option:

- 41% saying they would deploy IoT devices on a 5G network this year if it is available
- 37% would take a wait and see approach on 5G and instead stick with their current wireless network
- 22% do not rely on wireless networks for their IoT deployment

For additional information on the issues the IoT industry is facing, check out the panels at next year's IoT World in San Jose, Califonia April 6 – 9, where our speakers will be addressing these topics, with focus areas including Industrial IoT, smart home, smart cities, security, edge computing, smart buildings and construction, AI, healthcare, energy and utilities, transportation and more.

https://tmt.knect365.com/iot-world/

"Cyber threats come from so many different directions for the modern enterprise. So often the difference between being comprised and being secure is having done the checklist of best practices, like making sure every device has the latest software updates. Our research showed that luckily IoT executives are very aware of this reality"

-Zach Butler, director, IoT World



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Internet of Things World Europe: Seeing is believing and IoT needs to show us what it's got

Seeing is believing, or so the story goes – but how can developers demonstrate and show off the finest aspects of their IoT intricacies? There is a lack of confidence amongst organisations all over the world regarding safety, security and privacy. In spite of almost 26.66 billion people owning a device worldwide, very few people trust their devices or are even aware of how to enact IoT security precautions. According to the State of IoT Security, around 96% of companies and 90% of consumers want an IoT security code of practice, which makes sense when only 14% of consumers are even aware of IoT device security. 65% are petrified of hacker monitoring and a following 60% of consumers fear personal and professional information being leaked

Two tracks, one unmissable programme

This is largely down to a mass-misunderstanding of what IoT is; as its development has been on a racing trajectory since its conception in the late 1990s. Due to this rapid expansion, consumers are very rarely made aware of the changes being made and as such, aren't being given the bigger picture when it comes to how these changes affect their security or personal information. The challenge for developers is to practice transparency to help rebuild and re-educate end-users and consumers.

So, how can we do this? One way would be to demystify the processes and communicate those processes with the consumer – a gargantuan task and one that ultimately relies on IoT providers, developers, engineers, architects and designers to take the lead. Essentially, those 14% of consumers who are unaware need to be made aware and engaged with so that there is an accessible route for them to troubleshoot and identify risks within IoT. Inviting them into the conversation surrounding security can only be a good thing, when more often than not, the simplest questions are overlooked by the expert and it's the simplest questions that identify the problem-based-solution.

Another way that we can hand back control and cultivate trust with the consumer, or end-user, is to implement due diligence across the board. Development of a broader best practice when it comes to IoT security is paramount if there is to be a measurable way to define and regulate safety expectations. The impact of IoT on daily life is both insidious and glorious, depending on its intention, so the fears surrounding leaks in personal information and hacker monitoring are entirely justifiable.

The 2019 Global Risk Report identifies a survey conducted by Brookings in 2018, which suggests that 32% of respondents view artificial intelligence (AI) as a threat to humanity, while only 24% do not. People fear what they do not understand, so demystifying on a broader scale will not only open-up what IoT is but also remove its dystopian outer-casing. The report also comments on the development of IoT sophistication and prevalence; highlighting the potential to amplify risks or create new ones. It is inherent now, more than ever, that these conversations and interactions need to be happening.

In a order to take the lead and contribute to the accessibility of IoT, **IoT World Europe**, part of **TechXLR8**, London Tech Week's headline event, is opening the floor to end-users by hosting the event, free of charge for the first time since its inception. The event is taking place on 12-13 June at ExCel London and considers the issues facing the IoT community and wider ecosystem. The organisers have focused the event around tackling these issues head on by showcasing solutions spread across two tracks in one unmissable programme.

IoT Activate Track sessions are made up of ▶

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highly sought-after speakers, industry moguls and professionals at the top of their game; sharing case studies with invaluable information surrounding tech strategy, tactical implementations and much, much more. Not only will this be an education, but these insights are sure to help those involved in key decision-making processes.

IoT Execute Track is for the doers. This track encourages those who learn by doing and believe through experience. IoT Execute shows exactly how the Internet of Things is being realised on architectural levels with architects, engineers and developers from the likes of **Pirelli**, **Tata Steel**, **Comtech**, **Stanley**, **Black and Decker**, **Heathrow Airport** and **Vopack** bringing their knowledge to the show.

IoT World Europe understands that seeing is believing, and experience scaffolds learning. So, we've put our money where our mouth is and have dedicated a space for exhibitors, sponsors, end users and all those who lie in-between to come together and demonstrate, understand and discover cutting edge IoT developments.

IoT Demo Zone

Witness innovation in action and hear directly from the people making it happen. Situated at the heart of the event, the Demo Zone will encourage attendees to explore how the internet of things and the disruptive technologies enabling it are converging to create a new world of efficiency, experience and opportunity for those capable of harnessing them. Whether it be a new IoT implementation, or a unique industry leading product – this is where you can discover and be demystified on their application purposes and usefulness.

Technology is changing the landscape of business. From creating new revenue streams, enhancing efficiencies and rewriting business models, TechXLR8 presents the technologies that are fuelling the business revolution. Book your IoT World Europe Summit pass today and gain access to the TechXLR8 expo floor where you can come face to face with the latest products, solutions and senior representatives who can help you shape your vision and turn it into reality.

The free visitor ticket gives you exclusive access to the entire large-scale tech exhibition, the AI Summit London exhibition and demo zone, 100's of hours of free talks and panel discussions and access to the official TechXLR8 Event App where you can directly message other attendees and download all presentations after the event.

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