

# IoT NOW

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## Double-down, stick or twist, vendors make their moves as IoT matures

There has been a growing volume of assertions that IoT is entering maturity during 2022. Often that has seemed little more than wishful thinking but in the second half of the year, proof has emerged: big acquisitions are happening



**George Malim**,  
managing editor

Late July saw the announcement that **Telit** is to incorporate **Thales's** cellular IoT products business and create a new company called **Telit Cinterion**. Under the deal, Thales is to transfer its cellular IoT modules assets to Telit and receive a 25% stake in Telit Cinterion. The deal creates a western IoT provider. Thales's IoT modules business generated more than €300 million in 2021.

The following week saw **Semtech** confirm its US\$1.3bn purchase of **Sierra Wireless**, the cellular modules and gateways vendor that also offers cloud and mobile virtual network operator (MVNO) services and platforms. Semtech sees the deal generating US\$40m in synergies within 18 months of closing as the two vendors' cellular, LoRa and cloud offerings are combined.

It hasn't all been plain sailing. **Google**, for example, has announced it is to shut down its IoT Core platform, leaving **AWS** and **Microsoft** which had entered the IoT platforms market faster than Google as the hyperscalers serving the market.

Now, just in time for this comment the breaking news is that **Ericsson** has also hit the ejector seat button having signed an agreement to transfer its

IoT Accelerator and Connected Vehicle Cloud businesses to **Aeris Communications**. Used by more than 9,000 enterprises to manage 95 million devices and with 22 million embedded SIM connections globally, Ericsson IoT Accelerator had a growing ecosystem of more than 35 communications service provider partners for global IoT connectivity. The Connected Vehicle Cloud platform is among the most widely-adopted in automotive IoT with six million vehicles connected across 180 countries. Visit [www.iot-now.com](http://www.iot-now.com) to get the whole story.

However, with sales of SEK 0.8 billion (US\$77.4m) but quarterly losses of SEK 0.25bn (US\$24.2m), it appears Ericsson has lost patience. The divestment, related cost and other portfolio optimisations will lead to a negative one-time EBIT impact of SEK 1.1 billion (US\$106.4m) in Q4 2022.

Another indicator of market maturity is the emergence of winners and losers as the vendor landscape shakes-out to a size and pattern that matches the needs of the industry it supports. In IoT, we're seeing even the biggest companies acknowledge when their strategies haven't worked and when it's time to exit, double-down, stick or twist.

The second half of 2022 has seen examples of each and we will see more in 2023.

Enjoy the magazine and best wishes for the New Year!

George Malim

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## PTC offers US\$1.46bn for SaaS field service management provider ServiceMax

PTC has signed a definitive agreement to acquire **ServiceMax** for approximately US\$1.46 billion in cash on a debt-free, cash-free basis from an entity majority-owned by **Silver Lake**. ServiceMax is a provider of cloud-native, product-centric field service management (FSM) software.

The acquisition is expected to strengthen PTC's closed-loop product lifecycle management (PLM) offerings by extending the digital thread of product information into downstream enterprise asset management (EAM) and FSM capabilities. Subject to the satisfaction of regulatory approval and other applicable closing conditions, the transaction is expected to close in early January 2023.

"The addition of ServiceMax will realise a key part of PTC's closed-loop PLM strategy," said Jim Heppelmann, president and CEO of PTC. "The PLM capabilities PTC has long offered to engineering and manufacturing departments provide the system of record for the digital definition of any product configuration. ServiceMax will complement this by providing the system of record for monitoring and servicing product instances after they leave the factory and move into customer use. Upon completion of this acquisition, PTC will have the unique ability to complement the full digital product definition from our computer-aided design (CAD) and PLM solutions with detailed usage information from our internet of things (IoT) solutions and the complete service history from ServiceMax. PTC is poised to be the only company that will be able to offer manufacturers this comprehensive view of their products at each stage of the lifecycle."

Neil Barua, the CEO of ServiceMax, added: "PTC has a strong and consistent track record of success and now, following the



**Jim Heppelmann, PTC**

growth and innovation we've achieved during our partnership with Silver Lake, we're excited for the ServiceMax team to strengthen the service offerings of PTC's digital thread and closed-loop PLM portfolio."

Partners since 2015, PTC and ServiceMax both support manufacturers of complex, highly configured products for the medical device, industrial products, aerospace and related verticals. These manufacturers view field service as a strategic part of their businesses to maintain product performance, extend their products' lifecycles, increase customer satisfaction, drive revenue growth, and expand profitability.

The purchase price will be funded in two stages, with US\$808m paid at closing and US\$650m paid in October 2023. The transaction will be funded with cash on hand, borrowings under PTC's existing credit facility, and a new US\$500m committed term loan. ■

## Airtel launches Always On IoT connectivity

**Bharti Airtel** has launched its Always On IoT connectivity service in India. The offering comprises a dual profile M2M embedded SIM (eSIM) which allows an IoT device to always stay connected to a mobile network from different mobile network operators (MNOs) in the eSIM.

The Airtel Always On service complies with the **Automotive Research Association of India (ARAI)**'s AIS-140 standard implemented by the **Ministry of Road Transport and Highways (MoRTH)**. It lays down mandatory requirements related to connectivity and GPS tracking capabilities for devices in all passenger-

carrying buses, private fleets and other public transport vehicles for tracking, safety and security purposes.

"We are delighted to bring the Always On connectivity solution to our customers," said Ajay Chitkara, the director and CEO, of Airtel Business. "We believe this is the next big opportunity in the IoT segment. Our strengths in the network, modern and GSMA-compliant platform offering real-time access to data and flexibility to integrate the solution with custom application programme interfaces (APIs) will make Airtel Business stand out in the market." ■

## News in Brief

### NextNav announces acquisition of Nestwave

**NextNav**, a provider of GPS and 3D geolocation, has acquired **Nestwave**, a privately held global provider of low-power geolocation, for an enterprise value of US\$18m with a gross consideration value of US\$19.3m, consisting of US\$4.3m in cash and US\$15m in NextNav common stock.

Based in Neuilly-sur-Seine, France, Nestwave provides advanced geolocation solutions to IoT modem and digital signal processor vendors and end users. The combination of NextNav's technology with Nestwave's LTE/5G capabilities will allow NextNav to intelligently combine signals from existing terrestrial LTE/5G networks with its own highly synchronised TerraPoiNT system to deliver near nationwide resilient 3D position, navigation and timing (PNT) capabilities. ■

### Sumitomo invests in ClearBlade

**Sumitomo Corporation of Americas (SCOA)** has announced its investment in **ClearBlade**, an IoT company headquartered in Austin, Texas. SCOA's investment will help the company expand its operations internationally and provide SCOA and affiliated companies access to ClearBlade's software.

ClearBlade's IoT, edge and artificial intelligence (AI) software has been in use at some of the largest companies in North America, spanning several industries including transportation, energy, industrial products and manufacturing. The new growth capital provided by SCOA and other investors will be used to help grow ClearBlade's software installed base and to support those customers via SCSK USA, a Sumitomo Corporation's IT service company. ■



## Healthcare, industrial and automotive sectors lead IoT connection growth during 2022-2030

**Strategy Analytics** has published its latest report on IoT cellular connections by vertical and by air interface (25,3G,4G and 5G), forecasting a double-digit compound annual growth rate (CAGR) of 14% during 2022-2030. According to Waseem Haider, a principal analyst for enterprise IoT at Strategy Analytics and author of the report, 'IoT cellular connection by air interface by vertical' which provides projections until 2030 - industrial and automotive will be the biggest verticals in terms of number of IoT connections during the forecast period 2022-30.

This latest update forecasts IoT connections by air interface technology and by verticals - automotive, healthcare, home (non-security), industrial, primary processing, POS/retail, security, transport, utilities and others. During 2022-30, healthcare is set to be

the highest growing vertical with a CAGR of 23% followed by industrial and automotive verticals with a CAGR of 17% and 16% respectively. Strategy Analytics believes that the largest sectors will continue their growth trajectory, with IoT connections in industrial accounting for 21% in 2030, growing from 17% in 2022 and automotive accounting for 18% in 2030, growing from 15% in 2022, during the forecast period of 2022-30. In 2022, industrial is the leading sector with 17% of the total IoT connections followed by automotive and utilities with 15% connections, respectively.

Gina Luk, the director of enterprise research at Strategy Analytics, said: "By 2030, 5G IoT connections will be dominated by industrial and automotive applications, with 28% and 21% of 5G IoT connections respectively. Healthcare and



**Waseem Haider**  
Strategy Analytics



**Gina Huk**  
Strategy Analytics

security applications will be the next largest market in 2030, accounting for a combined 20% of 5G IoT connections. The low latency benefits of 5G will allow IoT use cases where near-instantaneous communications are required, such as platooning of trucks in transportation, autonomous driving, low latency in manufacturing and areas like remote surgery in healthcare, where a surgeon could be conducting a surgery via robotics and virtual or augmented reality, even though not located in the operating theatre with the patient." ■

## The cellular IoT gateway market reached US\$1.15bn in 2021

**Berg Insight** has released new findings about the market for cellular IoT gateways and routers. More than 4.5 million cellular IoT gateways were shipped globally during 2021, at a total market value of approximately US\$1.15bn. Annual sales grew at a rate of 14% as demand recovered following the COVID-19 pandemic.

The industry experienced at the same time constrained supply of key components like cellular modules and CPUs, resulting in extended delivery times. Sales growth has continued into 2022 but is likely to slowdown in 2023 as economic conditions tighten across the main regions. Until 2026, annual

revenues from the sales of cellular IoT gateways is forecasted to grow at a compound annual growth rate (CAGR) of 14% to reach US\$2.18bn at the end of the forecast period.

**Cradlepoint**, part of **Ericsson** since late 2020, is the clear leader in the market and differentiates itself by selling its routers combined with software and services exclusively through a subscription model. **Teltonika Networks** is the runner up and achieved the highest growth rate in the industry of close to 100%. Other vendors that hold significant market shares are **Cisco**, **Sierra Wireless** and **Digi International**. These five vendors

generated US\$625m in combined annual revenues from the sales of cellular IoT gateways and routers and hold a market share of 54%. Other important vendors include **MultiTech**, **Lantronix**, **Systech** and **Casa Systems** in the US; **InHand Networks**, **Peplink**, **Hongdian**, **Robustel** and **Advantech** in Asia-Pacific; and **HMS Networks**, **NetModule**, **Matrix Electrónica**, **Westermo** and **RAD** in the EMEA region. The European and Asia Pacific markets are fragmented with a large number of small and medium sized players that generate annual revenues in the range of US\$5-25m. ■

## Advanced driver assistance systems market to exceed US\$75bn globally by 2030, says SM Research

The global advanced driver assistance systems (ADAS) market will witness a robust CAGR of 13.83%, valued at US\$23.44bn in 2021, expected to appreciate and reach US\$75.23bn by 2030, says a new study from **Strategic Market Research**. ADAS are composed of technologies and electronic systems

in a vehicle to assist the driver. ADAS utilises the sensors that are present inside the vehicle, such as a camera and a radar, to enable a vigil to be kept on the outside world.

ADAS provides pivotal information like the level of congestion present on the

roads, updates on traffic, blockage, and closure of roads ahead so that the driver gets alerted beforehand. This system also measures the driver's distraction and level of fatigue of the driver, thereby suggesting precautions that need to be taken by drivers. ■



## DeltaTrak and Ericsson IoT combat food waste with real-time cold chain traceability

**Ericsson** and **DeltaTrak**, a specialist in cold chain management and end-to-end supply chain solutions, have announced a collaboration through **Deutsche Telekom** that will drive cold chain traceability enhancements powered by the Ericsson IoT Accelerator platform.

By providing real-time tracking data for perishable food and biopharmaceutical products in transit, this collaboration will enrich food chain visibility, increase food and medication safety and thus reduce waste, while enabling sustainability and environmental awareness in transit operations. Deutsche Telekom, one of the integrated telecommunications companies and an Ericsson IoT partner, provides the reliable and secure global connectivity which is key to enable real-time data transmission.

In the US alone, food loss and waste results in 170 million metric tons of CO2 emissions per year, according to the **Environmental Protection Agency**, excluding the emissions from wasted food sent to landfills underpinning the importance of working towards eliminating waste.

As a customer of Deutsche Telekom, DeltaTrak will harness the power of Ericsson's IoT Accelerator platform to gain real-time tracking data for perishables throughout the entirety of the transit process, realising the benefits of IoT in food and pharmaceutical logistics by



**DeltaTrak's cold chain data logger**

increasing safety and reducing waste. Roughly one-third of food produced in the world is lost or wasted highlighting the importance of having holistic and real-time data on food in transit to ensure that proper environmental conditions such as humidity and temperature are maintained.

"Representing the latest innovations from DeltaTrak, the cellular IoT enhancements enable our patented ecosystem offerings to deliver end-to-end chain of custody capabilities," said Frederick Wu, the chief executive and founder of DeltaTrak. "Actionable data visibility from the real-time FlashTrak Chain of Custody eCcosystem can improve product shelf-life, reduce spoilage, food waste and CO2 emissions." ■



**Frank Petznick, Continental**

## Continental integrates Ambarella's scalable system-on-chip family in ADAS

**Continental** has introduced advanced driver assistance systems (ADAS) based on the CV3 artificial intelligence (AI) system-on-chip (SoC) family from semiconductor company

**Ambarella**. The SoC, which is built for ADAS applications, complements Continental's solutions for assisted driving and further advances vehicle automation.

The more sensors that are installed in a vehicle, the greater the amount of data collected to detect the environment. The joint solution with centralised single-chip processing based on 5-nanometer technology enables the vehicles to process

the environmental perception of multiple sensors even faster, thanks to the increased performance level. Sensor solutions include high-resolution cameras, radars, lidars as well as ultrasonic sensors. The integrated SoC enables early data fusion, in which the information from different sensors is processed simultaneously for various applications.

"After exchanges on different use cases with Ambarella for two years, Continental is now integrating its high-performance, low latency, and low-power processing chipset into our assisted driving solutions," said Frank Petznick, head of the autonomous mobility business area at Continental. "This brings our ADAS systems to the next level and helps to serve the growing amount of sensor data in the vehicle. With this, we achieve a more comprehensive and accurate environmental perception." ■

## News in Brief

### Roku to launch new smart home products at Walmart

**Roku** and **Walmart** have announced the launch of Roku's new suite of smart home products which includes security cameras, video doorbells, lighting and plugs. This expansion of Roku's product line provides a broad offering of simple and affordable smart home devices, available exclusively in nearly 3,500 Walmart stores.

"At Walmart, we are dedicated to providing our customers with technology to simplify and enhance their lives at everyday low prices," said Laura Rush, senior vice president, electronics, toys and seasonal Walmart US. "Roku's new line of smart home devices, available exclusively in-store at Walmart, allows our customers to easily enjoy the security and convenience afforded by these new products from Roku." ■

### Tele2 IoT, EBS partner to deliver IoT connectivity

**Tele2 IoT** will support **EBS** with managed IoT connectivity for alarm systems and smart communicators supporting lone worker solutions and home alarms. The partnership for global managed IoT connectivity runs for three years and builds upon an existing relationship that includes managed connectivity through the 2CONTROL connectivity management platform from **Cisco Systems**. Connectivity includes LTE-M and 5G services.

"As a European manufacturer of security systems and business automation solutions, our goal is to deliver a complete solution to our partners and to be a pioneer in our industry," said Kris Stalewski, business development director EBS. "Tele2 IoT, as our partner, understands our needs and creates business synergy with us. We will launch a product soon in Europe, our next steps are to start in North and South America." ■



# Simple, open, flexible and automated connectivity enables the new wave of mass-scale global IoT deployments

Ajay Joseph, the chief technology officer of iBASIS, the communications solutions provider that is enabling operators and digital businesses to transform and connect worldwide, has a clear vision of easy to configure, flexible to use and efficient to manage global IoT connectivity. The rigid, use-it-or-lose-it, capacity-based operator-specific connectivity deals of the past impose too many constraints on multinational IoT deployments and the arrival of embedded and integrated SIMs are freeing IoT service providers from the shackles of traditional contracts.

