IoT Now: ISSN 2397-2793

Q4 2018 • VOLUME 8 • ISSUE 4

IoT NOW

HOW TO RUN AN IoT ENABLED BUSINESS

TALKING HEADS

1NCE CTO explains why traditional connectivity contracts won't work in Industrial IoT

Q4 2018
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IOT CONNECTIVITY DISRUPTED

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MMF2 eSIM
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2G
LTE-M[2]
MULTI-BEARER TECHNOLOGY
3G
4G[2]

RECEIVE

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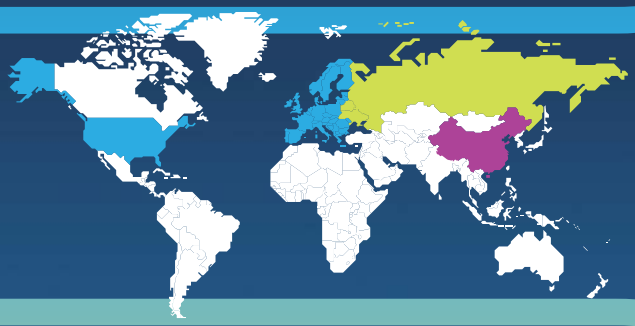
PLUG & PLAY

NO AUTHORISATION OR ACTIVATION REQUIRED



COVERAGE
- August 2018
- September 2018
- October 2018

More to come!

FLAT RATE PROMISE

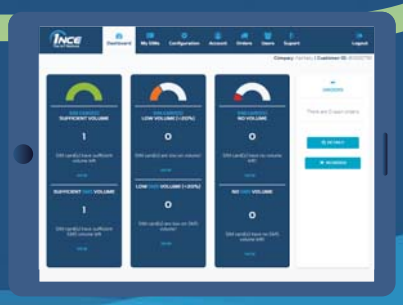
10 EUROS one-off cost per SIM **FOR 10 YEARS FLAT RATE[3]**

CONFIGURE

NO ADDITIONAL COSTS FOR APN OR VPN

OPERATE

NO HIDDEN FEES



CONNECTIVITY MANAGEMENT PLATFORM

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CONTENTS

IN THIS ISSUE

What's a few thousand million missed connections between friends?

As 2018 draws to a close we're just 13 short months away from 2020 and that number looks to be truly unlucky for those that projected a market of 50 billion connected devices by then. Nevertheless, there are good reasons for the IoT industry to be cheerful as we go into 2019

Projecting the rate at which a new technology will take off is never an easy task and doing so leaves you open to criticism from the more cautious. It was therefore a brave move for those analysing the old machine-to-machine (M2M) market to venture such bold suggestions of growth in connected devices. However, context is king and these commentators, researchers and analysts had just seen one of the most rapid uptakes of technology ever with the smartphone revolution. With the tap of a screen the iPhone revolutionised the market place and ushered in a massive new platform for opportunity.

In 2017, smartphones accounted for 57% of cellular connections, excluding cellular IoT, and are set to hit 77% by 2025, reports GSMA Intelligence. That demonstrates massive and sustained growth and, with its potential to have many more connections than there are humans, IoT is an even larger market. It's easy to see where the over-enthusiastic projections came from.

Now, though, IoT is starting to gather momentum. We have moved beyond the contained, trial and pilot schemes that generated a few thousand connections and we are starting to see the first pioneering deployments that involve tens and hundreds of thousands of devices. Very soon now, there will be device deployments in the millions and, when you extrapolate that to all corners of IoT, you soon get into double-digit billions of connections.

In fact, GSMA Intelligence in its 'The Mobile Economy 2018' report says we've already entered the billions with 7.5 billion IoT connections in 2017. The organisation predicts there will be 25.1 billion IoT connections in 2025. The industry may have missed the original mark of 50 billion by 2020 but with the scale and scope of IoT, coupled with enormous variables, it's of little surprise and even less concern.

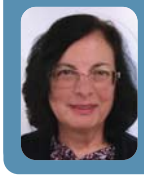
Just as with smartphones, once the industry moves into critical mass, the application developers are incentivised to develop and that creates more users, which attracts more development and still more users. Right now, we may be seeing that momentum begin as the work of the last few years starts to bear fruit. However, prophecy is for fools so you didn't hear that from me.

Enjoy the magazine and best wishes for 2019!

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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Total acquires G2mobility and forms partnership with Nexans

Total has finalised the acquisition of **G2mobility**, a French provider of electric vehicle charging solutions. The company says the deal will enable it to accelerate the growth of its electric vehicle charging businesses, from designing smart charging stations to optimising energy usage management and selling integrated services.

In the sector since 2009, G2mobility has developed and markets a comprehensive charging solution, with connected charging stations operated by a web platform that can remotely control the charge points, offer services, particularly smart energy management systems. With almost 10,000 points managed by its services platform, G2mobility supports municipal governments and private businesses.

Following the agreement with G2mobility and its shareholders, including **Bpifrance** and **Nexans**, Total now fully owns the company.

"Total is pursuing its expansion in new energies for mobility," said Momar Nguer, the president of marketing and services and member of the executive committee at Total. "Following the acquisitions of **PitPoint** in Europe

Nexans will work with Total to improve vehicle charging infrastructure

in 2017 and of 25% of **Clean Energy** in the US this year, which has allowed us to accelerate in natural gas fuel for vehicles, the G2mobility transaction is a pivotal step in improving our electric vehicle charging offering."

To help speed up the growth of infrastructure for electric vehicles, Total and Nexans have signed a partnership agreement that gives Total access to Nexans' production capacity and industrial knowhow. Nexans will be able to rely on G2mobility's technology and Total's range of service offerings.

"We're delighted to be working with Total to help improve vehicle charging infrastructure, the key to adopting sustainable mobility, in particular through our Agicity range." said Christopher Guérin, CEO of Nexans. "Nexans is proud to have helped G2mobility grow by providing this innovative company with our industrial expertise."

Munich Re acquires relayr for US$300m to advance IoT strategy

Knud Lasse Lueth, IoT Analytics

Through its subsidiary **Hartford Steam Boiler (HSB), Munich Re** has acquired 100% of relayr, a provider of industrial internet of things (IIoT) solutions, at a valuation of US$300m (€257.80 million). The companies plan to shape opportunities in the fast-growing IoT market.

While becoming part of Munich Re, the acquiring company says relayr will continue to operate independently to maintain its distinct company culture, drive innovation and attract IoT talent.

As part of the Munich Re/HSB network, relayr will benefit from the group's stability and financial strength, access to new prospects through the group's large client base and financial engineering expertise that will help create new solutions.

Commenting on the acquisition, Knud Lasse Lueth, the chief executive of **IoT Analytics**, said: "[This is] yet another acquisition of a successful German IoT platform. To me, US$300m seems like a quite hefty price tag that Munich Re Group paid for relayr."

"But there is a pattern: Larger enterprises seem to be on the hunt for upcoming IoT Platforms. Especially in Germany, with several notable acquisitions in the last 18 months - for example, **Cumulocity** by **Software AG**, **Device Insight GmbH** by **KUKA AG**, and **connyun GmbH** by **Koerber Digital**."

NEWS IN BRIEF

Fleet management systems in Europe to reach 15.6m units by 2022

The number of active fleet management systems deployed in commercial vehicle fleets in Europe was 7.7 million in Q4 of 2017, according to a new research report from IoT analyst firm **Berg Insight**.

Growing at a compound annual growth rate (CAGR) of 15.2%, this number is expected to reach 15.6 million by 2022. The top 15 vendors have more than 100,000 active units in Europe. **TomTom**'s subscriber base has grown both organically and by acquisitions during the past years and the company is the clear market leader on the European market and reached an installed base of about 708,000 units at the year-end of 2017.

Masternaut is still in second place and had achieved an installed base of an estimated 250,000 units. Berg Insight ranks Verizon Connect as the third largest player in terms of active installed base with around 235,000 units. **ABAX**, **Microlise**, **Gurtam**, **Viasat**, **Bornemann**, **Teletrac Navman**, **Trimble**, **Transics** and **OCEAN (Orange)** also have more than 100,000 active devices in the field.

Connected cars to exceed 775m by 2023

A new report from **Juniper Research** has revealed that 775 million consumer vehicles will be connected via telematics or by in-vehicle apps by 2023, rising from 330 million vehicles in 2018. This is an average annual growth of 18.7% over the next five years.

The new research forecasts that automotive original equipment manufacturers (OEMs) will enable in-vehicle infotainment systems to be accessible to third party developers. In turn, this will accelerate expansion of new technologies and services that will increase the value proposition for drivers. In this context, Juniper anticipates the growth of in vehicle voice assistant use, as well as in-vehicle commerce.

The research found that the total spend over connected car eCommerce platforms will reach $265bn (€233bn) by 2023. In order to cultivate a workable commerce ecosystem, Juniper urged stakeholder collaboration between automotive OEMs, network operators and payment solutions providers.

Juniper recommended that the provision of application programming interfaces (APIs) and development platforms that enable third party development of payment-capable in-vehicle apps is essential to the creation of new and innovative OEM services.

Sanjay Brahmawar, Software AG

Software AG and Dell Technologies extend IoT partnership to enable quick-start projects

Software AG has announced an extended partnership with **Dell Technologies** in which the company will bundle Software AG's Cumulocity IoT Edge with a selection of Dell's servers.

This will provide a joint plug-and-play solution for rapid deployment and simple configuration for instant IoT. Cumulocity IoT Edge, powered by Dell Technologies, is a high-performance industry-proof bundle, combining hardware, software and services for the IoT which enables customers to connect, power up and start their IoT project immediately.

Customers can connect any number of different end devices and sensors in just a few minutes. With features like integrated streaming analytics, preconfigured smart rules and field bus connectivity, it helps to create complex IoT solutions quickly and smoothly.

"We are thrilled to work with Dell Technologies to give our customers the ability to 'start fast and finish strong' with their Industrial IoT projects", said Sanjay Brahmawar, the chief executive of Software AG. "We listened to our customers when they said they wanted an easy on-ramp to IoT, already preconfigured and performance-tested. Along with Dell, we are freeing them up from development to focus on innovation and to create a differentiating digital business model."

Chris Wolff, the head of Global OEM & IoT partnerships at Dell Technologies added: "Software AG's vision and commitment to helping its customers embrace digital transformation and adopt IoT technologies is truly outstanding and aligns to our vision; we are thrilled to collaborate with them as part of our IoT solutions partner programme."

Aeris and BT&BT to offer consulting, technology digital transformation programs for enterprises

Aeris has formed a strategic partnership with **BT&BT**, a digital business consulting firm, to launch a joint go-to-market IoT solution for enterprises in India.

The two companies will address the consulting and technology-driven transformation needs of their customers. Enterprises in India now will be able to conduct a rigorous digital readiness evaluation using a comprehensive assessment framework known as Lean Digital Thinking and supported by a diagnostic tool, Lean Digital Quotient (LDQ) Finder.

Aeris uses the LDQ Finder to identify digital strengths and weaknesses of 11 pillars of an enterprise. Based on their digital strengths and weaknesses of each pillar, Aeris derives the opportunities, problems, architecture and then implements best-in-class IoT solutions to help enterprises improve their return on IoT investments. The Aeris Mobility Platform (AMP) allows enterprises to embark on their digital transformation across a portfolio of business solutions.

The Aeris and BT&BT partnership opens a wider enterprise market for both companies, powered with the digital domain consulting expertise of BT&BT and IoT technology capability of Aeris for managing connected devices with advanced analytics, and a robust AMP solution for diverse industries.

Calix launches mesh-enabled smart home system to boost CSP sales

Calix has launched the Calix GigaSpire powered by the EXOS operating system to enale smart home systems that have the potential to enable communications service providers (CSPs) to compete in the smart home market.

Subscribers are spending more than US$2bn (€1.75bn) each year with consumer electronics retailers in a quest to improve their Wi-Fi and smart home connectivity. Calix claims that with the new products – GigaSpire BLAST and GigiaSpire MAX, CSPs can deliver the most powerful mesh Wi-Fi in the world, with universal IoT support and **Amazon** Alexa built-in.

"The Calix GigaSpire smart home systems include all of the advanced features and functionality service providers need to respond to changing subscriber demands," said Shane Eleniak, the senior vice president of platforms for Calix. "The unprecedented combination of Wi-Fi 6 and universal IoT connectivity with voice services built-in - all powered by EXOS - allows service providers to elevate both their brand and the subscriber experience."

"The ability to add new subscriber services without complex deployments, make this far and away the best smart home solution on the market.," added Eleniak. "The fact that it's only available to service providers will allow them to elevate their position in the subscribers' lives and deliver a solution that is future-proof. Instead of a capital expense, their smart home systems will become a strategic weapon and a platform for growth."

Intel, Arduino and myDevices join Arm Pelion IoT platform ecosystem

Following Arm's recent collaboration with **Sprint**, which is using its Pelion IoT platform, and Platform Security Architecture (PSA) as the foundation of its Curiosity IoT offering, Arm has announced new strategic partnerships with **Intel**, **myDevices** and **Arduino** to deliver greater IoT flexibility, simplicity and scalability for organisations.

The combination of Arm's Pelion Device Management with the Intel Secure Device Onboard (Intel SDO) service allows organisations to manufacture devices without any prior knowledge of end customer-specific onboarding credentials or even which application framework the end user will choose. This enables a more flexible cloud provisioning model and seeds a compatible base of Arm and Intel devices ready for management by the Arm Pelion IoT Platform, with onboarding into any application cloud.

Arm is partnering with myDevices to simplify device and solution onboarding and to increase the number of sensors, gateways, and solutions integrated with the Pelion IoT platform that customers can use.

myDevices has partnered with numerous gateway and device manufacturers to create a robust ecosystem of LoRa-connected IoT solutions for specific vertical applications. myDevices' IoT in a Box solutions make it easy for a small-to-medium sized business (SMB) or enterprise employee to set up and securely connect a gateway and sensors and start benefiting from Pelion Device Management and monitoring their solution with Pelion Data Management in just minutes using their smartphone, Arm claims.

This simplicity is essential for enabling customers' IoT solutions to scale, so that they can obtain actionable insights from their IoT devices and data. Developers can try out Pelion services together with myDevices' IoT in a Box for US$199 (€173) utilising the new IoT Starter Kit.

Arduino is also partnering with Pelion Connectivity Management to give their users the option of competitive global data plans to suit everything from single IoT prototypes to production IoT deployments. Together with Arduino, Arm is set to enable developers to create cellular IoT designs in minutes – on a foundation that can scale to millions of devices, the company says.

July and August 2018

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
Arkaya	Makino, Japan	Arkaya SD-WAN as a service selected by metal cutting and manufacturing technology provider	7.18
Atos	Coca-Cola HBC, Europe	Deal to provide Coca-Cola Hellenic Bottling Company (HBC) with end-to-end IoT services for its Connected Cooler programme	7.18
BT	Stobart Group, UK	BT selected by Stobart Group to provide IoT platform and mobile tracking devices to underpin four-year contract with UK Environment Agency to respond to floods in England	8.18
Ctrack	SAS Global Communications, UK	Selection of Ctrack Online vehicle tracking system for fleet of vans used by engineers of managed network and application services company	8.18
Deutsche Telekom	Dusseldorf Airport, Germany	Deployment of narrowband IoT (NB-IoT) network to monitor infrastructure quality including bridges, tunnels and buildings at airport	8.18
EcoEnergy Insights	AWRG, USA	IoT solutions selected by American West Restaurant Group (AWRG), the third largest Pizza Hut franchisee in the US, to achieve 18% energy consumption reduction with aim of making savings of US$2m over the next five years	8.18
GTT	Nilfisk, Denmark	GTT chosen to manage global network and implement software-defined wide area network (SD-WAN) service for professional cleaning solutions company	7.18
IBM Watson	Red Electrica de Espana, Spain	Deal to optimise maintenance of strategic electricity transmission assets on behalf of grid operator	7.18
IBM Watson	Co-operativa Sole, Italy	IoT solution selected to alert nursing staff at elderly care provider when daily activity of residents deviates from the norm	7.18
IBM Watson	Tele2, The Netherlands	Creation of self-service app, powered by IBM Watson Assistant, for telecoms provider	7.18
IBM Watson	Electra Group, Israel	Development of mobile app plus solution to perform maintenance checks on smart air conditioning systems	7.18
MapR	Edwards, UK	MapR Data Platform selected by vacuum and abatement specialist to develop solutions for the semiconductor industry as part of a plan to deliver predictive maintenance and advance towards an Industry 4.0 portfolio	7.18
PTC	CIMC, China	Shipping container maker China International Marine Containers (CIMC) chooses PTC ThingWorx for its smart manufacturing pilot project	8.18
PTC	Elekta, Sweden	PTC ThingWorx Industrial Innovation platform selected to connect thousands of medical assets, enabling improved uptime for clinicians and increased patient volumes to be served	8.18
Semtech & X-TELIA	City of Montreal, Canada	X-TELIA LoRaWAN operator and Semtech devices and technology selected to support digital signage in bus shelters	8.18

September and October 2018

Vendor/Partners	Client, Country	Product / Service (Duration & Value)	Awarded
AT&T	KONE, global	Deal for AT&T to connect smart elevators and escalators across North America as part of KONE 24/7 Connected Services	9.18
C3 IoT	Shell, global	C3 IoT selected as strategic artificial intelligence (AI) software platform to power global AI and IoT digital transformation at oil company	9.18
Cubic Telecom	Audi, Asia	Cubic Telecom selected to provide connectivity and software services in 1.5m Audi vehicles in Asian markets	9.18
Eurotech	DB Cargo, Germany	Deutsche Bahn subsidiary selects Eurotech to provide on-board hardware so train operator can gain insights into its locomotives	9.18
Nokia	Elektro, Brazil	Deal to deploy private LTE network for grid automation, enabling fast power restoration in the event of outages	10.18
Nokia	BSNL, India	Nokia selected for smart telecom pole project and will integrate poles with smart LED lighting, CCTV cameras, digital billboard and environmental sensors across India	10.18
Orange Business Services	Octo Telematics, Europe	Expansion of contract for three-years with usage of Orange IoT Managed Connectivity offering to support insurance telematics services	10.18
Orbcomm	Associated Wholesale Grocers, USA	Orbcomm selected to provide fleet-wide trailer monitoring system for dry and refrigerated assets	10.18
Orbcomm	Department of Defense, USA	Vendor selected to provide end-to-end visibility and asset tracking of almost 24,000 assets	10.18
Orbcomm	Chief Express, USA	Truckload carrier chooses Orbcomm for in-cab solutions for trucks and a trailer monitoring system for its dry van fleet	10.18
PTC	Volocopter	Selection of PTC Windchill product lifecycle management system for development of autonomous flying systems at flying taxi innovator	10.18
Semtech	Kaifa Metering, China	Deployment of LoRa-enabled IoT systems for water metering	10.18
Semtech	SK Telecom, South Korea	LoRa technology used to create LiveCare IoT systems to enable accurate analysis of cow health and milk production capability	10.18
Semtech & Senet	Sensoterra, The Netherlands	Semtech LoRa sensors plus Senet LoRaWAN selected by Sensoterra smart agriculture system which claims it can enable farmers to reduce water usage by 30%	9.18
Software AG & TSME	Abu Dhabi, UAE	Completion of smart cities project with UAE capital city in partnership with Technology Strategies Middle East (TSME)	10.18
Telenet	Brussels South Charleroi Airport, Belgium	Strategic agreement signed to collaborate on development of Airport 3.0 concept	10.18
Telia	StalkIT, Sweden	Three-year agreement with waste disposal container tracking company to cover 100,000 containers with narrowband IoT (NB-IoT) network	10.18
Telit	China Unicom, China	Telit selected to provide deviceWISE IoT platform to accelerate Industrial IoT market place	10.18
Veovo	Port of Jersey, UK	Deal agreed to provide Veovo Port and Airport management system as operational backbone to port and harbour operations on island of Jersey	9.18
Whale Cloud	Repulic of Ghana	MoU agreed for innovative city development in Accra, the capital and largest city in Ghana	10.18

Abu Dhabi's Zayed Smart City project has begun its pilot phase

Abu Dhabi completes smart city project with Software AG Cumulocity IoT

Software AG has announced the successful completion of a wide-ranging smart city project with its partner, **Technology Strategies Middle East** (TSME). **Cumulocity** IoT has been used as the foundation IoT (Internet of Things) platform of choice in the capital city of the United Arab Emirates (UAE), Abu Dhabi.

The Abu Dhabi Municipality launched the pilot phase of a five-year project for smart cities and artificial intelligence (AI), called the Zayed Smart City project, earlier this year to validate key use cases and its viability. The city-wide project is designed to digitally transform the environmental, social and financial aspects of urban life to improve the lives of Abu Dhabi's citizens and visitors.

Ahmed Abdul Samad Al Hamadi, the director of IT forAbu Dhabi Municipality, said: "The smart cities project stems from Abu Dhabi's pioneering vision and is designed to digitally transform the environmental, social and financial aspects of urban life to improve the lives of Abu Dhabi's citizens and visitors. The project envisions the future, drives innovation and provides a best-in-the-world infrastructure."

During the proof of concept, there were ten use-cases spanning sensors, actuators and Cumulocity IoT to connect key components across the city. The project was centred in Abu Dhabi's Corniche Area and used low power wide area network (LPWAN) technologies to transport sensor data from across the city to a central office, where Cumulocity IoT used code-free integration capabilities to monitor and manage the use-cases.

The ten use-cases include air quality monitoring, asset tracking and logistics monitoring, structural health monitoring, water metering, palm tree weevil detection, street lighting, smart parking, waste management, water storage tank monitoring, and swimming pool monitoring.

Autonomous air taxi start-up selects PTC Windchill

Volocopter plans to run air taxi test flights in Singapore in late 2019

German start-up **Volocopter** has selected **PTC**'s Windchill product lifecycle management (PLM) solution for the development of its autonomous flying transportation systems. Windchill will record, configure and secure interdisciplinary product structures, requirements descriptions and documents and manage mechanical, aerodynamic and electronic computer aided design (CAD) models and the associated system software.

Volocopter was founded in 2011 and aims to revolutionise urban mobility with its autonomous air taxis. The company has developed the world's first, purely electrically powered, autonomous multicopter, which is based on drone technology and is large enough to carry two people.

The Volocopter is emission-free, very quiet and stable in flight. The fully redundant power train, driven by 18 independently-controlled propulsion rotors and an intelligent autonomous control system, make the Volocopter one of the safest aircrafts. The company is supported, among others, by its strategic investors **Daimler** and **Intel**.

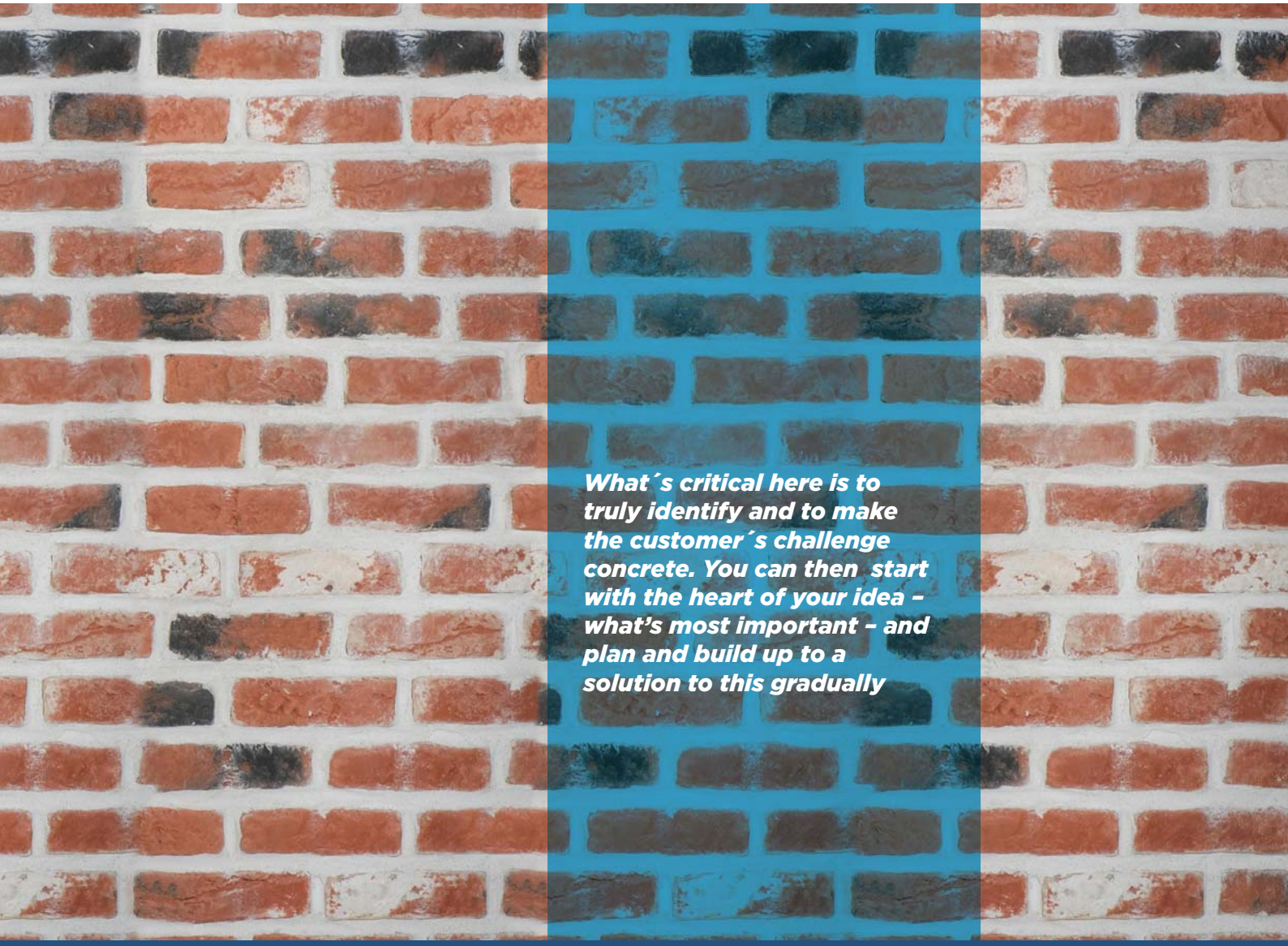
"We are creating tomorrow's mobility solution in the third dimension. Urban air taxis are a completely new market, and we are treading on new ground every day," said Jan-Hendrik Boelens, the chief technology officer of Volocopter. "The modular Windchill PLM system gives us the necessary flexibility to grow and stay at the forefront of innovation, while managing all our product data consistently through one central platform."

If you need to connect a low bandwidth device for a decade why do it more than 1NCE?

Younes Allaki is chief technology officer of 1NCE and one of the company's four founders who managed to develop and launch an IoT mobile virtual network operator (MVNO) in just under six months earlier this year. The company is bringing a new approach to IoT connectivity with a headline offering of the 1NCE Lifetime fee: connectivity for B2B applications for the pre-paid price of 10 Euros for 10 years of the device lifetime (10-10-Flat). In addition, 1NCE offers previously unseen flexibility in terms of minimum orders and the speed at which it can supply SIM cards to customers.

IoT Now caught up with him recently in an industrial location in Cologne, Germany to talk about the challenges involved in increasing customer understanding of the connectivity options that 1NCE can provide and communicating that time-to-market is critical for the success of many IoT businesses ▶

SPONSORED INTERVIEW



What´s critical here is to truly identify and to make the customer´s challenge concrete. You can then start with the heart of your idea – what's most important – and plan and build up to a solution to this gradually

IoT Now: The requirement to deliver as few as ten SIM cards in as little as four days is very different to traditional IoT deployments that require minimum SIM volumes often of at least 1,000 and lead time measured in months. When establishing 1NCE what technological approaches did you identify as critical to enable this flexibility at the appropriate cost?

Younes Allaki: First of all, 1NCE operates a lean and virtualised network environment that enables us to realize savings that are reflected in our pricing model so that customers directly benefit from the economies and efficiencies we have created in the connectivity provisioning process.

Secondly, a high level of standardisation is defined as a basic rule in our company to ensure flexible integration of our virtual platform into partner ecosystems and easy interconnection with other network providers. Furthermore, we offer self-service and self-diagnostic tools accessible through our customer portal and programming interface.

These capabilities complement our customers' targets for a fully automated environment on one hand, while allowing us to operate the connectivity platform efficiently on the other.

Last but not least, we simplified our product to its core capability which is providing connectivity for low bandwidth applications. We are not trying to meet individual needs by creating and supporting individual offerings, but offer one singular product.

What´s critical here is to truly identify and to make the customer´s challenge concrete. You can then start with the heart of your idea – what's most important – and plan and build up to a solution to this gradually.

IoT Now: How different are the requirements of the 1NCE offering to a standard, traditional enterprise connectivity contract?

YA: Traditional connectivity contracts try to provide a specific offering for any individual connectivity need. That creates complexity in tariff plans, keeps prices high and results in a ▶

lack of transparency. In addition, it forces customers to allocate usage on a month-by-month basis, charging fees for any excess usages and basic fees even when no usage occurs. Our product eliminates the complexity of multiple tariff plans or extra fees with an overall data allowance across the ten-year length of its contract. In short, it is truly a flat rate model.

IoT Now: Handling small volumes and delivering quickly is a core value proposition but how are you able to do this in the real world?

YA: Our company is based on the principle of customer centricity. We recognise that IoT solutions are different and complex so we focus on keeping connectivity simple. To achieve this we have standardised the connectivity building block as much as possible in order to simplify integration of connectivity.

Any order, be it ten or 10,000 cards, is placed via our online shop and after the payment is received, the cards are activated and shipped – it's that simple. The customer also gets immediate access to our connectivity management platform where they can directly see the status of their shipment, the number of ordered SIMs as well as how to setup the connection to our network and, later on, they can see data usage of each SIM via this platform.

IoT Now: Similarly, what approaches have you taken to ensure you can provide the flexibility at the cost that enables your offer for the pre-paid price of 10 Euros for 10 years of the device lifetime (10-10-Flat)?

YA: We consider ourselves as an IoT native company. That means that, right from the beginning, we created a company that is structured and technologically built for - and only for - the Internet of Things.

We do not have legacy, expensive overhead or administrative structures. We operate leanly and were able to set up an organisation that is agile and flexible. We do not silo functions, ideas and activities. In fact, ours is a 360-degree culture in which our salespeople understand our technical details, our technical people know marketing and our entire company functions without artificial structural divisions.

Within these functions we are highly automated and clearly focused on the low bandwidth IoT business.

IoT Now: Your proposition is very different to those out there in the market for IoT. How do you make customers comfortable that you can truly deliver what you say you can?

YA: We understand the unique challenges of serving a business-to-business market. This includes supporting our customers' high standards, their need for stable products and their inability to tolerate constant upgrade cycles. 1NCE has built a reputation as a trusted partner that offers exactly what our customers need: certainty and stability, delivered with impeccable speed. Of course, having the support of Deutsche Telekom as a partner is helping us tremendously in gaining trust and credibility. But, looking back over the past six months, we have also created a ▶

Younes Allaki, 1NCE

We set out our position to be the innovation leader in IoT connectivity and currently we provide seamless IoT connectivity across 28 EU countries plus Norway, Switzerland, Russia, Belarus, Ukraine, the United States and recently China

lot of traction and kept the promises we made at our launch event at MWC in February 2018. We have even outperformed some of our strategic goals in terms of geographical expansion, for example, and this is being recognised and valued in the market.

IoT Now: To what extent is 1NCE a greenfield environment? How important is it to have no legacy if you are to innovate effectively?

YA: 1NCE is not exactly a completely greenfield project because we have taken advantage of existing structures and developed our own solutions where necessary. For example, as a mobile virtual network operator we don't have our own radio network and we have no proprietary frequencies. But we do have our own evolved packet core (EPC) including all important technological core elements including packet data network (PDN) gateway (PGW) and home location register (HLR). To me, this approach is even smarter than a pure greenfield development because it enabled us to gain speed at a very early stage. Also, not all legacy should be seen exclusively as a bad thing. It´s more about evaluating and deciding when to exploit existing structures and when to innovate.

IoT Now: What attracted you to joining 1NCE?

YA: First of all, I am thrilled by our products proposition: a never-seen-before connectivity offering delivering exactly what customers want – connectivity that is simply delivered for the lifetime of the connected device. It is simple but, at the same time, revolutionary, because it hasn't been done before and it´s exciting to be a part of that.

On the other hand, having worked for corporate organisations and renowned brands and also understanding the advantages and disadvantages of company size, I wanted to take part in the creation in a completely new company. Being able to design it from scratch according to our customers' needs and not according to the product offering is exciting to be involved in.

IoT Now: How do you see the company and its technology developing over the next few years?

YA: We set out our position to be the innovation leader in IoT connectivity and currently we provide seamless IoT connectivity across 28 EU countries plus Norway, Switzerland, Russia, Belarus, Ukraine, the United States and recently China. We are moving at a fast pace aiming at truly global expansion in 2019 while keeping track of the technological developments occurring around us.

At the moment we are focusing on narrowband IoT (NB-IoT) and 2G and 3G cellular connectivity as the standards for IoT applications but, simultaneously, we are taking part in discussions on the role of 5G IoT connectivity in the context of cities and municipalities, for example. By keeping our agile mindset and lean company structure we secure flexibility and adaptability for these kinds of future developments and ensure we will be able to react accordingly to demand and developments as they arrive.

www.1NCE.com

CPaaS must provide IoT businesses with a flexible platform to build their propositions on

Communications platforms as a service (CPaaS) have lots of different names depending on what the service providers and vendors choose to call them but the principle of offering a standardised, global connectivity platform that is composed of network access and a management system is of appeal to IoT service providers, writes George Malim

If you think of a company such as **Caterpillar** or **JCB** that offers their excavators as a service in markets across the world, enabling new business models such as charging per scoop of an excavator or per lift of a loader is one of the main attractions of the Internet of Things (IoT). Although this represents a significant transformation to their traditional business of manufacturing heavy equipment, it still puts them in the same industries with their equipment providing the same functionality. Only the business model has really changed.

However, to get to this new business model IoT has to work. Data has to be collected, analysed, recorded and reconciled into billing and service statements. All of this relies on uninterrupted network connectivity which could be enabled by many different technologies and service providers. However, if you're JCB or Caterpillar, what you're good at is building machines, you're not a communications service provider (CSP) and you don't want to become one.

In order to enable their new business in IoT, specialised companies don't want to have to do deals with individual mobile operators in the regions or even countries that they operate in

In order to enable their new business in IoT, specialised companies don't want to have to do deals with individual mobile operators in the regions or even countries that they operate in. They don't want to have to manage relationships with satellite providers alongside low power wide area network (LPWAN) providers and the cellular players. They simply want the capability to add or remove connections according to their business needs and be charged accurately for the connectivity their offerings consume.

A CPaaS has the potential to perform this role by bringing together multiple connectivity providers and providing the communications management system that oversees and ensures the connectivity provided is done so as expected by the IoT service provider. However, as is common with new product introductions, some confusion exists as to what constitutes a CPaaS, which has been used by individual service providers to describe their ability to offer their cellular network in more than one country, through to comprehensive offerings that provide an overlay over multiple other networks.

"CPaaS is a cloud-based solution platform that enables CSPs to include real-time communications features - voice, video and messaging - in their own applications without needing to build back-end infrastructure and interfaces," clarifies Angel Garcia Barrio, the head of product management at WING, **Nokia**'s Worldwide IoT Network Grid. "CPaaS can support both human and machine communications on a single, reliable network. In IoT, CPaaS supposes a revolution in terms of how to define, develop and operate the communications infrastructure. Instead of investing in advance and taking time to deploy the system, CPaaS allows the CSPs and enterprises to rapidly benefit from a specific, reliable, shared network, fully operated, with web interfaces and application programming interfaces (APIs) to manage the connectivity and pre-built applications. From the business model perspective, CPaaS provides pay-as-you-grow models, avoiding the risk of investing in their own infrastructure."

James Wickes, the chief executive and co-founder of visual data specialists **Cloudview**, adds: "For me, CPaaS means a secure, cloud-based platform which enables the intake, management and storage of data from multiple sources in multiple locations across multiple organisations. Once data is within the CPaaS platform, the data can be integrated, analytics applied either in the cloud or at the edge, and results securely accessed by authorised users, again from any location. Another term might be a platform for IoT – or in Cloudview's case, a platform for visual IoT."

CPaaS benefits are applicable to many applications and Barrio sees a wide range of areas in which they will drive efficiencies and enable services. "There are many industries and markets that benefit from the CPaaS approach," he says. "Connected goods with sensors embedded in all types of retail and commercial items has introduced the growing need to simplify and maintain connectivity for these high-value products wherever they are delivered and installed in the world. The manufacturer doesn't want to be burdened with managing such a complex process and prefers to rely on a

James Wickes, Cloudview

Angel Garcia Barrio, Nokia WING

multi technology - cellular and satellite, multi CSP, cost-effective service to track the connected good effectively."

Barrio also cites Industry 4.0, with increasingly intelligent and data-intensive factories, and connected cars as additional areas in which CPaaS are in demand.

"Connected cars manufactured in one country are often delivered to subscribers in different countries, so automotive companies need ways to ensure the consumer can simply and easily establish the connection upon purchase," he adds. "The end-users want to be able to consume these connected services across networks and countries, without having to worry about excessive roaming charges or significant network latency causing issues."

With the need for CPaaS starting to become established, the next question becomes who should be the providers of CPaaS. Mobile operators would argue that, with their connectivity capability, they already have many of the capabilities in place. However, competitors would argue that they would struggle to be vendor agnostic when operating in markets in which they have their own networks.

"The best people to provide CPaaS are third parties who are experts in cloud, data management and storage," says Wickes. "That may not be telecoms providers, mobile operators or public cloud providers – I see such companies partnering with CPaaS experts to add new services to their portfolio. The value is in the integration of data from multiple sources, not the actual connectivity."

Barrio concurs but doesn't count out the CSPs. "CPaaS is not just about basic connectivity," he says. "The CPaaS offering should enable global, seamless connectivity across network technologies and geographical borders for Internet of Things. The infrastructure and services have to be compliant to various regulations in different markets."

"CSPs are able to provide a fully integrated end-to-end communications service, but it is the large infrastructure providers, such as Nokia, who can support them creating a broad CPaaS portfolio for better time-to-market," he adds. "WING is combining an innovative strategy and a huge investment in the deployment of the largest worldwide network with the direct access to the technology of the different Nokia business groups and the innovation of Nokia Bell Labs. Nokia WING offers a fully integrated, global managed service for IoT connectivity enablement across multiple technologies and geographical boundaries for CSPs and their enterprise customers."

The elements in that sort of fully-integrated service go far beyond just the connection. "A CPaaS offering should include the gateway, secure storage, a control system that governs data capture, storage, management and provision as well as application programming interfaces (APIs) to enable analytic software to connect and use data," says Wickes. "This then enables analytics specialists to build apps. If CPaaS is going to be used for real-time analysis then in my view it should be network agnostic."

The complexity is highlighted by recognition that IoT can never be a one-size-fits-all proposition. There are too many variables at play for that. "It is quite important that the IoT communication solutions fulfil the requirements of the service providers' applications in the different environments," says Barrio. "For example, a utility will need to connect points in different areas to efficiently manage the grid. All the information should be sent in a seamless, reliable, cost effective and secure way, but to provide the service, a unique type of communication will not cover all the possible scenarios."

"Cellular is a very flexible and cost-effective technology but can be complemented by fixed technologies if higher bandwidth or quality of service (QoS) is required, low power wide area (LPWA) networks are needed in the case of low power availability or coverage constraints and satellites are needed in the middle of nowhere. CPaaS has to manage the different types of communication to support the customer needs."

"For me, CPaaS means a secure, cloud-based platform which enables the intake, management and storage of data from multiple sources in multiple locations across multiple organisations"

Nokia WING lets operators take flight with enterprise IoT customers

Ankur Bhan, is global head of Nokia's Worldwide IoT Network Grid (WING), which focuses on enabling its telecoms operator customers to provide seamless IoT connectivity to their customers. He recently met Analysys Mason research director Tom Rebbeck in Dubai to provide an update on the project's progress since it was first announced in early 2017

Tom Rebbeck: Please can you start with an overview of WING?

Ankur Bhan: WING stands for Worldwide IoT Network Grid. We started with a vision of enabling operators to offer global, seamless IoT connectivity to their enterprise customers. Our starting position was that many large enterprises were looking for a way to provision and manage devices across multiple geographies with low latency, cost control and consistent service experience.

The vision was to build global scale, multi-technology, carrier-class infrastructure that we build and deploy for our operator customers so that they can offer their large enterprise customers seamless, global IoT connectivity services. The second objective was that with the global shared network, we achieve scale, which will enable operators to benefit from global economies of scale, reduce their cost to operate per SIM and reduce investments into IoT specific developments in the core, such as service capability exposure function (SCEF) for narrowband IoT (NB-IoT).

TR: What's the archetypal use case for WING?

AB: Automotive is the prime example. Automotive original equipment manufacturers (OEMs) sell their cars across the globe and they require a partner operator that can support them regionally or globally, and that is where it is very, very important that we are able to provide them with infrastructure that provides a consistent experience with a uniform set of service level agreements (SLAs) and a consistent set of operations across their entire footprint.

Many of the jurisdictions, including India, China and Brazil, have different regulatory requirements, such as permanent roaming restrictions or requirements for data sovereignty, which requires infrastructure to be hosted locally. In addition, the growing market of embedded connectivity services like in-car-Wi-Fi, requires a local relationship. That's where WING with its 'glocal' approach of combining the simplicity of one global integration and the benefits of local network comes into play.

TR: How does it work architecture wise?

AB: We have designed our network with control and user plane separation that allows us to offer local break outs, cost control, regulatory compliance and reduced latency by our design. Just think about roaming; in a roaming scenario, the data is backhauled to

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the home core location and that's an inefficient way to handle traffic. With control and user plane separation (CUPS) you are able to break out traffic locally and your data doesn't need to go back to your home core location.

TR: So if it is a car in Russia, it complies with the data sovereignty and the latency is lower?

AB: Yes, and operators can also reduce their costs of roaming as well. They can lower their roaming costs by avoiding the backhaul costs. We believe it can lead to a reduction of roaming costs by up to 25%.

TR: What about other use cases?

AB: Consumer electronics is another example use case. Many consumer electronics and devices are manufactured centrally but are shipped globally. Again these companies have to be compliant with local data requirements, such as data sovereignty laws and the end user requires access to local internet services. They require local break out of traffic. There are many more examples – use cases across manufacturing and logistics. Cold-chain logistics require connectivity – indoor, outdoor and even on the oceans through satellite as well. That's the other aspect of WING, we are trying to blend multiple technologies

TR: Let's take a car company – it has a contract with AT&T and then you are supporting that contract. Does it need other partners other than AT&T?

AB: For an automotive OEM, it has a lead operator as the main partner, and then it has operator partners in multiple markets. Let's take an example of an OEM in the US that requires connectivity in India, China and the US. For such an arrangement to work in a seamless way, you require infrastructure in each country. All of this infrastructure should be designed in a consistent manner.

The problem today is that each operator has its own systems, its own policy control rules function (PCRF) and, if an enterprise wants to have a uniform policy of, for example, downloading the software updates, then it is not possible if you are working with multiple operator core networks. The enterprise would have to do it three times as there are multiple operation schemes. You can't offer a global SLA with the current model.

The current alliance agreements try to solve this, but only do so in a surface layer. What they do at most is provide harmonisation at the interface layer. The customer sees a common connectivity management platform, but there is no deep integration with policy control, back end gateways, call data record (CDR) reconciliation or managed services.

With WING, we are building and operating all of that infrastructure by design. It is a cloud-based using the latest technologies. We are upgrading it to 5G as we speak. Operators are getting best in class infrastructure in a pay-as-you-go business model that is designed to cater to the most advanced requirements of enterprise customers.

TR: Do you think there is a benefit to doing this now as you don't have to support a legacy technology?

AB: Absolutely. We have designed our infrastructure on all of the next generation technology. Our core is cloud-native, is compliant to control and user plane separation, we have the application programming interface (API)-driven connectivity management platform, it supports multiple technologies 2G, 3G, 4G, 5G, and also LTE-M and NB-IoT and the cloud really provides us with a lot of agility for supporting multiple tenants, for supporting new instances, for replicating the infrastructure in multiple locations.

WING brings unique set of capability to the market by delivering a next-generation shared

Ankur Bhan, Nokia WING

Tom Rebbeck, Analysys Mason

> *Tele2 IoT was our first customer. We announced that at MWC 2018 and soon after we announced our partnership with AT&T to support its global rollout*

> *Some of the operators we see don't just want to offer managed connectivity, but want to offer an end-to-end service*

network with global economies of scale. This was not possible before and utilises the latest developments in virtualisation both in network and IT stack.

TR: Let's come back to the SLAs as that seems to be a key feature. Can you give examples of the type of SLA?

AB: Operators have been growing their networks with Nokia and other vendors over the last decades. This led to various different capabilities being set in the local operators. However, in the automotive example, to get a software update, the automotive company needs to be sure that the user and operations experience works consistently across the globe, due to the implied liabilities, costs and brand exposure. With WING they can have a single integration that works consistently across associated networks, it is a big enabler for them to be able to launch these services much faster and drive the market.

TR: And it can be the difference between doing something and not doing it – because the barriers are too high. You might not launch a connected car service in India if volumes are relatively small.

AB: Look at the high average revenue per user (ARPU) markets like the UAE. You don't have connected cars like you do in the US or the UK. It's not that people can't pay. The technology barriers are too high. We are taking those barriers away from multiple opportunities and enabling apps to globalise.

TR: Can you talk about where you are with customers?

AB: Tele2 IoT was our first customer. We announced that at MWC 2018 and soon after we announced our partnership with AT&T to support its global rollout. And we also announced a contract with Marubeni, an MVNO in Japan. We are supporting all of these three customers in their local markets and also supporting their global ambitions. To take an example with Tele2 IoT, it announced the commercial launch of the solution last month. Tele2 IoT calls it EnCore, and it is an IoT core-as-a-service that they are offering to their large enterprise customers to support the challenges of low latency, roaming costs and of full control of the connectivity.

With AT&T, we are already in the deployment phase, supporting its first OEM customer in Europe, and that is going very well. And with AT&T we have already made a public commitment that we will be present in more than 20 countries by Q1 2020, so we are aggressively deploying our infrastructure in Asia, Brazil, the US and Europe.

With Marubeni, we have already started working with its host provider, and that infrastructure is already integrated and, again, Marubeni is trialling with many consumer appliance customers in Japan. There are all sorts of connected appliances – air conditioners, washing machines – and Marubeni is a trading company that has touch points with 400 operating companies. So even their internal demand is quite substantial.

TR: You are trying to help operators with something that isn't necessarily their key differentiator, but they may not want to use the same infrastructure as a competitor. How will your existing contracts affect future deals?

AB: The way we see it at Nokia is that we are building an Amazon Web Services (AWS)-style connectivity infrastructure that an operator can offer its customers in an easy to consume way with a flexible business model. The operator is not having to make the upfront investment to build the infrastructure. We are taking the delivery risk away, the investment risk away. Do two enterprises feel threatened if they use AWS for their enterprise IT? Perhaps not.

I think it goes back to the question of what is an operator's proposition. From our perspective, we have a strategy to build this infrastructure. We have heard feedback from operators across the globe that they want us to set up and take the investment risk. WING is an answer to that feedback.

TR: The AWS analogy is useful but it also raises the question of how you position yourself. AWS sells through service

providers but also directly to large enterprises. Is there the potential for enterprises taking WING directly?

AB: Our go-to-market model is through operators. Of course, we are evangelising the benefits of WING to enterprises, but our go-to-market model is through operators. And in the end of course what we are doing together with operators is to offer to enterprises and their end users more flexible ways to consume connectivity.

We are very happy to work with operators or MVNOs across the globe. For example, Marubeni is not a classic operator. It is an industrial conglomerate with multiple businesses. It has an entity called Marubeni Wireless, which has an MVNO licence, with its own independent mobile subscriber identity (IMSI) number range.

If an enterprise wants to consume, they will have to have their own IMSI range, and the necessary licences to operate. Nokia WING will never have its own IMSI range that we will sell.

TR: What are you doing to stimulate the demand with enterprises?

AB: We see IoT increasingly as a regional or a global play. In fact, one of your recent research reports said that 40% of the IoT connectivity demand in Asia was falling as part of a regional or global contract. We definitely believe that enabling seamless connectivity that works consistently across multiple markets will accelerate the whole ecosystem.

We are actively supporting that ecosystem with that infrastructure layer but also evangelising some pre-packaged vertical solutions fully integrated into our ecosystem. A good example is our comprehensive smart agriculture services that we demonstrated at AfricaCom in Capetown. This solution is pre-integrated with sensors, the application layer and integrated with the platform. We are offering to our MNO partners so they are not just monetising managed connectivity layer but also can take certain vertical applications.

TR: So that changes the proposition - from outsourcing the core network, that maybe the operator doesn't want to do, to providing a full end-to-end solution.

AB: Some of the operators we see don't just want to offer managed connectivity, but want to offer an end-to-end service. It is not all built within Nokia, but we are taking advantage of our global presence and reach to bring together with partners.

Within IoT we see lots of examples of good companies in small markets that are not able to expand globally. WING also provides a platform to these partners and helps them to work with our MNO customers.

TR: In Geoffrey Moore's book Crossing the Chasm he talks about how you can sell technology to your earlier clients, but to sell to the mass market you need to provide much more than just technology. And that sounds more like your model here. AT&T probably doesn't need you for agriculture but there is a long tail of operators who definitely do.

AB: Absolutely. And they are not going to be scale players in managed connectivity and so they want to specialise on vertical solutions. We are following this hybrid strategy of managed connectivity and vertical solutions.

TR: Are you looking at other verticals?

AB: We will be looking at asset management, smart cities and utilities. Things that work across multiple geographies and that are easily addressable by our MNO customers.

Our core proposition is still managed connectivity. Our main business is managed connectivity and that is where we focus on. There are many operators all around the world that may not want to jump into managed connectivity but really want to go into a particular vertical. We support them there but we also take the vertical lead or try to help them expand horizontally.

TR: Let's finish by touching on 5G. How do you see that developing?

AB: I believe that 5G will bring a new era of connected devices in automotive, industrial IoT and those leveraging AR/VR applications. That can scale in large numbers with low latency connectivity. We will be supporting 5G from 2019 and we are already working with our customers on 5G for automotive and manufacturing. We are really excited about that development.

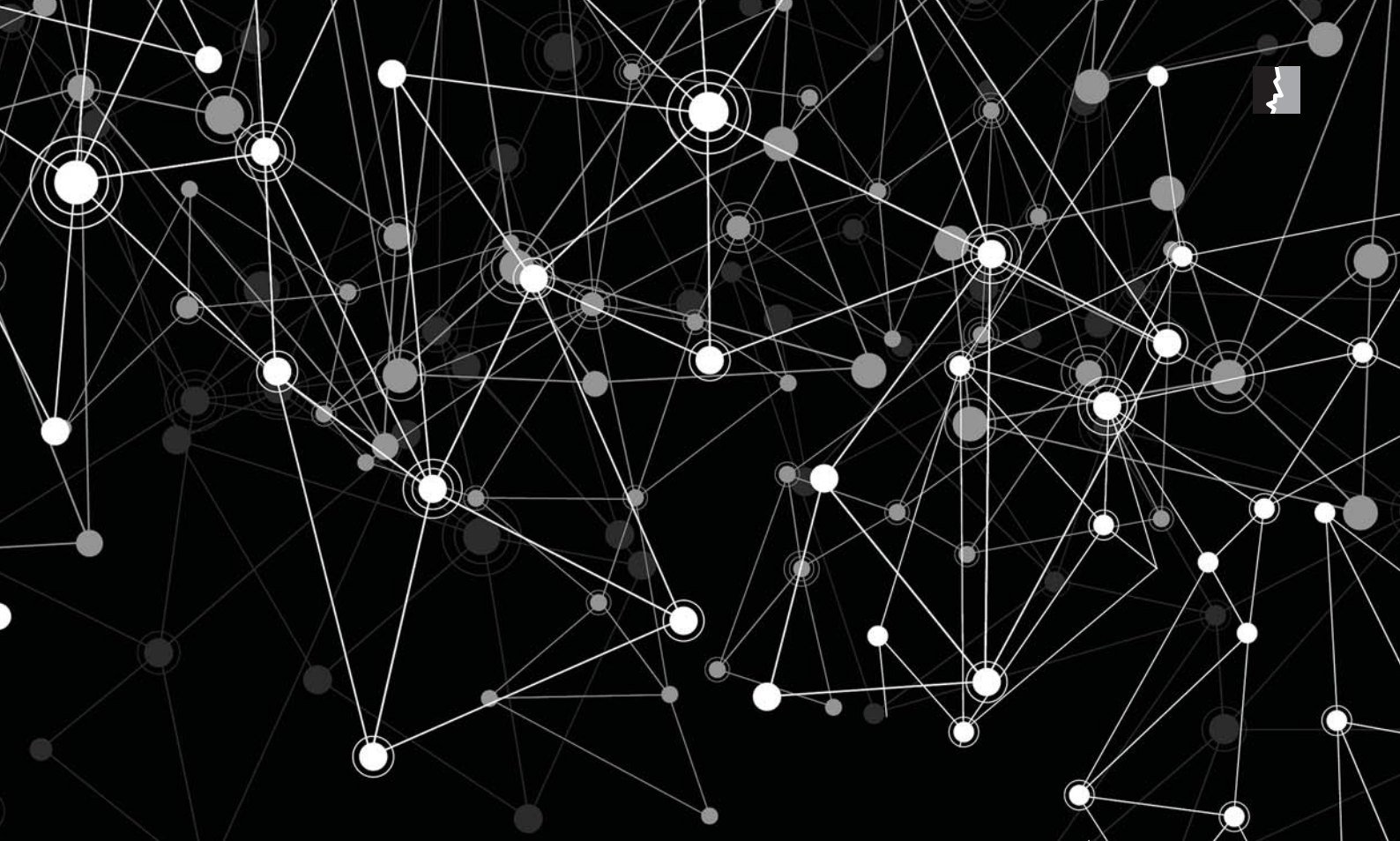
networks.nokia.com/services/nokia-wing

Cost is the definitive issue for an IoT solution to be scalable

Semtech is a US-based supplier of high performance semiconductors and advanced algorithms for communications and industrial end-markets. The company's LoRa devices and wireless radio frequency technology - LoRa - offers long range, low power wireless connectivity that has become a leader in the low power wide area (LPWA) networking market worldwide. The company is a founding member of the LoRa Alliance and a member of the IoT M2M Council (IMC). Here, Therese Cory, a senior analyst at Beecham Research, interviews Alistair Fulton, the vice president of IoT product management and marketing at Semtech

Therese Cory: What do you see as the role of LoRaWAN in enabling the IoT?

Alistair Fulton: The wireless remote monitoring of assets relies on understanding the condition of these assets, through the transmission of data from IoT-enabled devices to IT systems for analysis. Most applications of this type do not need deep analytics, and data aggregation and display is sufficient. Semtech views LoRa as the best wireless technology available today for industrial use cases. The utilities and water industries, where small amounts of data are sent intermittently,



and low power devices can work buried in the ground for many years without being dug up, are particularly well-suited.

TC: Do you see LoRaWAN as sufficiently accurate and low power to enable the tracking of the billions of smaller assets which ultimately will make up the IoT?

AF: Low power and accurate geolocation provision afford the best combination for tracking the small assets that will ultimately make up the IoT. The value of many IoT solutions is understanding where an asset is, as well as its condition – including temperature, humidity and other data. That kind of vision requires the availability of low cost and easy to implement connectivity. Using GPS combined with cellular techniques provides sufficiently accurate location data for connected assets today. However, looking to the future where billions of assets will be connected, customers will have to think carefully about the scalability and affordability of building IoT deployments on this scale. If one wanted to determine the location of every one of these assets, the cost would be prohibitive with today's technologies.

For example, taking a sampling approach, measuring location for one in every 100 devices then using extrapolation to estimate the other 99% would be barely affordable today; we estimate the costs involved relating to the components and their power usage would really limit implementors to examining only one in 100 devices or fewer. We believe that compared with other wireless technology, LoRaWAN can rise to this challenge by affording the scalability needed at affordable cost.

TC: Why is developing IoT solutions too complex, time consuming and costly? How is Semtech helping developers and solution providers for this purpose?

AF: Building IoT solutions with today's resources and skills necessitates developers to have deep knowledge of RF technologies and expertise in embedded systems, particularly in a brownfield scenario. For customers buying an IoT solution, cost is the definitive issue, particularly for a solution that must be scalable.

Semtech aims to assist both developers and solution buyers by making IoT solutions both accessible and low cost, by supplying a cheap, malleable set of development tools based on LoRa. These include a cloud-based tool which works by extracting key network and signalling data, sending them to the cloud where a specially designed algorithm is applied, and where the resulting geolocation info can be retrieved through an application programming interface (API) call. In early 2018, the company began trialling a simple cloud-based service for the purpose; some 500 customers are using the service, sending several million requests a day – though this is still relatively small scale compared with a full implementation. We expect commercial service to be available in 2019.

In addition, Semtech along with the LoRa Alliance are helping implementors through offering app templates and simple building blocks, as well as offering graduate level training resources to help developers work with LoRa's idiosyncrasies. They are working towards a full end to end reference solution for common use cases such as asset tracking. ■

www.semtech.com

Spanish cities served efficiently with smart water software suite

Jaime Barba Sevillano is the chief executive of go-aigua, a provider of smart water utility IoT solutions and the name of a software suite of smart solutions dedicated to the improvement of efficiency of water industry processes. Bill Ingle, a senior analyst at Beecham Research, interviewed him to learn more about the company and the needs of smart water utilities

Bill Ingle: Please can you introduce us to go-aigua?

Jaime Barba Sevillano: go-aigua emerged from the deep digital transformation of its parent company, Global Omnium, that began more than ten years ago. Global Omnium, based in Valencia, Spain, was founded in 1890 and manages the collection, treatment and distribution of drinking water in more than 400 Spanish cities. go-aigua's solutions were developed and refined in actual use cases at those installations before coming to market.

BI: What solutions does go-aigua offer?

JBS: go-aiqua offers six solutions; an IoT analytics platform and five specialised solutions:

Nexus Integra is a robust and agile IoT analytics platform that allows you to manage, experiment and get the most from massive amounts of data. It has been developed to enable the ingestion of information from multiple sources and technologies, allowing real-time processing and customised visualisation. The platform is a high-performance, extensible and scalable data integration system with a micro-service architecture based on streaming distributed processing systems that can process large volumes of data in real-time; it's designed to simplify the development and integration of IoT solutions. Nexus Integra was built from a distributed operating system based on data centre operating system (DC/OS) that allows for the management of multiple machines, both in the cloud and locally, from a single web interface.