Now, he tells Matt Hatton, the founding partner of Transforma Insights, the technologies are coming together across networks, the SIM landscape and with in connectivity management platforms (CMPs) to make that simplified, de-risked era of IoT communication a reality. This new flexibility and radically increased automation are arriving just in time for modern CMPs to enable hyperscale IoT service deployments

**As a big player in the voice market we have a lot of assets which are very important for addressing IoT**

**Matt Hatton: For the benefit of any readers who aren't familiar with iBASIS, can you tell me a little bit about the company?**

**Ajay Joseph:** The origin of the company is as a start-up in the Boston area with a DNA in wholesale voice services. In 2007 we acquired **KPN Global Carrier Services**, the international voice business of KPN, the Dutch incumbent telco, and then in 2008 the international wholesale voice business of the Danish incumbent **TDC**. After that we became a wholly owned subsidiary of KPN, until in 2019 we were acquired by **Tofane Global**, a group which also acquired the international businesses of carriers in France, Portugal and the Dominican Republic. Today, we have presence in 22 countries and we connect to more than 1,000 operators worldwide, making **iBASIS** one of the top three international carriers.

As a big player in the voice market we have a lot of assets which are very important for addressing IoT. We act as an Internetwork Packet Exchange (IPX), we connect to hundreds of mobile network operators as customers and suppliers and we

facilitate roaming between mobile network operators around the world. For instance we support roaming on 700 LTE networks, and an ever expanding number of 5G networks.

**MH: That's the background in voice. What's the interest in IoT?**

**AJ:** We started in IoT for two reasons. Firstly, our customers were coming to us and asking to provide access for their things. Secondly, we have deep and extensive relationships with mobile operators that we can make use of. About four years ago, we started with a customer in travel and transportation, supporting hundreds of thousands of SIMs. Having the relationships with all of those operators meant that we were in a great position to buy from the operators and sell to enterprises. Our ideal customer is an IoT service provider or device manufacturer that needs connectivity for their enterprise or consumer customers.

**MH: Tell me a bit about the tools you have within the organisation for connecting IoT devices. ►**

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**AJ:** There are a couple of things that are very relevant. Since the beginning, iBASIS Global Access for Things has offered **GSMA** standards-based eSIMs with connectivity from across the world. In 2022 we acquired CMP provider, **Simfony**. Simfony's Connectivity Management Platform augments the iBASIS IoT Portfolio. In addition to serving the IoT service providers, this integration has expanded the offering to enable IoT mobile virtual network operators (MVNOs) to launch and deliver IoT connectivity services under their own brand.

**MH: What was the rationale for the purchase of Simfony?**

**AJ:** Simfony has become the business layer of our offering. We have three layers that we provide. The network layer includes all the networking technologies, the eSIM, remote SIM provisioning, intelligent network selection, enterprise virtual private networks (VPNs) and so forth. Above that is the business layer, which provides for things like service management, device management, visualisation and analytics, real-time notifications,

rate plan management and mobile network permissions.

Think of this as a journey for the customer creating a plan. They start with needing 10MB of data in a certain set of countries. The CMP is the interface for MVNOs, resellers and end users. Within the CMP, orders get placed, the SIM cards are tracked for delivery, and activated, traffic starts, and location of the SIM, rating, billing and volume tracking all occur. All features are also available via application programme interfaces (APIs).

**MH: And you mentioned there were a couple of things that were relevant for connectivity, what was the other?**

**AJ:** The other thing was that we developed patented software for profile switching. We onboard profiles from mobile operators onto the remote SIM provisioning (RSP) platform and, using a set of patented software, provide intelligent profile switching. There's a lot of sensitivity at the moment around following the regulations around ►

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**Think of this as a journey for the customer creating a plan**



**Matt Hatton**  
Transforma Insights



**Ajay Joseph**  
iBASIS

*Our connectivity is based on eSIM and the flexibility that it brings which enables products to have a single stock-keeping unit (SKU) number that can be deployed anywhere in the world*

local rules for permanent roaming, both from regulators and from operators, a lot of the time due to taxation implications. Lots of companies have found that they can get away with it for a while, but ultimately permanent roaming may get your devices shut down. Operators are very sensitive to it and intelligent profile selection is very important for ensuring that any connected device is compliant with the local rules.

**MH: Using remote SIM provisioning and eSIM profiles is very hot at the moment. Tell me what you're doing there?**

**AJ:** We at iBASIS have a very close relationship with operators such as **Verizon**, meaning that our customers can download a profile onto their SIM cards in real-time. There aren't many companies that have cracked the code on real-time donation. Some have used multi-international mobile subscriber identification (IMSI), but that runs into some issues with not being standards-based and secure. We follow the standards. To get the donation of profiles from tier one operators there's no other way to do it. This is why IoT service providers and MVNOs chose to work with us, our longstanding relationships with operators and eSIM technology allows them to benefit from multiple carrier profiles.

**MH: How would you summarise your approach to the IoT connectivity space? What are your company beliefs?**

**AJ:** Our belief is that connectivity should be simple and we should de-risk the process of buying and using connectivity for the customer so that they don't face problems. We talk a lot about the concept of unlocked freedom, which comprises a few areas.

The first area is that it should be safe, with devices connected over a private network. We are also an IPX provider so we're connected directly to mobile network operators.

The second consideration is that of economics. Lots of customers have package plans where if you don't use all the data in your bundle, you lose it, meaning it's the carrier who is keeping the bulk of the revenue. iBASIS prefers to only charge for services used, which means next to a nominal monthly service fee, it is primarily a pay-per-use model. Most others don't have that, they typically have plans for a certain number of megabytes and if you don't use it, you lose it.

Third we have reliability. This is related to the use of eSIM. iBASIS provides customers with multiple operator profiles between which the best can be selected for quality and cost. The SIMs use a combination of local and network based intelligent profile selection, which means that it selects the optimal profile for that device. If that doesn't work there is a fall back to a roaming profile. There's always some kind of connectivity regardless of where the device is deployed.

Another key belief is around flexibility. Our connectivity is based on eSIM and the flexibility that it brings which enables products to have a single stock-keeping unit (SKU) number that can be deployed anywhere in the world. This is really important from the point of view of inventory control. There's no requirement for different SIMs for different countries or regions.

The final belief is that the provisioning of IoT connectivity should be automatic. We try to automate as much of the process as we can. For instance, the question of which profile to use ▶



**Matt Hatton**



where and when and for which plan is all automated. Similarly, alerts from the connectivity management platform are automated too.

**MH: How does that impact the customer experience in the market?**

**AJ:** This all helps to unlock the customer. IoT service providers face the nearly impossible challenge of a physical SIM swap in scenarios of migrating away from one operator card to another. The iBASIS multi-profile eSIM gives them the ability to move connections across providers. This isn't something that is usually offered by IoT connectivity providers. iBASIS can deliver extra value because we're independent of the operator. We have an independent view which means we can make selections based on the right business logic, for instance whether the client needs high data rate, network quality, low latency or other functions that might be enabled by 5G in the future perhaps.

**MH: Any views on the current state of the standards for remote SIM provisioning, particularly the SGP.31/32 IoT variant?**

**AJ:** Well, the specification is not out yet but we're getting prepared for it. It's not clear yet how the mobile network operators are going to embrace it. The machine-to-machine (M2M) variant was clearly aimed at the enterprise department, and the consumer one at the consumer department, but for the new IoT type, is it the consumer department? Or the enterprise department? Or maybe it's wholesale? There's a lot that's not clear about it now, and it will be two years before it's really ready.

**MH: What about the other interesting SIM-related development, iSIM? What do you think of that?**

**AJ:** We've been involved in a few prototypes on the integrated SIM (iSIM). Currently it's very complicated, simply due to the number of players who are involved, including the likes of the chip vendor, the module vendor, the iSIM OS vendor, the mobile network operator and iBASIS. This all has to scale with secure hand-offs. What we've seen done by most players so far is just proof-of-concept. To get to scale the processes need to be industrialised and the ecosystem needs to mature.

**MH: How about 2G and 3G sunsets, how do you see that affecting your customers?**

**AJ:** The sunseting is not a tremendous concern because we have multiple profiles and fallback roaming. Our customers will always have the ability to switch to another network for as long as there are networks available.

**MH: Are there any other interesting trends that you're seeing in the US?**

**AJ:** There are a couple of other quite significant trends that we're seeing. First, we're seeing lots more customers asking for multi-operator profiles, covering several of the network operators. Only a player like iBASIS is in a position to really support that. The operators themselves can't.

The other big thing we're seeing is demand for ultra-high bandwidth unlimited traffic applications like fixed wireless access growing like wildfire. That will become ready for eSIM soon, with iBASIS offering unlimited multi-operator tariffs. It's a router requiring a lot of bandwidth. Is this an IoT use case? It's a grey area, but we have it in the arsenal and we're able to sell to those businesses that demand it. We expect those plans to grow greatly in the coming years. ■

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***We're seeing lots more customers asking for multi-operator profiles, covering several of the network operators***

[www.ibasis.com](http://www.ibasis.com)



# Combonet finds iBASIS makes the critical difference for global IoT connectivity

Combonet, a digital wireless mobile network and trusted provider of mission-critical telecommunications in Belgium, the Netherlands and the United Kingdom, aims to provide the most reliable, secure and clear communications to the professional user allowing them to work safer, smarter and simpler. By offering complete flexibility, every organisation can find its ultimate communications capability. Combonet controls its own network to ensure that only authorised users have access. This keeps all communications completely secure which is vital for its work with professionals and emergency services. Combonet guarantees that radio communications between individuals and control rooms on any device will be locked down to authorised users only and, to support the success of critical IoT, its secure network keeps all sensitive data private. Combonet is a subsidiary of the Entropia group which also includes Combus which takes care of software integration between platforms and in control rooms. Combonet has also delivered its first app in the Google play store

With a long history of supporting its mission-critical customers, **Combonet** was keen to expand its applications and IoT connectivity in addition to its critical communications capabilities. It turned to iBASIS for its global IoT connectivity and programmable SIM management capabilities. Traditionally, business-critical functionalities are focused on voice with only limited data support, with iBASIS offering higher bandwidth that also enables certain data functionalities to be added to the proposition. Higher availability than many national mobile operators and top security credentials were important determinants in the selection of **iBASIS** for Combonet's expansion.

iBASIS's global IoT Connectivity offering and fully

featured remote programmable SIM (eSIM) management capabilities were also identified to help unlock new levels of speed, reliability, security, and scale for critical voice, data-only, and machine-to-machine (M2M) services. As a result, with a single Combonet SIM card, critical 4G and 5G broadband services are possible over multiple networks on a global scale. If a network fails, the SIM card immediately and automatically identifies which network has the strongest signal, depending on the location, and partly connects seamlessly using the Combonet apps and ComBus software.

Via iBASIS' Symphony CMP, Combonet's multi-network mobile data products are managed independently through a hassle-free management ►

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portal and are also accessible to external managers. The communications management platform (CMP) allows Combonet to create its own plans and proposals for different customers with an option to have real-time connectivity research troubleshooting. Even Combonet’s customers can get their own management environment, managing their own eSIMs and mobile data.

“We’re Europe’s leading experts in mission critical communications expanding our TETRA networks with broadband,” explains Philip Verduyze, the founder, chairman and CEO of Combonet Group. “All three companies, Combonet, ComBus and Entropia deliver diverse offerings but share the same passion, integrity and enthusiasm to connect human-to-human, human-to-machine, and machine-to-machine to create a safer, greener, more sustainable world where communities enjoy the highest quality of life.”

“ComBus’s advanced feature-rich broadband push-to-talk applications in combination with Combonet and Entropia will amplify your operations, safety, and efficiencies as they can be utilised on site via your own broadband and Wi-Fi installation, and when working remotely through access to the global 4G and 5G connectivity,” he adds. “Combining these elements facilitates continual coverage seamlessly.”

With iBASIS providing high-bandwidth global connectivity and redundant routes to multiple

public networks in over 180 countries and more than 500 networks, multi-network SIM cards eliminate additional roaming charges for Combonet. The Combonet SIM cards dynamically identify and automatically connect to the strongest signal available to maintain connectivity if one or more providers fail, in conjunction with the Combonet platform and the ComBus application programme interface (API), both powered by Entropia.

As a result, the Entropia Group has now expanded its market reach from Entropia’s mission-critical services to include Combonet’s critical solutions, which can be accommodated via Wi-Fi 6e, 4G, and 5G broadband solutions, as well as integrated into the Entropia mission-critical TETRA networks. Benefits include lower costs with optimised deployments, with a single cloud-based management platform and a single point of contact within Combonet.

Private access point names (APN) and virtual private networks (VPNs) with Combonet and the ComBus data centre are used to add additional layers of security and iBASIS’s independent backbone network coverage, in addition to Symphony IoT and CMP features, enables Combonet’s wireless voice and data 4G/5G SIM and embedded SIM (eSIM) technologies to transform the way every team performs, regardless of industry or location, with mission-critical connectivity and global coverage. ■

***We’re Europe’s leading experts in mission critical communications expanding our TETRA networks with broadband***

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# Can connectivity platforms manage the scale and the specifics?

Enabling control of millions of connected devices is a tough task for connectivity management platforms (CMPs) which has only been added to by the arrival of flexible SIM options, such as embedded and integrated SIMs. On top of this, the growing maturity of IoT means we're now entering the era of mass-scale IoT. That means billions of devices now need to be managed efficiently, writes George Malim

Connectivity management in IoT can't be a one-size-fits-all option because there are so many different approaches to IoT deployments and many conflicting needs. A global deployment needs connectivity to be consistent in multiple markets while national or regional deployments have a more limited number of choices to accommodate. Some use cases demand high security or low latency or both while others are fine with best effort low speed connectivity. CMPs must offer a management path for each extreme and do so in a way that is easy to use and cost effective.

Research firm **Berg Insight** has reported that CMPs are diversifying to reflect different dynamics. Developments in the domains of network virtualisation, SIM technology and low power wide area (LPWA) networking are currently driving a shift in the market towards a greater diversity of IoT connectivity management services, the firm says, reporting that about 67% of the global installed base of 1.74 billion IoT SIMs were managed using commercial connectivity management platforms at the end of 2020. Acceleration of deployments as markets exit

pandemic constraints is well underway, although inflation and recession may slow the pace slightly into 2023.

"CMPs are crucial when it comes to managing large scale IoT deployments, ensuring devices are always connected to the network and that the connectivity is reliable and consistent," says Michael Setton, the IoT platform lead at **Connexin**. "In the utilities sector for example, deploying thousands of water meters in a single week, would be a challenge without a CMP in place. The other benefit is that any hardware or software related issues on a network can be diagnosed remotely making the process of keeping devices connected on a 24x7 basis easier. CMPs also offer more functionality such as optimising ever evolving security considerations or adding new functionality, for example related to device power optimisation."

It's a challenge of both scale in itself and the breadth of requirements deployments place on CMPs, confirms Ed Porter, the director of IoT Solutions at **IMS-Evolve**. "IoT is a very broad ►



# CONNECTIVITY MANAGEMENT PLATFORMS



industry and, as a technology, it is being utilised in many different ways, from connecting cities together to connecting whole retail estates or more simply for smart lighting,” he says. “As an industry it is only trending upwards, with the number of connected devices set to grow to 29 billion by 2030. All of this means the quantity of data being produced is set to rise to astronomical levels, which legitimately calls into question the economic and technological viability of CMPs.”

Larry Socher, the senior vice president of Strategy and Alliances at **Eseye**, acknowledges that scaling up is an industry-wide challenge but thinks harnessing innovative technologies such as machine learning will help CMPs meet the market’s needs. “Today, organisations can right-size, change and optimise connectivity as their requirements, the market and technology evolve,” he says. “The Eseye Infinity IoT Platform ensures organisations can deploy and secure virtually any type of IoT device globally, to any network with confidence, solving the problems of carrier lock-in, connectivity and security through a single solution. In order to help scale, Infinity recently

introduced machine learning to help with the increased complexity of selecting, managing and optimising connectivity, which complements a rules engine for orchestrating connectivity. Together they eliminate the need for human involvement by automating activities.”