Production equipment and data sources are integrated into a Nexus component, Connector, through any industrial communication protocol, where production information is processed and registered in real-time. Connector also communicates with databases or business resource systems such as enterprise resource planning (ERP), manufacturing execution systems (MES), or customer relationship management (CRM). Nexus has the ability to operate in a local environment in a single factory or distributed across multiple sites within a company.

The platform is in continuous evolution with the development of new applications, aimed at offering a complete response to the process of Industry 4.0 digital transformation and is already implemented in more than 400 water supply systems. ▶

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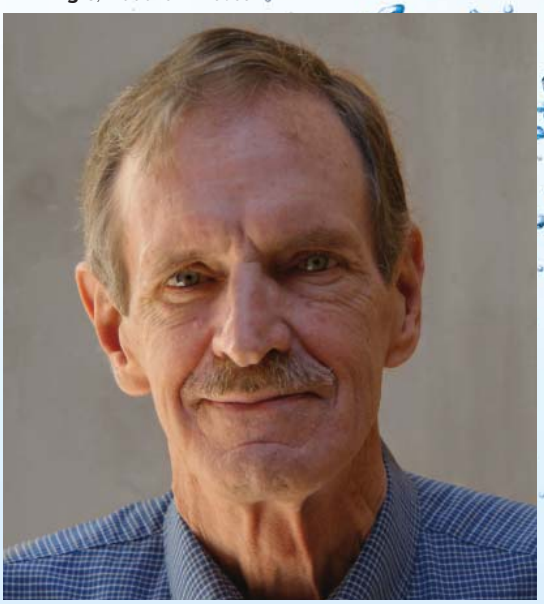
Jaime Barba Sevillano, go-aigua

Bill Ingle, Beecham Research



Nexus Water Twin enables a digital twin – a 3D rendering of a complete installation or structure, providing a control team as well as real-time visualisation of as many process variables as required by the user with an integrated alarm system looking out for potential failure or uncommon events, providing a bird's eye view of the entire process and a reduction on the reaction time in case of emergencies.

Linkwatt minimises the costs of water distribution processes that rely on the activation and operation of powerful electrical pumps to refill water tanks that will later supply entire towns. Linkwatt provides an exhaustive analysis of energy prices, the level of water in tanks and reservoirs, and demand predictions, using advanced analytics with algorithms and machine learning adapted to the unique characteristics of each supply.

EARS efficiently manages hydraulic performance in a water distribution network by monitoring flow, pressure and consumption values as well as managing data from different sources. EARS automatically scans this data for different types of events such as leaks, fraud or equipment failure, currently it has helped save more than 8,000 million litres which would have otherwise been lost to inefficient systems.

Glacier is a comprehensive commercial water cycle management system that enables centralised administration of customer management services in multi-company and concession environments. Glacier can be customised for the needs of each client and provides meter reading and billing, collection, debt management and asset management. In addition, it can interface with accounting and customer relationship management systems.

Tiresias is a smart metering analytics service that allows the identification and early notification of events from remote meter reading data. Tiresias processes data to automatically identify situations such as internal leakage and fraud or tampering with the household or installation meter, among others. It also provides an agile connection with different customer service systems, allowing passive notifications such as email or active notifications, such as phone calls or home visits.

BI: What is go-aigua's domestic and international experience?

JBS: go-aigua has customers in South America, the Middle East, Africa and Europe. It is currently operating in the UK. We also have partnerships in Qatar and Angola.

Production equipment and data sources are integrated into a Nexus component, Connector, through any industrial communication protocol, where production information is processed and registered in real-time

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Construction of Ashghal's Mesaimeer pumping station

Smart water technologies eliminate double waste for Qatar's public works authority

How go-aigua, with its suite of smart water software, is helping the Ashghal Public Works Authority in Qatar achieve its goals

In Qatar, the Ashghal Public Works Authority is responsible for the planning, design, contracting, construction and management of all infrastructure projects and public buildings in the country. This includes the construction and supervision of roads, highways, sewer systems and public buildings such as schools and hospitals.

In 2017, the authority was collecting and evacuating waste-water while quality water flows were used for secondary uses. These secondary uses, such as the irrigation of green areas or the thermal exchange in air conditioning systems, do not require the extremely high quality of the water produced in desalination systems; the non-reuse of wastewater and the use of high quality water for secondary uses represented a double waste of the nation's scarce water resources.

Aware of this situation, and following the guidelines of the Qatar National Vision 2030 programme, the Ashghal Public Works Authority designed and built wastewater regeneration facilities to provide a reclaimed water supply of treated sewage water (TSW). These waters are not suitable for human consumption but are suitable for use in garden irrigation and as a secondary flow in the heat exchangers of air conditioning systems.

Nexus and Qatar National Vision

The Ashghal Public Works Authority selected Nexus Integra as a management platform for the utilisation facilities of these reclaimed waters.

Nexus Integra is a robust and agile big data platform that collects, manages and takes full managerial and technical advantage of massive amounts of data. It can perform the ingestion of information in real time from various sources simultaneously; it supports IoT (Internet of Things) sources and proprietary technologies including supply chain and data acquisition (SCADA), programmable logic controllers (PLCs), fieldbuses, sensors and others.

Nexus Integra applies advanced algorithms to guarantee the quality of the stored data, also allowing the visualisation of the information in predefined control panels while also allowing the user to design their own, thanks to its intuitive and widget-based dashboard interface.

In addition to technical and sensorisation information, Nexus Integra accesses information from geographic information systems (GIS), maintenance and preservation operations, asset management data as well as any other information available in the organisation that may be interrelated with the previous ones.

Currently, the Nexus Integra platform developed by go-aigua receives and handles more than six billion data inputs annually, thanks to its real-time variable monitoring mechanisms as well as its ability to integrate information from most industrial protocols operating at the sensor and installation level.

A more water-efficient Qatar

In the first phase, already executed, of the facilities requested by the Ashghal Public Works Authority, the Nexus platform supervises the distribution of reclaimed water and its delivery to the public greening and cooling systems of public government buildings. The uses to which the reclaimed water is destined are complementary over time, in the sense that the air conditioning works mainly during the day while the green areas are irrigated during the night.

The Nexus platform currently optimises the use of reclaimed water by adjusting service pressures and controlling circulating flows and monitoring possible losses. It also predicts, based on experience and through guided learning algorithms, the expected demands for each use.

In a second phase, the environmental sensorisation of the irrigation installations of public green areas is being carried out, collecting information on temperature, humidity of the air and soil, insolation, evapotranspiration and more. This information, included in the Nexus platform, will optimise the use of reclaimed water for the irrigation of green areas by adjusting the irrigation flows according to the type of plantation and the specific environmental conditions.

Water Twin

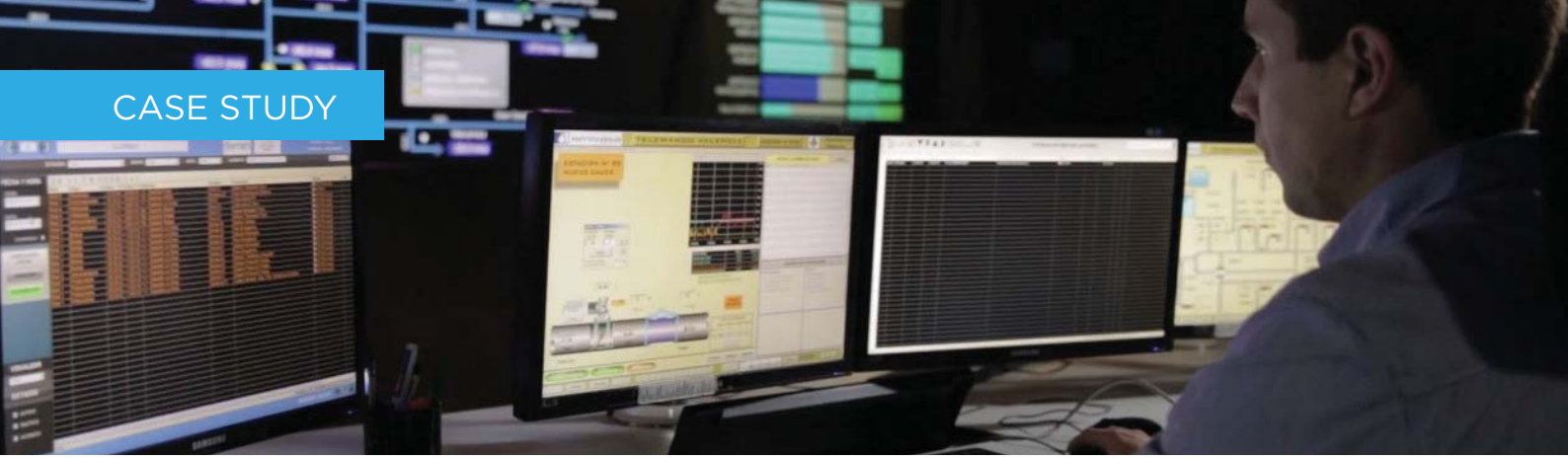
Through Nexus Integra's platform deployed over Ashghal's assets, Nexus Water Twin, another solution powered by go-aigua, accesses the huge information stored in the big data system and integrates in a single environment all the gathered data related to the collection, treatment, distribution, use and return of water systems.

On this information integration route, a set of vertical applications offers specific solutions to, for example, optimise production processes or perform strategic controls of the business technical reality. It includes management of alarms and events, generation of reports and graphs as well as predictive analysis of machinery failure.

The Nexus Water Twin Solution, like all the components of the go-aigua suite, offers Ashghal's operative unites great freedom to configure the visualisation and exploitation of the data, so that it is the end user themself who, if they wish, can personalise the applications to their specific needs. ■

NEXUS INTEGRA BIG DATA PLATFORM

WATER TWIN IOT PLATFORM



Tiresias system processes two billion data points each year for Spanish water utility

When Spain's Global Omnium Group wanted to provide early warnings for consumption anomalies it turned to go-aigua's smart water solutions including its Tiresias system that brings smart algorithms to enable data processing

The Global Omnium Group is one of Spain's largest water utilities, with a large share of the water-related service market, it manages more than 400 municipalities, from small towns to large cities. Altogether, it serves more than one million customers. In its 130 years of experience, the company's offering to clients has gone from community service through public sources to highly technical domiciliary service. After the appearance of water consumption meters, Global Omnium evolved from taking readings on paper to manual recording on handheld terminals and automatic taking of walk-by or drive-through measurements, a process which guaranteed the veracity of the data.

Even with that new technology, from the users' counters only punctual readings were available, whose only utility was the billing of the consumption made. Between reading and reading three months would pass, in which the meter would record the consumption but no useful information beyond that was obtained.

Tiresias and the efficiency of smart metering

In recent years, the Global Omnium Group has developed the Tiresias environment through its smart solution company: go-aigua. Tiresias is a big data remote readout platform suitable for any sensorisation, but optimised for large meter parks with a large amount of information being produced. It uses a fixed communications network, through issuers, concentrators and repeaters, communicating with the networks and protocols of the main meter manufacturers; it is, however, optimised to receive data streams from IoT devices through standard technologies such as SigFox, Lora and narrowband IoT (NB-IoT).

Currently, the Tiresias environment in Global Omnium receives information from more than 700,000 water meters adding up to two billion annual data points, while displaying a highly efficient data intake. As with the big data information system, the data intake is a crucial point to ensure the quality of the results obtained after treatment. Tiresias incorporates deep learning algorithms to efficiently reconstruct the information that may have been lost in the transmission.

The incorporated algorithm and its machine learning capabilities allow Tiresias to obtain individual consumption patterns of each client and, relating them to variables such as the use of water, socio-economic and geographical environment and other factors, extrapolate the known consumption patterns to users who do not yet have meters with remote-reading capabilities – smart metering.

From the incorporation of the smart metering environment, users can see in the virtual office, an online environment designed to streamline the billing process as well as make it more transparent, the evolution of their consumption updated hourly.

Internal and external leak detection

Beyond a transparent, efficient and accessible consumption tracking system, the Tiresias platform allows for multiple added value features. Users who deviate from their pattern of habitual consumption can be warned of the possible existence of internal leaks within their own household or installation pipelines. Each month 2,500 users are informed of possible internal leaks in their installation.

In a similar fashion the smart solution has also helped in locating manipulated counters as well as fraudulent situations. The combination of the information processed by the Tiresias platform with that coming from the sensorisation of the distribution network and its sectors is also used for the pre-location of leaks in the distribution network.

Knowing the water produced, Tiresias combines this information with the aggregation of the consumption of the system and generates complete and reliable information about the quasi instantaneous hydraulic performance of the sectors and the whole of the distribution network.

Tiresias and go-aigua

These analysis capabilities related to the location of leaks in distribution networks and the evaluation of the hydraulic performance of the systems makes Tiresias a key ally and introducer for other solutions in the go-aigua smart solution suite.

For example, Ears, go-aigua's system for intelligent management of water distribution, collaborates with Tiresias in the evaluation of hydraulic performance of sectors or complete networks, and also in the identification of leaks in the distribution network itself. The forecast of the water demand that Tiresias calculates allows Linkwatt to apply its advanced algorithms of both hydraulic and energy cost optimisation of the production of water, optimising the cost of potabilisation in the treatment plants.

Tiresias receives, treats and quality-checks the instantaneous information gathered from the users' counters. Such features, allows it to evolve beyond a gatherer of big data into a real business intelligence engine.

TIRESIAS SMART ALGORITHMS

EARS INTELLIGENT WATER DISTRIBUTION MANAGEMENT

LINKWATT ENERGY COST EFFICIENCY PLATFORM

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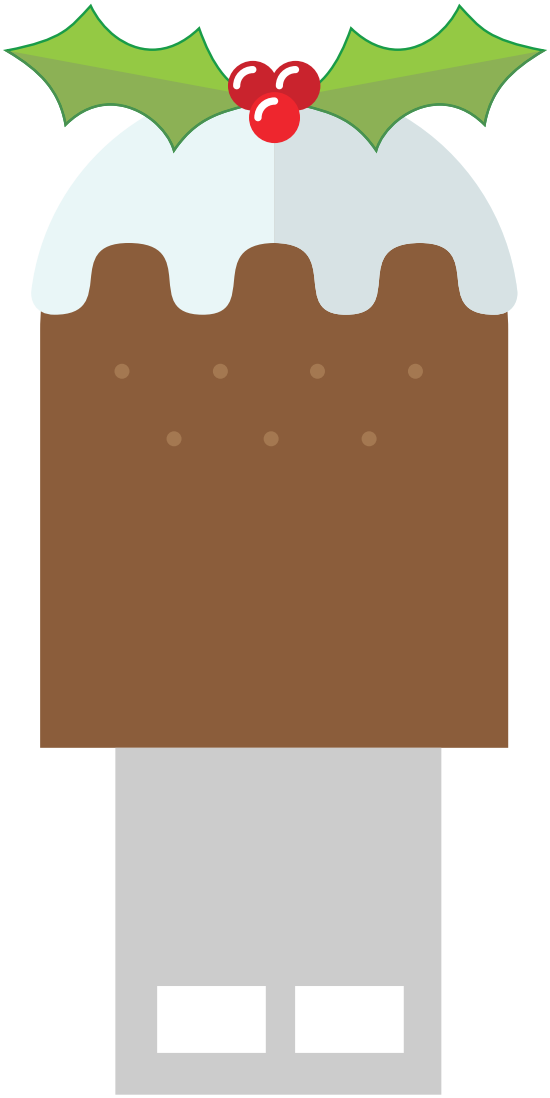
Seasonal data.



Beecham Research is the leading strategic advisor on IoT, supporting bespoke IoT projects with over 25 years expertise in both M2M and IoT. We provide market information and advice to help make your IoT wishes come true.

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Shaping the IoT future

ANALYST REPORT

Can smart utilities enable a joined-up future?

Analyst Report
Prepared by
Beecham Research

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Shaping the IoT future

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Nexus Integra is part of Go-Aigua, the Water Software Suite.

GoAigua is a technology business group in the integral water cycle sector, and a global reference in the implementation of technological innovations and digital transformation.

NEXUS
INTEGRA
BIG DATA
PLATFORM

Nexus Integra is a robust and agile Big Data platform that allows you to manage, experiment, and get the most out of massive amounts of data.

Connect, integrate, and boost your company competitiveness.

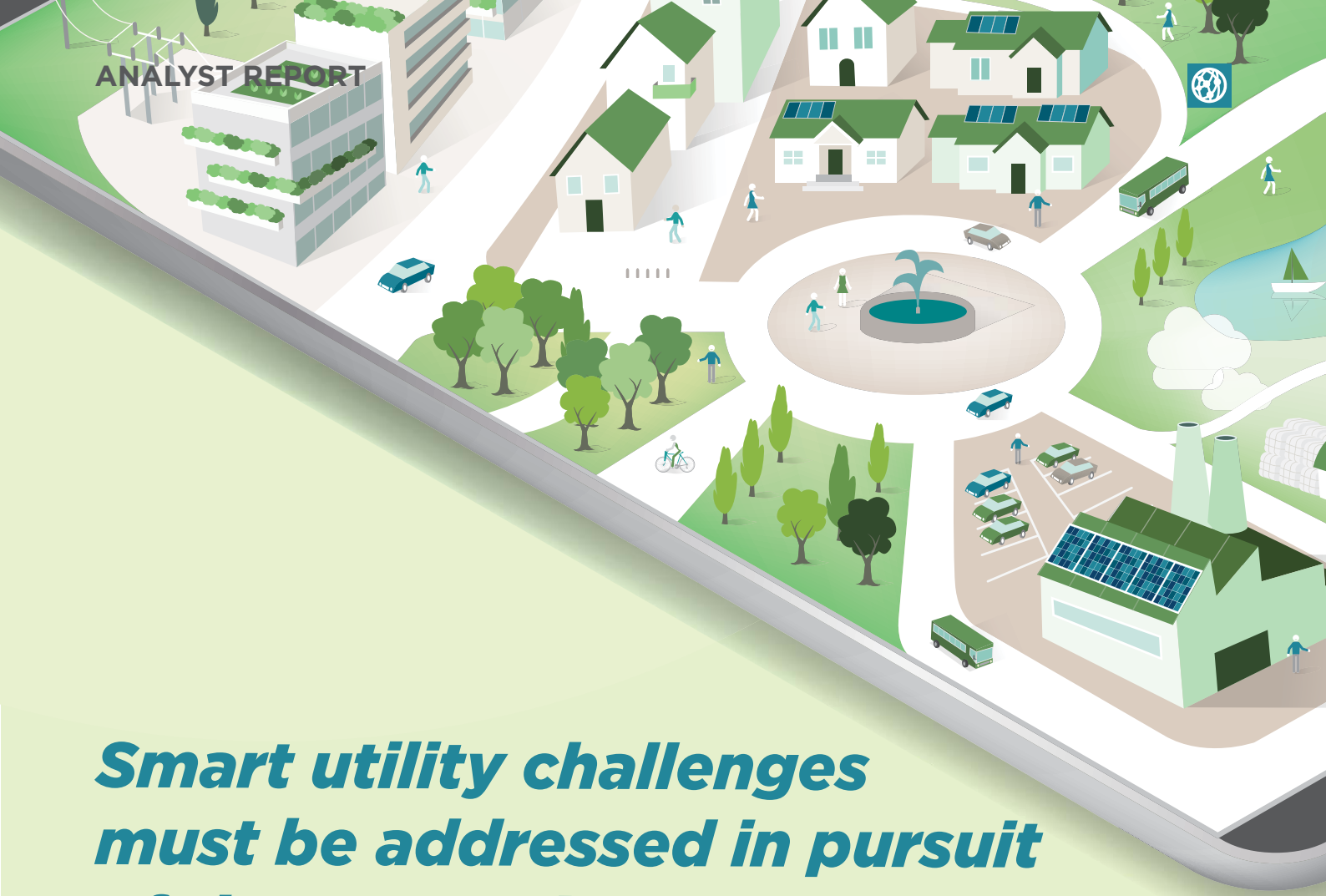
Sucessful water management utilities are reducing their costs of facilities maintenance up to 20% thanks to connect their systems Nexus Integra.

100% customized: Nexus Integra mirrors your production system.

Nexus Integra connects your existing processes and is fully adaptable to production changes. Our customized solutions can be connected to any system or set of existing systems. Connect your business to the Nexus Integra core system and get real-time data and streamed analytics.

Stream analytics within a data centric architecture

The architecture of Nexus enables a very efficient data ingestion, allowing, in parallel, the real-time processing of data from thousands of IoT devices, together with the persistence of the same in databases of different characteristics.



Smart utility challenges must be addressed in pursuit of the smart cities dream

All over the world, societies and industries rely on the supply of energy and water. For energy and particularly electricity, in the past two centuries this has come from industrial scale generation based on fossil fuels. As of the second decade of the new century, it has become a matter of urgency to address challenges never seen before, writes Therese Cory, a senior analyst at Beecham Research

These challenges are as significant as they are numerous and encompass the following issues that must be addressed if smart utilities are to become a reality and play their part in the realization of the dream of smart cities and smart living. Key challenges today include:

- National and international regulations driving the replacement of fossil fuel generation with cleaner, renewable methods of generating electricity to reduce Co2 emissions
- The distributed nature of renewable energy leading to a vast increase in the number of assets needing to be managed in real-time
- Secure monitoring of energy flows for management and financial settlement purposes as households and businesses become prosumers
- Flat customer demand in developed economies and rising demand in developing economies
- The balancing of supply and demand to make electricity grids more efficient
- The rapid growth in grid scale storage for demand and frequency response applications
- The electrification of transport, resulting in millions of batteries being connected to the grid and time-shifting of peak demand

None of these challenges can be met without wholesale application of IoT technology.

Energy utilities cover a wide range of services – in **Figure 1** we identify the broad range of sectors and activities, from energy generation through to distribution and consumer use. The outer layers of the chart offer examples of applications of relevance to these sectors. Many will be common to all the sectors, such as asset management, troubleshooting and predictive maintenance. Whilst the way in which analytics is performed depends on the context of the application, the same data collected at source should, where possible, be utilised for all these applications, rather than the same data collected many times over – provided that this data is accurate and has not been corrupted. ▶

Therese Cory, senior analyst, **Beecham Research**

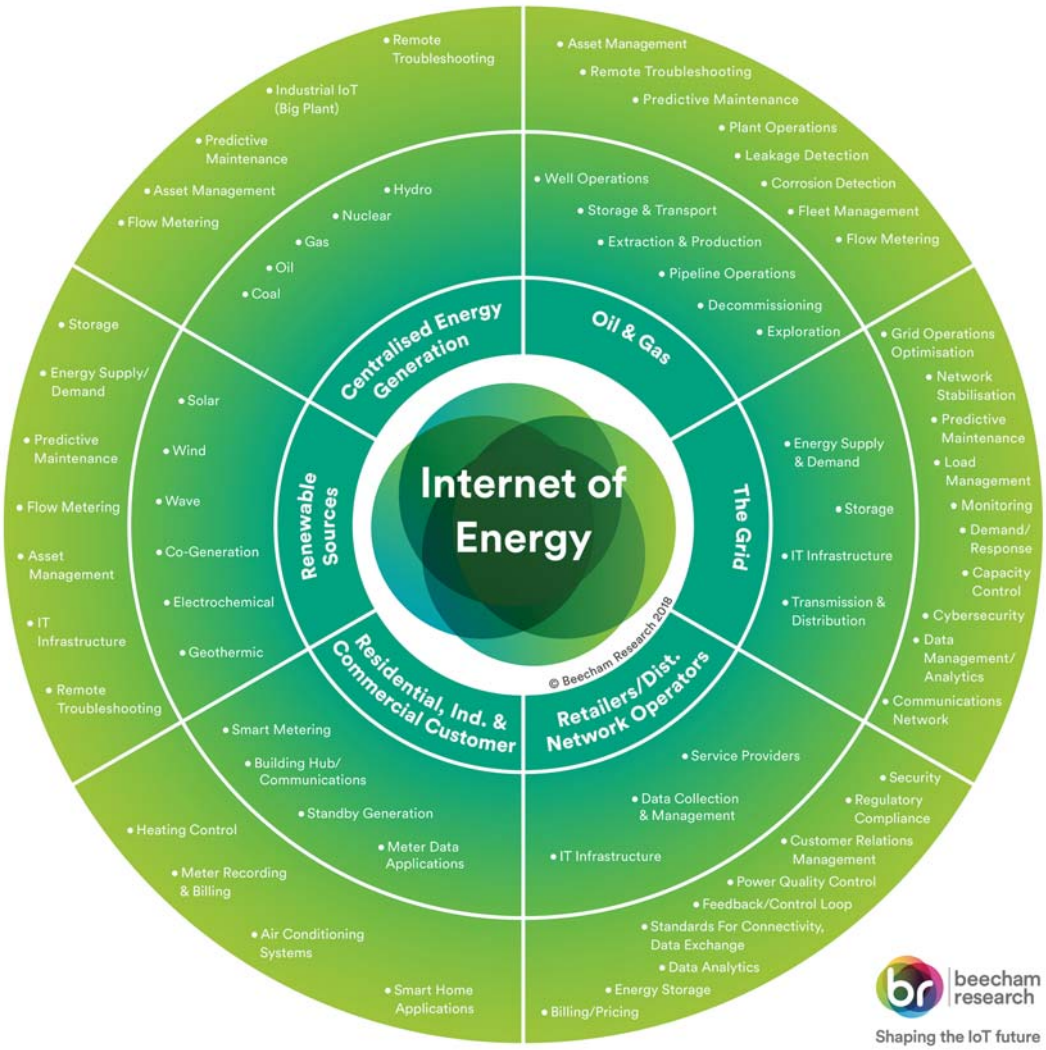


Figure 1 – The Internet of Things in the energy sector (Source: Beecham Research)

The energy sector needs IoT

The objectives of both users and suppliers today include energy reliability and efficiency, a sustainable energy supply, transmission and consumption that are understood, a balance between energy demand and supply, all supported by an optimised infrastructure. At the same time, the need to digitise operations and the business goes hand-in-hand with attaining these objectives. Making the networks smart by instrumenting all parts of them will necessitate skilful analysis of the data to understand the workings of these entities and identify areas for improvement.

According to the International Energy Agency, the global total electricity consumption reached nearly 21,000TWh in 2016, 3.2% higher than the previous year. What is more, the electricity market is set to grow at twice the overall energy demand to 2040. Global gas demand is set to grow at an average rate of 1.6% to 2023. The agency also found that in 2016 the investment in the electrical power sector surpassed that of oil and gas, propelled by renewables, including solar, wind, wave and tide energy, geothermic and other sources. However, more than one billion people globally still lack access to electricity and satisfying this demand will put even more strain on suppliers and networks.

Figure 2 illustrates the components of the energy supply chain, from generation through transmission, distribution and finally consumption and billing. Parallel to these activities are the data analytics necessary for billing and performance measurement. More recently consumer-based generation such as use of community microgrids, solar panels and 'behind the meter storage' have begun to be added to the demand/supply equation. ▶

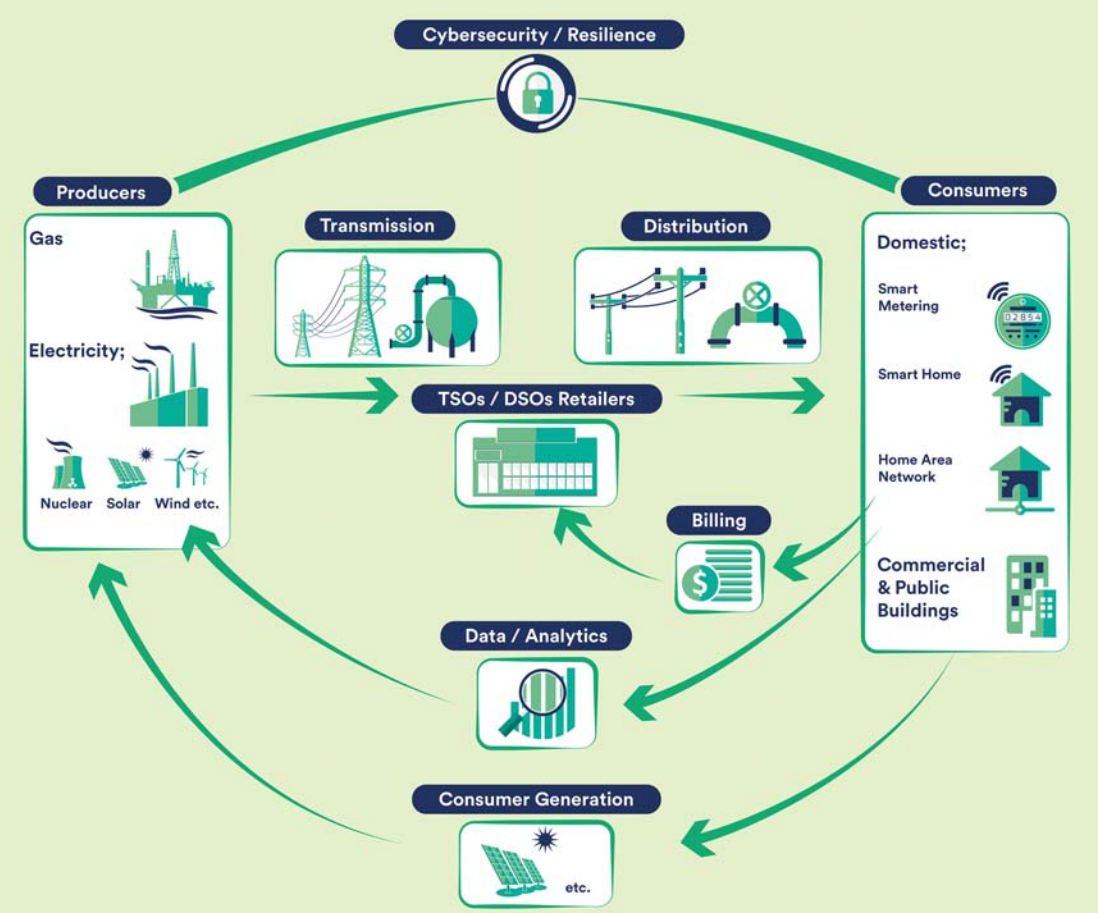


Figure 2: The components of the energy supply chain (Source: Beecham Research)

The figure shows that connectivity is key for all parts of the supply chain, from transmission and distribution through to final analytics. Connectivity goes beyond the connection itself. It includes:

- Hardware and components – silicon components, modules, sensors, devices and others for the gathering of data
- Connectivity services enabling the exchange of data between and across IoT platforms for managing the devices, analysing the data and enabling application development
- Data storage management and analytics providers and solution integrators

Connectivity in the electric power industry poses several challenges including:

- Large volumes of data
- Proprietary legacy IT systems
- The need for enhanced security because of connectivity with external systems
- The differing lifespan of utility assets and connectivity technologies

Different types of connectivity technologies are proving useful for different purposes. They include power line communications and radiofrequency (RF) mesh technologies such as Wi-Fi and Zigbee in combination with wireless wide area network (WAN) technologies for backhaul. Various types of cellular technologies are also used including 3G/4G with low power cellular, such as narrowband IoT (NB-IoT) to come, and also unlicensed wide area wireless technologies such as LoRa and SigFox.

LoRa is proving a favourable choice for many applications to do with energy monitoring and metering. Proponents cite its long battery life, in-building and in-ground capabilities along with its low costs. The technology also supports geolocation for scenarios in which it is important to know where the assets are and their status.

One example of this is the Belgian operator Proximus, which has added NB-IoT connectivity to its network and intends to greatly increase its LoRa footprint. More details can be read here:
https://www.proximus.com/en/news/proximus-launches-nb-iot-network-support-digital-meters

Semtech, a manufacturer of LoRa chipsets, also supplies meter manufacturers which are integrating LoRa technology into their IoT smart meters to improve facilities management. ▶

IoT applications contribute to grid reliability and resiliency.

The applications depicted in **Figure 1** all start with the collection of data from connected elements of the grid and generation assets connected to it. Different devices collect different types of data including voltage, frequency, power loading, switch status, temperature, vibration and other parameters that engineers are interested in that best describe the condition and workings of the network.

Asset tracking

Asset tracking is part of the Industrial IoT (IIoT). Instrumenting of assets is key to tracking them and avoiding the occurrence of stranded assets, an issue particularly associated with telecoms networks.

Electrical equipment is typically inspected on site by powerline technicians, sometimes aided with helicopters fitted with cameras. These identify the problems that could result in power failures, fires or explosions. In addition, with the increasing shift to renewable energy, more advanced drone technologies are needed to monitor the new connections that link renewable sources to the standard electric grid. Drones are also being used to examine the grid in remote parts of Europe – the drone sends back data to allow technicians to create virtual models of sections of the grid.

Energy-related IoT smart devices, including meters, inverters, appliances and thermostats, provide utilities with measurement data that can be used for asset performance, usage, deployment and optimisation. However, this data can only be made actionable and intelligent for utility operations if it can be processed and presented in near real-time.

Predictive maintenance

Predictive maintenance is common to many industries. It entails comparing the specified part of the network's real-time status with a history of faults. Analysis of the data in real-time can show if failure is likely to occur soon in order that the part can be identified and replaced before failure. This improves grid reliability by reducing downtime.
New ways of handling data are being continually found to bring new perspectives and understanding to data collected from utility networks. As an example of this, the Weather Company, owned by IBM, has created a predictive model which combines big data and machine learning to provide utilities with safe and efficient outage management processes.

Predictive maintenance and other IoT applications also form part of an iterative cycle of continuous improvement – a concept well understood in manufacturing industry. As new data is collected and added to the expert database, more is learned about the workings of various parts of the network and grid, intelligence that was not possible to garner previously. In this way, predictive maintenance becomes precision maintenance, enabling an ever-growing understanding of detailed grid workings.

Smart metering

At the consumer end of the supply chain, smart meters are being installed at premises all over Europe, as per an EU mandate. Smart metering is a subset of the smart grid which itself evolved from automated meter reading (AMR). In addition to getting timely and accurate readings of customer use, smart metering also offers opportunities for supplying data for a range of useful applications upstream and downstream – demand response, home energy management, prosumer integration and in the future more and more electric vehicle charging and storage.

Customer relationship management

Customer relationship management (CRM) is becoming more of an imperative thanks to demands from regulators and customers unwilling to put up with poor service. With the expected rise of customer requirements, utilities must become more efficient and do more with less, yet keep customers supplied and happy with good service and reliable billing information.

Major changes are coming to the traditional grid

Electric vehicles

Electric vehicle (EV) charging is set to become an issue as more people buy and charge their vehicles from their businesses and residences. The electric grid could be affected by the risk of overloading by domestic car owners. This will require additional monitoring of the pressure on the grid.

The growing numbers of electric vehicles could constitute a drain on the grid, but also serve as reservoirs of power for homes and businesses. According to Bloomberg, cumulative passenger EV annual sales worldwide were set to hit four million in August 2018.

In response to this, the French car maker Renault, for example, has signed agreements with key players in the European energy markets. It has formed ventures in partnership with EDF, Total and Enel with the aim of ▶

developing a smart electric ecosystem to promote the large-scale take-up of electric cars.

Renewables added to the mix
A renewed focus has been placed on renewable energy since the United Nations announced that major changes would be needed across the world to limit the effects of climate change. Consistent with this, it has recommended a 45% cut in carbon emissions by 2030. For its part, the UK government has announced its intention to phase out coal power by 2025.

In a further sign of change, in 2018 Scottish Power became the first major UK energy firm to cease fossil fuel generation in favour of wind power, having sold off its remaining gas and hydro stations. The company plans to invest more in other renewable energy sources, including sunlight, tidal and wave energy, increasing its total renewable capacity.

Water

There is also an urgent requirement to achieve water resiliency worldwide considering the increased frequency and severity of droughts, as well as population growth in urban areas and corresponding demand for more water supplies. The International Energy Agency claims that more than 34% of pumped water is lost as non-revenue water because of tampering, theft, meter errors and faulty distribution networks.

Other factors driving greater investment in water and wastewater infrastructures include ageing infrastructures, and the increasing complexities in maintaining and managing water and wastewater facilities. Supervisory control and data acquisition (SCADA) systems are proving useful in obtaining data from remote devices such as valves and pumps and offer remote control from a host software platform.

There have been calls for the UK government to compel water companies to introduce compulsory metering, using smart meters. It is considered that the water industry should collectively be aiming to reduce leakage by 50% by 2040, rather than 2050.

Thames Water, the country's largest water company, has launched several projects in 2018 to examine its pipelines and detect leaks across its 20,000-mile underground network. These include a fleet of drones, aeroplane and satellite monitoring to send back state of the art images to reveal leaks from above ground. The company aims to achieve a leakage reduction target of 15% between 2020 and 2025; previous targets have not been met, resulting in penalties from the regulator.

The use of low power connectivity is also finding applications in water metering and management as well as power. In Spain, FACSA is to deploy LoRa-enabled smart water meters in its smart city project, following a successful pilot. Telstra is also reported to be introducing NB-IoT for water monitoring in Australia.

A joined-up future with smart cities?

Smart energy and smart grid solutions are being explored and designed today to support and enable the objectives outlined in this report. In addition to addressing current challenges, the long term IoT vision is to tie in power supply with smart city projects, joining up all services such as public lighting with power generation. This might employ a generic connectivity technology supporting the entire interlinked system of systems. However, all of this is contingent on a highly secure network resistant to cyberattack – another key element requiring continuous improvement. ■

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With the infrastructure not built to hold the loads we use, dynamic switching for load balancing becomes important

IoT is the lineman for the county

MultiTech designs, develops and manufactures data communications equipment – cellular and LoRAWAN modems, routers and gateways – for the Industrial Internet of Things (IIoT). Bill Ingle, a senior analyst at Beecham Research, interviews Sara Brown, the vice president of marketing, and Gregg Zastrow, the senior manager of programmes and partnerships, at MultiTech, to understand how the company is helping utilities become smarter

Bill Ingle: How does an aging electric utility infrastructure, with an aging workforce, fit into today's smart utilities picture?

Sara Brown: In most of the world, the infrastructure that delivers electricity was built out over 100 years ago. When that infrastructure was first deployed, the electrical load it had to carry was significantly different to what it is today.

Today's load is much greater, which creates a great deal of strain. Over time, utilities have been updating and adding to the infrastructure, but infrastructure projects are not exactly fast and easy projects.

The frontline personnel doing that work tend to have been with a utility for quite some time and may be approaching or past retirement age. With today's unemployment rate and, perhaps, disinterest in being a lineman, utilities have to think about other ways to manage and update that infrastructure.

BI: How does a need for dynamic switching for load balancing heighten the need for utilities to be smarter?

SB: With the infrastructure not built to hold the loads we use, dynamic switching for load balancing becomes important. Automated metering and dynamic pricing impacting consumer behaviour was first implemented in Europe, where utilities would charge less per kilowatt hour and less for water if I did my laundry at 10:00pm instead of at 8:30am. That had an impact but didn't completely solve the problem.

In the US, some of the utilities are incentivising businesses to step off the grid during high power draw times, whether during a storm emergency, when a business can switch to a generator, or at other times when circuit overloads are anticipated. With the addition of alternative energy sources such as solar or wind, utilities are looking at dynamic energy resource management (DERM), which involves switching from one source to another depending on availability.

The availability of power from solar and wind changes with the weather and time of day; even a solar eclipse will impact load balancing. During the 2017 eclipse, non-solar plants in North Carolina that would otherwise have been sitting idle had to be fired up.

The systems are complicated; intelligent software systems must switch between sources providing a variety of data during special events and high power usage times. Some systems may switch where you're sending the electricity – I don't need it at my house at the highest rate at 9:00am but they need it at the office at 9:00am.

Gregg Zastrow: Electric vehicle (EV) charging systems will become an increasing part of the mix, as well.

SB: EV charging stations are like vending machines and kiosks. We're seeing people lean more towards cellular, for a variety of reasons, including security and latency, for connecting them.

BI: What about critical infrastructure? ▶

SB: The regulations for critical infrastructure came out of possible cyber-terrorist activity, but the implications are broader. The holy grail for smart cities, for example, is emergency response. Whether because of a terrorist event, or events like hurricanes or wild fires, disparate systems – utilities or emergency responder systems or even street lighting or traffic routing – must work together.

The fact that those things are critical is bigger than just data security. How do we deal with evacuating 100,000 people from the entire coast of North Carolina – what's the traffic management associated with that? How do we know that those people are not in the building from which we've asked them to vacate? Then on the back-end, how do we make sure that when they go home the water they're consuming is safe and they have power, heat and air conditioning? How do we get medical services to them in instances where bridges may be out or roads are blocked from fire?

When I think about critical infrastructure, whether it's utilities or the broader smart city or smart community context, I think critical has a much bigger meaning.

BI: What's the role of hybrid communications in smart utilities?

SB: Cellular, Ethernet, Wi-Fi, LoRaWAN – there are a lot of communication technologies out there. When you look at a utility's distribution network, whether water or electric or gas, there's a place for each one of these technologies, but they need to work together in hybrid networks. Low power wide area (LPWA) technologies such as LoRaWAN and SigFox are already commercialised; narrowband IoT (NB-IoT) and Cat-M are at the beginning of their life cycles. They open the door for monitoring equipment and networks and building communications into the aging infrastructure at lower cost.

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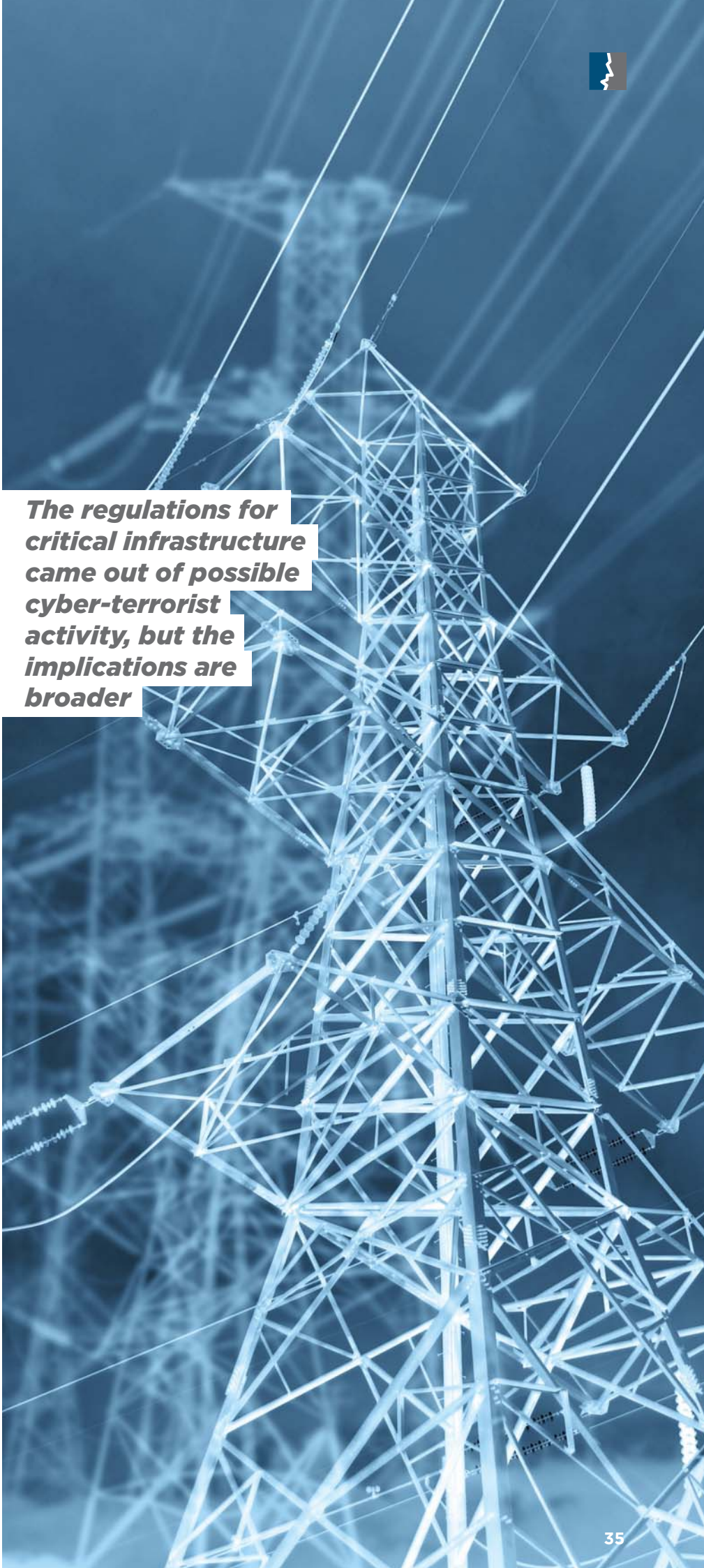

The regulations for critical infrastructure came out of possible cyber-terrorist activity, but the implications are broader

Take control of the future electric grid today

To ensure continuous visibility, utility providers need reliable communications to deliver effective operational intelligence. Gridco Systems selected MultiTech rCell 100 series radios to meet its key criteria of form factor, operational temperature, usability and overall cost effectiveness and is now utilising MultiTech radios for effective distribution grid management

The Problem

The need for robust, reliable communications within a small footprint to deliver operational intelligence.

The Solution

MultiTech's rCell 100 series radio and it's QuickCarrier USB-E

The Benefits

- Meets criteria for electric utility applications
- Large product portfolio
- Easy to integrate and use
- Robust, secure communications

The energy landscape is undergoing a fundamental shift. In the US, current electric grid infrastructure was designed more than 100 years ago to support predictable, unidirectional power flows from large centralised generation facilities to millions of geographically dispersed customers. However, this century-old design must now accommodate bi-directional power flows from distributed and variable renewable generation resources and increased variances in supply and demand – phenomena that were simply not anticipated when the grid was originally developed.

The combination of the increasing frequency of extreme weather events, greater regulatory focus on energy efficiency, higher cost of peak demand capacity, and mounting customer demand for better quality, cleaner and more affordable power has created unprecedented challenges to maintaining a robust, reliable power delivery system.

Traditional business-as-usual grid reinforcement techniques, such as reconductoring or replacing transformers, are simply not cost-effective nor do they give electricity utilities the awareness, intelligence and agility needed to respond to dynamic system changes. Traditional primary side control solutions are not always effective, lacking the responsiveness and ability to target specific feeder locations without impacting a large branch or the entire feeder itself. It is clear that different solutions are necessary to meet electric utility needs for the next 100 years. ▶

SPONSORED CASE STUDY

The MultiTech rCell 100 series

Gridco Systems static VAR compensator device

Through its family of power regulation products, Gridco Systems provides the foundation for greater visibility and control of power out to the low voltage (LV) edge of the grid. The company's mission is to help distribution utilities solve problems close to the end customer, facilitating systemic benefits that include meeting aggressive renewable portfolio standards, increasing energy efficiency, reducing peak demand and improving overall power quality.

The Gridco Systems emPower solution includes end-to-end hardware based on modular power electronics and advanced software for dynamic control and enhanced visibility throughout the grid. To ensure continuous visibility, utility providers need reliable communications to deliver effective operational intelligence. Because of this, Gridco Systems set out to qualify communication options through a combination of key criteria including size, operational temperature, usability and overall cost effectiveness. Achieving an optimal combination of these criteria became the overall determining factor in Gridco's choice to utilise the MultiTech rCell 100 series radio and the QuickCarrier USB-E.

MultiTech has a large product portfolio to choose from, along with the company's long standing reputation of providing rugged and reliable hardware. MultiTech's QuickCarrier USB came as a certified end-device purpose-built electric utility applications. MultiTech's extensive hardware options meant that the relationship grew even deeper when Gridco selected its rCell product for communication with Gridco's In-line Power Regulator (IPR) and the static volt ampere reactive (VAR) compensator (SVC) devices.

"Cost was definitely a driver and MultiTech provided the cost effective option that carried over in pricing to our customers," said Vince Martinelli, the vice president of product management at Gridco Systems. "MultiTech's embedded radio provided us the ability to offer multiple radios in one device, giving utilities the operational flexibility of leveraging different communication networks. Using Telit as Multitech's main choice of cellular modems also greatly benefits Gridco Systems in offering robust, secure communications solutions for its customers."

In the future, Gridco Systems is eager to forge strategic relationships with suppliers, like MultiTech, that provide great value and benefits for its customers. Being able to meet stringent, utility-grade standards for quality, reliability and safety is the top priority. ■

"Utilising the MultiTech embedded radio provided us the space to offer multiple radios in one device."
Vince Martinelli, Gridco Systems

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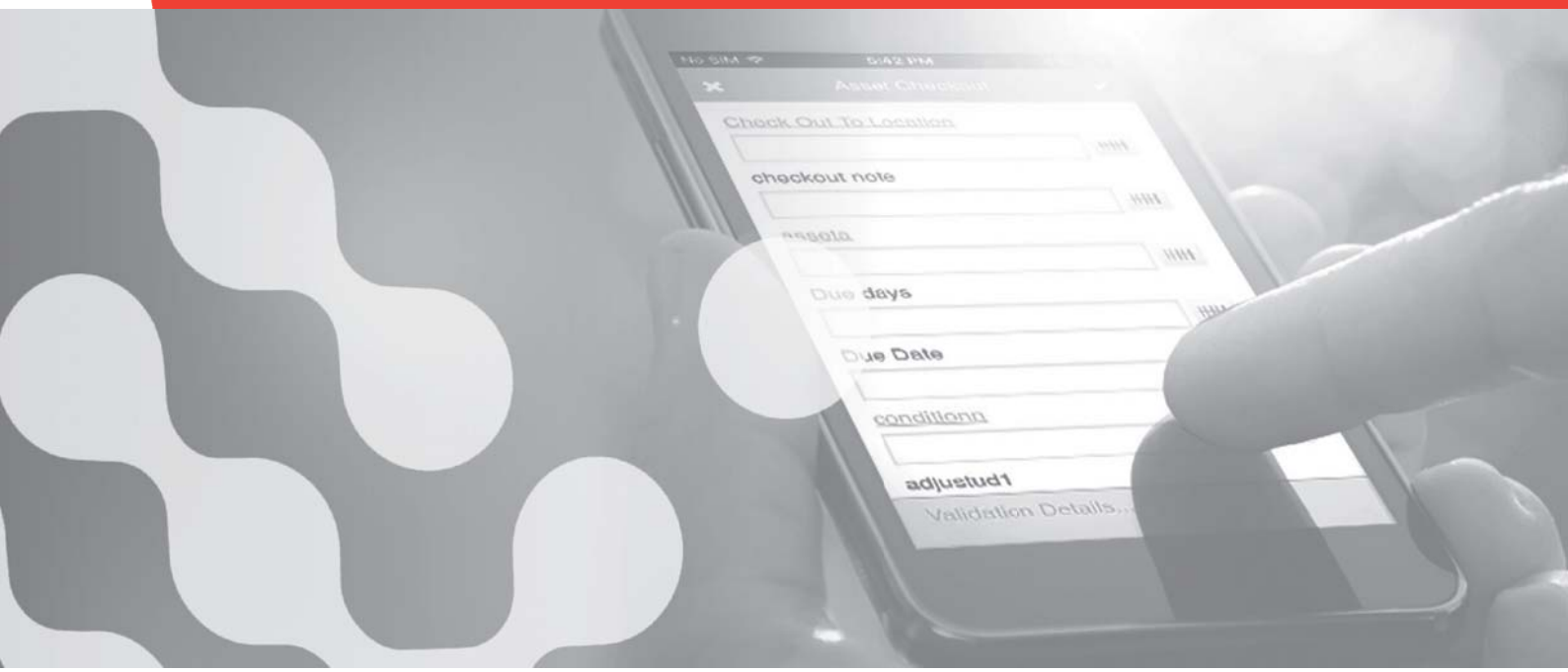

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Shaping the IoT future

Tracking and tracing of mobile assets: New IoT opportunities for OEMs

Along with remote monitoring, tracking/tracing applications are a bedrock of the IoT. The ability to find assets, to track them as part of a logistical operation or even to just monitor where people or animals are is a fundamental requirement, finds this exclusive report authored by Beecham Research and sponsored by Sierra Wireless. As shown in **Figure 1**, the number of mobile assets being tracked worldwide at end 2017 was in the region of 50m units of which over 90% were vehicles, followed by trailers, containers, personal trackers and a long tail of others. Yet the addressable market for mobile assets is huge. It totals about 1bn vehicles worldwide and about 10bn pallets, let alone the potential for tracking people for a variety of needs, tracking livestock and pets and even luggage ▶

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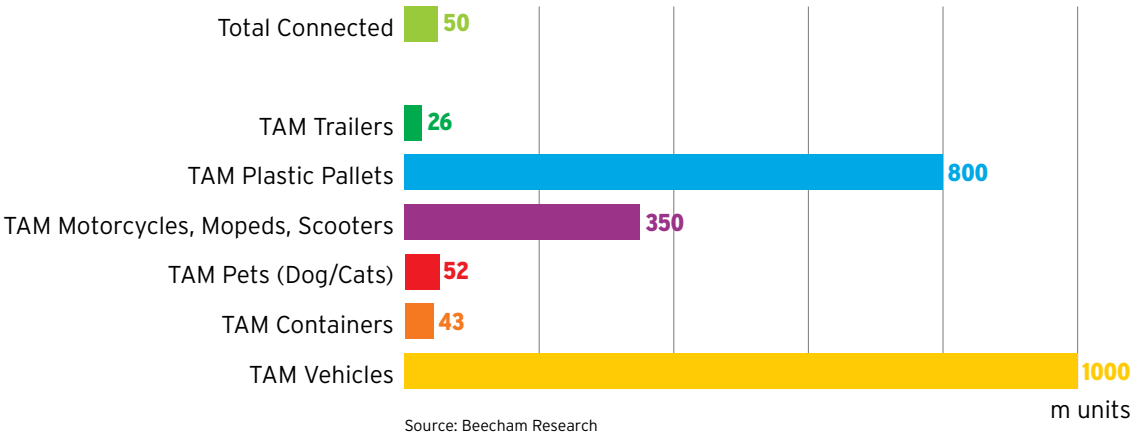

Figure 1: Mobile asset tracking market

As these figures show, in spite of rapidly-evolving cellular and other wide area wireless technologies over the last 30 years, the number of mobile assets currently being tracked over a long range is just a small fraction of the total number that we would expect to be connected in a truly connected world. Why is that? Partly, it is a question of priorities. Tracking/tracing applications being used today are largely business-oriented: Where is that truck? When will it reach the depot for loading/unloading?

It is also a question of need versus cost. It would be great to be able to track your luggage or brief case if it goes missing, but for most of us it is not economically viable. In a purely business environment, there is a real need to keep track of all the tools in a construction site. This is often only viable for the high cost items like bulldozers and cement mixers. Yet it is the smaller items – clump hammers, spirit levels and even ladders – that are more likely to go missing and there are usually a lot more of those.

The introduction of new forms of connectivity such as NB-IoT and LTE-M (LPWA - low power wide area technologies), with very low power consumption and extended coverage for low bandwidth applications, offer new opportunities to track an enormous range of lower cost mobile assets more effectively than ever before. In addition, new technologies to select wireless subscription such as eUICC, offer a vastly improved process to enable those connections for large numbers of those assets wherever they end up being used.

EUICC: Enabling OEM Market Development

A previous report "eUICC: Accelerating the IoT opportunity for OEMs" explored what the eUICC is and why this was developed primarily with OEMs in mind, to provide a streamlined way to enable cellular connectivity for manufactured products.

As detailed in that report, while the traditional SIM card (Subscriber Identity Module) has contributed significantly to the growing success of the mobile handset market for many reasons, it is not ideal for other connected devices which are not purchased through mobile phone retail outlets. For IoT applications, matching up the SIM card and device occurs at a different point in the supply chain, which introduces new and sometimes costly logistical issues. In addition, if there is a need to change the mobile operator during the life of the application, it means changing the SIM card and that introduces other logistical issues. It may, for example, require a site visit. Even when on site, the card may be physically difficult to access. It may be up a lamppost. It may be in a small cabinet out of easy reach. On the other hand, if it is easy to access and in a public location, it may then be open to tampering and even theft. Such issues and ▶

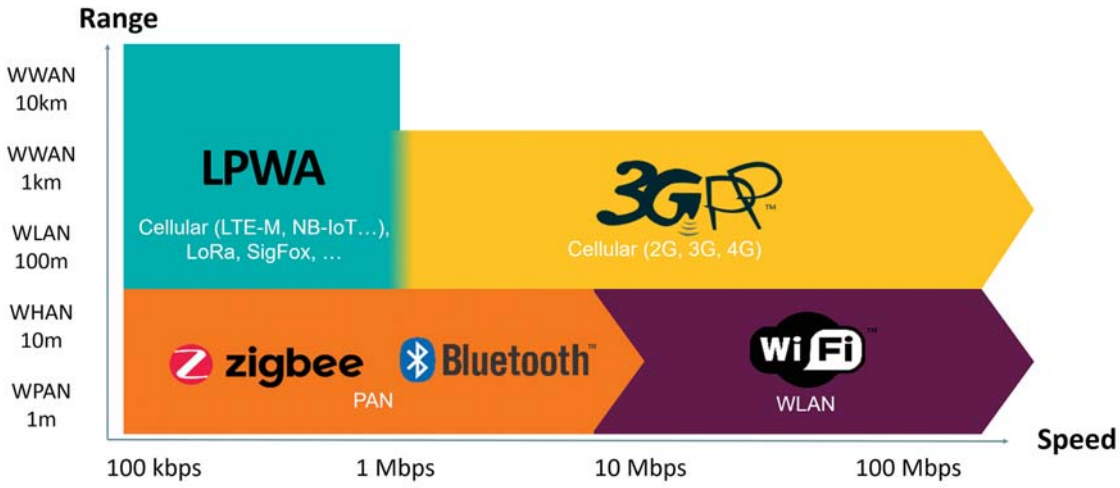

Figure 2: Where LPWA fits with other wireless technologies

more all add cost and further logistical challenges in the use of SIM cards for connected devices.

To address these and other challenges posed by the SIM card in this market, a new type of SIM has been introduced that is provisioned over the air. Termed eUICC, this makes it possible for the network operator's subscription attached to the SIM to be assigned or changed remotely. It should be noted that the term eUICC refers to all SIM form factors that can be remotely provisioned, including cards (2FF form factor for example) and small electronic chip embedded onto the circuit board of a device during manufacture (MFF2 form factor for example). This embedded version therefore removes the need for a SIM card holder and reduces the volume of space required for the SIM. eUICCs are normally embedded in the device so they cannot be physically removed, although because they are also available in card form they can also be inserted into devices instead of a normal SIM card and thereby provide a remote provisioning facility for those devices.

The major advantage for OEMs of this approach is that the SIM can be inserted into a device's circuit board during manufacture like any other component and then provisioned later with the appropriate network operator profile for wherever in the world it happens to be. It converts the SIM into a single SKU (Stock Keeping Unit), thereby helping to streamline production processes and reduce costs. This is particularly important for the OEM market where products may be shipped anywhere in the world. It replaces the procedure for traditional SIM cards, where each product shipped needs to be physically matched up with a SIM card and the card inserted into each individual device. To do that, the SIM card needs to be pre-ordered with the profile of the appropriate network operator and then sent to where it will be inserted, which often creates logistical problems, added time and cost. As such, it represents a barrier to more widespread use of cellular connectivity in IoT devices.