Porter scopes out how CMPs will need to improve to meet the requirements of specific industries using the example of the food retail industry. “For the food retail industry, solution providers must have the capability to connect to large volumes of assets across many sites in order to pull significant amounts of data points together at speed,” he explains. “With the desire for data only growing, it is imperative that providers have the ability to effectively collect and handle extensive data sets from an ever-growing number of sites and assets. To truly grow with their customers’ requirements, there can be no cap on maximum capacity. In addition, this ability to scale must be achievable on-demand, for example following a new acquisition, the opening of more stores or the addition of new machines. CMPs are often inefficient when it comes to handling that many ▶

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**Today, organisations can right-size, change and optimise connectivity as their requirements, the market and technology evolve**



**An IoT offering is a complex assembly of devices and processes and only a fraction of the solution components are purely related to a given business case**



**Ed Porter**  
IMS-Evolve

data points and, in an increasingly connected world, they risk becoming increasingly obsolete.”

“A more practical solution for businesses will be to utilise an IoT solution that not only has the ability to collect, normalise, process and translate real-time data from assets, but that also actively monitors and manages data to drive efficiencies, take corrective action and drive automation,” he adds. “We’re already seeing this type of strategy being utilised within the food retail space: due to the food retail industry operating with such small margins, retailers simply can’t afford to run a CMP as a separate piece of technology, instead relying on plug-and-play options that deliver out of the box business cases at speed and scale.”



**Michael Setton**  
Connexin

Setton sees the need for management platforms to encompass more than connectivity but sees them remaining horizontal rather than becoming targeted to serve the specific needs of vertical sectors. “An IoT offering is a complex assembly of devices and processes and only a fraction of the solution components are purely related to a given business case,” he says. “For example, in the cases of utilities or smart cities, dashboards and data management or integration can be customised to either focus on billing, reducing energy costs related to street lighting, all with the objective of providing decision makers and city planners with more granular insights. Whether it’s tracking waste collection, handling water meters or managing air quality, the wide variety of use cases could be better managed via a federation of platforms. Thanks to the increasing availability of serverless applications, software-as-a-service and application programme interfaces (APIs) all the data can be brought together into a cohesive single end-to-end solution.”



**Larry Socher**  
Eseye

Socher sees the value of a unified management platform for all aspects of IoT but fears the sheer complexity of IoT connectivity renders this unrealistic. “Ideally, there shouldn’t be a different management platform for connectivity, organisations should be able to access an all-in-one-place, single IoT platform to manage all aspects of their IoT initiative,” he says. “However, given the incredible difficulty in managing global connectivity, specialised connectivity management platforms such as Infinity have emerged. Given the importance of managing the full-stack of applications, data, compute, storage, OS and security, Infinity has been designed to offer a rich set of RESTful, batch and push APIs to expose connectivity selection, management and optimisation to higher layer services.”

“In addition to managing and optimising global connectivity, it enables customers to manage existing legacy SIMs as well as eSIMs and iSIM solutions,” Socher explains. “With our Infinity IoT Platform we can offer bring your own contract (BYOC) capabilities that enable customers to import existing mobile network operators’ (MNO) contracts into the platform. This puts organisations in complete control of commercial decision-making and enables them to customise network connectivity options to meet their requirements, while at the same time allowing them to bring negotiated rates from their existing carriers.”

There is an opportunity to invert the argument that CMPs should become part of a wider, more comprehensive IoT management platform and suggest the CMP could become the foundational platform for IoT enablement to which additional functionality can be integrated. “CMPs will need to adapt from solely providing connectivity to helping customers handle multi-protocol or multi-technology IoT deployments which is a big and costly challenge,” says Setton. “With a greater variety of data types, fast diffusing wireless communication technologies, CMPs will need to adjust to an eSIM and iSIM world in which switching CMPs and managing your IoT fleet and private networks, will become almost as easy as changing a SIM card in your mobile phone today. A shift to more reliance on software defined radios coupled with DevOps automation, artificial intelligence (AI) and machine learning will allow IoT providers to streamline and strengthen the processes to manage security, detect and fix problems and guarantee service level agreements. They will embark on a path to standard operating procedures (SOP) and outcome-based contracts.”

Willingness to adapt will be the key to success for CMP providers, says Socher, as eSIM and iSIM transform IoT organisations’ approaches to accessing connectivity: “eSIM and iSIM deliver flexibility to accommodate different connectivity types, thus enabling users to switch easily between networks. They are solving the interoperability challenge, effectively putting control and choice in the hands of the enterprise and breaking the 40-year lock-in with MNOs. The power has switched from MNOs to the enterprise, with proprietary relationships becoming a challenge of the past. CMPs need to recognise that enterprise customers will have different needs and priorities to operators and will be seeking tailored solutions that support their specific use cases.”

“A new breed of MVNO will be needed to help mix, and match different technologies and operators, and finally provide true global ►



device-to-cloud connectivity keeping control in the hands of the enterprise,” Socher adds. “This next-generation MVNO must go well beyond aggregating and reselling cellular roaming.”

That new breed of connectivity provider will be reflected in the expanded capabilities of CMPs. “Organisations will be looking for platforms that can provide high value end-to-end solutions, not just connectivity,” confirms Setton. “These will include everything from helping them select best of breed hardware or high-performance databases, deploy or upgrade software and manage software versions or handle new business models for tens of thousands of devices deployed over a period of five-to-ten years.”

CMPs will increasingly have a wider impact that goes beyond connectivity. “As IoT matures and CMPs continue to provide end-to-end solutions there will be dedicated teams to manage each network function as they require different skill sets,” Setton adds. “They will also need to understand their customer needs better. To handle exponentially growing data volumes, customers will also benefit from the capacity to scale or shrink the network. For example, in transportation, if trains do not operate between 1am and 5am every day, you don’t need to have 15 servers running like they do at peak times, you can utilise these servers in other areas, bringing cost savings and increasing the efficiency and sustainability of private networks.”

CMPs therefore won’t disappear but they will change shape. “While some of the focus of CMPs may disappear as the market evolves, they will shift in focus from provisioning and managing SIMs to the overall selection, management and connectivity over multiple radio access technologies and network providers,” says Socher. “This will require machine learning and a world-class IoT platform to handle the complexity of simultaneous optimisation across multiple device constraints including availability, reliability, bandwidth, latency, signal strength, cost, power and security that can be tailored to meet application needs and data flows. CMPs will also ensure IoT is secure and compliant, delivering reliable, low-latency device-to-cloud connectivity security and routing. Customers also benefit from support for General Data Protection Regulation (GDPR), data sovereignty and other regulatory requirements.”

“CMPs are absolutely crucial for IoT estates to scale and evolve with the market. In fact, our State of IoT Adoption Survey 2022 highlighted that IoT success is fuelling further expansion,” adds Socher. “78% of survey respondents expect to increase the number of devices in their IoT estates in the next 18 months and larger IoT estates anticipate the strongest growth, with 95% expecting IoT estates of 100,000+ devices to expand further; CMPs are fundamental to enabling this. In fact, 32% of respondents surveyed said a single platform for all IoT connectivity would make future IoT initiatives even more successful.” ■

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**Organisations will be looking for platforms that can provide high value end-to-end solutions, not just connectivity**

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### INTERVIEW

Tele2 IoT's Cyril Deschanel details how global connectivity is powering EVs onto the road ahead



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# Cellular connectivity powers the EV ecosystem into the fast lane of user adoption

Electric vehicles (EVs) have come a long way since the cumbersome quadricycles that dotted city streets at the dawn of this millennium. Range anxiety, comfort and ease of charging are all being addressed by a wave of innovation as lawmakers across the world mandate the move to EVs. Cyril Deschanel, the managing director of Tele2 IoT, tells George Malim, the managing editor of IoT Now, why cellular connectivity is the critical enabling technology that is bringing together the vehicles, the charging infrastructure and added value applications and services to create the EV charging ecosystem that is on the cusp of dominating personal transport

**Cellular connectivity is one of the key enablers of EV charging because of this huge increase in charging points**

**George Malim: How do you see the electric vehicle ecosystem developing and in what ways will it align with adjacent sectors?**

**Cyril Deschanel:** The EV ecosystem is growing quickly. Everyone thinks only about cars but it's also trucks, boats, ride sharing and two-wheelers, so this is a much bigger area than just cars. You therefore need the full infrastructure for all vehicles to charge but also to be able to remotely control charging. The more charging points there are, the greater need for them to be controlled remotely.

The ecosystem is composed of two main parts, the vehicles and the charging infrastructure, both of which have added value services on top. If you go to charge your car, for example, you currently have to wait for between 25 minutes and two hours depending on your vehicle and how quickly it charges. This presents an opportunity for digital signage and advertising such as for the best burger available within a ten-minute walk.

All this added value lies on top of the ecosystem and includes the payment terminals. If you're connected you can have a lot of additional revenue and richer customer experiences – if you're not, you can't.

There are currently about 380,000 charging points in Europe and the European Commission estimates that, by 2030, we will need three-to-four million more. That, excluding household charging points, is ten times more than we have today and presents a huge challenge for scaling-up in time to meet targets for the end of selling combustion-engine vehicles.

Cellular connectivity is one of the key enablers of EV charging because of this huge increase in charging points. You can't physically place humans at every charging point, so you have to manage and perform maintenance remotely in order to reduce costs. This is where IoT is important and **Tele2 IoT** has many examples of how to reduce cost with remotely controlled installations.

The goal is to have to send people only when they need to address very large problems. A cellular connection enables EV charging operators to determine the cause of the problem, troubleshoot and often fix it but there are also opportunities to move from corrective to preventive to predictive maintenance by communicating information over the connection.

**GM: EV charging sites will be connected to power grid infrastructure so why isn't fixed fibre connectivity a viable option?**

**CD:** Of course, you can get fibre everywhere, but it will be expensive, complex and too slow to meet the urgency the market faces. Planning, compliance and installation will not be fast enough for fibre to be viable. If you were bringing charging to Route 66 in the US, there would be thousands of charging stations to connect and each one would require a contract, a work order, local government permissions and someone to dig a hole to run the cable. The same would be true for parking slots that offer charging in European city centres. I don't know of a single EV charging operator that is not using cellular connectivity.

If you consider EVs, cars such as **Tesla** and all other electric cars are connected with cellular ►

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technology. In addition, our customer ride-sharing provider **Voi** has 100% of its scooters connected. Mobile operators like us have deployed 2G, 3G, 4G and 5G so why not use it?

**GM: There's a lot of excitement in IoT about the speed and low latency of 5G connectivity but do EV use cases really need this?**

**CD:** 4G is enough for most of the applications. 4G has enough capacity, coverage and good latency and you don't need a lot of data to run a charging point effectively. When 5G is rolled out internationally, with roaming agreements in place so you can move your trucks from one country to another, 5G will be more suitable and bring some benefits to some apps but in the meantime 4G meets the sector's needs. All our customers use 4G and the whole ecosystem uses 4G. ▶

Cyril Deschanel



**We need a more universal solution for when you move from one country to another than having to download an app for each country you pass through**

**GM: Moving between countries is an important point that is particularly relevant in Europe but also in other parts of the globe where vehicles routinely move between countries multiple times a day. How are the challenges of this being addressed?**

**CD:** This plays directly into the strength of our core business which is providing global managed connectivity. We provide a single rate for the EU27 countries to all customers, so they pay the same in Finland, the UK and Italy. Obviously, this simplifies the life of end customers, and they can drive their connectivity however they want to use our self-service platform. We have one rate plan in the US as well.

Roaming is not only about connectivity, it's also about payment and other services and this highlights that the EV market is fragmented, whether that's the car maker, the fuel retail chains, the charging point operators, the electricity companies or anyone else at the heart of the ecosystem. There is no specific answer but the experience needs to become more cohesive for customers so they can have the convenience of being able to use the charging point that best suits their needs at any given time.

We need a more universal solution for when you move from one country to another than having to download an app for each country you pass through. This is being addressed by companies such as our customer **Virta**, a Finnish company that has created a cloud-based platform that

brings together companies who own and operate charging stations, as well as services for companies who want to provide mobile apps for drivers and want to handle payments and money flows. Virta's digital platform connects all of these hundreds and thousands of companies together so that EV drivers can charge their cars anywhere, whether that's in Europe or around the globe, connecting charging station operators to hundreds of thousands of EV drivers.

This type of end-to-end system is vital for the development of the market because it brings everything together for the charging operator and the customer. It encompasses everything from discovering the charger, to pricing and cross-border payments. The only thing Virta doesn't cover is the physical installation of the charging station.

**GM: We've talked about public charging points but what about home chargers, do they need connectivity?**

**CD:** The greatest investment in EVs is being made by the car makers, the second largest is in the charging infrastructure and the third is the power grid, which has to invest a lot. There are already a lot of individual charging points that are connected as well as those owned by home service providers. These companies need to know that the charging point is working, and cellular technology is a great enabler here. For these to be connected to the grid as well is important so usage information can be communicated. This will ►



become increasingly essential as the grid tries to manage peaks and troughs in demand alongside the variable power generation of home-based renewables such as solar and wind. EVs entering the mainstream will move substantial power consumption to the home and grids need to be prepared for this new profile of demand.

A recent report from **McKinsey** has reported that US\$0.2bn has been invested in public EV charging infrastructure but this will need to reach US\$3.4bn in 2030 to serve the market's needs. For grid companies, US\$2.6bn has been invested but US\$42.1bn of investment is required by 2030 to ensure readiness of grids for EV charging.

**GM: Why is Tele2 IoT well-positioned to serve the EV market?**

**CD:** It is the ability to handle scale and the connectivity expertise that we have that makes us strong in this market. With more than nine years of experience serving EVs so we are confident that we understand the market's needs and that we have the ability to meet those. We have proved this with more than 20 players in Europe and we have the commercial flexibility that this market needs.

We are now in the top 8 European providers in the IoT connectivity space overall because we have the right platform, the right commercial flexibility and, of course, we're competitive. On top of this, our people differentiate us from the competition. We have 75 dedicated IoT experts that offer 24/7 technical support. Not every mobile network operator offers that with a dedicated IoT expert.

This expertise is important. Imagine you're a charging point operator and one of your most popular charging points has a technical issue. You don't want to speak to a call centre agent who normally handles consumer or B2B queries. You need an IoT expert who understands how important uptime is to your business and knows how to address the problem quickly.

In Europe, we are very strong in the security and healthcare markets where our connectivity powers mission critical applications. EV charging is also mission critical and having secure, robust connectivity is essential. If a slew of charging stations go down because you've been hacked, cars will be stuck on the street but we know the connectivity is secure because it is built-in to our network and IoT platforms and we go end-to-end. We also have an integration with **Equinix** which

provides interconnectivity with the main cloud providers.

**GM: As a Nordic mobile network operator is it an advantage to be based in one of the world's earliest EV adopter regions?**

**CD:** There's no doubt that the Nordics and Northern Europe lead in innovation and new technology adoption and the EV ecosystem starts with our adoption. Norway, for example has reached the point where 80% of new vehicle sales are EVs and from 2025 it will be mandatory not to sell internal combustion engine vehicles. We are a company in the Nordics where adoption is high, and this gives us a step up. We know the ecosystem isn't just about charging stations and we understand how cellular plays into the broader market.

Our customer **Elonroad**, for example, has developed conductive charging infrastructure that is embedded in the road. This means EVs can charge where they park or even when they are running, and no cables are needed. Pilot projects are underway in a number of places, including in Helsingborg Port in Sweden as well as in France.

**CityQ**, also a customer, sells its electrified cargo bike that has been designed for urban movement, including city deliveries and for tradespeople. The Norwegian company's vehicles deliver 60% faster than delivery vans and cut emissions by 90% in comparison to diesel vans and could solve huge urban challenges.