The eUICC solution dramatically opens up the opportunities for OEMs to use cellular connectivity in their products. It has already been taken up by the auto industry manufacturers, who have pioneered its use for a variety of telematics and in-car entertainment uses, and is relevant for any application where embedded, wide area connectivity is appropriate. Through the way it works, this solution also changes the ownership of the SIM itself. The traditional SIM card has always been the property of an individual network operator. It is supplied by the operator and to change operators requires a physical change of SIM. With the eUICC, the ▶

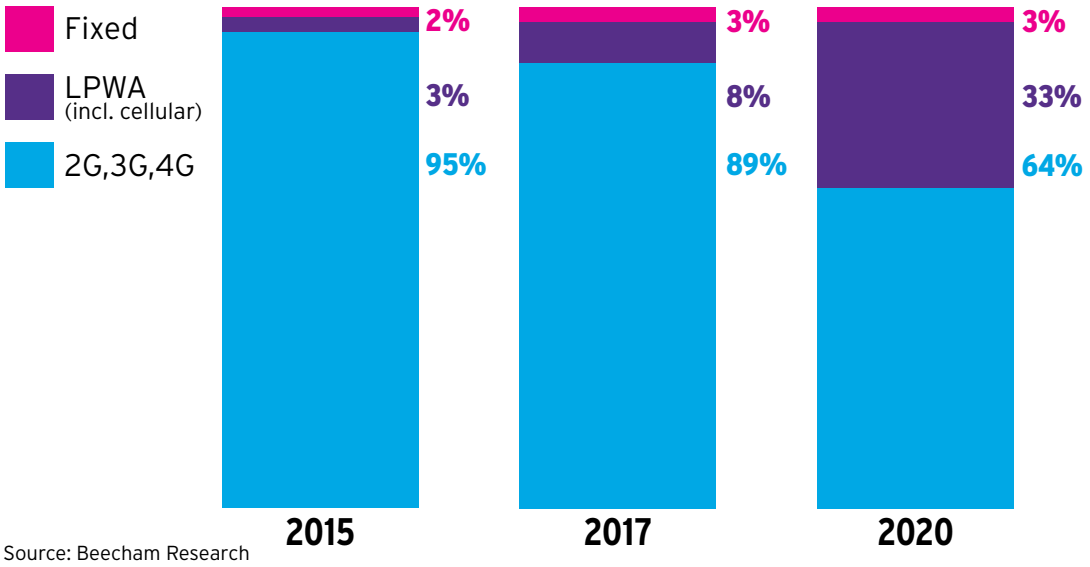

Figure 3: IoT Wide Area Connections – Projected Take-up of LPWA Technologies Worldwide

SIM is owned by the OEM or service provider and has a bootstrap network profile installed in it. Wherever the product is subsequently shipped to, when the eUICC is switched on the bootstrap profile sets up a wireless connection so the correct network profile for that location can be downloaded over the air. There is no physical intervention.

Cellular LPWA: Connectivity for Mass Deployment

Low Power Wide Area (LPWA) wireless technologies such as NB-IoT and LTE-M, are currently being introduced to the IoT market, designed specifically for low bandwidth, low power IoT applications in wide area environments. There are two groups of these technologies – those that use unlicensed spectrum and those that use licensed spectrum (cellular-based). Their place in the market compared with other wireless technologies is illustrated in **Figure 2**.

The promise of IoT is for everything everywhere to be connected. Yet current wireless technologies do not fully meet this need. They either tend to be short range and low cost, or alternatively long range at higher cost. What is different about LPWA technologies is the recognition that very large numbers of remote devices that would add value by being connected only need to transmit and receive small amounts of data. In addition, the vast majority of these are nowhere near any power source so need to operate on battery power over long periods. This is what LPWA is designed for – connectivity offering low bandwidth with very low power requirement over long distances. This enables very low cost compared with other wide area technologies. As a result, LPWA is expected to provide the means for driving mass deployment of connected devices.

Figure 3 shows projected take-up of LPWA technologies worldwide over the next few years. The figures shown for each year are the percentage of wireless wide area connections ascribed to each technology for IoT applications. So in 2015, 95% of these connections were using traditional cellular (2G, 3G, 4G), with 3% using LPWA (including cellular LPWA). By end 2017, the LPWA element had grown to 8% and is expected to reach 33% of connections in 2020. What should be born in mind is that this rapid growth is happening at a time of already rapid growth in overall IoT connections – the total connections in 2017 is significantly higher than for 2015 and 2020 continues that growth. This means that LPWA growth is expected to be exponential over the next few years and is because of clear pent-up demand for this type of connectivity.

There are many products that immediately become more feasible to connect with the ▶

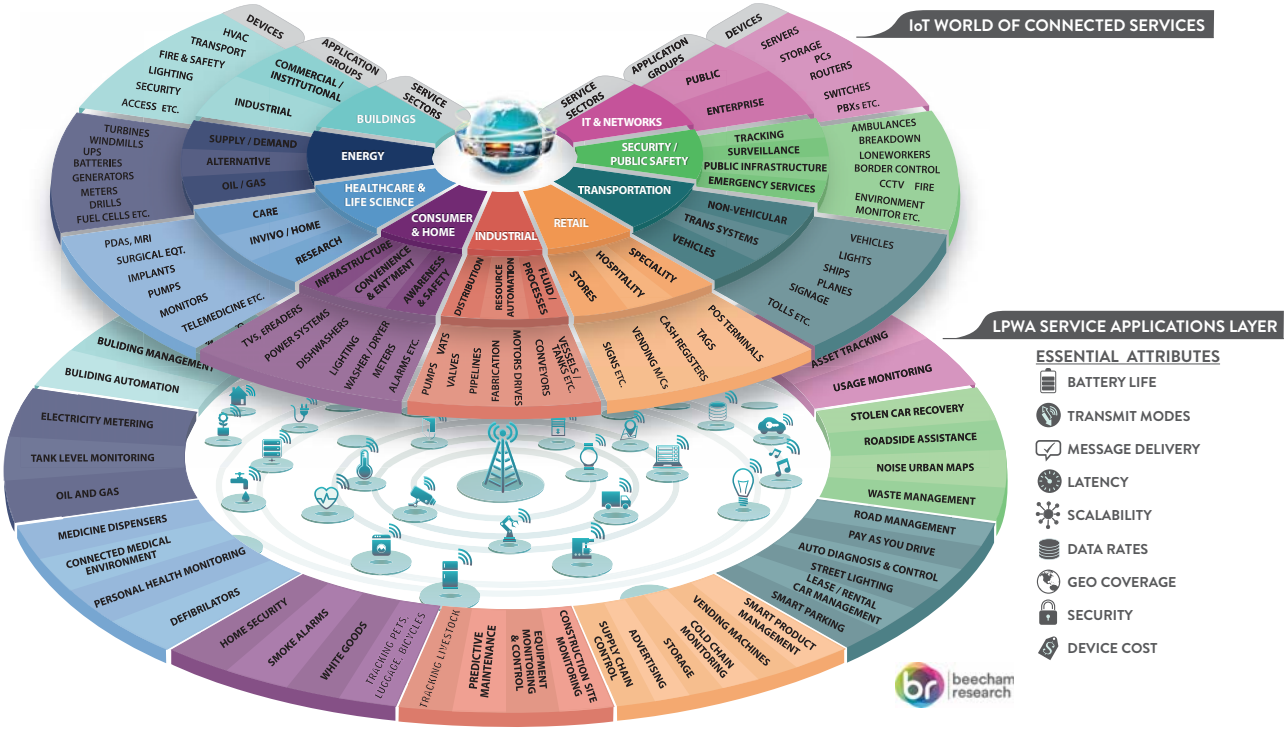

Figure 4: LPWA applications as part of overall IoT market

introduction of LPWA and this will be particularly attractive to OEMs. The remaining issue is then whether these will use licensed or unlicensed spectrum LPWA connectivity types. It is outside the scope of this report to compare the opportunities for these various technologies, but cellular versions of LPWA (including NB-IoT and LTE-M) have several particular advantages. For example, because they utilize existing cellular networks, over the next year or so they will rapidly become available in many countries globally wherever 4G networks have been deployed. As a result, mobile applications involving roaming can be supported and also those requiring low latency. The transmissions are also highly secure and network quality is guaranteed due to being on restricted licensed spectrum. A further factor is that this technology is future proofed to 5G, ensuring it will be around for a long time with a widely established ecosystem with many suppliers. These developments point to the combination of eUICC and cellular LPWA being particularly attractive options for OEMs. These are looking to deploy products with small form factors that require very low battery usage over many years, using wide area wireless connectivity. They are also looking for the proven reliability and resilience offered by cellular networks at low cost.

Untapped Market of New Application Opportunities

What sort of applications does this enable? In **Figure 4**, Beecham Research's traditional chart illustrating applications across 9 sectors in the IoT World of Connected Services has been expanded to show a new layer of applications enabled through the use of LPWA technologies such as NB-IoT and LTE-M. The essential attributes for deciding which of the LPWA technologies is most appropriate for any particular application are listed on the right – battery life required, transmit mode required (one-way or two-way) and others required including latency, data rate, security and – perhaps most importantly – target device cost.

While not all of the applications shown in the LPWA Service Applications Layer are tracking related, there are many that are. For example, in the Buildings sector, this includes in-building ▶

tracking of people and assets as well as moving infrastructure like lifts and escalators. In the Energy sector, it includes monitoring field staff who may be in hazardous environments. In Healthcare, it includes personal health monitoring, tracking social care staff and assets that are frequently moved – such as defibrillators. The Consumer/Home sector includes a wide variety of tracking requirements such as for pets, but also for luggage and even bicycles. Tracking is of course essential for bicycle sharing schemes that may be community based or commercial services, which are usually city-wide. The Industrial sector includes Agriculture, where accurate and low cost livestock tracking has been sought for many years. The sector also includes all aspects of warehouse management, for example tracking of mobile assets like forklift trucks. The other sectors – Retail, Transportation, Security/Public Safety, IT & Networks – all have examples where tracking and tracing applications are required.

The main point from this is that tracking/tracing of mobile assets has a very broad addressable market that includes all IoT sectors, not just one or two like the Transportation sector for example. As such it represents a substantial opportunity for OEMs that is being further enabled using cellular LPWA and eUICC technologies.

Example Applications in Use

With cellular LPWA technologies just being introduced to networks, there are not yet many examples of those technologies being used. Outside of the auto sector, there are also few examples for eUICC, However, two examples are as follows:

Introduced in Barcelona, Spain, and now operating in Madrid and Bordeaux, France, Yugo Scooters is an electric scooter sharing service accessed via a smartphone app. Yugo can be parked anywhere in these cities and require no key – the scooters are started with the smartphone app. An eUICC solution ensures mission critical, real-time, low latency connectivity; users must know where they can locate a scooter and where they can charge it – before running out of battery charge. The ▶

solution also reduces incidents of fraud and theft since the eUICCs cannot be removed.

In-Car Cleverness is a subsidiary of Accident Exchange Ltd, which "has worked with vehicle manufacturers, leading contract hire and leasing companies and automotive dealers" since 2002 to "help them improve and develop innovative customer service strategies." Based in Birmingham, UK, and operating in the UK and Europe, In-Car Cleverness offers a range of telematics solutions that benefit its various customers, whether in connecting drivers with professional support personnel or with the companies they lease their vehicles from; those companies benefit from improved customer relations and the efficiency and cost savings advantages of fleet management.

Mobile asset tracking examples are more numerous and these are expected to increase sharply as LPWA and eUICC technologies are incorporated. Offender tracking and monitoring is one example. Omnilink (acquired by Numerex in 2014, Numerex acquired by Sierra Wireless in 2017) has offered offender monitoring services since 2004. One customer, The Charlotte-Mecklenburg Police Department (CMPD) in the city of Charlotte and Mecklenburg County in North Carolina, uses an Omnilink solution to monitor about 400 offenders – on probation, out on bail, etc. -- on a daily basis. An ankle bracelet collects location points for each offender and uploads the location data to a software application, enabling members of the CMPD Electronic Monitoring Unit to track hundreds of offenders 24/7. The total cost per offender is less than $5 per day, much less than attempting to monitor offenders manually, while greatly reducing crimes that had been committed by offenders prior to adoption of electronic monitoring.

Trailer tracking is a traditional low data rate cellular tracking application that will benefit from newer LPWA technologies. At its most basic level, it allows operators to know where their trailers are, enabling optimization and efficiencies as part of larger logistics and supply chain systems, while also reducing theft-related losses.

A further example is pallets used for shipping purposes. The majority of the world's 10 billion shipping pallets are made of wood, but a growing percentage are made of plastic and are more valuable and reusable. There are already examples of these types of pallets being tracked using a range of technologies but LPWA raises the prospect of dramatically increasing the addressable market at low cost. ■

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IoT NOW ANALYST REPORT

IoT SECURITY

Why securing IoT devices demands comprehensive and strategic commitment

Analyst Report
Prepared by

beecham research

Shaping the IoT future

Security in IoT devices relies on sustained, pervasive attention to detail across the entire threat surface

Robin Duke-Woolley,
CEO, **Beecham Research**

Cyber-threats are growing every day and what traditionally was seen as a data protection issue in the IT domain is becoming an increasing reality in the machine-to-machine (M2M) domain. Compounding this rise in capability is the rapid growth of the Internet of Things (IoT), writes Robin Duke-Woolley, the chief executive of Beecham Research. In this fast moving market we are becoming increasingly connected, whether through cellular, Wi-Fi, bespoke wireless or other connections. This interconnection inherently creates a massive expansion in the attack surface available to hackers. Couple this with new devices being rapidly developed and deployed to market, with all of the inherent code issues and bugs in new products and there is a golden opportunity for attackers

Traditionally, control and monitoring systems were isolated or of limited interest to attackers. Today we are moving to a place where smart meters enable utilities to monitor, and ultimately control or kill, power to a house, potentially enabling a burglar to either monitor if a family is at home or on vacation, or maybe even switching off the electricity prior to committing a robbery. We are seeing smart white goods developed with good intentions to allow smoothing out of electrical peaks on the power grid, but which again could be used to build up a picture of an individual's habits or movement. And, of course, we are seeing the creation of complex industrial control systems that have been compromised through a variety of attacks. In other words, the capability to attack M2M systems has expanded at the same time as the value of such an attack is increasing and has been demonstrated.

With the move from strongly and simply architected M2M systems to more fluid IoT solutions this attack surface, and the realistic ability to do significant harm, is set to accelerate. This means it is very important that the industry as a whole joins together to architect the IoT for security from the ground up to ensure the right frameworks are in place. This must ensure innovation and security is implemented without the need for massive and expensive layers of software and services that are ultimately debilitating to the usability and economics of the IoT solutions.

All IoT stakeholders have a part to play

The security issues are systemic and ultimately rely on all stakeholders working together.

- End users must develop the capability to measure and manage risk, enabling ▶

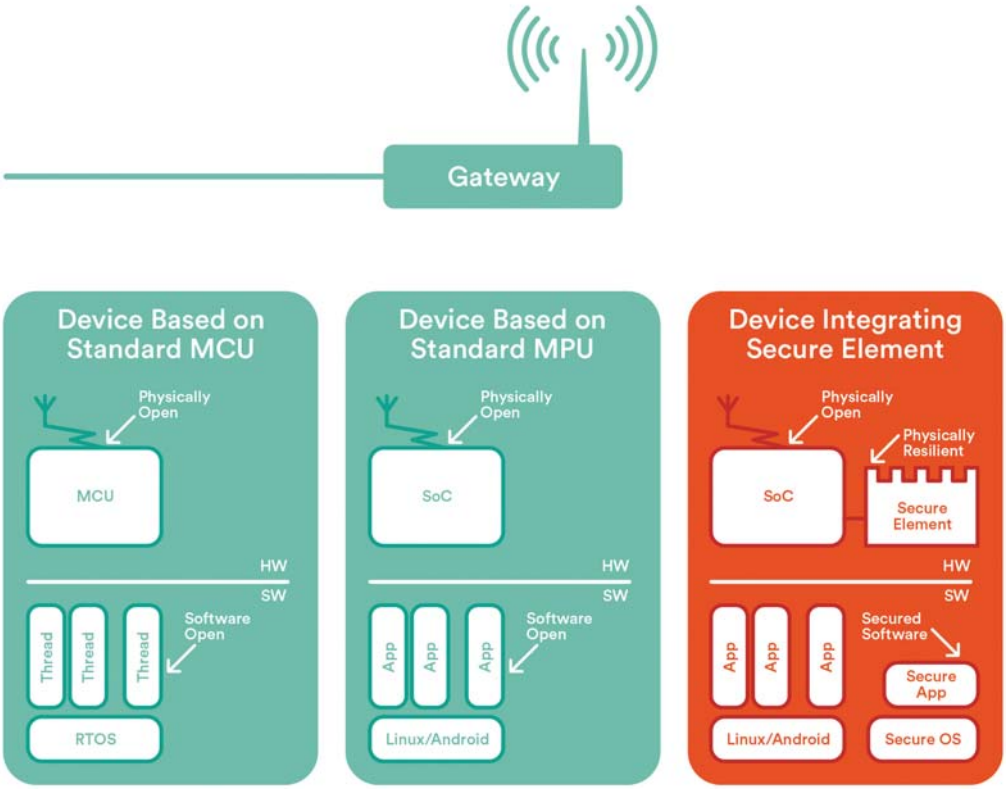

Figure 1: Existing IoT device classifications

them both to manage their long-term business and to enable formal liabilities to be assessed.

- System integrators must be able to build, test and certify systems against current and future unknown attacks. System integrators must assume responsibility for consumption of complex technologies for multiple vendors and need to balance security inside a system architecture.
- Original equipment manufacturers (OEMs) need to design better devices to reduce system integration issues and software complexity. Devices must include relevant security features including next generation anti-malware solutions and policy management capabilities.
- Silicon vendors must ultimately put in place the fundamental building blocks to strongly root security and enable functionality in an easily consumable framework. Security will always be device and use-case specific and will vary in capability across secure elements (SIM-type devices), smart sensors, microcontrollers and microprocessor/system on chip (SoC) devices found in gateways and networking applications.

To enable a safe, secure and robust IoT it is critical that security is achieved from end-to-end, from the servers and cloud services that are subject to traditional IT security measures all the way to the vast number of edge nodes that will evolve over the next decade.

To achieve the level of security required, an evolution in the capability of most devices is needed to deliver robust architectures that maintain simplicity for the user.

The silicon level

IoT will continue to be defined by a vast array of different solutions, varying from extremely low cost to extremely complex devices, and from single remote nodes through to autonomous mesh networks. As such there is no single answer for what a device should look like. Instead, it is useful to explore the security challenges within IoT through three existing processor hardware categories:

1. Secure element
2. Secure microcontroller
3. Secure microprocessor

1. Secure elements

These devices are at the forefront of many M2M systems as embedded subscriber identification modules (eSIMS) in connected cars, new smart meters and other areas.

- **Strength:** IoT secure elements inherently utilise security features designed for mobile SIMs, and therefore can easily meet the basic IoT security certification requirements. Today, the secure element is the favoured approach to embedding security within devices either as a traditional SIM or an embedded SIM.
- **Weakness:** Secure elements typically have strictly limited functionality and are therefore useful for creating a trusted point within a system. However, the target application, such as monitoring and control, must exist on a separate processor increasing costs and reducing system security. ▶

2. Secure microcontroller

Microcontrollers (MCU) are the traditional workhorses of the IoT offering relatively low cost and fast time-to-market with strong tools ecosystems and high levels of ease of use. However, MCUs have not traditionally been designed with a robust root of trust and security in mind, and as cyber-threats grow vendors are needing to react to this requirement.

Some vendors, especially of 32-bit MCU devices, have introduced some security requirements. For example, many vendors now include cryptographic accelerators, such as advanced encryption standard or secure hash algorithm (AES/SHA), and some include special tamper-resistant pins on the microcontroller to detect if the device's external box has been compromised. However, these devices are still open to significant attacks and could represent vulnerable points to inject viruses or compromises to systems.

- **Strength:** The vast array of microcontrollers, and their ability to easily integrate cyber-physical requirements through their specialist interfaces, makes MCUs the mainstream platform for IoT nodes.
- **Weakness:** The limited security capabilities of microcontrollers are the biggest limitation of these devices within the IoT domain. While more and more MCUs are integrating encryption and decryption capabilities, there is little standard behaviour beyond that to secure the system against the growing cyber risks.

3. Secure microprocessor

The cost of high performance microprocessors continues to fall as strong competitive pressures and oversupply impact the mobile handset marketplace. Devices that traditionally cost more than US$20 are now retailing at an entry level of sub-US$5 in volume, delivering unprecedented price to performance ratios.

The positive impact of price-constrained microprocessors (MPUs) is that many more of these devices can be deployed into a wide array of M2M and IoT devices ranging from the traditional router or gateway down to relatively inexpensive edge devices. Indeed, many of the pioneering, mainstream IoT devices such as the Nest Thermostat are based on such microprocessors.

The nature of these MPUs is that they have traditionally been designed to run rich operating systems, such as Android, Linux and Windows, which offer great flexibility but a limited approach to security based on memory management unit (MMU), and virtualisation to create application sandboxes.

For additional strength against advanced and persistent threats, some processor vendors have added specific processors to their SoCs, either with complete fully ▶

fledged processors with complete memory systems, or via virtual processors, one of the most well-known of which is Arm's TrustZone technology.

The advanced process geometry and cost of large SoCs have meant these devices tend to have limited on-chip storage memory, with execution random access memory (RAM) on device and off-chip flash supporting execution code. This approach, while cost efficient, does lead to a requirement for specific secure boot processes, and the use of secure elements for critical control points or data.

- **Strength:** The wide array of performance points and modern vendors of SoC type devices has led to a rich variety of chips that can be utilised widely. While the majority of devices utilised in IoT were originally conceived for mobile type applications there is a good synergy in terms of cost, power and ability to execute many applications.

Further integration of some security technologies has led to the emergence of a small but robust ecosystem of software vendors which support the specific requirements of security via the Arm TrustZone or Intel SGX platforms.

- **Weakness:** Microprocessors were never envisioned to be running the mixture of very secure code or data alongside rich open operating systems. This mix has led to attacks where malware apps can interact with, or intercept, critical applications such as banking or secure login, and further creates strong business issues for applications such as bring your own device (BYOD) where malware may impact critical data services or steal trade secrets.

  Additional issues come about in the cases of managing devices or biometric data types. For example, to manage a handset under a subscription agreement there is the need to introduce a separate SIM device to hold the certificates and applications that bind the phone to the network. Similarly, with biometric fingerprints there are major privacy issues relating to any leakage of these, since we only have ten fingerprints each. To solve these security challenges requires a physically tamper-resistant store for the data, something which is not only immune to software attacks, but is also highly resistant to physical probing.

Hardware-based security is essential

Building trust between IoT devices is the first step in a holistic strategy. IoT devices need strong protection for tamper-resistance. This degree of protection cannot be provided by software alone – it needs hardware-based security at the level of the three processor hardware categories outlined above.

It is important that the cost of security is as small as possible to provide lightweight solutions and to limit unaffordable impacts on the end device and service costs. To achieve this, the fundamental silicon chips and underlying intellectual property must contribute strong security features that can be exposed upwards to OEMs and system integrators.

Many critical devices need to be serviceable for ten to 20 years. These include delivering upgrades and patches remotely, support of anti-malware over long timescales, and general support of devices over a longer period than traditionally experienced, all of which require substantial security frameworks to be implemented.

Vendors must be able to demonstrate that their device operates correctly via industry- or self-certification and prove that the device was protected against reprogramming or wilful misuse. In both cases this requires protection of core functionality and proof that the device is protected, both ultimately relying on a robust security foundation. ▶

What does this all mean?

These and other issues arising from our research lead to the following being some of the key pointers towards an IoT security strategy:

1. Security is fundamental in enabling all of the value of the system, device or gadget to be realized. It should not be viewed as a cost burden – it is a value enabler. This means that a security solution should be optimised for IoT devices and use cases and assist in overcoming typical business and operational challenges.

2. Security must become a number one priority to be integrated from the beginning – it must be designed-in from the start. It cannot be added later as an afterthought.

3. Building trust between IoT devices is the first step in a holistic strategy. IoT devices need strong protection for tamper-resistance. This degree of protection cannot be provided by software alone – it needs hardware-based security.

4. Consistent with this, it is important that the cost of security be as small as possible to provide lightweight solutions and to limit unaffordable impacts on the end device and service costs. To achieve this, the fundamental silicon chips and underlying intellectual property must contribute strong security features that can be exposed upwards to OEMs and systems integrators.

5. Many critical devices need to be serviceable for ten to 20 years. These include delivering upgrades and patches remotely, support of anti-malware over long timescales, and general support of devices over a longer period than traditionally experienced, all of which require substantial security frameworks to be implemented.

6. Vendors must be able to demonstrate that their device operates correctly via industry- or self-certification and prove that the device was protected against reprogramming or wilful misuse. In both cases this requires protection of core functionality and proof that the device is protected, both ultimately relying on a robust security foundation. ■

MWC19 changes name to reflect it's now more than mobile

MWC Barcelona 2019 introduces a new name and new themes as it returns to the Fira Gran Via, Barcelona, Spain on 25-28 February 2019. Here, IoT Now previews the event

As the mobile industry has evolved, Mobile World Congress has become more than mobile. We are rapidly moving to a world where mobile will connect everyone and everything, but at the same time, we are expanding our reach beyond mobile. In order to accurately reflect this new era, beginning in 2019, Mobile World Congress will be referred to as MWC19 Barcelona. The new event brand retains the familiar acronym, while placing less emphasis on mobile to reflect the broadening scope of communications today.

The theme of this year's event is Intelligent Connectivity - the term the organisers, GSMA, use to describe the powerful combination of flexible, high-speed 5G networks, the Internet of Things (IoT), artificial intelligence (AI) and big data. Intelligent connectivity marks the beginning of a new era defined by highly contextualised and personalised experiences, delivered as and when you want them. This is the future of our industry and our world, says the organisation.

"We have an amazing show lined up for February, with more than 2,400 companies participating across the exhibition, four days of conference programming and so many other events and activities taking place at MWC19," said Michael O'Hara, the chief marketing officer of GSMA. "With in-depth examination of topics such as 5G, artificial intelligence, Internet of Things, content, security and many others, MWC Barcelona, now more than ever, is the must-attend industry event."

Executives scheduled to headline the four-day Barcelona conference programme include:

- **Vivian Chan**, CEO and co-founder, Sparrho
- **James Forese**, president, Citi
- **Dave Grannan**, co-founder and CEO, Light
- **Mats Granryd**, director general, GSMA
- **Ping Guo**, rotating chairman, Huawei
- **Chang-Gyu Hwang**, chairman and CEO, KT Corporation
- **Anastasia Leng**, founder and CEO, Picasso Labs
- **Blythe Masters**, CEO, Digital Asset Holdings
- **Nick Read**, chief executive officer-designate, Vodafone Group
- **Stéphane Richard**, chairman and CEO, Orange
- **Simon Segars**, CEO, ARM
- **Anjali Sud**, CEO, Vimeo
- **Cher Wang**, founder and CEO, HTC
- **Rich Williams**, CEO, Groupon

MWC19 Barcelona will bring together leading players from across the mobile ecosystem, as well as adjacent industry sectors such as automotive and consumer electronics, showcasing the latest technologies, products and services. More than 2,400 companies will participate at MWC19, including major brands such as Accenture, Alibaba Cloud, ARM, AT&T, BMW, Cisco Systems, Deutsche Telekom, Ericsson, Facebook, Google, HTC, Huawei, Intel, Lenovo, LG, Mercedes-Benz, Microsoft, NTT DOCOMO, Nokia Solutions and Networks, Ooredoo, Oracle, Orange, Qualcomm Incorporated, SAP, SEAT, SK Telecom, Telefónica, Verizon, Vodafone, Xiaomi and ZTE. The show floor will also include more than 40 country and regional pavilions. **www.mwcbarcelona.com**

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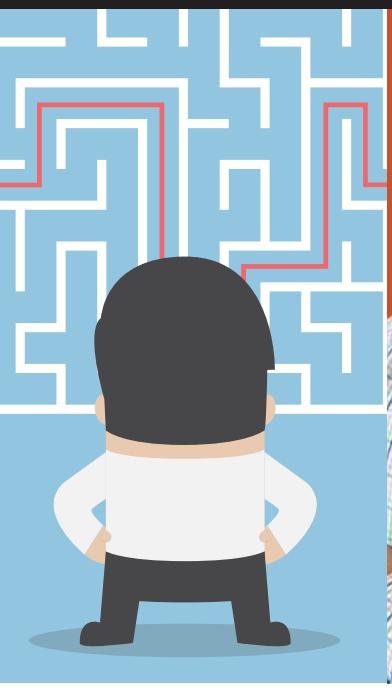
Asset Tracking



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Asset Monitoring

TRANSPORT360
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IN THIS ISSUE

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Is data the transport sector's most precious cargo?

The most successful carriers and hauliers have long since learned to optimise their services by tracking their assets online. As my Antipodean friends would say, that's a statement of the Bleedin' Obvious. But it is clearer to the industry now that there is much more that they could do to enhance their quality of service and with it their bottom line.

As Annie Turner, editor of **IoTNowTransport.com**, reports on pages 72-73, "often companies opt for asset tracking primarily to fix the first issue – knowing where their assets are — with little if any thought about how they could get the much greater benefits of the subsequent phases, and potentially at incremental cost. This is partly because for many organisations, this is new territory and they do not grasp the scope of asset tracking in the first place nor how it could support wider asset management, and much else." Worryingly, she adds, "Data is a by-product of their business activities, rather than something of huge intrinsic value in its own right."

I found a similar story when interviewing **KORE**'s William Sandoval (see pages 68-69). Asset monitoring doesn't just mean using vehicle diagnostics to record tyre tread, fuel consumption, mileage, engine function, and maintenance schedule – valuable as these data are. It means a single cloud-based application can enable the fleet manager to predict more accurately when services may be required, thereby planning maintenance in quieter times and avoiding failures that are costly in profits and reputation.

Furthermore, it strengthens Just-in-Time Delivery through route optimisation, and cuts costs by better management of human and hardware resources and by accurately analysing shipping capacity. As we can see in **Berg Insight**'s report on page 60, demand for these skills will only expand as the number of IoT-connected endpoints grows exponentially. Big Data is no use at all if it doesn't give you insights into your business.

We hope you enjoy Transport360.

Jeremy Cowan,
editorial director, Transport360

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Micron collaborates with BMW to advance automotive memory technologies

Micron Technology, Inc., a provider of memory and storage solutions, is to collaborate with BMW Group to advance the development of automotive memory solutions used in vehicles.

Memory and storage are key components in accelerating the intelligence and user experience of next-generation systems in vehicles, including in-cabin infotainment as well as advanced driver-assistance systems (ADAS) technology, which together play an important role in making self-driving autonomous cars a reality.

Micron and the BMW Group will intensify their existing efforts toward testing and development of automotive memory solutions at Micron's state-of-the-art lab in Munich, Germany. Using the Test Automation Framework of the BMW Group as a car emulator platform, the two companies will work together to define and validate memory and storage solutions for next-generation platforms.

The collaborative effort will leverage Micron's memory and storage technology expertise, along with its broad portfolio of DRAM, NAND, and NOR technologies, including LPDRAM, e.MMC, UFS and SSD storage solutions.

Formula E tech partnership expanded for season 5 by Renesas Electronics and Mahindra Racing

Semiconductor solutions provider, Renesas Electronics Corporation, is expanding its technology partnership with Mahindra & Mahindra, Ltd in the development of electric vehicles (EVs), and with Mahindra Racing, one of the 10 founding teams competing in the ABB FIA Formula E Championship for the 2018-19 season.

The team is collaborating on system-level design upgrades featuring the Renesas RH850/E2x microcontroller (MCU), designed for the robust requirements of powertrain systems, and Renesas' automotive battery management ICs. For Season 5, Renesas took a module-level approach to the proof of concept design, developing an electronic control unit including PCB design, schematics, software, and modular-level testing.

The upgrades will deliver significant processing power improvements and an improved safety system for the low-voltage battery. The ABB FIA Formula E Season 5 starts with the Saudia Ad Diriyah E-Prix in Riyadh on December 15, 2018 and runs through to July 14, 2019 at the New York City E-Prix.

UK to open smart city mobility centre

A new Smart City Mobility Centre is to be opened in the UK's West Midlands region, to create driverless and electric vehicle technology. It is part of a multi-million-pound pilot scheme to support smart cities by reducing congestion, emissions and traffic accidents.

The centre will prototype new vehicles and systems that its backers hope will "transform UK transport", bringing together expertise and research from the Warwick Manufacturing Group (WMG), part of at the University of Warwick, and Jaguar Land Rover.

Backers are also claiming, "It will be Europe's most extensive and significant integration of technology research projects at such a scale. Combining the very latest research, transport data, infrastructure, and vehicle prototyping".

Jaguar Land Rover engineers and WMG researchers will work together at Wellesbourne to design and engineer connected, driverless capable, prototype electric modular architectures. These will be tested in real world conditions alongside a specially designed 5G communications network on the University of Warwick's main campus.

Investment of US$2.6bn in insurtech forces companies to evolve quickly

The Insurtech M&A Market Report from international technology mergers and acquisitions advisors, Hampleton Partners, reveals that 2018 global fundraising for insurance technology start-ups has already reached an all-time high in volume with 204 deals and transaction values of $2.6bn, close to the 2015 peak of $2.7bn.

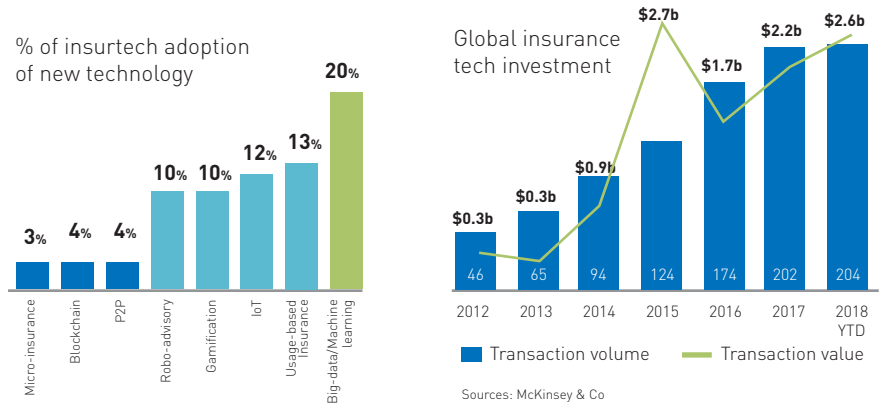
Since 2016 the insurtech sector has reported 151 transactions, with 22 buyers making more than one acquisition. Strategic buyers, such as insurance enterprise software company Sapiens International and insurtech Charles Taylor, are in the driving seat with 87% of all transactions, versus private equity's 13%, says Hampleton.

Miro Parizek, founder, Hampleton Partners, says: "There's an army of insurtech start-ups which are challenging legacy players and the market has adopted a survival of the fittest environment. Since organic growth and investing in R&D is a long-term game, M&A has been the natural solution to the incumbents' problem of accelerating technological transformation and evolving their traditional business models for the 21st century."

One key example of an insurance giant innovating via M&A is Zurich International which bought Bright Box and its AI-first, connected car platform Remoto. Zurich Insurance Group is working with data gathered by its connected car technology to develop personalised auto insurance and services.

Parizek concludes, "Next-generation insurance is having to evolve quickly with new business models and a greater focus on technology innovation. Insurtechs have become a natural threat to incumbents, but also potential valuable partners in this changing landscape. It's a sector that's growing rapidly and stands to capture a meaningful share of the value pools within a few years. How quickly incumbents adapt to these inexorable market changes will determine the size of their share in the next generation of the insurance industry."

InsurTech M&A Adoption & Investment - 2H 2018



Sources: McKinsey & Co

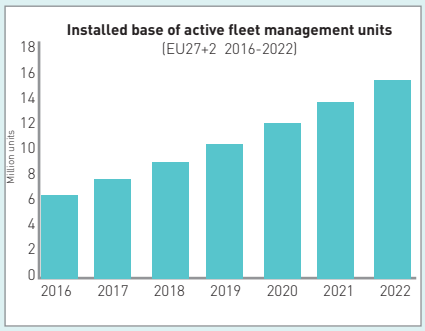
Healthy growth in European fleet management solution market

IoT analyst firm Berg Insight has again taken the temperature of the European fleet management market. Numerous interviews with the leading market players have shown that the number of active fleet management systems deployed in commercial vehicle fleets in Europe was 7.7 million in Q4-2017. Growing at a compound annual growth rate (CAGR) of 15.2%, this number is expected to reach 15.6 million by 2022.

The top 15 vendors have today more than 100,000 active units in Europe. TomTom's subscriber base has grown both organically and by acquisitions during the past years and the company is the clear market leader on the European market and reached an installed base of about 708,000 units at year-end 2017. Masternaut is still in second place and had achieved an installed base of an estimated 250,000 units. Berg Insight ranks Verizon Connect as the third largest player in terms of active installed base with around 235,000 units. ABAX, Microlise, Gurtam, Viasat, Bornemann, Teletrac Navman, Trimble, Transics and OCEAN (Orange) also have more than 100,000 active devices in the field.

All major truck manufacturers on the European market offer OEM telematics solutions as a part of their product portfolio. Mercedes-Benz, Volvo and Scania launched their first products in the 1990s followed by MAN in 2000, Renault Trucks in 2004, DAF Trucks in 2006 and Iveco in 2008. A major trend in the past years has been the announcements of standard line fitment of fleet management solutions. Since the end of 2011, Scania has been rolling out the Scania Communicator as standard on all European markets and includes a 10-year basic service subscription.

The new generation of the Actros trucks from Mercedes-Benz contains the FleetBoard vehicle computer as standard in all EU28 countries. Volvo offers Dynafleet as standard in Europe. New MAN trucks are now equipped with RIO as standard replacing MAN TeleMatics. DAF launched its new optional DAF Connect that has been developed in-house in September 2016. The leading OEMs in Europe are Scania, Volvo and Daimler with 219,000, 117,000 and 108,000 active FM subscribers respectively at the end of 2017.



Infineon acquires silicon carbide specialist Siltectra for €124mn

Infineon Technologies AG has acquired Siltectra GmbH, a start-up based in Dresden. The start-up has developed an innovative technology (Cold Split) to process crystal material efficiently and with minimal loss of material. Infineon will use the Cold Split technology to split silicon carbide (SiC) wafers, thus doubling the number of chips out of one wafer. A purchase price of €124 million was agreed on with the venture capital investor MIG Fonds, the main shareholder.

"This acquisition will help us expand our excellent portfolio with the new material silicon carbide as well. Our system understanding and our unique know how on thin wafer technology will be ideally complemented by the Cold Split technology and the innovative capacity of Siltectra," said Dr. Reinhard Ploss, CEO of Infineon. "Thanks to the Cold Split technology, the higher number of SiC wafers will make the ramp-up of our SiC products much easier, especially regarding further expansion of renewable energies and the increasing adaptation of SiC for use in the drive train of electrical vehicles."

Dr. Jan Richter, CTO of Siltectra: "We are glad to become part of the team of the global market leader in power semiconductors. Having shown that the Cold Split technology can be used at Infineon in principle, we will now work together to transfer it to volume production."

Ericsson, Einride and Telia use 5G to connect sustainable, self-driving trucks

Einride, Ericsson and Telia are putting 5G into motion at a DB Schenker facility in Jönköping, Sweden. The goal is to power an all-electric, autonomous transport ecosystem. Ericsson Radio System and Ericsson Cloud Core for 5G are providing high performance connectivity to Einride's T-pod – a driverless vehicle operating continuously at DB Schenker's logistics facilities in Jönköping, Sweden.

Robert Falck, CEO and founder of Einride, says: "Our driving mission is to lead the sustainable transition of road freight transportation. 5G provides the connectivity and reliability we need to safely introduce the T-pod onto public roads, paving the way for a 90% reduction in CO2 emissions and the elimination of nitrogen oxide (NOx) emissions."

Ewald Kaiser, chief operating officer, DB Schenker, adds: "This pilot is a milestone in the transition to an intelligent transportation system which will be safe, cost-efficient and sustainable. Autonomous, all-electric trucks on public roads is not a dream any more – it's happening right now. Thanks to our partnership with Einride, and connectivity through Ericsson and Telia, we are at the forefront of this great transition."

"5G is a very exciting technology that will enable new sustainable business opportunities and create customer value," according to Mats Lundbäck, chief technology officer, Telia Sweden. "Together with our partners, we are building a powerful ecosystem that is going to have a deep impact for customers and society as a whole."

Speaking for Ericsson, Åsa Tamsons, head of business area technologies & new businesses, says: "There is a paradigm shift going on in the transport industry. 5G, with its high-data speeds and ultra-low latency, is powering a new world of autonomous vehicles that takes fleet management to the next level. Einride's transportation solution is a perfect example of how 5G can drive cost efficiencies, improve safety, and create a sustainable future."

The partners believe the high-capacity and low-latency characteristics of 5G will be cornerstones of future transport solutions. Einride's T-pod and autonomous transport system, powered by 5G, can potentially replace more than 60% of today's transport with a cost-competitive and sustainable alternative. An Ericsson report on 5G business potential shows a US$619 billion revenue opportunity for telecom operators by 2026.

Ericsson, Einride and Telia power sustainable, self-driving trucks with 5G

Field service solution launched with business intelligence, IoT reporting and predictive maintenance capabilities


Mary Hunter

Columbus, a global digital business services provider, has launched an end-to-end intelligent field service solution that utilises the full Dynamics 365 platform. This includes seamless integration between Dynamics 365 for field service and IoT sensor reporting, predictive maintenance and advanced business intelligence to enable customers to make real-time, data-driven decisions on operations. Completing the field service scenario is Dynamics 365 Remote Assist, the mixed reality heads-up display technology delivered via HoloLens devices.

Columbus has drawn on over 25 years of manufacturing industry experience to develop the new solution, which enables medium and large enterprises to quickly adopt and leverage emerging technologies to take full advantage of digital disruption and develop a competitive advantage. The Columbus Field Service offering introduces greater operational visibility by connecting the entire service supply chain to deliver a personalised, customer-focused experience and reduce operational costs.

For organisations looking to tailor a field service solution around existing systems, Columbus also integrates out-of-the-box with Dynamics 365 Finance and Operations to optimise additional processes such as work orders and invoicing.

By consolidating data streams to provide businesses with a holistic view of operational performance, the solution helps boost scheduling efficiency, first time fix rate, engineer punctuality, on-site productivity and engineer billable time, while enabling engineers to identify more opportunities to cross-sell and up-sell services and products.

Mary Hunter, managing director at Columbus UK, says: "As customers become increasingly connected, businesses must evolve accordingly to maintain a high level of service and meet rising expectations. Columbus helps organisations such as Orangebox, Handicare, and Capital Solutions add value to their businesses and support a customer-centric experience. The new Columbus Field Service solution extends this ability even further to introduce greater business intelligence, end-to-end business process automation and drive cost efficiencies."

Important wins for Intel in fleet safety and automation

Intel is aiming to grow significant alternative revenues to its traditional semiconductor business, not least in autonomous driving, as *Antony Savvas* reports.

If you want to get attention when it comes to technology deployments then what better way than getting the solution used in big red iconic London buses. With so many of them travelling on the UK capital's busy roads, anything to help them safely round their long routes is welcome. So, in steps Intel for a major trial of its safety technology Mobileye. The trial is supported by Transport for London (TfL) through a grant from its Bus Safety Innovation Fund.

Collisions

Bus company Abellio is conducting the trial. It operates 48 bus routes across London using more than 740 vehicles. For the trial, 66 buses on three of the company's routes have been equipped with Mobileye collision avoidance technology – each having a camera unit installed on the inside of the windshield and a display placed in the driver's cab. The final results of the trial should be available by the end of this year.

Focused on reducing bus collisions with cyclists, motorcycles, pedestrians and other road users, the trial's findings to date show the Mobileye technology has reduced avoidable collisions – those which are in the driver's control to prevent – by 29%, and reduced injuries from such collisions that have taken place by 60%.

Mobileye, of course, is also being used by autonomous test vehicles on many less busy roads in the US, so putting it up against a busy road network in London is a real test. While this trial does not involve the autonomous driving seen in California, one wonders whether we'll see bus drivers assisted by such technology in the future?

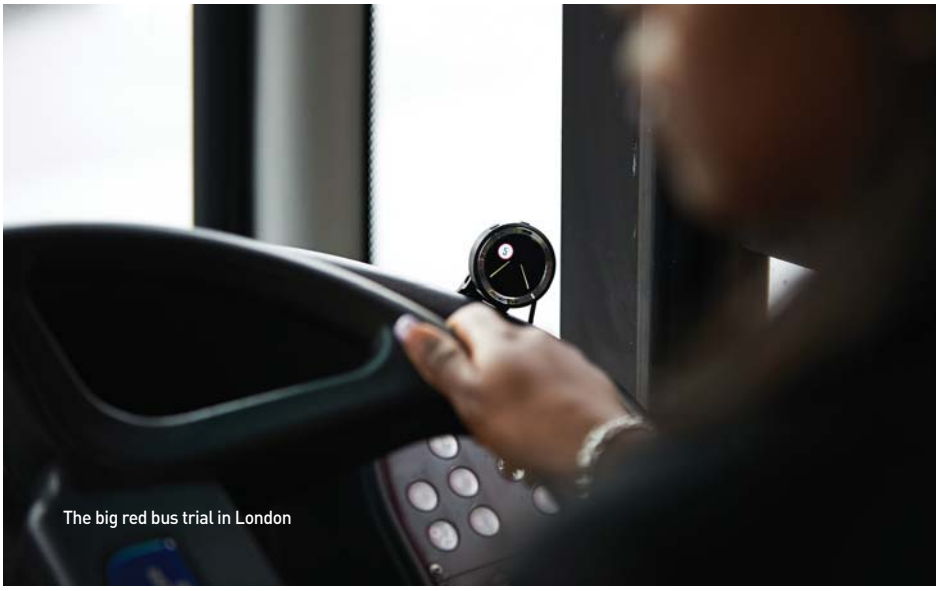
Gil Ayalon, director of EMEA, Mobileye

Safety automation

What they are already using on the London buses includes collision warnings and headway warnings if the distance between the bus and a vehicle ahead becomes unsafe. The system also monitors lane markings and warns drivers of unintentional lane deviation. In addition, it recognises and reads speed limit signs and warns drivers when they are exceeding them.

Gil Ayalon, director of EMEA at Mobileye, said: "Abellio takes safety very seriously, and they've been a superb partner, helping their drivers get the very best out of the system."

The US Department of Transportation's Federal Motor Carrier Safety Administration says an estimated 119,000 injury-causing crashes involving large trucks or buses occurred in 2016 in the US. And with 4,440 large trucks and buses involved in fatal crashes during that same year, the sooner the industry gets this type of technology through trials the better.



The big red bus trial in London

Mobileye and VW deploy Israel's first autonomous EV ride-hailing service

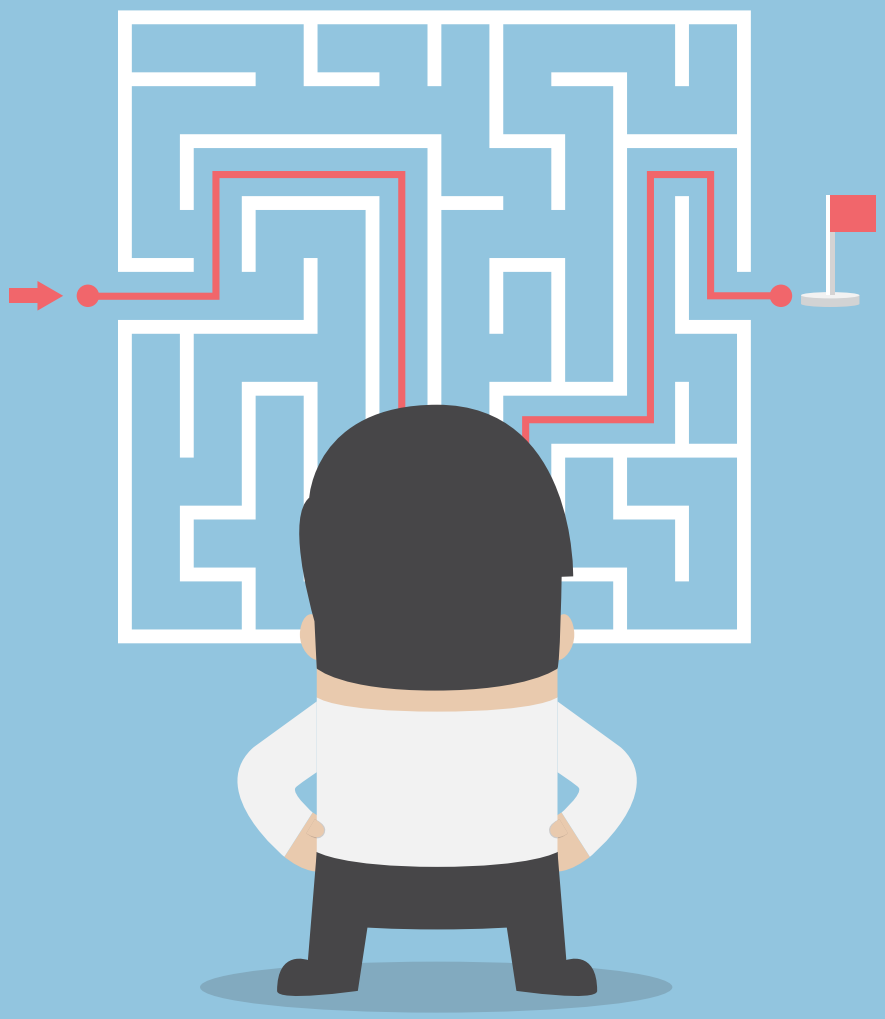
In another potential seal of approval for its solution, says *Antony Savvas*, Mobileye has joined forces with Volkswagen and its local distributor Champion Motors to deploy the first autonomous electric vehicle (EV) ride-hailing service in Israel.

The commercial mobility-as-a-service (MaaS) effort will see Mobileye provide a full turn-key hardware and software self-driving system validated for level-4, driverless capability. Champion Motors will be responsible for fleet logistics and infrastructure of the MaaS deployment.

The Israeli government has backed the project, with development beginning in early 2019 and roll-out in phases reaching full commercialisation in 2022. The New Mobility in Israel joint venture and the government support it will receive, will be extended to other players coming into the market with their own services, said the Israeli government.

Volkswagen, Mobileye and Champion Motors said they will use the venture as a "global beta site" for testing the MaaS model. In Israel, they will start with "several dozen" vehicles and scale to "hundreds" of self-driving electric vehicles, they said.

"We firmly believe that self-driving electric vehicles will offer Israel and cities around the world safe, clean and emission-free mobility, which is accessible and convenient," said Herbert Diess, CEO of the Volkswagen Group.



Start with a business problem to build an asset-tracking strategy

Annie Turner explores why companies need asset tracking (beyond the immediately obvious), where to start and how to plan to get to where you need to go.

Annie Turner

You can't make use of assets if you don't know where they are. You can't make proper use of assets if you know where they are but not the state they are in or their proximity to other assets with which they need to be deployed — and the state those other assets are in.

You can't make effective use of assets without being able to predict accurately how many will be off the road or rail, or out of the warehouse or off the dock or airport apron when and for how long — whether the reason is for maintenance, modification or repair, to comply with regulation, because they've been stolen or reached the end of their life.

You can't make full use of assets without putting all that experience, practice and knowledge by combining it with data from and about your assets, so that the tracking and management system can constantly learn and recommend how to make the most efficient and sensible use of each and all your assets in combination.

A logical trajectory

This is a logical trajectory and progressing through these stages is clearly the way to run and grow a profitable, efficient transport and logistics business. Yet often companies opt for asset tracking primarily to fix the first issue – knowing where their assets are — with little if any thought about how they could get the much greater benefits of the subsequent phases, and potentially at incremental cost.

This is partly because for many organisations, this is new territory and they do not grasp the scope of asset tracking in the first place nor how it could support wider asset management, and much else. Concerns about cost are a big factor for many transport and logistics companies. They typically operate in markets where margins are tight and competition ferocious and have little or no internal resource to investigate and plan forays into new territory.

But perhaps most of all, it is because for most companies, data is a by-product of their business activities, rather than something of huge intrinsic value in its own right. They don't yet see it as something they can commercialise in many ways and that should inform every business decision. For many, moving to a world view set out in the graphic below represents a terrific shift in thinking and often they cannot see how it applies to their business. ▶

Fig 1. Phases of becoming a data-driven organisation

In this market, the suppliers' job is one of education and guidance about the options and possibilities, as well as ongoing support — in short, a partner. They need to help the client look beyond their immediate need to see what could be achieved, affordably, in the longer term and make sure investments act as a bridgehead towards those longer-term goals.

Partners listen to each other

Companies should start with well-defined issues where results will be easy to measure — fewer stolen or stranded trailers, for instance. Success will build confidence across the company in asset tracking and encourage further investment to make bigger gains. It is imperative that even when they only want to address a single problem, solutions need to be tailored to specific needs, but they should not be discrete dead-ends whose usefulness is limited. Greater reliance on data and a move to the progression described above will sooner or later be essential if companies are to compete.

As William Sandoval, VP Advanced Platform Applications, **KORE** points out, the biggest single reason for all kinds of IoT deployments failing, "can be directly traced to a lack of strategic planning and misunderstanding of the scope of activities".

The partner/supplier must pay close attention to customers' needs. It is encouraging to hear Benoît Luc, **Total**'s senior vice president, Marketing & Services, Europe talking about how it had delivered a solution (called Where's my trailer?), through its subsidiary **Stela**, which had been tested for a year with the company's transporter customers. At the end of that testing phase in late 2018, Luc stated, "It's a first step that is driving us forward in our broader ambition to take greater advantage of the Internet of Things for the benefit of our transporter customers."

That phase involved putting simple boxes on all its trailers which use **Sigfox** technology to communicate via low bandwidth links at a small cost, that can be tracked through portals with a variety of dashboards.

On such foundations many additional applications can be built – Johan Fagerberg, CEO of **Berg Insight**, recently wrote about how asset tracking can evolve at airports, moving beyond keeping track of everything from chocks to complex machinery like belt and container loaders for unloading and loading baggage and containers off and onto aircraft, moving into predictive and even the beginnings of prescriptive asset management.

As Fagerberg said, "Maintenance management can enable workshops to perform maintenance based on engine hour data collected electronically and engage in maintenance forecasting to automatically determine upcoming preventive maintenance activities."

On a bigger scale, data reporting and analysis of the assets' use enables enterprises to run optimal-sized fleets and use fuel efficiently which, beyond radically cutting costs, could impact how they run operations. In addition, the reporting options and data included in airport asset tracking solutions could be exported to third-party applications using standard interfaces to enrich that data — such as weather conditions or to smooth hand-offs to other operators or to comply with regulation — and extend its use even further.

There is vast potential for all kinds and sizes of businesses in asset tracking, so long as their supplier-partners help them get started, then help them build and execute a comprehensive, pragmatic strategy to meet their business needs. In particular, it is never too soon to start thinking how ultimately artificial intelligence, beyond machine learning, could play a role. ■

"It's a first step that is driving us forward in our broader ambition to take greater advantage of the Internet of Things for the benefit of our transporter customers."

Screenshot of the Where's My Trailer? customer portal.

Bridging the gap between IT and OT for the Industrial Internet of Things

Moxa provides a full spectrum of products for industrial networking, computing, and automation, and maintains a distribution and service network that reaches customers in more than 70 countries. Its products have connected over 50 million devices worldwide in a wide range of applications, including factory automation, smart rail, smart grid, intelligent transportation, oil & gas, marine, and mining. Here, Robin Duke-Woolley (RDW), CEO of IoT industry analyst firm Beecham Research, interviews Stefan Palm (SP), business development manager - Embedded Computing at Moxa.

RDW: The convergence between operational technology (OT) and information technology (IT) has meant a significant change for industrial environments. What is Moxa's approach to bridge the gap between these two worlds?

SP: Actually, it is a change for the people in the IT environment, too, because both worlds are moving closer together - and OT as well as IT people have to leave their comfort zones as they are being confronted with the reality that has developed outside of their scope.

For both kinds of experts it can be compared with starting to learn a new foreign language. OT people are used to Fieldbus protocols that are often based on serial communication principles. They have developed efficient ways to pass the information gathered by sensors on to the management level, for example via SCADA systems. Yet, they are not very familiar with ▶

IN ASSOCIATION WITH MOXA

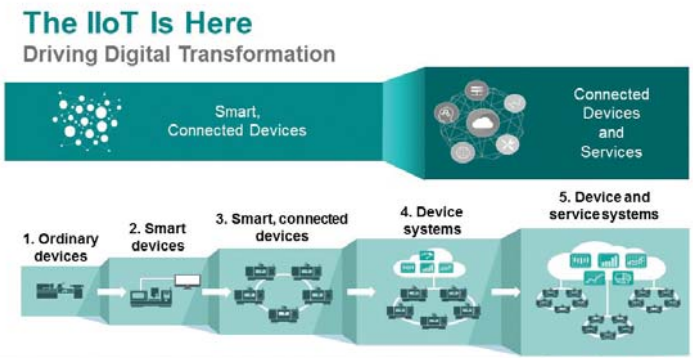
Moxa´s core business is to build the foundation for successful IIoT and industry 4.0 implementations by connecting even legacy devices and making the data available and understandable for people in both worlds

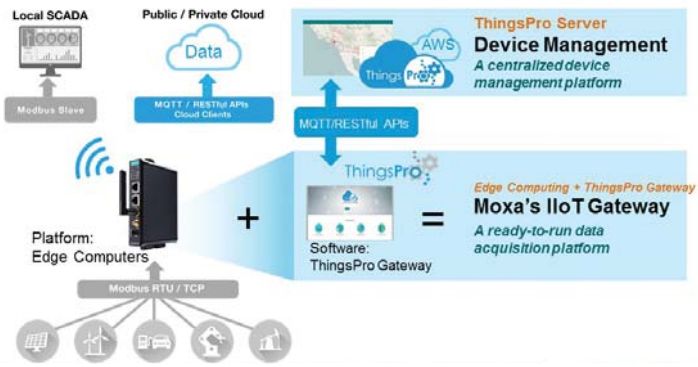
systems in an enterprise environment that use TCP/IP based protocols to efficiently transfer information over the Internet, store it in datacenters and manage the big data in a way that enables them to retrieve information through the visibility of a much bigger database.