Finally, let's not forget that EVs are not only road vehicles. We also have customers that make electric boats. **Candela** makes advanced electric speedboats that feature hydrofoils for greater efficiency. The range of the Candela Seven is 50 nautical miles at 20 knots, which is a world record for an electric boat. Also in Sweden, **X-Shore** has created the Eelex 8000 electric boat which uses battery technology and at speeds of less than six knots is totally silent.

It's clear that a lot of innovation comes out of the Nordics as well as from every other point of the globe. Although the EV journey started ten years ago, legislation is accelerating it into the fast lane of user adoption. Technology advances are making it practical and appealing, and our job is to provide the connectivity that powers the ecosystem, justifying the investment in infrastructure that is needed and enabling the experiences that users want. ■

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***We're now in the top eight European providers because we have the right platform, the right commercial flexibility and, of course, we're competitive***

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# GLOBAL CONNECTIVITY

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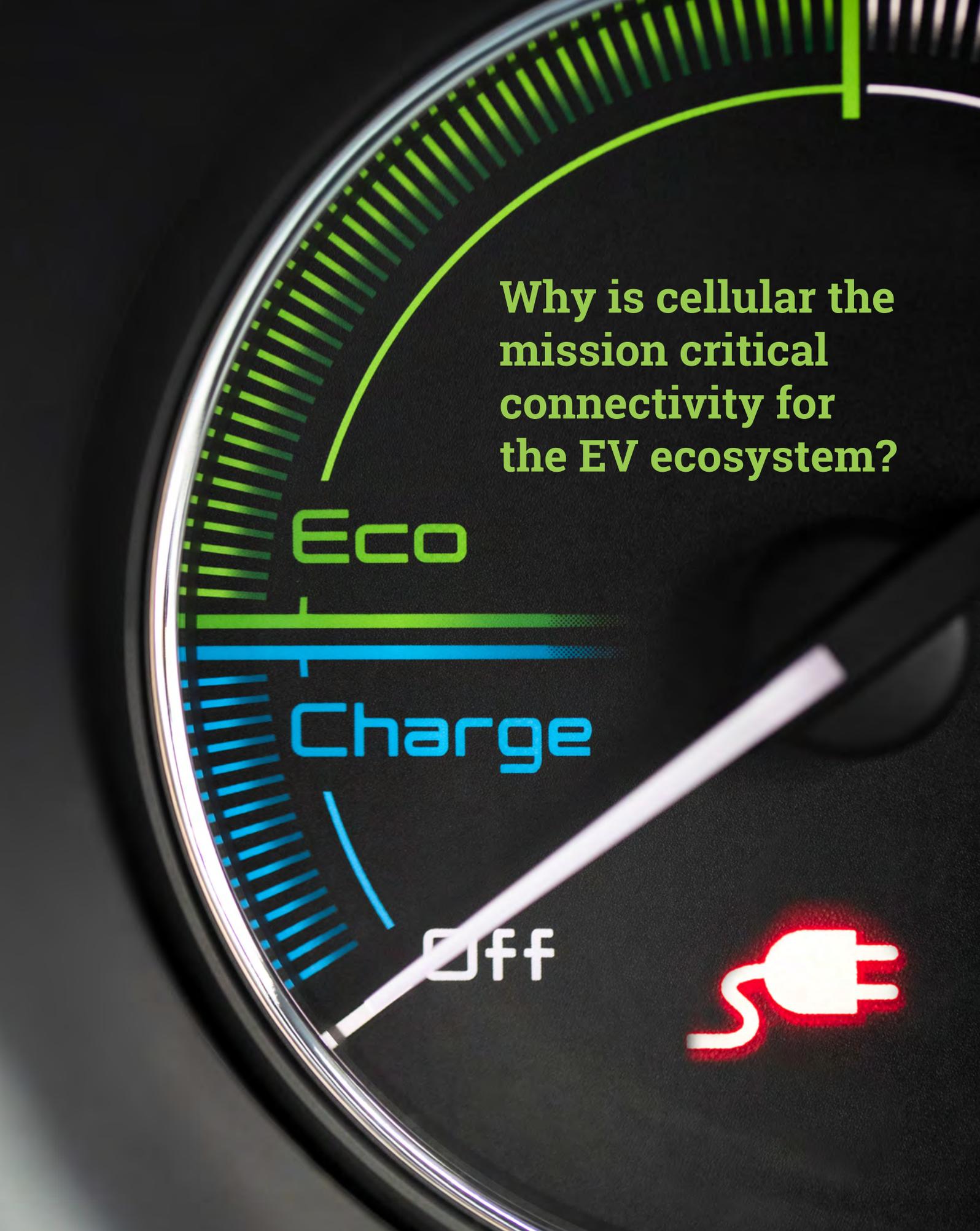


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# Why is cellular the mission critical connectivity for the EV ecosystem?

## Introduction

Electrification of vehicles goes way beyond plug-in cars and encompasses, ships, trucks and a range of ride-sharing and local delivery vehicles that are set to transform transportation. To realise this efficient, more environmentally friendly world, the enabling technologies need to be put in place and optimised. Both the power grid and charging infrastructure need billions of dollars of investment so electric vehicle (EV) charging demands can be accommodated by the power infrastructure and so the experience is attractive to users of all types. With internal combustion engines (ICE) already starting to be phased out in various global markets, the pressure is on for all those involved in the electric vehicle ecosystem to build charging points and ensure grids can cope with the changed demand profile that EVs bring

Connectivity has an essential role to play in this mission critical market. The data that the grid and parking providers need so they can optimise performance has to be communicated and connections are vital to enable users to find, operate and pay for their use of public charging sites.

The challenges are not only about public charging. In many markets, the bulk of charging will happen at users' homes and service providers and charging device makers addressing this market need connectivity as well in order to communicate with the grid and perform preventative and predictive maintenance. Don't forget that ultimately, millions of vehicles will result in a need for millions of charging points so frequent human interaction will not be viable.

As EVs enter the mainstream, IoT is poised to demonstrate the strength and depth of the value it can add. Robust, secure, comprehensively available connectivity is a critical technology here because it supports charging and goes further by enabling a wider ecosystem that adds value and richness to user experiences.

From the roads in your town it's clear to see the EV revolution has already arrived. Just a few years ago, simply seeing an electric car was cause for comment but now, routinely, there are battery-powered electric

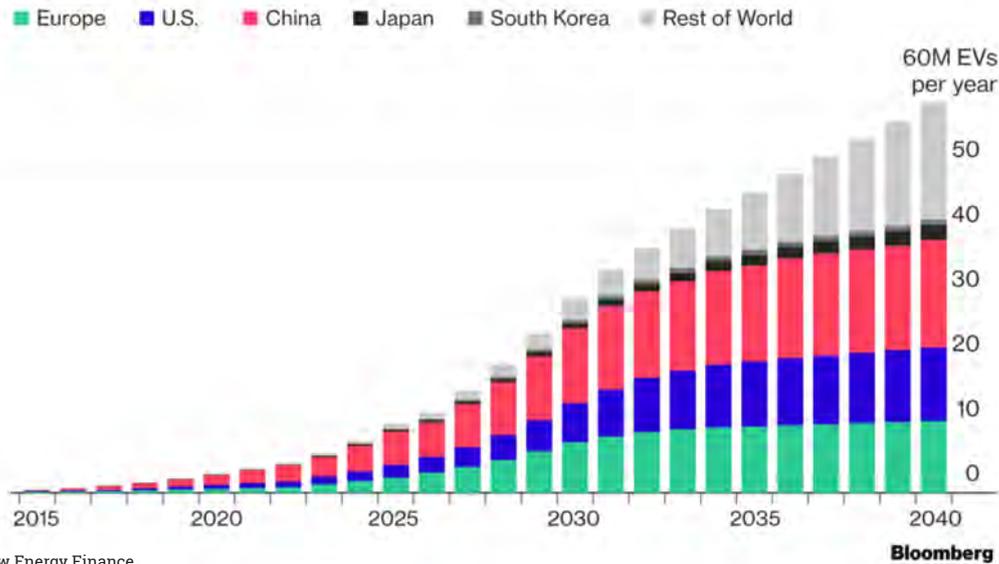
vehicles, ride-sharing scooters, electric bikes and other two-wheelers, plus a growing range of electric, local delivery vehicles. The days of there being a handful of hybrids are long gone and the pandemic, with its lower emphasis on regular commuting, has helped to make EVs a viable alternative to ICE vehicles.

This adoption is clear to see although there remains a substantial distance left to travel. Pandemic supply chain woes aside, EVs are not just another vehicle, they demand new infrastructure that cannot be served by the existing ICE fuelling infrastructure and this demands sustained investment in the power grid and the charging network. Without this, cars will grind to a halt and streets will be blocked.

Large-scale efforts are underway according to analyst firm **Berg Insight**, which reports that the installed base of charging points is set to hit 22.8 million globally in 2025. The firm expects 1.8 million EV charging points to be shipped to Europe and North America in 2025 with the total in these two regions reaching 7.9 million a year in 2025<sup>1</sup>.

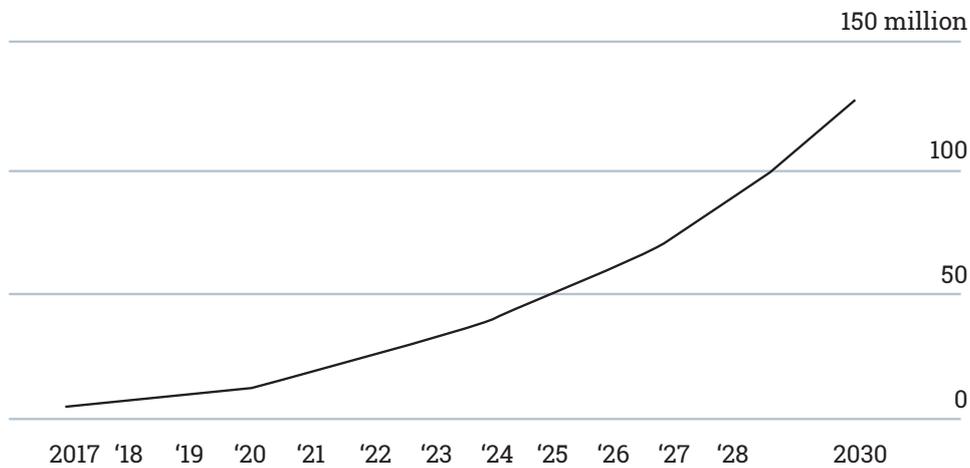
This projected uptake reflects a steep increase in the number of electric cars being sold globally and **BloombergNEF** estimates that more than 5.6 million EVs were sold worldwide in 2021, in spite of pandemic-related supply chain constraints. That's an 83% higher rate of ►

<sup>1</sup> <https://www.berginsight.com/the-number-of-connected-ev-charging-points-in-europe-and-north-america-to-reach-79-million-by-2025>



Source: Bloomberg New Energy Finance

Figure 1: Global electric car revolution set to take off



Source: IEA

Figure 2: The global fleet of electric vehicles is set to soar

sales than in 2020 and an increase more than 168% over 2019 sales, the firm reports<sup>2</sup>.

In Europe, the adoption of domestic charging takes some of the pressure off the public charger roll-out but few EV owners will charge exclusively at home. **IHS Markit** forecasts that the cumulative deployment of EV charging stations will increase at 24% CAGR during the 2020-30 period. By 2030, about 20 million houses within Europe are expected to be equipped with domestic charging stations, while public or semi-public charging station deployments will increase eight-fold on 2020<sup>3</sup>.

The tide has turned away from ICE and more than two-thirds of residents in Oslo, Norway own an EV, heading the world in terms of EVs per capita according to management consultancy **McKinsey**<sup>4</sup>. With European nations aiming to ban sales of new ICE vehicles by 2035 at the latest, the direction of travel is set for an electric future<sup>5</sup>. McKinsey estimates that EVs will make up 75% of European new car

sales by 2030 and the electric vehicle market in general is growing with increased sales of two and three-wheeled vehicles in addition to four-wheeled cars.

Appetite is not only driven by the Nordic markets. Electric cars accounted for 17% of Europe's car sales in 2021, according to the **International Energy Agency**<sup>6</sup>. The largest market in Europe by volume of EVs sold is Germany, where electric cars accounted for 25% of new cars sold in 2021. Other countries with larger EV market shares include Norway (86%), Iceland (72%), Sweden (43%) and the Netherlands (30%), followed by France (19%), Italy (9%) and Spain (8%).

### The race is on

As adoption of EVs continues to grow, so will demand for charging both at homes and workplaces and at remote locations. This places significant pressure on vehicle-makers, electricity companies, the traditional fuel forecourt industry and a new breed of property ►

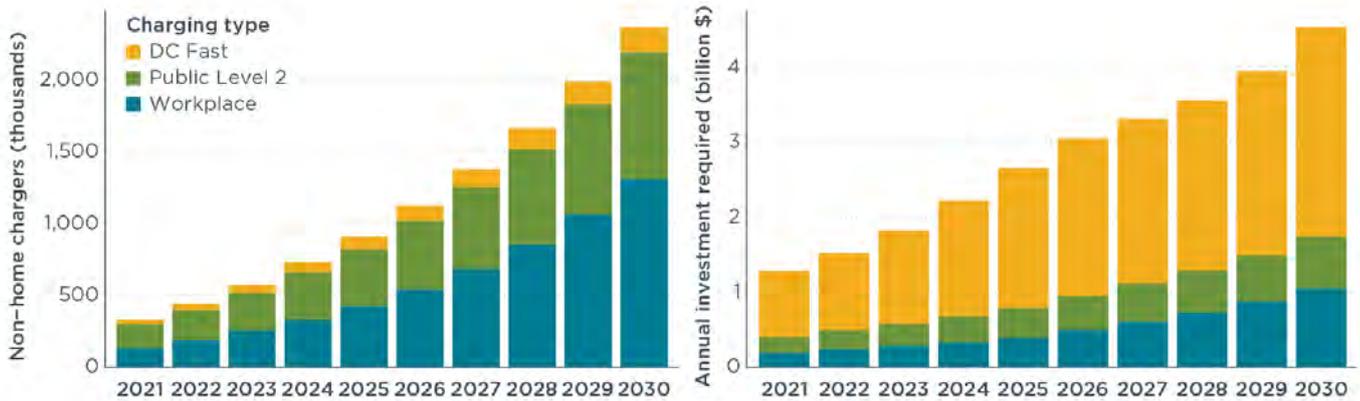
2 <https://about.bnef.com/blog/electric-vehicle-sales-headed-for-five-and-a-half-million-in-2021-as-automakers-target-40-million-per-year-by-2030/>

3 <https://ihsmarkit.com/research-analysis/ev-charging-infrastructure-report-and-forecast.html>

4 <https://www.mckinsey.com/business-functions/operations/our-insights/shaping-the-future-of-fast-charging-ev-infrastructure>

5 <https://www.euractiv.com/section/transport/news/eu-countries-approve-end-to-combustion-engine-sales-by-2035/>

6 <https://www.iea.org/reports/global-ev-outlook-2022/trends-in-electric-light-duty-vehicles>



Source: ICCT (2021)

**Figure 3: Charging infrastructure (left) and the associated investment (right) needed to support US electric vehicle market through to 2030**

companies, charging service providers and application providers. These companies are in a battle to secure the best sites, roll-out charging points to these and ensure their sites have maximised utilisation.

With charging taking from 20 minutes to two hours or more depending on the state of charge and the availability of fast charging, an ecosystem is developing around public charging that encompasses not only charging but value-added services such as advertising, infotainment and entertainment. These are all important for making the EV experience attractive and for monetising charging sites.

With annual investment in EV charging away from homes in the US set to exceed US\$4 billion in 2030 according to **the International Council on Clean Transportation**, efficiency in deployment and operation is necessary to optimise expenditure. Additional revenues that can be generated beyond the fees for charging itself will make the business case more attractive and help increase the number of charging points that can be deployed.