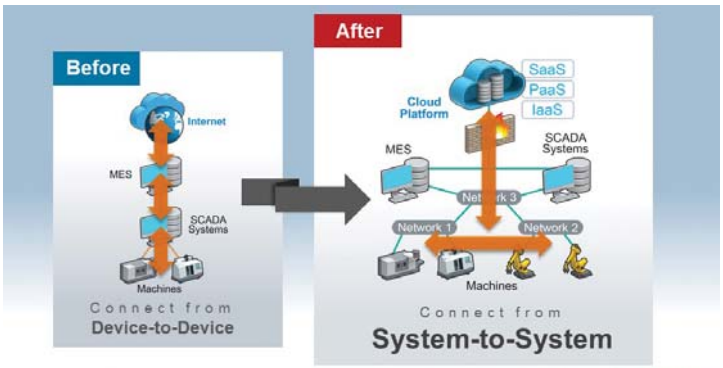
This is the expertise and domain of the IT people who are usually unaware how the data from a single sensor finds its way into the enterprise world. As an expert in acquiring data in the field, converting it from one protocol to another and then transferring it securely and reliably, Moxa bridges the gap and makes the data available in a format that IT people are used to and can deal with.

The same happens in the other direction when it comes to giving commands towards devices in the field as a result of complex analyses done in data centers. These commands, of course, also need to be converted into a format OT people can understand and manage.

Moxa´s core business is to build the foundation for successful IIoT and Industry 4.0 implementations by connecting even legacy devices and making the data available and understandable for people in both worlds.







RDW: In the industrial IoT space, what do you see as the main challenges and how should they be addressed?

SP: Industrial IoT (IIoT) is currently facing three major challenges:

1. Connecting devices in the field and making the data available and usable in private and public clouds to be utilised by OT and/or IT systems
2. Making sure the acquired and transferred data is protected and will be available for the intended user only
3. Assuring that the data transfer happens in a deterministic way and in real time to enable full control even in critical situations ▶

Stefan Palm of Moxa Europe is talking to Robin Duke-Woolley of Beecham Research.

Accelerating an IIoT development is essential to ensure the correct data is delivered at the right time so that an application can reap the benefits of the IIoT

To master challenge 1, devices are necessary that can forward the data acquired in the field on sensor level and even translate them in a way that they can be understood by the big number-crunchers up in the cloud - which will then eventually come back with some meaningful actions to optimize the processes monitored by the sensors. The major obstacle is the lack of standards that can be applied to streamline the access methods. Currently, this point is being addressed, and the effort is progressing as we speak. There are promising candidates like MQTT, Restful API or OPC-UA that have the potential and are widely accepted by the industry. However, this is work in progress and we may see more in the future.

Challenge 2 is the wide field of cyber security and the ability to protect the environment from attacks, to avoid unauthorized access to machines, the production environment or even the complete plant, respectively. IEC 62443 is a widely accepted guideline that may guide you in achieving this. Yet, this requires the support of any member in the communication chain down to device level. However, this is just a start and needs further development in order to deal with the specific requirements of different industry segments which may need variation.

Mastering challenge 3 is extremely important to ensure data integrity. The technology that addresses this issue is called TSN (Time Sensitive Networking). TSN is a set of standards under development by the Time-Sensitive Networking task group of the IEEE 802.1 working group. The different TSN standards can be grouped into three basic key component categories that are required for a complete real-time communication solution:

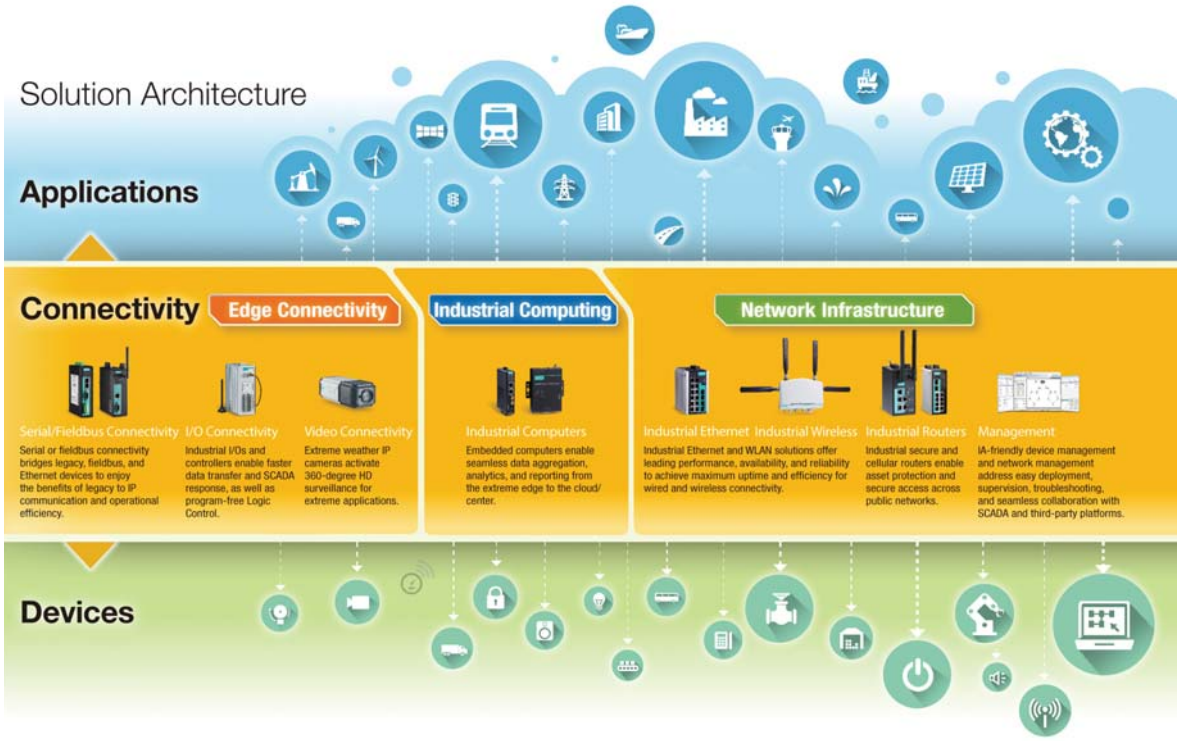
- Time synchronisation
- Scheduling and traffic shaping
- Selection of communication paths, reservation and fault-tolerance

TSN will play an important role in the future, but it still needs to be widely adapted in order to become effective. This is work in progress, too.

RDW: Can you provide an overview of your activities in the smart rail and intelligent transportation segments?

SP: Smart rail and intelligent transportation are additional sectors where Moxa is quite active. We are actively contributing to the IEC TC9 WG43 standard to define the next generation of TCN (Train Communication Network). The latest achievement is the release of the IEC 61375 that specifies the onboard communication and in particular the Train Control and Management System (TCMS).

In cooperation with leading train manufactures like Alstom and Bombardier, Moxa was able prove the interoperability of our devices. This makes us one of the ▶



leading manufacturers for network devices on board of trains. And we are still actively driving the standards forward. Another initiative is the contribution to an effort called Safe4Rail (https://safe4rail.eu) under the umbrella of Shift2Rail (https://shift2rail.org/) which is funded by the EU.

Safe4Rail provides the baseline for a fundamentally simplified embedded computing and networked TCMS platform for the modular integration and certification of all safety, time and mission critical train functions, including distributed hard real time controls, safety signals and functions up to SIL4. The results are demonstrated with a SIL4 brake-by-wire system safety concept. Ultimately, the project provides recommendations for the standardization and certification of next generation TCMS embedded platforms.

RDW: Considering Moxa's focus on providing industrial networking solutions for the critical infrastructure sectors, how are you helping companies overcome the challenges they are facing around security?

SP: Moxa has already adopted the IEC 62443 standard on device level in a variety of our devices in order to provide the feature set that is required to satisfy even higher levels of requirements to secure the system and even the environment. The next step is the full integration into Moxa's MxView real time network management software toolset in order to allow customers to assess their current situation and to suggest the necessary steps to achieve the desired security level. Moreover, Moxa is participating in different industrial consortia to keep the discussion going and to shape the requirements, so they will eventually become industry standards - and, of course, to ensure constant security improvements to make our world a bit safer every day.

RDW: Transportation and factory automation are often mentioned as industries expected to lead the adoption of 5G technologies. What is your expectations of 5G and its potential impact in these markets?

SP: 5G will change the communication infrastructure significantly as, for first time, a wireless cellular technology will offer a performance as high as 20 gigabits per second which is up to ten times higher than the current 4G networks. This is a considerable performance boost that will allow the deployment of cellular networks in places where the bandwidth requirements cannot be fulfilled today.

There will be clear savings, too, especially regarding cabling as this will be no longer required. Moreover, installation and maintenance will become much easier and less costly. So, traditional wired Ethernet or Wi-Fi networks will migrate to wireless cellular technologies based on 5G. It will also enable real time applications based on TSN over telephone infrastructures, so we are expecting a shift towards this kind of network setups. ■

Transport experience helps IoT to benefit other industries

Asset monitoring has been described as one of the most promising applications of connected technologies. Applications with vehicles are well-known, but here Transport 360 asks KORE's VP and General Manager - Location Based Services, William Sandoval (pictured below) about other possibilities for using data from Internet of Things sensors. For example, how is transport experience helping IoT medical device users?

For more traditional medical devices, many of which are related to out-patient monitoring, IoT data provides valuable insights into the health of the patient as well as the effectiveness of any treatment received

William Sandoval: Just like a vehicle's tyre, engine, or brake system, IoT sensors can be embedded on or attached to medical assets or medical devices to ensure they are functioning as they should, their surrounding conditions are optimal, and any potential medical issues are detected as early as possible. Looking at medical assets, one of the primary use cases we have seen is the implementation of IoT solutions to monitor the temperature and humidity levels of donated organs as they are transported from the donor site to the receiving patient.

Real-time location data of the donated organ enables hospital staff to more appropriately prepare the receiving patient while remotely monitoring vital conditions of the organ throughout the entire trip. Analysis of IoT data generated throughout the process enables doctors and nurses to more accurately and efficiently evaluate the status and condition of the organ upon arrival.

For more traditional medical devices, many of which are related to out-patient monitoring, IoT data provides valuable insights into the health of the patient as well as the effectiveness of any treatment received. One of our customers, for example, offers an intelligent glucose monitoring device for patients with diabetes. The solution not only removes the hassle of manually recording and tracking blood glucose levels, but also stores the collected reading data in a cloud-based application. The analysis of this data enables the organisation to provide users with personalised coaching and guidance for improving their diabetes care and overall level of health.

T360: So, companies are using IoT sensor data to generate real-time alerts. What are the next steps? Implementing predictive analytics? Automating reporting processes?

WS: Most active IoT asset monitoring solutions today are in place to provide real-time alerts based on programmed rules or thresholds – should the level of oil in a tank fall below a certain level, the company is notified that it may need to be refilled. If an electric meter reader registers a certain level, the customer is billed accordingly. While IoT providers and application developers have done a great job adding value with these types of solutions, IoT data needs to be leveraged beyond triggering reactionary operations to enable long-term, actionable business intelligence.

Almost all IoT asset monitoring solutions generate some form of data, but the key lies in how the data is stored, analysed, and applied to business processes. Both predictive analytics and automated reporting processes are completely viable next steps for businesses who are able to use their IoT data effectively. For example – a fleet organisation that is leveraging asset monitoring solutions for vehicle diagnostics can store all data regarding the vehicle's tyre tread, gas mileage, engine functionality, maintenance schedule, etc. in one cloud-based application to uncover patterns and trends related to vehicle performance. This allows the fleet manager to more accurately predict when services may be required before the repair need is imminent. All of these data points can even be consolidated and presented to the fleet operator in weekly or monthly vehicle maintenance reports.

Organisations who can successfully take IoT data one step further are empowered to bring entirely new services and business models to market. The usage of IoT data enables ▶

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"-as-a-Service" offerings, which give businesses the opportunity to penetrate new, previously unreachable markets. For example, manufacturers of large, expensive medical devices in the healthcare space can now deliver OpEx, "Device-as-a-Service" offerings to smaller healthcare clinics that could never have afforded purchasing the equipment outright. The device activity is monitored and measured with IoT-based asset monitoring technologies to ensure proper usage and appropriate billing processes.

T360: There's been a lot of discussion lately about regulatory compliance in telematics. What are the other big challenges: Centralised insights, monitoring driver behaviour, vehicle metrics? Or something else?

WS: Telematics solutions have been critical in helping fleet and other transportation companies obtain various levels of regulatory compliance. This includes the recently implemented "ELD Mandate" in the United States that requires all commercial drivers who must prepare Hours of Service (HOS) and Records of Duty Status (RODS) to replace traditional paper logs with Electronic Logging Devices (ELD). By leveraging an IoT-enabled ELD application that translates data collected via a device embedded on a vehicle's engine, drivers and fleet operators are able to present the appropriate, federally mandated information using a smartphone or tablet. These types of applications are closely related to driver monitoring solutions.

While the aforementioned topics (centralised insights, driver behaviour, etc.) are certainly important challenges that telematics solutions address, some of the most prevalent issues facing fleet and transportation organisations today are actually external market pressures stemming from the rapid expansion of e-commerce. The growing popularity of online shopping has tightened trucking capacity, elevated the importance of final-mile delivery, and created demand for more precise pick-up and delivery times. These shifts are also affecting warehouse and distribution centre processes, presenting a strong need for improved routing optimisation and analysis of shipping capacity. Through telematics' implementation and data analysis, transportation businesses can better adjust to these changing economic factors.

T360: Field Service Organisations in insurance, healthcare, industry or fleet all have big data in common. Are there also similarities when they design, implement and operate a full stack of connected devices and cloud technologies?

WS: At the most basic level, IoT solutions are implemented to establish autonomous communication among "things", as well as collect and analyse the data that is being transferred. Of course, there are similarities across industries when examining IoT solution architecture at this very high level, however there are myriad different components, technologies, and operational processes that vary greatly among industries as well as individual solutions. Everything ranging from the combination of IoT endpoints, to network connectivity technologies, to application functionalities – just to name a few – are specific to each IoT implementation and specifically selected or designed to achieve the desired business outcomes. The more expansive the "stack" of connected technologies used by an organisation to deploy IoT, the more complex the deployment becomes and the more unique the solution becomes.

For example, managing medical devices and patient monitoring solutions are wildly different than managing vehicles and monitoring drivers – aside from the basic components, data privacy, security, and analysis processes are some of the major processes that must be custom-fit to each IoT solution. While having IoT experience can certainly aid in the deployment process, the vast majority of businesses do not have the resources or expertise needed to understand and execute against all IoT intricacies in-house. This is where IoT ecosystem partners really show their value by complementing internal skill-sets and filling operational gaps.

T360: What are the most common pitfalls to avoid as IoT applications scale up for customer growth and more complex services?

WS: Bringing an IoT solution to market is only one step of the IoT implementation process, and many organisations fail to recognise the operational management, sustainment, and support activities that are required for the long-term health and success of the deployment. The more connected devices that need to be maintained, the more complex and comprehensive these processes become. In fact, most IoT failures can be directly traced to a lack of strategic planning and misunderstanding of the scope of activities. In order to accelerate value realisation, the comprehensive IoT strategy – tailored to the organisations' respective industry and use case – should extend to cover the entire IoT solution lifecycle.

Planning for the entire IoT solution lifecycle enables scalability and growth, and also uncovers the potential for new revenue streams or monetisation opportunities. For example, in the operational phase of the IoT deployment, enhanced helpdesk and service assurance services ensure improved customer/end user satisfaction and enables customer organisations to scale their own deployments with a single point of contact for all component support needs and issue resolution. In the sustainment phase, advanced exchange services and processes enable rapid delivery of new endpoints or components that require upgrade, thus adding value for downstream customers with business continuity assurance. It is worth reiterating that many businesses fail in these areas because of inexperience or lack of resources, and IoT partnerships are a critical component to IoT lifecycle strategy development and execution. ■

The more connected devices that need to be maintained, the more complex and comprehensive these processes become

William Sandoval is VP and General Manager - Location Based Services at KORE.
www.korewireless.com

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NOKIA

Pervasive Vehicle-2-Anything connectivity enables safe, engaging rally racing

Background & challenge

Over the past decade, a surge in rally sport competition has resulted in greater incidences of injury, fatalities, and property damage. In an attempt to mitigate these risks, regulators and rally industry representatives are taking steps to rewrite many of the procedures, requirements, and rules currently on the books. This includes firming up team and vehicle licensing requirements, mandating the use of specialised safety equipment, and requiring the latest integrated in-vehicle GPS and communication technologies.

These risks may be attributable to the following factors:

- Increasingly remote venues that are far from city emergency support services
- Competition involving more challenging terrains and under harsher conditions
- Higher density rallies with more competitors, spectators, and event support staff
- Faster vehicles that are pushing the limits of speed, distance, and endurance
- More rallies in more places worldwide than ever before.

Due to the technological limitations of legacy 2G cellular networks, reliable connected- vehicle communications solutions were traditionally unrealistic. In the absence of pervasive high-speed cellular or modern vehicle-to-vehicle (V2V) connectivity, organisers were forced to use high-cost, proprietary GPS-based satellite services or fall back to legacy short-range radio-frequency (RF) communications.

RallySafe realised early on that legacy, short-range radio frequency (RF) was ill-equipped to handle the expanding needs of rally sports. This technology could not handle challenging terrains or unpredictable weather conditions and did not appreciably decrease vehicle collisions. Reliance on RF communications left event organisers and officials largely in the dark, and large numbers of marshals and volunteers were needed to relay accurate information from the course back to race control.

In addition to safety concerns, timing continued to prove challenging for event management. As races grew in size and complexity, and with more vehicles competing over larger areas, the ability to accurately capture vehicle times became increasingly difficult. The traditional clipboards-stopwatches-radio method was inaccurate and couldn't keep up with the increasing pace and scale of the events.

Solution

RallySafe is a technology early-adopter, founded on a vision of providing the motorsports industry best- in-class safety and communication management solutions. Today, the company continues its legacy of providing drivers, organisers, and spectators next-generation products and services that use the latest Internet of Things (IoT) technologies.

Since 2010, RallySafe's value-proposition has been based on a unique understanding and appreciation of the safety and communication challenges of drivers, competitors, and event organisers. RallySafe's go-to-market plan is predicated on the following critical-success-factors (CSFs):

- Regulatory Compliance: Network and industry road-mapping, testing, and certification
- Seamless Connectivity: Carrier integration and secure, managed IoT connectivity
- Reliable Vehicle Communications: Integrating high-speed, low-cost V2V RF
- Pervasive GPS: Access to reliable anywhere, anytime satellite positioning. ▶

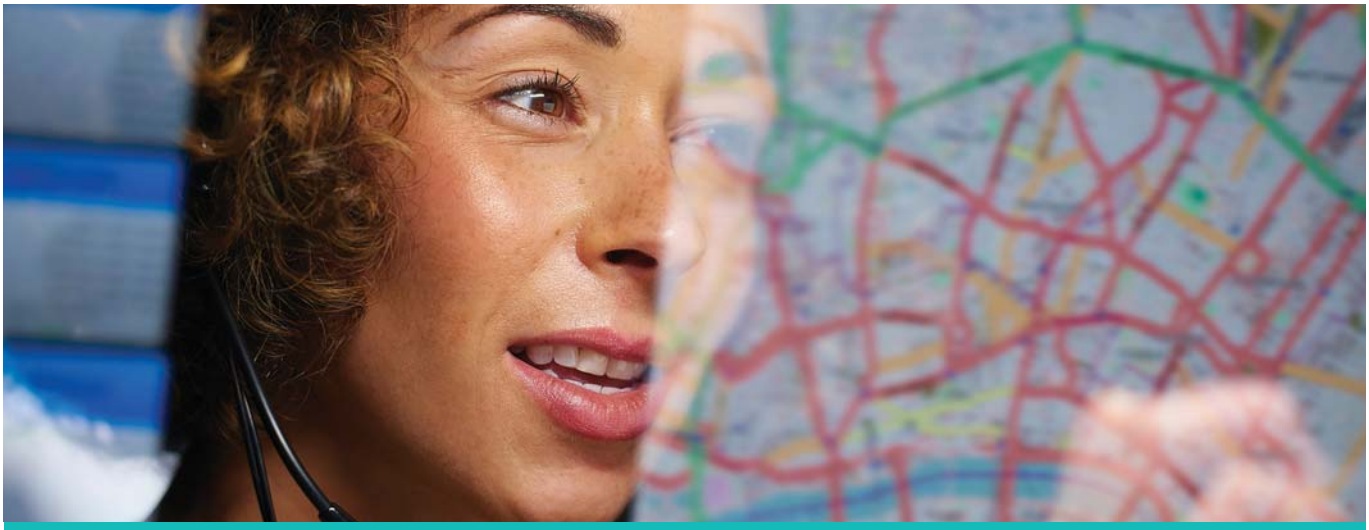
Due to the technological limitations of legacy 2G cellular networks, reliable connected-vehicle communications solutions were traditionally unrealistic

RallySafe realised that actualising their plans was predicated on careful implementation of a value-added IoT solution. This solution would provide drivers, organisers, and event staff with network-agnostic connectivity that would enable them to communicate effectively and precisely determine their location. More importantly, the solution would need to offer RallySafe customers an integrated ecosystem, purpose-built to solve their unique safety and communication challenges and those of the wider rally sports industry.

The IoT solution would also need to seamlessly integrate RallySafe product lines and engineering processes to produce a secure, managed, end-to-end vehicle-2-anything (V2X) connectivity solution. Lastly, RallySafe would require a trusted, neutral, expert IoT advisor with the global reach and industry expertise needed to simplify complex carrier certification and connectivity challenges.

KORE was that trusted IoT advisor. Since 2012, KORE has been working closely with RallySafe leadership and product development groups to help the company simplify their strategic technology initiatives and actualise their go-to-market plans by focusing on the following criteria:

- Ubiquitous Connectivity: Expanding global connectivity for events held anywhere, anytime, worldwide
- Purposeful Enablement: Helping RallySafe customers focus on competing, organising, and managing rallies by providing enabling technologies
- Next-Gen User-Experience: Enhancing user experiences for competitors, organisers, and support staff.



Results

Implementing KORE's IoT solutions has enabled RallySafe to offer its customers the following benefits:

- Ease-of-Use: An all-in-one rally solution that combines embedded KORE connectivity pre- programmed with race coordinates and an intuitive no-touch hazard alerting system. Real-time GPS positioning and hassle-free V2V communications provide drivers the situational-awareness they need to navigate challenging terrains.
- V2V RF Connectivity: The RallySafe automated on-board vehicle-proximity technology provides drivers a low-distraction, high-value warning system. High-speed V2V communication offers push-to- pass options that enable drivers to see the road ahead.
- Management: Automatic hazard warnings enable race control to rapidly respond to incidents. Additionally, integrated satellite capability provides drivers V2X communication locations with poor or unavailable cellular coverage and provides organisers an all-inclusive map-based view of participating vehicles.
- Timing: Accurate and timely race metrics means better race results. Battle-tested for changing environments, high-frequency GPS and interpolated algorithms enable instant timing and increase the validity of control-start/stop times. This results in fewer race enquiries, disputes, and reduces timing errors, helping to keep event costs down.

KORE has enabled RallySafe to offer the rally racing industry an interactive, engaging, and safe user experience. KORE's comprehensive IoT capabilities have helped RallySafe go-to-market with best-in-class rally management solutions that unlock real-world benefits. Together, the RallySafe and KORE partnership represents a union of competencies and technologies that offer next-gen rally management solutions that enable the rally community to safely focus on the sport of rally racing. ■

KORE is a pioneer and trusted advisor delivering transformative business performance. We empower organisations of all sizes to improve operational and business results by simplifying the complexity of IoT. Our deep IoT knowledge and experience, global reach, purpose-built solutions, and deployment agility, accelerate and materially impact our customers' business outcomes.

RallySafe was originally conceived after the occurrence of a secondary crash that took place at a rally race-Targa Tasmania, Australia. The original creators of RallySafe – one of whom is an experienced rally racing participant – conceived RallySafe under its parent company Status Awareness Systems in 2010. The overall idea was that this accident may have been prevented if there was some way, communication-wise, to alert the drivers of the situation beforehand.

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HOW TO RUN AN IoT ENABLED BUSINESS

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TALKING HEADS

Cradlepoint CEO unveils Elastic Edge for pervasive IoT connectivity

PLUS: 4-page preview of The Smart City Event, collocated at IoT Evolution Expo in January 2019 • 1NCE chief executive Alexander Sator on applying simplicity to connectivity to remove the barriers for IoT businesses • Where to go and what to see at early 2019's IoT events • Latest news online at www.iot-now.com

IoT Now Guide to IoT Evolution Expo

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Cover sponsor: Cradlepoint is the global leader in cloud-delivered wireless edge solutions for branch, mobile and IoT networks. The Cradlepoint Elastic Edge vision - powered by NetCloud services - provides a blueprint for agile, pervasive and software driven wireless WANs that utilise 4G and 5G services to connect people, places and things everywhere with resiliency, security and control. More than 25,000 enterprise and government organisations around the world, including 75% of the world's top retailers, 50% of the Fortune 100, and first responders in ten of the largest US cities, rely on Cradlepoint to keep critical branches, points of commerce, field forces, vehicles and IoT devices always connected and protected. Major service providers use Cradlepoint wireless solutions as the foundation for innovative managed network services. Founded in 2006, Cradlepoint is a privately held company headquartered in Boise, Idaho, with a development centre in Silicon Valley and international offices in the UK and Australia. **www.cradlepoint.com**

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NEWS IN BRIEF

Smart homes in Europe and North America reached 45 million in 2017, says Berg

According to a new research report from the IoT analyst firm **Berg Insight**, the number of smart homes in Europe and North America reached 45 million in 2017.

The most advanced smart home market is North America, having an installed base of 22.3 million smart homes at the end of the year. This represents penetration of 15.9%. Between 2016 and 2017, the market grew by 40.7% year-on-year. The strong market growth is expected to continue in the next five years. By 2022, Berg Insight estimates that more than 63 million homes in North America will be smart, meaning 44% of all homes in the region.

Telit selected by China Unicom IoT to accelerate IIoT

China Unicom is to use **Telit**'s deviceWISE IoT Platform to support the rapidly expanding deployment and device management needs of its growing install base. In addition, deviceWISE will provide the ability to address the Industrial IoT (IIOT) market by providing the ability to natively connect the vast array of industrial assets and machines thereby giving manufacturing companies the data they need to improve productivity. With the Telit IoT platform, the need for custom coding and other expensive, time-consuming integration tasks is eliminated allowing for faster and easier deployment.

"Telit is honoured to be working with China Unicom IoT to deliver best in class IoT solutions to customers in the thriving Chinese IoT market," said Paolo Dal Pino, Telit's executive chairman. "Our new relationship with China Unicom IoT is key for growing the Telit IoT module and IoT solution market share in one of the world's largest, fastest-growing economies."

Hyundai Cradle has been investing in technologies to enable computer vision

Hyundai invests in deep learning computer vision startup allegro.ai

Hyundai Cradle Tel Aviv, Hyundai Motor's corporate venturing and open innovation businesses in Israel, announced its strategic investment in **allegro.ai**, a provider of deep learning-based computer vision technology. Through this partnership, Hyundai aims to speed up the deployment of artificial intelligence (AI) technologies across various business areas.

Hyundai expects to provide safer driving experiences for its customers by adopting deep learning computer vision technologies that can be applied to autonomous driving systems to enhance road navigation and real-time decision making. Founded in 2016, allegro.ai offers the first end-to-end deep learning lifecycle management solution focused on computer vision. The company's platform simplifies the process of developing and managing deep learning – powered solutions – such as autonomous vehicles, drones, security, logistics and others.

"Our investment in allegro.ai is a further step in enhancing our presence in the Israeli market, a global leader of technological innovation in the fields of automation, AI and deep learning and allegro.ai is clearly an innovation leader in that field" said Ruby Chen, the head of office at Hyundai Cradle Tel Aviv. "This is our fifth investment in an Israeli company and our activities will continue to grow in the coming year."

Nir Bar-lev, the chief executive and co-founder of allegro.ai, added; "We are proud to partner with Hyundai and share Hyundai's belief that AI empowers the industry to provide greater road safety and autonomy, to better understand customers' needs and to help broaden their experiences."

XPO Logistics to deploy 5,000 collaborative warehouse robots in North America and Europe

XPO Logistics, a global provider of transportation and logistics solutions, announced plans to deploy 5,000 intelligent robots throughout its logistics sites in North America and Europe. The robots, which are designed to collaborate with humans, will supplement XPO's existing workforce and support future growth. XPO has a strategic partnership with robotics manufacturer **GreyOrange** that makes XPO the exclusive logistics provider for use of its robots in North America, the United Kingdom and eight European countries.

Bradley Jacobs, chief executive officer of XPO Logistics, said, "We've developed our logistics technology to integrate the latest intelligent automation and adapt it at lightning speed. This allows us to dramatically improve fulfilment time and cut costs. The addition of 5,000 collaborative robots will make our logistics operations safer and more productive in picking, packing and sortation. These are important benefits for our customers – particularly in the e-commerce and omnichannel retail sectors, where order speed and accuracy are essential ways to compete."

The autonomous robots are part of a modular goods-to-person system that also includes mobile storage racks and fulfilment stations. Each robot can move a rack weighing approximately 1,000 to 3,500 lbs., bringing it to a station where a worker fulfils up to 48 orders simultaneously. The entire process is controlled by XPO's proprietary warehouse management system.