Connectivity is a prerequisite for this because it enables both remote maintenance, management and charging and because the connectivity is the enabler for a large number of commercial opportunities. Public charging points are a unique environment because they boast a captive audience. Being able to push offers that are relevant to that location such as restaurant, retail or entertainment options is valuable and appealing and the connectivity can enable advertising of these or downloads of specific content.

The need is set to continue to grow as EVs become mainstream and people look to charge on longer journeys and even plan their charging stops around local attractions. The charging industry is maturing rapidly in terms of site selection, deployment speed and management efficiency and it relies on connectivity to gather data, ensure charging point uptime, enable convenient charging and help easy discovery of available charging locations.

### Wherever EVs roam

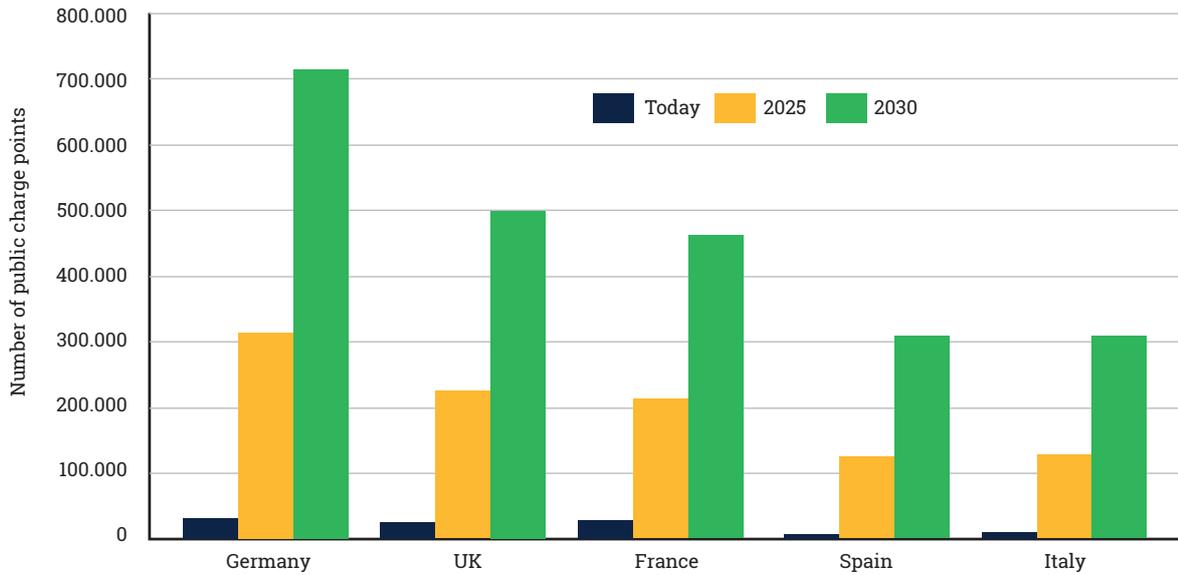
In regions, such as Europe, in which multiple countries border each other and are traversed each day multiple times by various vehicles this fragmented ecosystem needs to be managed to provide a cohesive experience. App providers have emerged to handle this so users don't have to download multiple EV charging apps for every country they visit and to make the experience streamlined and more appealing. Users need to be able to roam freely and have the capability to access the best charging fit for their needs.

For some, this might mean the nearest fast charger but for others that might mean a slower charger in a popular location with lots of amenities. Connectivity enables those preferences to be communicated and the closest match to be selected.

### Wireless leads the charge

Wireless connectivity is widely adopted for public EV charging points even though it may seem obvious that fixed line connections could be run to terminals at the same time as the power itself. There are many reasons why fixed fibre connectivity has not been adopted by the public charging sector. Fibre connections are complex to deploy, require rights of way, permission from local authorities and the cables themselves to be embedded into the ground. Inevitably gaining permission, digging the cable channels and then scheduling the works alongside power and other installations adds cost and causes delay.

Large car parks at highway service areas or at a new breed of charging plazas are seldom being networked by cables because 4G provides a robust, secure, globally adopted, cost-effective connectivity method that is easily able to support the needs of EV charging now and into the future. Ultimately, 5G could be used but today there is no necessity to adopt the technology because EV apps don't need the low latency and high speed of 5G. In addition, 5G roaming has not been fully addressed and coverage remains incomplete. In the mid-term it will not be a significant challenge to upgrade 4G-enabled ▶



Source: Transport & Environment. (2020)

Figure 4: Projected need for public charging infrastructure in Europe's largest car markets

chargers to support 5G so, when the business case emerges, it will be relatively simple to upgrade to 5G.

The reality of already-existing wireless connectivity to support EV charging makes it attractive to charging point operators but the current, still low rates of charger utilisation mean there is a long ROI period associated with the EV charging business. After more than ten years in operation, the EV market is only now entering its growth phase and charging service providers are conflicted between investing to meet the mass needs

of the coming five years while still needing to operate profitably as demand builds.

The maturity of the cellular industry means it is able to accommodate flexible commercial models that enable providers to pay in line with growth and adapt their connectivity commitments as their business demands. This flexibility is an important element of de-risking the build-out of charging infrastructure and one that the specialised, global IoT operators, including **Tele2 IoT**, are able to support.

## Conclusion

As innovation continues to improve charging capabilities and experiences, we expect to see a simplified ecosystem in which EV users can discover, locate, use and pay for charging regardless of the vehicle they drive and the charging companies they have relationships with. This unification of the ecosystem will be enabled by ubiquitous, global cellular connectivity, which provides the cost-effective, secure means of transmitting customer, service provider, vehicle and power grid data.

All of these organisations need to share data safely, apportion revenue fairly and operate efficiently. Standardising on the already-proven 4G cellular technology provides a constant in a charging ecosystem of apparently limitless variables. As new innovations see EV charging enabled without contact between vehicles or even for vehicles on the move, it's apparent that choice is going to become far wider for those needing to charge their EVs.

Options extend from battery swapping centres to fast charging options. Customers will be able to tailor a charging option to fit their needs. An off-peak time on a slow charger at an unpopular site will be cheaper than a fast charger at peak time at an over-subscribed charger. Users will balance their needs accordingly and rely on 4G to keep themselves informed of what's available, reserve a slot, pay for it and then receive useful content from the site owner. ■



# Elonroad pioneers electrified roads for charging on the move

Sometimes inspiration strikes in the most unusual way – and for Elonroad founder Dan Zethraeus, inspiration came from the snow and slush that gather along the highway’s median strip during winter. Zethraeus, a former film director, was commuting between his home in Lund, Sweden to his office in Malmö, and as early as 2012 he wanted to buy an EV – but the cost was prohibitive at the time, and because he lived in an apartment, the charging infrastructure just wasn’t there

**“Stationary charging stations will not be enough when we become a fully electric vehicle society”**

Zethraeus’s idea was that plus and minus posts, not in parallel with one another but instead one after another, could solve EV charging challenges. To confirm his hypothesis, Zethraeus built a prototype using his children’s Lego.

“As Dan was driving to work every day, he thought to himself ‘What if there was something there that could charge my car’ – a bit like the car racing tracks he played with when he was a kid,” explains Karin Ebbinghaus, the chief executive of **Elonroad**. “We have Lund Technical University right in our backyard, so Dan contacted a professor to discuss his idea. The professor thought there was potential but pointed out that if conductive rails were above ground level, it might be a bit like having a speedbump on a highway, which could make them unpleasant for drivers.”

Zethraeus went to a lumber yard and cut a piece of wood to mimic exactly what the rail would look like, then took the professor to a racetrack and drove over the mock-up rail at various speeds – and he did it with a full coffee cup in the cup holder of the car. When the professor saw how little disturbance there was, he was convinced.

New technology requires new solutions and new mindsets – and one of the biggest challenges for Elonroad was getting people to understand the concept. After the first prototype was built, Zethraeus took part in numerous conferences, trying to explain the concept and how it fulfills a real need in the EV ecosystem, where you would no longer have to follow the traditional ‘fuel up at the gas station’ model to keep your EV charged.

“Stationary charging stations will not be enough when we become a fully electric vehicle society,” explains Ebbinghaus. “They will be part of the larger ecosystem of charging options. And if we look at rural areas, the Elonroad solution will have very positive implications: when you’re in a city or

town, you usually have quite a few charging options, but out in the countryside there aren’t as many, so having charging rails on the roads outside the cities will solve a lot of problems in a very simple way.”

And as urban populations continue to grow, cities have to ask themselves if they want to take up more space for parking where an EV could be charged? Or would it be better to use existing infrastructure, such as roads?

“In a city, there are so many use cases that can share the same infrastructure and solution,” says Ebbinghaus. “So, if you put a network of charging lanes, you can charge anything from cars and buses, to taxis and last mile vehicles. You wouldn’t have to build as many pantographs for buses or charging stations for cars – it’s suboptimising the charging infrastructure because you are using one solution to solve the challenges faced by many user groups.”

Elonroad’s electrified road solution can also be a boon for large, long-distance trucks, where battery size is a challenge, as is the amount of time to charge the large batteries that would today be needed to power a large vehicle. In fact, the Swedish government has large trucks as a use case, due to the difficulty in electrifying them. Elonroad would enable them to be charged while they’re operating.

## Connecting Elonroad with Tele2 IoT

On a practical level, a device is placed in the car that connects to the conductive rail in the road. There is both a digital and physical connection called a pickup, and there is also an antenna that sends an encrypted signal identifying the vehicle and unlocking the power distribution. The driver is in control of whether or not energy is being picked up, and can set parameters, such as setting when the battery should be charged, among other ▶



Elonroad's in-road charging

things. That signal also enables payments, which can be pay-per-use or via a subscription.

“The system also knows how much effect we have in the grid at any moment, which means we can then distribute it to whomever needs it the most. We will know in real-time how many users need charging,” explains Ebbinghaus. “We have a lot of sensors in the road, and we have a lot of processing power to have the safety to unlock the power system. It’s the IoT sensors that allow us to unlock the energy strip in real time. Right now, we’re using 4G, but 5G is going to be even better, both for real-time and for lower latency.”

Elonroad’s embedded IoT sensors are able to gather data on more than just charging - they can also gather data on things like moisture, air quality, temperature, ice and snow - in other words, Elonroad’s solution can make the road smart and gather information that can benefit different stakeholders - and that’s not limited to drivers. Real-time and historical data can be used by municipalities to gauge what is happening in the moment, such as if a road needs to be sanded because it’s covered in ice. That information and data can also help with long-term planning of repair work, upgrades to roads and identifying problem areas, such as: Where is it getting icy? Is water rising? Where is wear and tear most dire? So, while this is a solution for EV charging, its applications are much wider.

As the technology evolves and more innovative ideas come to the fore, electrification will no longer operate in small hubs. Instead, these will cluster and merge as the ecosystem matures - and electrified roads will play a big part in this. ■



Karin Ebbinghaus, Elonroad



# Seamless multinational EV roaming is the Virta reality

With the massive increase in sales of electric vehicles (EVs) the global infrastructure supporting EV charging stations must scale up rapidly. What is also developing is the software needed to run these charging stations – and Finland’s Virta is supporting both users and suppliers while creating a global industry standard

**Essentially, our business model services both the consumer and the provider**

**Virta** doesn’t do hardware or get involved with installing EV charging stations. What it does is develop systems that are compatible with the hardware or charging station being installed. The company’s cloud-based platform includes everything needed to build a charging business, from charging infrastructure management to end customer services and smart energy management solutions. It is an end-to-end solution for EV charging, providing services for companies who own and operate charging stations, as well as services for companies who want to provide mobile apps for drivers and want to handle payments and money flows.

Virta’s digital platform connects all of these hundreds and thousands of companies together so that EV drivers can charge their cars anywhere, anytime. But different companies in different countries use different kinds of hardware – and this is where Virta’s solution really shines.

“There are a lot of different charging station models around the world,” explains Jussi Ahtikari, the chief technology officer of Virta. “Our solution is compatible with more than 200 of them and we’re growing that number all the time. This is critical, since there is a clear market need for an open platform that works with all kinds of hardware and all across the globe.”

Virta has several different customer profiles: the first is companies that own the charging stations. Virta provides management software that is connected to the charging station and allows the company to process payments, troubleshoot, see what needs maintenance, and get an overview of usage so they can optimise accordingly.

The second group is EV drivers. Virta provides payment solutions and a mobile app that allows the user to see all available charging stations from all the different companies in the Virta network. ►



“Essentially, our business model services both the consumer and the provider. This is very different from other companies working in this space, who are often involved in both software and hardware,” says Ahtikari. “When your solution has both hardware and software you can get locked in, unable to easily change to a different software solution or buy new hardware from another company.”

Virta’s open solution allows customers to use whatever hardware they want and even have ten different models, offering much needed flexibility while avoiding the headaches of lock-in effects.

### Think local, act global

When you’re working with global payment solutions, there are a number of challenges that need to be addressed. Mobile payment systems can sound simple, but in reality, they can be quite complex, particularly when you’re talking about cross-border payments.

“A few years ago, I drove my EV to Sweden and had difficulties charging because to use the local charging solution I had to download an app, register, then wait for verification to arrive at my home – where I wasn’t at. It just didn’t work smoothly,” explains Ahtikari. “There are also local regulations and other challenges, such as which currency the payment will be in and who gets the taxes. In the end it’s a complicated issue.”

Virta offers EV drivers the entire Virta network, where you need just one account to access EV charging stations, location maps, and other features in any of the countries Virta operates in.

Charging stations using Virta’s solution are equipped with **Tele2 IoT** SIM cards, but this wasn’t always the case. When Virta first started offering its solution in 2014, it worked with a local Finnish telco, connecting around 30 charging stations. “We noticed pretty quickly that as our operations expanded into more and more countries, we needed a better connectivity solution,” says Ahtikari. “We didn’t want to negotiate with individual operators every time we entered a new country, so we needed a telecoms operator that could offer global connectivity, as well as roaming. Roaming is important to us – we need to ensure that if a network is down or otherwise not available, we can quickly connect to another. If we don’t have a connection, we’re losing business. Tele2 IoT has the right agreements with operators across the globe.”

Because Virta operates globally, it needed an easy way to make and manage different configurations of its deployment. The answer? **2CONTROL** (**Cisco’s** IoT Control Center), which allows Virta to easily adjust rate plans and communication plans for different use cases and different markets.

“We need an easy way to deploy SIM cards used in new charging stations and to manage the SIM



cards in the stations which are already deployed, as well as follow, analyse and solve different problems,” explains Ahtikari. “2CONTROL provides good functionality to manage big numbers of SIM cards in an easy way. Also, automation makes life a lot easier, because managing hundreds of thousands of SIM cards and IoT devices can be really difficult. 2CONTROL allows us to focus on our own business, and not waste time managing the difficulties of connectivity of our devices.”

When Virta was founded in 2013, the company had just three employees. Today, it has more than 200 people on staff and was recently named Europe’s fastest growing EV charging company by the **Financial Times**. The growth is the result of adjusting.

“What we at Virta are doing today is very different from what we were doing even a year ago,” says Ahtikari. “Operating in a swiftly evolving market means we need to respond to changes quickly and make sure we’re providing our customers with what they need both now and what they’ll need going forward. Our solution does just that.”

Virta is already operating in nearly every European country and has begun expanding quickly outside of Europe, recently opening its first office in Singapore as it grows into Asia.

“Our competitors tend to focus on particular areas, taking one angle,” says Ahtikari. “That might be a charging app, but no charging stations, or they might have a platform to manage charging stations but don’t have a payment solution. The big strength with our solution is that you don’t need to build your own solution as an individual by buying from a bunch of different companies – you get a really good, well-working solution from us, which is very much out of the box, plug-and-play.” ■

**What we at Virta are doing today is very different from what we were doing even a year ago**



# EV stakeholders charge towards an electric vehicle opportunity

Antony Savvas highlights the growing pains charging networks face as they try to ramp up to have sufficient capacity to make our electric dreams a reality



**Tim Evans**  
3ti Energy Hubs

EV charging demands costly, dedicated power infrastructure to enable fast charging at public charging locations, while private charging potentially puts unfamiliar strains on the electricity grid. The increased adoption of renewables at users' homes will help to level out some of the spikes in generation and consumption via the adoption of efficient home batteries, but the need to fast charge at public charging poles in order to complete long journeys demands that intelligence and connectivity are embedded into the charging point.

This intelligence is essential to optimise charging performance and to enable variable pricing, so charging station owners can generate a return on their investment. This information will also be useful to drivers, as they search for compatible chargers that are available when and where they need them.

Being able to communicate is therefore fundamental to charger performance. For example, knowing that you could charge a vehicle to 80% of its capacity in 30 minutes for a fixed price, rather than waiting 50 minutes to reach 100%, could be valuable for many users and enable optimised utilisation of the charger. The connectivity can also be used to support payment, infotainment and other services at the charging site, and wireless - predominately cellular connectivity - looks cost-effective and simple to deploy in contrast to running fibre to every charger.

## Scaling up to meet growing demand

When it comes to being ready for massive uptake, Rollo Home, head of product at **Ordnance Survey**, says: "For charging on the move, it's essential that charging infrastructure is fairly and intelligently distributed, taking into account the requirements of rural and urban areas. In short, we cannot have not spots.

"To ensure an equitable roll-out of EV infrastructure, we need to ensure all stakeholders involved in creating this infrastructure have access to data that provides a coherent national picture of requirements," he adds. "If left to individual market players, we will get pockets of priority areas and likely not spots developing. Stakeholders must coordinate and governments must be able to identify when and where intervention is necessary."

Home says combining geospatial data with datasets that provide deeper contextual information around potential charging sites, from environmental impact to accessibility, potential energy demand and projected frequency of use, will help to establish the optimal national infrastructure. When it comes to energy supply, increased investment in renewable sources is essential, he adds, as "powering the transition to a greener future through fossil fuels would be a clear contradiction".

On the challenges to growth, James McKemey, head of policy and public affairs at EV charger provider **Pod Point**, says: "It's clear that certain parts of the charging ecosystem are developing more fluently than others. We believe the vast majority of charging will be done at home or at work. Scaling this private provision presents its own challenges, but success so far makes us confident we can keep pace. However, the development of en route charging facilities, particularly at motorway services and other sites near to strategic road networks, is currently lagging behind."

McKemey adds: "How we charge EVs for those without off-street parking and who can't charge at work remains a big question, with a mix of solutions required: on-street charging, overnight local hub charging, ubiquitous destination charging or high-powered hub charging, all of which will need to scale." ►

**How we charge EVs for those without off-street parking and who can't charge at work remains a big question**



Leon Wong, EV business development manager at **Pilot Group**, says: "Investment in public charging points closer to homes is vital to cater for those in cities who do not have access to off-street parking. These points need to provide the fastest charging possible. Rapid or ultra-rapid DC charging can provide between 50kW and 350kW and charge a car in around 40 minutes. Fast AC charging offers an output of 3.6kW and 22kW, with average charging times of between four and six hours. A key focus of introducing off-street parking charging should see a solid mix of both AC and DC points, so the infrastructure caters for all. AC charging is cheaper than DC, better for the longevity of a battery, and more cost efficient to install."

Naturally, says Wong, EV drivers will install home chargers where possible, and workplaces are putting in infrastructure to help. But it is necessary for governments to support local authorities on solutions for off-street parking, he adds.

Tim Evans, CEO of **3ti Energy Hubs** in the UK, warns: "Government guidance indicates an optimal EV-to-charge point ratio of 10:1. The UK is currently at 52:1, and the situation is getting worse."

"Predictably, perhaps, rapid and ultra-rapid charge point networks, capable of charging EVs at rates of 50-350 kW/hr, have been lauded by many in the EV world as the holy grail of charging," he adds. "It's almost as if the petrolheads have embraced EVs by becoming charge rate heads."

Also, "unsurprisingly", says Evans, the industry has focused on trying to replicate the petrol filling station model with an EV clone. "Encouraging customers to fill up rapidly on their way to and from work, whilst stopping to spend money in the forecourt supermarket franchise, is what the industry currently does best. Replicating this

model for EVs though requires significant investment in infrastructure, leaving EV drivers charging their cars on expensive, carbon-intensive electricity, much of which is being generated by burning fossil fuel."

He says we shouldn't be asking how many rapid charge points are required to service growing EV demand, but what is the most sustainable method of supporting EV drivers.

Evans maintains the most cost- and carbon-efficient EV charging is done at home, but that in the UK, for instance, for around 50% of households this is not an option. Workplace and destination charging, where cars park for a minimum of two to three hours, represents a considerable opportunity. "Helping EV drivers move away from a traditional stop to refuel mindset to a recharge where you stop approach is key."

3ti has developed Papilio3, a pop-up mini solar car park and EV charging hub. It aims to have a network of up to 50 units in operation in the next 12 months.

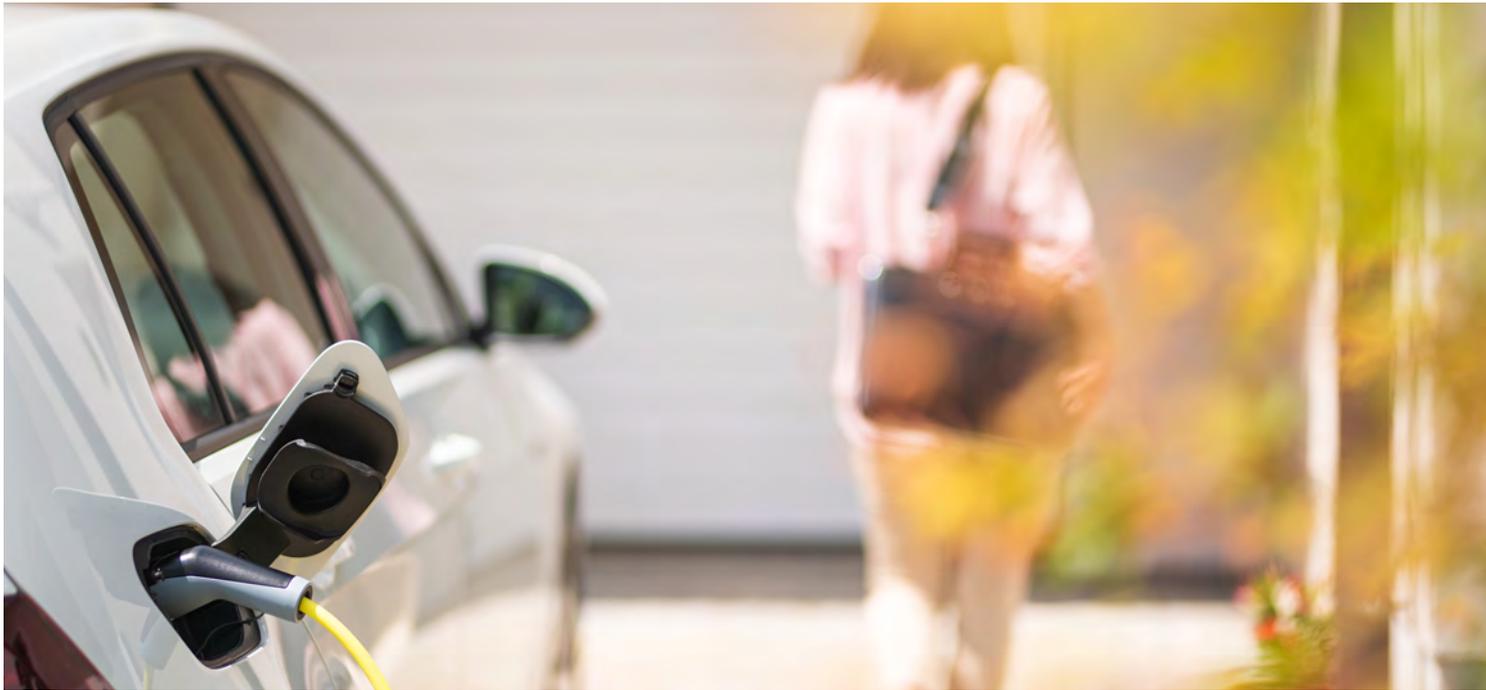
Paul Loustalan is a partner at **Reddie & Grose**, a firm of UK and European patent and trademark attorneys. He says of standards: "One of the biggest factors will be the standardisation of both the physical charging connectors and of the charging protocols. This could be decided by government policy, by consumer demand or by consortiums of major OEMs choosing to standardise their products."

"But without standardisation, it is likely that resistance to installing charging infrastructure will persist," he adds. "It is difficult to obtain agreements on standardisation between competing OEMs, as there are clear incentives for OEMs to lock their customers into proprietary ►



**Paul Loustalan**  
Reddie & Grose

**3ti has developed Papilio3, a pop-up mini solar car park and EV charging hub**



**Nick Earle**  
Eseye

**National grids will, of course, need to be upgraded in line with the implementation of EV infrastructure, but some estimates of the potential demand are greatly exaggerated**

systems, with the **Tesla** model a prime example of this. This is where government policy could intervene, and minimum technical requirements in the guise of a formal standard will mitigate some challenges.”

**Why 5G?**

Cyril Deschanel, managing director at **Tele2 IoT**, says of the need for 5G: “In all fairness, 4G is sufficient for most EV use cases at the moment. The main challenge is overall quality of service within coverage areas. This is especially important for charging on-the-go, since many current locations were not prioritised by mobile network operators previously, due to less population density. 5G provides a solution to the problem through improved latency and bandwidth.”

Deschanel adds: “There are digital signage and e-commerce opportunities that can create more revenue streams for EV ecosystem players. If more interactive data is to be transferred to and from charging stations, 5G will add value.”

Paul McHugh, UK area director at **Cradlepoint**, adds: “Laying fibre cables to new sites is costly, time-consuming and often requires maintenance, with engineers having to travel to locations. Cellular connectivity can be set up by plugging in a router, and multiple routers across different sites can be remotely managed and kept up-to-date using software updates.”

“5G connectivity is also better at supporting the deployment of IoT devices, which can lead to more benefits to drivers, from supporting smart charging to keeping people informed about the availability of chargers to manage queues,” he says. “In addition, 5G provides network slicing control, with firms able to ensure enough bandwidth is available to quickly process payment transactions, whilst supporting other processes such as machine-to-machine communications and complimentary Wi-Fi.”

Nick Earle, CEO of cellular connectivity provider

**Eseye**, confirms the need for reliable, high-speed connectivity: “High-speed and reliable connectivity have become integral to EV charge point operations, including the payment process, software updates and user analytics. Any individual charge point must communicate with back-end IT systems and be able to exchange this data in real-time. Charge points also aspire to run for a decade or more with minimal human intervention, requiring high-speed connectivity to monitor and manage them remotely.”

Earle adds: “EV charging operators can meet any challenge by deploying a flexible and future-proof cellular connectivity solution, such as eSIM technology, coupled with a next-gen IoT connectivity management platform. This enables charge points to switch mobile networks seamlessly to take advantage of the best available coverage and radio access type, whether it’s 4G or 5G, for complete network redundancy.”

**Breaking the gridlock**

Ordnance Survey’s Home says of power grid needs: “National grids will, of course, need to be upgraded in line with the implementation of EV infrastructure, but some estimates of the potential demand are greatly exaggerated. Such assumptions are often based on the maximum requirement, which would entail every EV owner charging their vehicle on the same day and at the same time.

“This is clearly never going to be the case, but it does raise an important point about how we ensure there is adequate capacity for times when demand is high,” he says. “Vehicle-to-grid (V2G) technology allows EV users to push surplus energy back to the grid and earn money in doing so, so investment in this technology is one potential solution to manage some of the increase in demand.”

David Hall, the vice president of power systems at **Schneider Electric** UK & Ireland, says: “EV chargers have to be installed in vast quantities, ▶



and evenly geographically. But we need to ensure that the right infrastructure is in place to manage this usage spike,” he says. “Harnessing a smarter grid will help create network efficiencies and avoid pressures caused by an increase in electricity usage, in a cost-effective and resilient way. Smart grids, operating independently from larger grids, and with the ability of being able to store and reserve energy, have the potential to enable efficient EV charging with user contingencies.”

## Contactless charging

And how about contactless charging? Deschanel at Tele2 IoT says: “We already have customers that are producing contactless charging solutions, such as **Elonroad**. Authentication is a key component of these. Vehicles that use charging infrastructure on the fly need to authenticate themselves, initiate payment and keep staying authenticated during the charging duration. SIM cards bring encryption end-to-end, and further IoT security technologies around cloud interconnect can be enabled to secure the communication.”

“Wireless charging has the potential to become an essential factor in the future of EVs,” says Martin Kochman, vice president and head of customers and industries at **Hitachi Vantara**. “Through its nature, wireless charging is more user friendly, simplifying the charging process with pre-installed receivers fitted to the EV, autonomously communicating with the charging pad, whether installed in the pavement or charging bay. Drivers could also simply drive over a charging pad, with the EV charging automatically, like a mobile phone charging wirelessly. However, wireless EV charging is still a relatively new technology, meaning it is still expensive to install.”

## Apps and services

Home at Ordnance Survey says of apps and services: “Many app developers are motivated by sustainability, and the ecosystem around EVs offers compelling opportunities to build a greener future. Users should also not have to worry about who the operator of a charging unit is, so payment

solutions that provide users with a single account to charge against, across all providers, are essential.”

Home adds that accessibility is also a huge issue for some, as charging locations may not accommodate disabled EV users. The location of charging stations might also be a problem for others, who may not feel safe waiting for their vehicle to charge in a dimly-lit area at night if they are alone. “These are the kinds of challenges EV users face, which can be addressed through applications and dynamic safety and accessibility features that improve their experience,” he explains.

Deschanel says of extra services: “Charging locations could be equipped with last mile delivery boxes. Travellers who know they will pass the location can have orders delivered to the spot. For instance, you forgot to buy a present to the wedding you are invited to. You could purchase one online and get it delivered to the charging station where you know for sure you will have a pit stop at. It could even be delivered by a drone.”