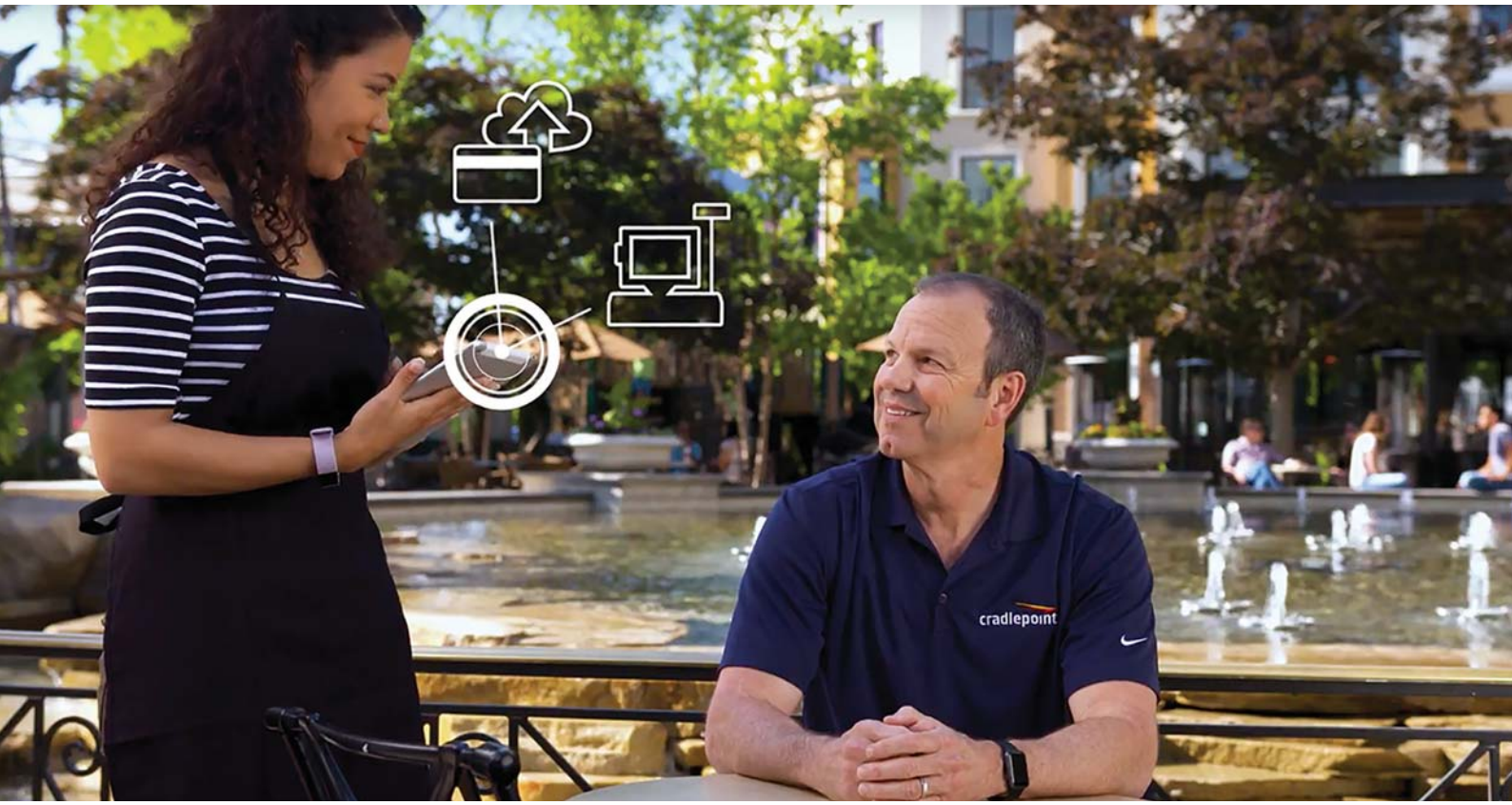
XPO's latest robotics implementation is part of the company's planned US$450m (€392m) investment in technology this year. Other recent innovations include the XPO Direct shared-space distribution network, voice integration with **Amazon** Echo and **Google** Home to track the last mile delivery of heavy goods, and the XPO Connect digital freight marketplace with multimodal infrastructure.

A GreyOrange logistics robot

Cradlepoint's Elastic Edge provides blueprint for secure, scalable and cost-effective 4G and 5G networks for IoT

George Mulhern is CEO and chairman of the board at Cradlepoint, a provider of cloud-delivered LTE network solutions for business, service providers and government organisations that was established in 2006. More than 25,000 customers worldwide in retail, financial services, healthcare, transportation, public sector and other industries, rely on Cradlepoint to keep their branch and mobile networks, and their IoT devices, always connected. The company is expanding into the 5G market by providing a pathway to the technology with services that help enterprises seamlessly transition to 5G. With its Elastic Edge vision, Cradlepoint is delivering the blueprint for next-generation, software-defined edge networks built on pervasive and reliable 4G and 5G wireless services

Mulhern joined the company in 2011, following a 20-year career at Hewlett Packard in which he had responsibility for hardware, software and services businesses that ranged in size from several million dollars to multi-billions of dollars of annual revenue. More recently, Mulhern was a general partner with Highway 12 Ventures, a Boise-based venture capital fund that served as a catalyst for entrepreneurs and startups to help drive economic growth in the Northwest region. ▶



There is no denying that IoT has the potential to create incredible value for all businesses and their customers

IoT Now: What do you see as the greatest challenges facing the further development of IoT? The consensus is that there's tremendous value to exploit, but early deployments are being viewed as unsuccessful. So, what has gone wrong?

George Mulhern: There is no denying IoT has the potential to create incredible value for all businesses and their customers. It is also true that, to date, many of the IoT deployments or initiatives have met with mixed results. Cisco surveyed a broad set of customers in 2017 and found that 74% of the surveyed companies considered their IoT deployments and initiatives unsuccessful.

There are a number of contributing factors to this, but in our experience, one of the key stumbling blocks has been when the IT organisation and the operations team are not partnering on the planning and deployment of the IoT solution. Often the operation team's sense of urgency to get a solution up and running doesn't match the IT organisation's ability to react and support the initiative. As a result, the operational teams will bypass IT in order to get a solution to market sooner. More often than not, this results in a situation where security models and overall system performance haven't been thoroughly thought through.

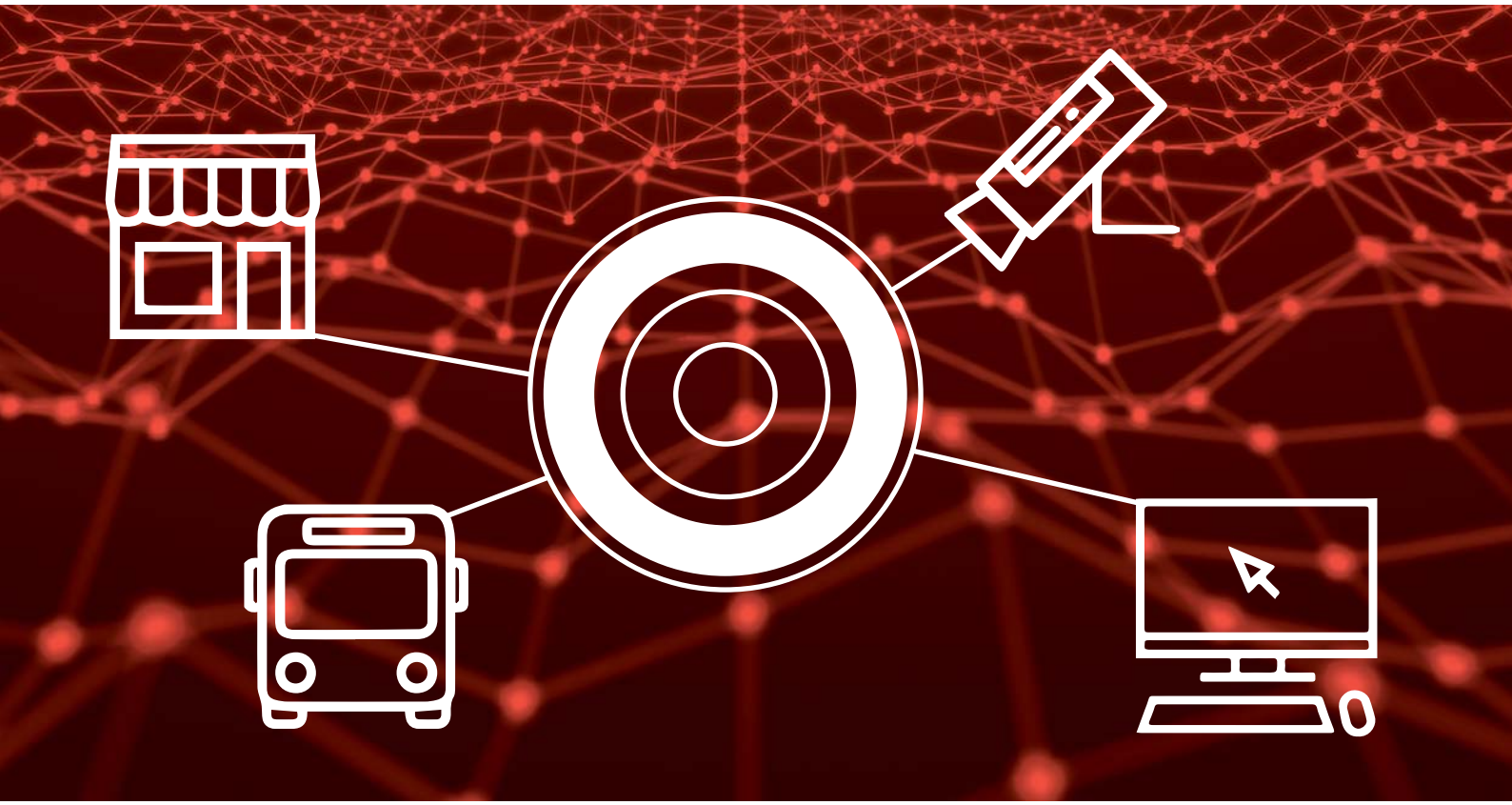
IoT Now: Can you give an example of an unsuccessful pilot and expand upon what could have been done differently to ensure success?

GM: We were recently working with a company that provides residential solar energy solutions. The IT team had approached us to help them build a secure network that they could use to monitor usage and performance of their solar installations on the customer premises. IT was not the group that would be monitoring and consuming the data supplied by this IoT application, but they wanted to ensure the network would be secure and meet the performance needs of the operations team that would manage the application.

The operations team wasn't sold on the time it would take or the expense of the project. Consequently, they decided they would piggy-back their sensor solution on the homeowner's Wi-Fi. The result was a network that had completely unpredictable uptime, was full of security holes and that was ultimately scrapped. In the end, they had to go back to the drawing board and start rebuilding their plan.

IoT Now: How important is it that companies seek out solutions that can serve both IT and operation teams? How can the different skills and needs of each be brought together so IT and the business work in harmony?

GM: We believe it is critically important the two teams are in harmony on IoT projects. Ultimately the IoT network needs to become an integral part



of the company's information systems. The operations team needs easy access to the applications and information being delivered by the IoT project. The IT organisation is responsible for delivering a cost-effective, secure and scalable network to support the various IoT initiatives.

This is a system that will need to support both edge and cloud compute capabilities, so IT will need to be able to respond with more agility to the demands of the operations team. That agility comes from moving to more software-defined and cloud-orchestrated architectures, and, of course, wireless will always be more agile and flexible to deploy than any wired solutions.

IoT Now: To what extent is the ghettoisation of IoT into isolated or contained trial and pilot projects hampering market development? How can IoT projects be made an extension of the existing enterprise rather than an adjunct to it?

GM: The ultimate success and value of IoT in the enterprise will depend on the organisation's ability to collect, analyse and act on the data provided. At some point, the number of isolated IoT implementations starts to work against a company's ability to both support all of those isolated networks and also to integrate, analyse and act on the information coming from them. In order to support the widespread deployment of IoT, it must become an integrated part of the overall enterprise network architecture.

There is work to do on the IT side to evolve what has historically been a manual, command line-driven, relatively static network architecture into something that is much more agile when it comes to meeting the ever-changing needs of the business. The wide area network was historically built around the needs of a branch office, with the company's applications being resident in their own data centre. Obviously, that does not work as we move from connecting hundreds to maybe thousands of branch offices — to a world of hundreds of thousands or millions of connections involving not just branches, but also people, places and things such as cameras, sensors, vehicles and temporary locations.

We talk about this in terms of the need for a more Elastic Edge — a network architecture that is much more agile and capable of adapting to this new world of IoT.

IoT Now: What three attributes do you see as fundamental for achieving enterprise-ready IoT solutions?

GM: Three that have to be at the top of the list are security, scalability and manageability.

The security model that worked for connecting branch offices to the data centre will not meet the needs of IoT applications. There will be a significantly larger attack surface, and most of the processing work will be done at either the edge of the network or in the cloud. This is going

The ultimate success and value of IoT in the enterprise will depend on the organisation's ability to collect, analyse and act on the data provided

We should be looking for every opportunity to reduce the complexity of managing these networks

to require changes to many areas of the security model.

For example, the benefits of discovery in the old network paradigm become a serious security threat. We have seen countless cases where bad actors have entered through an IoT device and then pivoted to other areas of the network. This raises the need for "zero-trust networks" to reduce the opportunity for bad actors to discover the network and micro-segmentation to make it much more difficult for them to pivot if they do find a way on to one of the IoT networks.

The ability to prevent or at least rapidly detect and respond to threats like these is important. There are a number of companies delivering software-defined perimeter (SDP) security solutions that address many of these issues and vulnerabilities.

Obviously, the ability to handle the scale of a network that may have millions of connections or endpoints will be critical. Being able to seamlessly move from a proof of concept (PoC) to full deployment, to easily add new endpoints, to provide security at this scale, and to process terabytes of data both at the edge and in the cloud implies a level of automation and control that can only be delivered through a software-defined networking approach.

Finally, there is the component of manageability. These networks will be providing business critical information and insight to their users. We all recognise there is a growing shortage of available IT talent. Therefore, given their size and scope, these networks will require a level of automation and policy-driven orchestration that goes well beyond the capabilities of most enterprise networks today. Things like zero-touch deployment, the ability to easily upgrade or patch potential security vulnerabilities, and simple access to machine learning or artificial intelligence tools either at the edge or in the cloud will be paramount.

At the end of the day, anything that can be automated should be. If it can't be automated, we should be looking for every opportunity to reduce the complexity of managing these networks.

I would be remiss if I didn't mention the importance of wireless connectivity to the success of IoT. No one is going to want to run millions of wires to connect devices. The only way to achieve the scale and agility needed in these networks will be through wireless connectivity. At Cradlepoint, we are obviously big believers in the role that LTE and 5G will play in IoT.

IoT Now: How do you see Cradlepoint developing its IoT presence? Which areas do you see as most attractive, and what are your future plans?

GM: We are a wide-area, wireless networking company at our core. We see the need for a secure, more agile, software-defined and cloud-managed network being critical to the long-term success of IoT. We continue to invest to this end and refer to it as the Elastic Edge.

We are a leader in LTE networking today and are actively working with some of the largest carriers in the world to help make 5G a reality in the enterprise. We are also investing in and building partnerships with key IoT application platform providers. We are going to make it easy for IT to stand up and manage an IoT network and for the operations team to get easy access to the applications and analytical engines they need to gain the value they seek. ■

www.cradlepoint.com

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29 January – 1 February 2019
Broward County Convention Centre
Fort Lauderdale, Florida, USA
www.TheSmartCityEvent.com

Gain knowledge, contacts and solutions for the cities of the future

Get educated on the hottest applications and services emerging in today's smart city ecosystem. Learn from cities, municipalities and organisations who have achieved success. Network with an ecosystem of providers who are driving solutions and position yourself and your company to be an emergent leader in this hot sector.

The Smart City Event will be held at IoT Evolution Expo on 29 January – 1 February 2019 at Broward County Convention Centre, Fort Lauderdale, Florida, USA. Attendees will hear about the hot applications, services and technologies that are creating today's smart city.

At The Smart City Event in January, delegates will hear use cases of how cities are implementing solutions and how the ecosystem is delivering on the promise of the Internet of Things (IoT) as an enabler for smart living. From improvements in traffic congestion to renovations in infrastructure, the conference and exhibition will detail how technologies, including artificial intelligence (AI), IoT and edge computing, are expanding services while reducing costs.

Key themes at the event include

- Connected, data-driven infrastructures that will improve traffic patterns and safety
- Frameworks for building sustainability in modern cities
- Lessons from the city of Atlanta, Georgia and how it overcame safety, security and other challenges
- The public and private partnerships that are advancing smart solutions
- How smart lighting is enabling a multitude of smart solutions
- Fleet management use cases that are setting the bar for quality and innovation
- Effective solutions for both mass transit and personal transportation
- How one city utilised IBM's Intelligent Operations Center to aggregate data from disparate sources to drive safety and security initiatives

The agenda can be viewed in full at
www.thesmartcityevent.com/east/agenda.aspx

www.TheSmartCityEvent.com

Featured speakers

- Steve Brumer, partner, **151 Advisors**
- Greg Najjar, director of Business Development at Advanced RF Technologies, **ADRF**
- Homaira Akbari, president & CEO, **AKnowledge Partners**
- Davitt Potter, field CTO, **Arrow Electronics**
- Ashwin Krishnan, tech transformer and human revitaliser, **Ashwin Krishnan**
- Marcos Radonic, president & CEO, **Automated Parking Corp.**
- Brad Canham, vice president, **Cassia Networks**
- Maciej Kranz, vice president, Corporate Strategic Innovation Group, **Cisco**
- Kenneth Schlather, executive director, **Cornell Cooperative Extension of Tompkins County**
- George Mulhern, CEO, **Cradlepoint**
- Ernest Chrappah, chairman, **Department of For-Hire Vehicles**
- Dr. Aakanksha Chowdhery, software engineer, Machine Learning, **Google Brain**
- Frank Bradshaw, CEO, **Ho'ike Technologies**
- Tao Zhang, senior director for Technology and Industry Development, **Huawei Technologies (USA)**
- Jason Kelley, general manager, IBM Blockchain Services, **IBM**
- Dr. Claudio Lima, co-chair for Industrial Internet of Things (IIoT) Energy/Utility/Oil & Gas, **IIC Industrial Internet Consortium**
- Steve Hanna, senior principal, **Infineon and Trusted Computing Group**
- Lisa Brown, senior national director, Municipal Infrastructure & Smart Cities, **Johnson Controls**
- Stephane Wyper, senior vice president, New Commerce Partnerships and Commercialization, **Mastercard**
- Leonardo Simoes, IT Smart Cities specialist, technical counselor, **Smart City Business Institute Americas**
- Tracy Markie, CEO, **Small Box Energy**
- Eugene Grant, mayor, **The City of Seat Pleasant**

www.TheSmartCityEvent.com

Smart City collocated conferences

In addition to the packed speaker programme at The Smart City Event, the show is collocated with IoT Evolution Expo, which is celebrating its 20th event since 2009, as well as a series other sector-specific events detailed below. Super Pass and Diamond Pass holders may attend all events

www.iotevolutionexpo.com

IoT Evolution is where operational technology (OT) and IT professionals, developers and business executives go to learn how to strategize, build and profit from end-to-end IoT solutions. From building a network of edge devices to IoT gateways to scalable IoT connectivity networks, IoT Evolution covers all the critical issues and provides attendees with an unmatched resource for information, contacts, partners and providers.

Hear about IoT business intelligence and analytics, solutions for enterprise operations, fog and edge computing, and market opportunities within different verticals including smart cities, healthcare and industrial.

www.lpwanexpo.com/east

LPWAN Expo explores the technologies and deployment benefits associated with LoRa, low power wide area networks (LPWAN) and related connectivity solutions.

Take a deep dive into LoRa technologies as well as narrowband IoT(NB-IoT), CAT M1 and cellular connectivity. Visitors will be able to compare and contrast these solutions and see what is right for their application and company. Other topics will include security and application case studies in logistics, smart cities, industrial solutions and more.

www.TheSmartCityEvent.com

www.iiotevent.com/east

The Third Industrial Revolution is embodied in the IoT, and innovation is the heart of our industry. In this series of forward-looking sessions and breakouts, Industrial IoT (IIoT) event attendees will look ahead to make plans for implementing the Systems of Things that will shape the future of today's manufacturing and production functions. Attendees will have the opportunity to learn from IIoT test beds and use cases, hear about factory floor solutions that improve production management and control and as well as to learn about technical solutions to mitigate cybersecurity risks

www.iotevolutionhealth.com/conference

IoT Evolution Health is laser focused on showing attendees how IoT technologies and associated business initiatives can improve patient outcomes, drive down costs and expand patients' treatment options.

This event provides an education and networking forum for healthcare enterprises, IoT developers, suppliers and health original equipment manufacturers (OEMs). All attendees will have an opportunity to learn from each other and collaborate on solutions that will lead to improved efficiencies, new profit centres and better health outcomes for patients.

Other special events to prioritise

Business Impact Awards:
The IoT Evolution Business Impact Award is a special awards programme focused on recognising companies and business leaders that have successfully implemented M2M and the IoT solutions to solve a business issue, launch a new service or create a revenue opportunity. Winners present their solutions during the event.

Battle of the Platforms
The Battle of the Platforms is an exciting opportunity for leading companies to present cutting-edge IoT platforms and for businesses to hear and see what the market has to offer. The Battle of the Platforms will provide participants the opportunity to demonstrate their platform live to a panel of judges and attendees.

Career Enhancing Certifications
IoT Evolution is one of the only technology conferences that provides something many others don't - certifications in seven different technology areas ranging from block chain to edge computing, to IoT strategies.

IoT Evolution Certifications provide proof to your employer, customers and business partners that you possess the knowledge and skills, and the level of competence, necessary in today's competitive technology marketplace.

IoT @ The Edge
With edge computing now seen as a primary tool in enabling IoT and the data processing IoT applications require, IoT Evolution is dedicated to bringing together the best possible information on how IoT enterprises can leverage edge technology to improve their business through using the intelligence, control and automation, and predictive capabilities.

Driving Intelligence, Solutions and Advanced Services from the Edge of IoT

Hear how edge computing is handling the IoT data deluge and delivering large scale IoT implementations in Use Cases Across all Industries

IoT™ EVOLUTION EXPO

SD-IoT
Data Analytics
Transport & Fleet
Blockchain
Smart Buildings
Digitial Twin
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January 29th – February 1st, 2019
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It's up to us to connect the world and remove barriers to IoT businesses, says 1NCE CEO

1NCE, which launched at this year's Mobile World Congress (MWC), is now bringing connectivity to thousands of IoT devices. The company's recently opened webshop is now enabling an unparalled easy onboarding of customers to its unique flat fee 500MB IoT connectivity offering. Here, Alexander Sator, the founder and chief executive of the company, tells IoT Now how the company's vision has been realized and customers are benefiting from the simplicity of the offering. This could only have been developed by IoT natives, he says

We have built up our whole product including all systems and processes from scratch

IoT Now: You've recently launched the 1NCE webshop. How has that gone and are customers embracing the concept of transacting simply online for IoT connectivity?

Alexander Sator: We have built up our whole product including all systems and processes from scratch within seven months and the webshop has gone according to plan and is now exactly as we announced it at the MWC in Barcelona in March.

No one outside of 1NCE believed or hoped that we would be able to do this in the timeframe and now, – here we are. We have one-of-a-kind connectivity webshop that allows our customers to purchase an IoT grade SIM card with a 500 MB data allowance and 250 SMS included for €10. Customers can purchase just one or millions of SIM cards – all online within a couple of clicks. There are no limits, nor any hidden fees. Therefore it's up to the customer if they want only a few cards for testing or several thousands or more. Exactly this is happening at the moment within the webshop – we are seeing customers trying our cards before they go for larger amounts but we're also seeing customers going for the large buckets of cards right from the start.

IoT Now: How does the process of onboarding customers work?

AS: Every customer orders our product in the same way – that's one of the beauties of the system. After having filled the online order forms they get an invoice immediately and we send out the cards after we have received the payment. Since each card is already activated ▶

Alexander Sator, 1NCE

there is no need for any further registrations. The customer also gets immediate access to our connectivity management platform where they can immediately see the status of their shipment, the amount of ordered SIMs as well as how to configure and setup the connection to our network. And that's everything – it's all you need to start connecting your IoT devices.

IoT Now: Please can you tell us how trials with pan-European test clients have gone?

AS: Well, it's amazing, we have already deployed approximately 10,000 test cards among our clients all over Europe with great success. Everyone was happy with our capabilities, especially because we are able to deliver seamless multi bearer capabilities which has enabled us to build up connections almost everywhere in Europe and the US utilising almost any host network.

In addition to that we had some customers in Germany that were testing our narrowband IoT (NB-IoT) capabilities here. It has worked perfectly from the very first moment.

Other customers have told us that our SIM card has established a connection to the cellular network even faster than anyone else before, which was very satisfactory feedback for us.

Naturally, our test customers have helped us to fix some bugs and address some setup issues. We highly appreciate this valuable support which has enabled us to build the reliable product we were able to commercially launch in August.

IoT Now: You describe yourselves as IoT natives – what does that term mean to you?

AS: Each member of the 1NCE management team has worked in the IoT market for a long time prior to joining 1NCE. I myself have been active in this market for almost 20 years now. We founded 1NCE because we all knew about the challenges and obstacles that our customers are facing. So we developed the 1NCE Lifetime Fee which is the answer to many problems. Typical among these are that customers don't know what total cost of ownership (TCO) they could expect for the lifetime of their devices, which bearer would be best to use and how much data or SMS their application would require over the coming years.

Our product eliminates the complexity of multiple tariff plans or extra fees. Many IoT customers do not exactly know what they will need, but we know because we had all those insights thanks to our experience in this market. This is why we only provide one offer that covers all of the necessary requirements to start an IoT business.

IoT Now: How important is it to practice what you preach and run your business with an IoT model from product to technology and customer journey?

AS: We have created a product purely dedicated to IoT customers. Connectivity can no longer be a hurdle to prevent IoT businesses being started. This is why we have streamlined and automated all steps and processes to get IoT devices connected. It starts with the order process which you can do with only four clicks. Also each customer has easy access to our platform and to our knowledge base. We have a first level support that helps with the onboarding and setup processes. This is how I would have liked to have got my devices connected ten years ago but, because there wasn't any progress since then, I thought: okay – it's up to us to connect the world

See for yourself how to solve your IoT connectivity challenges simply by visiting **www.1nce.com**

Other customers have told us that our SIM card has established a connection to the cellular network even faster than anyone else before

IoT M2M COUNCIL

The IoT M2M Council is the only trade organization in the industry that brings together IoT Buyers at scale.

The IMC's rank and file membership is comprised of 25,000+ enterprise users, OEM's, and apps developers that deploy IoT Solutions, including Hardware, Software and connectivity.

The IoT M2M Council is the largest and fastest-growing trade organisation serving the IoT sector. Companies at the forefront of IoT innovation make up our Board of Sustaining Members.

In addition to being promoted as Thought Leaders in the IoT sector, only IMC Sustaining Members have access to the IMC Adopter database for purposes of lead generation.

IMC Sustaining Members

Our 25,000 IoT Adopter Members must apply and qualify as buyers of IoT Services and Solutions to gain access to:

IMC's Content Library

8 vertical newsletter channels

Free webinars covering the latest innovations

Participation in our Quarterly survey to help track IoT buying trends

Invitations to live IoT events

imc
IoT M2M COUNCIL

For more information and to become a member visit www.iotm2mcouncil.org

The Intelligent Automation Week – Austin 2018
Austin, Texas, USA
3-6 Dec 2018
https://intelligentautomationevent.iqpc.com/

AI World Conference and Expo
Boston, Massachusetts, USA
3-5 Dec 2018
https://aiworld.com

GSMA Mobile 360 Series – Latin America
Buenos Aires, Argentina
4-6 Dec 2018
https://www.mobile360series.com/latin-america/

Big Data & AI Asia (digital only)
Singapore
4-5 Dec 2018
https://bigdataasiashow.com/2018/

Edge AI Summit
San Francisco, California, USA
11 Dec 2018
https://www.iotevents.org/event/edge-ai-summit/

IoT Infrastructure Pavilion @CES
Las Vegas, Nevada, USA
8-11 Jan 2019
http://www.iotm2mcouncil.org/ces2019

Intersec
Dubai, United Arab Emirates
20-22 Jan 2019
https://intersec.ae.messefrankfurt.com/dubai/en.html

3rd Internet of Things India 2019 Expo
New Delhi, India
29-31 Jan 2019
http://www.iotindiaexpo.com

IoT Evolution Expo
Fort Lauderdale, Florida, USA
29 Jan-1Feb
https://www.iotevolutionexpo.com/east/

The Smart City Event
Fort Lauderdale, Florida, USA
29 Jan-1Feb 2019
https://www.thesmartcityevent.com/east/

The Industrial IoT Event
Fort Lauderdale, Florida, USA
29 Jan-1 Feb
https://www.iiotevent.com/east/

Connected Manufacturing Leaders Summit
Munich, Germany
30-31 Jan
https://manufacturing.wbresearch.com

MOVE
London, UK
12-13 Feb 2019
http://bit.ly/2DWBIIv

MWC19
Barcelona, Spain
25-28 Feb
https://www.mwcbarcelona.com

Embedded World 2019
Nuremburg, Germany
26 Feb-28 Feb
https://www.embedded-world.eu/home.html

IoT London
London, UK
12-13 March
https://www.smartiotlondon.com

Creating Smarter Cities

Advancing cities for improved sustainability, resiliency & efficiency

Today, many public-sector IT teams are embracing opportunities to implement technologies that drive down costs, ramp up efficiency, and improve quality of life. From conserving energy and utilities resources, improving public safety and emergency services, creating more effective fleet management and public transit systems, to reducing traffic congestion, a plethora of smart applications are improving and connecting the world around us.

To learn more how Cradlepoint NetCloud Solutions enable Smart Cities, go to cradlepoint.com

Or come visit us at IoT Evolution 2019

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