While there are still challenges to the rapidly evolving EV charging industry, the obstacles are not insurmountable. ■



**Martin Kochman**  
Hitachi Vantara





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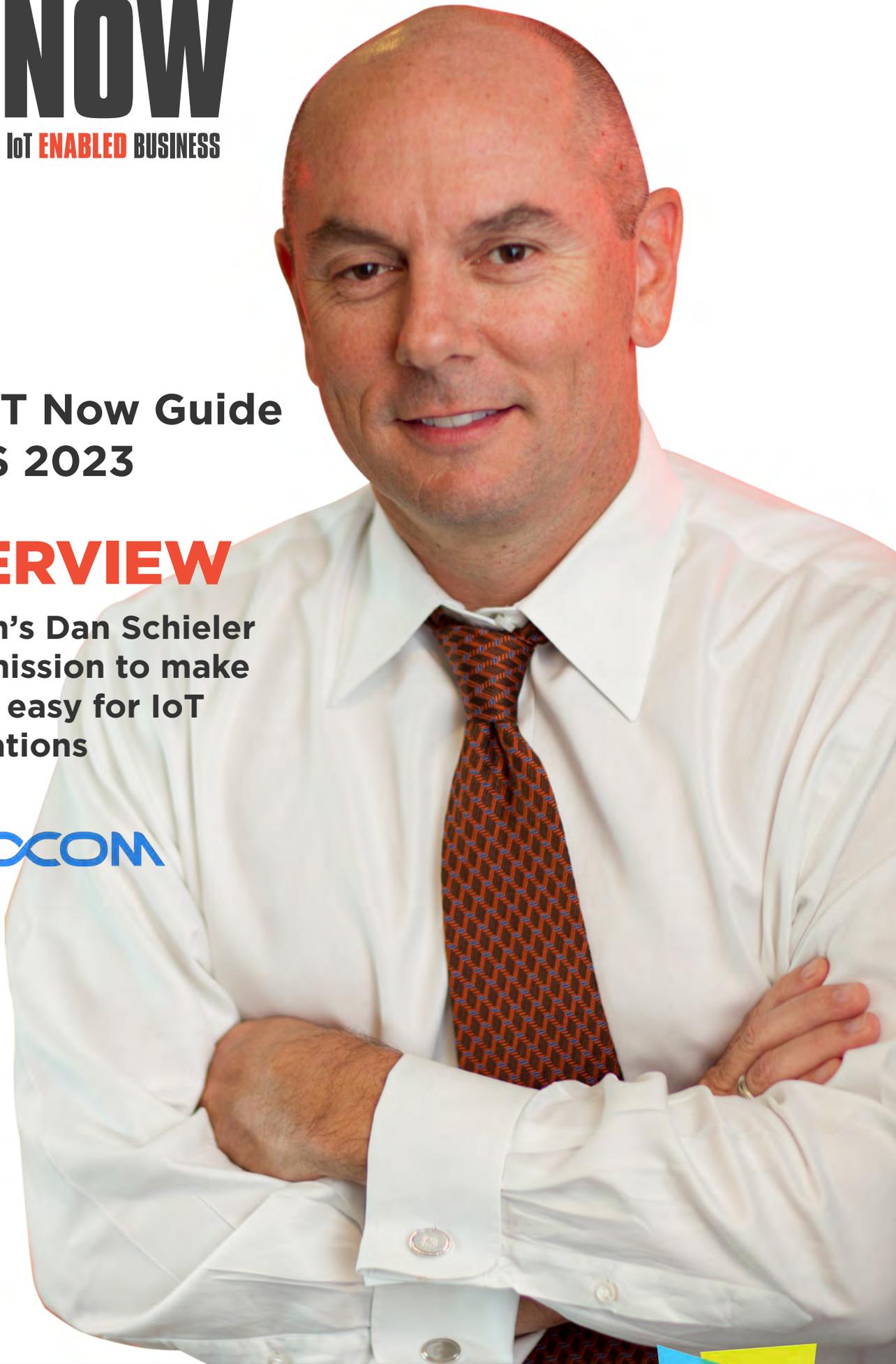
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### INTERVIEW

Fibocom's Dan Schieler  
on the mission to make  
wireless easy for IoT  
organisations

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# How mature is the IoT sector? The IMC sees early signs of mass-market readiness

The IoT M2M Council (IMC) is about to publish new research that indicates there's a developing maturity among IoT adopters that might presage larger-scale technology deployments that have long been predicted. Keith Kreisher, IMC's executive director, spoke to IoT Now to discuss the group's findings and what they might mean for IoT moving forward. We found him on the eve of the Consumer Electronics Show, where the IMC is the exclusive partner for IoT programming and exhibitions at what might be the largest IoT event of 2023

***We know of no other group that qualifies IoT adopters on this kind of scale - that was true in 2014 and it's still true today***

**IoT Now:** Keith, the IMC has been around since before the term IoT was popular. Now, on the eve of the group's big coming out party at the large, post-covid CES show, talk to us about how the group gathers insights into the IoT sector and is that perspective unique in any way?

**Keith Kreisher:** That's true - when we first started in 2014, the phrase machine-to-machine communication (M2M) was the term of choice. A lot has changed since then, but not the IMC's perspective perhaps. We've been pushing the concept of IoT as the communications layer in the stack at CES for six years now. As a trade association, we have 25,000 rank-and-file members that are individual enterprise users, product makers and designers, and apps developers that qualify for membership as buyers of IoT technology. We know of no other group that qualifies IoT adopters on this kind of scale - that was true in 2014 and it's still true today. We think that gives us unique perspective on the market and a platform to gather real statistically relevant data on what IoT buyers are planning.

**IoT Now:** What methods are you using to gather data from your rank-and-file, and what broad topical areas does the data cover?

**KK:** We have basically three methods to gather quantitative survey results - the newest is an updated version of our IoT Readiness Calculator (IoT-RC), which is a survey tool that doubles as a lead generator for our Sustaining Member companies. The tool violates almost every rule of online surveying - it's too long, too technical and it asks open-ended questions - but people who finish it are very serious about deploying IoT technology. It is, by far, the deepest data we've ever seen regarding a large number of different IoT projects. We ask about everything from, "Are you doing predictive maintenance?" to "What are your latency requirements?" to "Have you considered the need for data portability?"

We also survey our rank-and-file adopter members on a twice-yearly basis about IoT buying patterns, and I have to say, the data has been remarkably stable, particularly in regard to scale of ▶

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deployments. Like the IoTRC, we ask about scale of projects, vendors used, biggest hurdles to success, but without the same depth. The IoT sector looks very small in that data, just as it did five years ago. Finally, we do ad hoc polling on subjects that we think are particularly timely, and that can yield some eye-opening results.

**IoT Now: Let's get into some specifics. Where do you think the IoT is on the technology growth curve? And do you have data to back that up?**

**KK:** Analysts have been talking about billions of IoT devices in the field, with even more billions in investment getting those devices deployed, but I think it's fair to say that the industry is still waiting for mass IoT to happen, where almost everything you can imagine is equipped with sensors and the ability to communicate. But we're seeing data - particularly our IoTRC data - that would seem to indicate we're dealing with a newfound maturity in the IoT sector, things that we haven't seen before. I like to think that this indicates we're on the precipice of much stronger growth, that perhaps the IoT sector is ready to realize the potential we've all been waiting for.

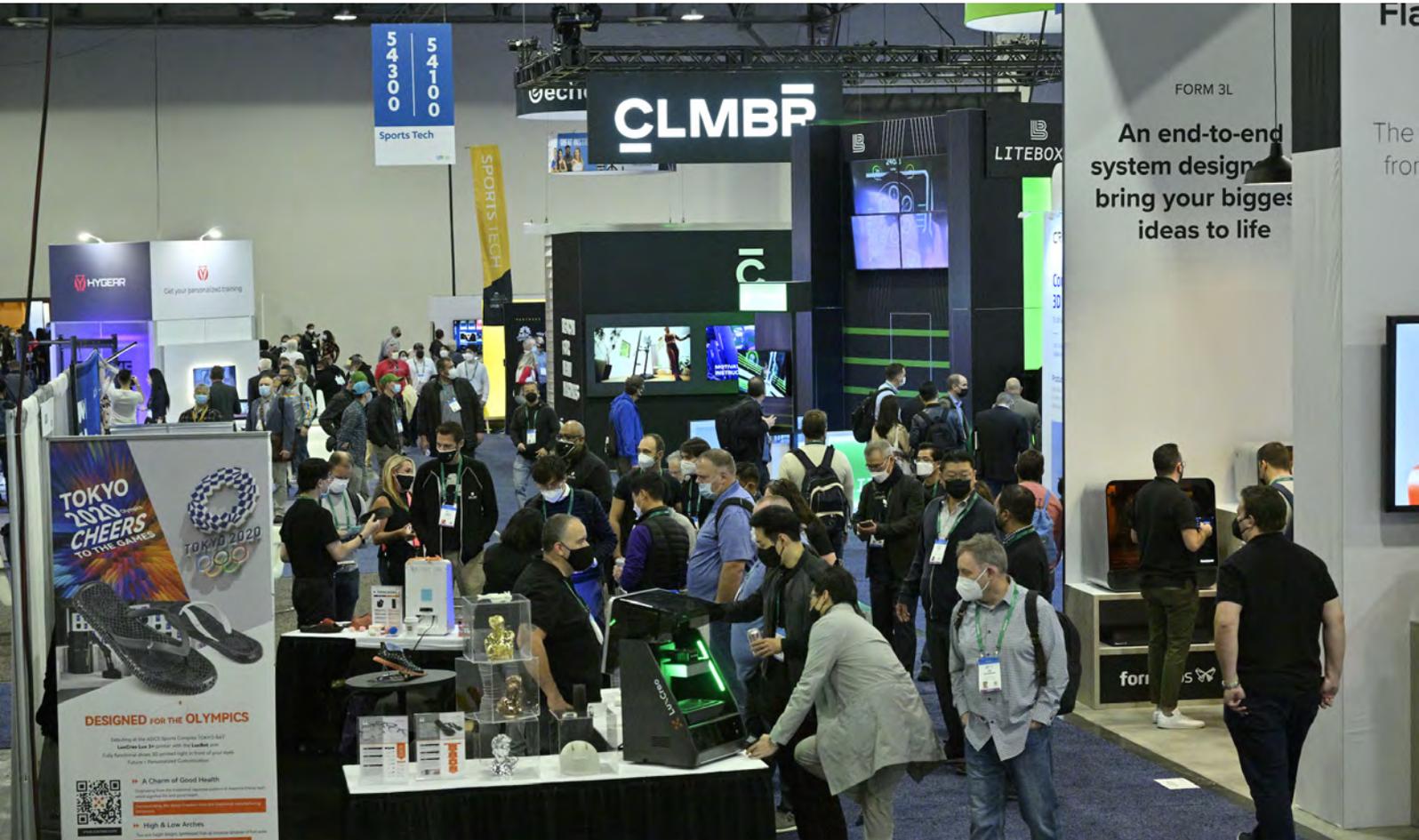
I can't go into specific numbers because we're still waiting to publish our report, and gathering new data as we speak, but for example, we're seeing a greater number of people citing their corporate function as digital transformation than we've ever seen before. Likewise, a majority of the ▶



**Keith Kreisher**  
IMC

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**To provide a more tangible metric, we've got a much larger number of respondents saying that they intend to deploy more than 100,000 devices in the field at the maturity of their IoT projects than we ever expected**

respondents we've got thus far say that they already have experience in deploying remote devices with connectivity. It's an anecdotal comment, but our IMC Board of Governors was surprised to hear these things - they expected those numbers to be lower.

**IoT Now: You're not revealing actual numbers from the survey you've conducted, so what you're relating sounds very anecdotal - is there more you can share?**

**KK:** Of course. To provide a more tangible metric, we've got a much larger number of respondents saying that they intend to deploy more than 100,000 devices in the field at the maturity of their IoT projects, than we ever expected. Again, I can't divulge the actual response rate, but it dwarfs the responses to a similar question on our bi-annual members survey by a factor of ten. I think it's important to acknowledge that there may be some selection bias in the figures we've produced - the number of respondents willing to fill out a 25-question survey may be self-selecting for those that are very involved in IoT technology deployment. Still, I think it bodes very well.

**IoT Now: Do you anticipate that an increased maturity and scale in the IoT sector will affect the actual kinds of technology that gets deployed? In other words, does larger scale**

**automatically bring more technological advancements?**

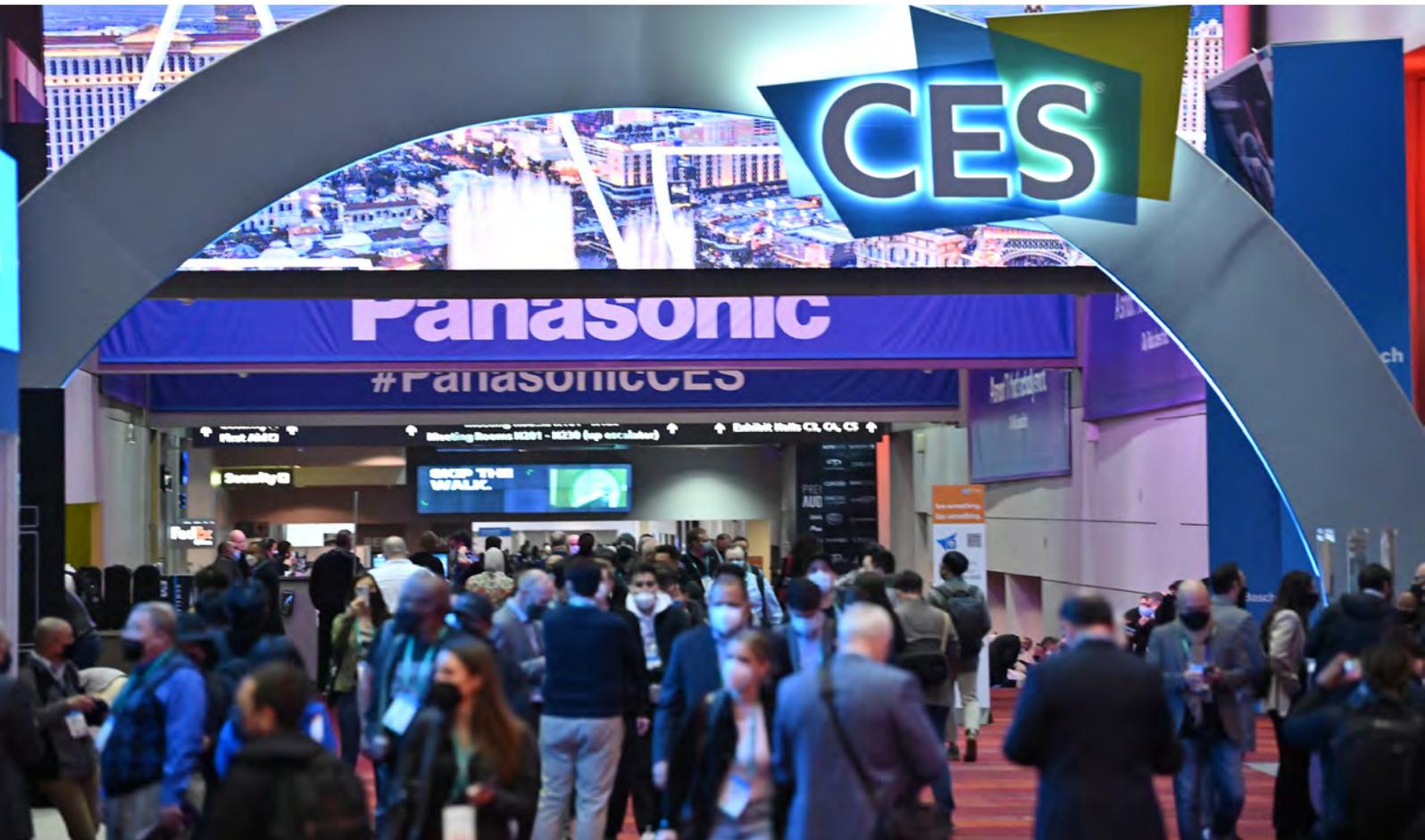
**KK:** Early returns seem to indicate that they will. For example, we asked what tasks they expect their IoT deployments to perform, and the possible answers ranged from simple monitoring on one end of the continuum, to predictive maintenance on the other end. The number that answered, all of the above, up to and including predictive maintenance, was almost a majority, which we thought was astounding. Only two years ago, I asked a particular high-end IoT software vendor about the number of deployments they did that included predictive maintenance, and they offered that it was less than 10%. Clearly, things are changing quickly.

Likewise, we saw a very large majority of respondents answer that they had high or medium requirements for IoT integration with backbone software systems like enterprise resource planning (ERP) and customer relationship management (CRM). This seems to indicate that IoT data is becoming mission critical in operations that are deploying the technology.

**IoT Now: In addition to more advanced technology, are you seeing different behaviour patterns among IoT buyers? This must be affecting the technology sourcing process. ▶**

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**KK:** Absolutely. It's not directly related to the research that the IoTRC is generating, which I've been talking about up to now, but we've recently done a survey about the intersections between the IoT and embedded sectors. Again, we're turning up some interesting numbers that we wouldn't have expected that would show, at least anecdotally, that things are changing. Embedded technology, to my way of thinking, is all about sensors and actuators and therefore highly related to IoT connectivity these days.

We asked about the sourcing of embedded hardware and data plans – did respondents buy one of these things first, then the other? Or both at the same time? We found that, for a strong plurality, the answer was the latter. We take this to mean that more embedded engineers are thinking about connectivity much earlier in the process than we would have surmised. And that's just one change in the buying process that we're seeing from multiple sources.

**IoT Now: Your data is pointing to a more mature IoT sector poised for growth, where fundamental changes have already occurred in technology sourcing. Is there any data among your various platforms that argues against this?**

**KK:** Yes there is. For example, a plurality of respondents on the IoTRC lists cost reduction as

their main objective. Another plurality says that one of their biggest hurdles to deploying IoT technology is a lack of industry business models. One would hope for and expect these numbers to be lower – they're certainly countervailing data points. Our role at the IMC is to present and interpret the data that we gather as best we can, warts and all.

**IoT Now: How can IoT Now readers find out more about this new research, as well as IMC activities in general?**

**KK:** I encourage all who are interested to visit the website or to reach out to us directly at [info@iitm2mcouncil.org](mailto:info@iitm2mcouncil.org). IMC will also be organising IoT Week @ CES, of course, where we're producing conference programming, video content from the show floor, networking events, press events, and more, in addition to organising the IoT Infrastructure Pavilion – likely to be the largest IoT gathering in 2023 – please stop by the IMC booth. ■

*Embedded technology, to my way of thinking, is all about sensors and actuators and therefore highly related to IoT connectivity these days*



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# Accelerate time to market and maximise ROI by making wireless easy

The complexity of wireless connectivity is one of the barriers that has held back adoption of IoT but IoT innovators don't have to become experts in all aspects of wireless in order to access the technology they need to enable optimised connections for their deployments. Here, Dan Schieler, the senior vice president of the IoT Overseas Sales Department at Fibocom, tells IoT Now about the company's mission to make wireless easy

**IoT Now: Fibocom has a mission to make wireless easy. What does that mean to you and how are you executing on that goal?**

**Dan Schieler:** Established in 1999, **Fibocom** has a history of more than 23 years in the wireless communication industry. We are thriving along with the evolution of cellular technologies from 2G to 5G. In the 5G era, we've launched a series of impactful and powerful 5G module products since 2019, with more than 20 global stock-keeping units (SKUs) to fit into the global markets.

Fibocom's latest products are designed to advance wireless solutions for the fixed wireless access (FWA) and artificial intelligence IoT (AIoT) industries, among those are the 5G Sub-6GHz and mmWave module FG170(W) series, which features the Snapdragon X65 5G Modem-RF System. Another example is the 5G smart module SC161, which supports 5G standalone/non-standalone (SA/NSA) networks and enables AIoT applications such as virtual reality and augmented reality (VR and AR), door entry systems and telemedicine. Other demos include a 5G Ethernet gateway and a 5G Wi-Fi hotspot, both embedded with our 5G module FG160 that supports OpenCPU, enabling 160MHz bandwidth, 4096 QAM as well as Wi-Fi 6E.

As a key component in making devices connected, there are a variety of communication protocols,

frequency bands and certifications that a module vendor has to take into consideration at the beginning of the product design. Fibocom provides high-performance 5G, LTE-A Pro, LTE-A, LTE Cat 1, Android Smart and global navigation satellite system (GNSS) module products and solutions to IoT customers from a variety of business sectors. Our module products have different regional versions that adapt to different frequency bands, along with our localised and customised support. It's worth mentioning that with modules certified by the mainstream global carriers, we help customers to reduce the time-to-market and achieve the best return on investment (ROI).

Beyond new product launches, Fibocom is firmly focused on expanding into new regions. The focus is on how to expand globally, which includes making products that fit all those geographies. Doing so means deciphering the right carrier band combinations that are skewed locally and globally. That is the challenge that we have and is the big picture view of what we're trying to do.

**IoT Now: How do you see the trends towards RedCap devices and private networks accelerating into 2023? What are the benefits and how can Fibocom help here?**

**DS:** The release of the 3GPP R17 standard has addressed the RedCap in 5G to help devices ►

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## ***The high-cost and high-complexity does have some impacts on the 5G commercialisation***

reduce complexity and capability associated with full-5G devices, allowing for a more appropriate and optimised design intended for mid-tier use cases. As far as we can see at the moment, the first RedCap chipset will be released in 2023, and we will keep paying attention to the trends from the upstream. We believe that the benefit of RedCap is to replace LTE Cat 4 and make 5G affordable to all, and Fibocom will support it.

I think that is going to open a lot more doors for 5G because it will hit a more accessible price point. It also opens up the capability of using more spectrum, which the carriers like because that will make them more efficient.

There is a good demand for private networks, and a lot of great utility that comes out of being able to be connect quickly in a small private network as opposed to sharing a public network with 40-60,000 people.

### **IoT Now: 5G offers greater bandwidth, higher device density per cell and lower latency but it comes with greater complexity - and cost. What is Fibocom's role in making 5G easier and more attractive for IoT organisations to deploy?**

**DS:** The high-cost and high-complexity does have some impacts on the 5G commercialisation. By utilising hardware design, and optimised replaceable components, Fibocom is offering a cost-down 5G module solution to customers worldwide.

### **IoT Now: What's next for Fibocom?**

**DS:** Fibocom will keep offering leading-edge wireless module and module solutions to address various IoT scenarios. We help IoT implementers to connect any number of IoT devices easily and seamlessly worldwide, further accelerating the digital transformation in industries. ■

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**Dan Schieler**  
Fibocom





# IMC's IoT buyer personas cover enterprise users, OEMs and app developers

For several years the IoT M2M Council (IMC) has collected data on a quarterly basis tracking IoT buying patterns by surveying its 25,000 rank-and-file IMC Adopter Members – all self-identified IoT buyers, writes Keith Kreisher, the organisation's executive director. To get started, there was much discussion among industry experts – mostly, the companies making up the IMC Board of Governors – about what kind of industry roles would be helpful to track ►

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## The product maker is as likely to define their corporate role as product design/development as operations

We settled on three key categories of the IoT industry to focus on:

- 1) **Enterprise users** – defined as business units that utilise connected devices for their day-to-day operations, such as tracking assets for supply-chain management.
- 2) **Original equipment manufacturers (OEMs)** – defined as business units that embed connected devices within products that they in turn sell, such as car makers or medical device manufacturers.
- 3) **Apps developers/systems integrators/independent software vendors (ISVs)** – defined as businesses that develop new, specific applications, possibly to be sold to or used among the two groups above.

In the last two years, we've quantified that these groups do, in fact, show significantly different characteristics that validate different personas among IoT buyers.

### Enterprise users

Almost one quarter of those identifying themselves as enterprise users are directly involved in logistics. The enterprise user is often a supply-chain manager within an enterprise who defines their role broadly as operations. It is interesting that a plurality of IMC rank-and-file members define themselves in this way, and that's true across 25 of the 27 vertical markets that we track. Almost three quarters of their IoT deployments are low-volume – under 1,000 devices. This makes this user the lowest-volume end user of our three identified personas.

Because they are in operations, we surmise that they have a greater need to integration of IoT technology with backbone systems like enterprise resource planning (ERP) and customer relationship management (CRM). They are more likely to begin their IoT procurement process by speaking with systems integrators rather than other IoT buyers. Enterprise users also cite a lack of business models as their biggest IoT hurdle more often than other buyers, while they are less likely to cite interoperability as a problem.

### Product makers and OEMs

The product maker is as likely to define their corporate role as product design/development as operations. Almost a third of their IoT deployments involve more than 10,000 devices, making them the highest volume buying persona out there – they're 50% more likely to be sourcing large-scale deployments than others.

A plurality of all IoT buyers begin their journey by talking to systems integrators, but product makers are more likely to make their first stop a device maker. They cite a lack of interoperability as one of their biggest hurdles in the IoT procurement process – more so than others – and this is a trend that is increasing over time. These demographics make sense because the product maker is incorporating IoT technology into products that they provide to others.

### Apps developer

The developers' function goes by different names – apps developer, independent software vendor, application-specific systems integrator – and their role is somewhat more difficult to define. On the scale-volume, this persona falls between the enterprise user and the product maker – just over half of their deployments are under 1,000 devices. Apps developers have lately been telling us that they are planning longer lead-times for their deployments but it's hard to know whether this is simply a function of current, unstable economic conditions.

Apps developers are more likely to begin their buyer's journey by talking to an IoT software platform provider than our other personas. Like product makers, they are increasingly citing interoperability as a concern, as well.

The **IMC** has substantial data to back up these personas, and we make that data available to our Sustaining Member companies on a bi-annual basis. This includes complete breakdowns of buying timelines, size of deployment, connectivity types, vendor types, and time to implementation for the three buyer personas described above. ■

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# It's a packed Vegas IoT stack at CES 2023

CES 2023 promises to deliver a cornucopia of announcements and opportunities for IoT players, reports Antony Savvas

The annual global show in early January, run by the US Consumer Technology Association (CTA), is being held across the Las Vegas Convention Center and major hotels on the strip, including the Aria and the Venetian.

There will be hundreds of keynotes and presentations made at the various venues. The CES 2023 conference programme will highlight advancements in artificial intelligence (AI) and robotics, the environment and sustainability, the metaverse and gaming, digital health, vehicle tech and advanced mobility, and home entertainment and smart homes, among other areas. New this year will be content on non-fungible tokens (NFTs) and Web3.

## Economic headwinds

The show comes at a critical time for the IoT industry, as enterprises, vertical markets and national economies look to weather economic headwinds.

Galit Shemesh Cohen, product manager lead at IoT connectivity and management platform **FirstPoint**, says: "2023 will be a year of economic downturn, therefore an increasing number of businesses will be looking at how to reduce operational costs while still focusing on improving user experience. One significant way to achieve this goal is through digitisation through the Internet of Things, harnessing the power of millions of devices such as pressure and temperature sensors and electric, pneumatic actuators to collect, analyse, automate and control business data and processes. This will also improve end-customer satisfaction."

One of the most exciting examples, she says, is smart grids, that will drive improved energy efficiency through increasing production resiliency, connecting to renewable energy and incentivising reduced energy use during peak load times. Cellular connectivity adapted to the different IoT needs – especially 5G – will be critical," says Cohen. "Its promise, to support low latency, high bandwidth and a massive number of devices with unbreakable security, will undoubtedly be a game changer."





### IoT modules

5G module provider **Fibocom** echoes that sentiment. It says: “As 5G technology keeps evolving from usable towards useful, recently launched cutting-edge 5G module products, based on mainstream chipset platforms, have unleashed 5G’s potential in speed performance, network coverage and power consumption.”

Some of its own products include the Fibocom 5G Module FG170(W), which offers a “fibre-like wireless connectivity experience” with extended network coverage and boosted throughput, further enhancing 5G performance in fixed wireless access (FWA), industrial IoT, cellular vehicle-to-everything (C-V2X), private networks, and other mass data scenarios.

Chip and module provider **Sequans** says a key driver in cellular IoT is its high level of security and flexibility, enabled by integrated eSIM technology now available and certified on leading cellular IoT chipsets.

“Our GSMA-compliant integrated eSIM in the Sequans Monarch 2 LTE-M/NB-IoT chip platform is Common Criteria EAL5+ certified, which saves on device costs and enables utilities to easily switch to any mobile network operator (MNO) at will, improving longevity and lowering operational costs,” says Sequans.

### IoT Infrastructure Pavilion

At CES 2023, the IoT Infrastructure Pavilion will be located at the Las Vegas Convention Center, and will showcase the latest technologies that are the backbone of all connected consumer technology.

It has been organised by the **IoT M2M**

**Fibocom**

**Council (IMC)** which has a mission of bringing technology adopters together with solutions providers through online and in-person events. The overall aim is to accelerate the adoption of IoT technology. The IMC counts more than 25,000 IoT buyers as members from 24 vertical markets across every continent. These are enterprise users and original equipment manufacturers (OEMs) that procure software, hardware and connectivity.

The IMC is organising attendee conferences, press events and networking receptions throughout the CES week.

### Big IoT presence

The companies located in the IoT Infrastructure Pavilion include **Airgain, BICS, Digi International, iBASIS, KORE, INCE, 2J Antennas, Arima, AzureWave Technologies, Bantam Clean Power, Blues Wireless, BRT Systems, Canonical, Cygnus Reach, ESH Technology, floLIVE, GetWireless, Nichicon, Pod Group, Quectel, QuEST Global, Samyoung S&C, SIMCom Wireless Solutions, SmartWitness, Taoglas, Telit, u-blox, Vodafone, Voltaic Systems** and **WTIwireless**.

The Pavilion is housed in the North Hall of the Convention Center, along with related exhibitions around vehicle tech and advanced mobility, artificial intelligence and robotics, digital health, and sustainability.

### IoT solutions conference track

The IMC is also hosting two panel discussions at the LVCC focusing on different IoT technology. The first panel is, ‘Satellites provide new options for consumer devices’, taking place on

Thursday 5 January at 2pm.

The speakers here include Lilac Muller, vice president of product management at **Kymeta**; Tushar Sachdev, executive vice president and chief technology officer at **KORE**; Jaume Sanpera, founder and chief executive officer of **Sateliot**; and Rick Somerton, president and CEO of **eSAT Global**.

The lead-in for this panel is this: the main benefit of satellite connectivity has been ubiquitous coverage outside of cellular networks, including in maritime and deep-rural environments, but costs associated with satellite communications have been prohibitive for most consumer applications, until recently.

Today, low earth orbit (LEO) satellites have cut the costs of satellite connectivity by more than half, and it’s likely these costs will continue to drop. At the same time, innovations in device hardware are making it possible to seamlessly switch between satellite and terrestrial connectivity. The panel will investigate what’s happening now with satellite connectivity services and how that’s likely to impact consumer devices moving forward.

### A threatened world

The second interesting panel is, ‘How low power IoT can help save the planet’, which is happening on Saturday 7 January at 2pm.

Speakers here include Natasha Barrios, director of sales at **Quectel Wireless Solutions**; Mobeen Khan, chief operating officer at **Blues Wireless**; and Ivo Rook, COO at **INCE**.

Climate disasters, breaking infrastructure, stressed supply chains and low food productivity are major issues creating public fear. But there is hope, says the IMC. The panel will discuss how new technologies are driving down the cost of communicating devices.

Sensorisation or mass IoT - the widespread deployment of communicating sensors - can help predict and speed responses to many of the aforementioned threats, the IMC maintains.

Connectivity like narrow-band IoT (NB-IoT) and low-power wide area networks (LP-WAN), as well as messaging protocols like lightweight M2M (LWM2M), will feature in the discussion. They not only cut the costs of transmitting data, but also offer low-cost hardware options and extend the life of batteries and other components, while making it easier to mitigate a threatening world.

CES 2023 will take place in Las Vegas on 5-8 January 2023. ■

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# Why iSIM is providing scalable trust for IoT

Robin Duke-Woolley, the chief executive of Beecham Research, interviews Laurent Leloup, the product line manager, and Stephane Quetglas, the marketing director, of Thales DIS (Digital Identity & Security) to understand how integrated SIM (iSIM) technology has been developing and what it enables in IoT

**Robin Duke-Woolley: It has taken several years to establish the embedded SIM (eSIM) in the IoT market. Now attention is moving towards the iSIM. Why is there a need for a standard for iSIM?**

**Laurent Leloup:** Like eSIM, we need to have an iSIM that is fully endorsed by **GSMA** in compliance with the remote SIM provisioning (RSP) standard. This ensures that not only the hardware is secured, but also compliance with the remote provisioning servers and compliance with a secure production process. All of this is needed to provide an iSIM solution that can scale to meet the rapidly-growing demands of the IoT market.

**RD-W: What do you mean by secure production process?**

**LL:** A secure production process is needed because to make an iSIM you need to load the initial profile of the mobile network operator (MNO) in a secure way. For an iSIM, the integrated chip will not go through the embedded universal integrated circuit card (eUICC) manufacturer production site, which is a secure place. Instead, it has to be done by the device original equipment

manufacturer (OEM) and it must be done in a secure way.

This is a specific process that was standardised by GSMA which implies a security process and certification only for the system on chip (SoC) maker, a vendor such as **Qualcomm**, and the eUICC manufacturer. This specifically avoids the need to secure the device OEM production site.

**RD-W: Does that mean the device OEM needs to put further investment into their production process?**

**LL:** No, they only have to rely on an SoC maker and eSIM manufacturer that are compliant to the GSMA process. The specific process was created by GSMA to avoid this. Without this process, the OEM would need to be certified by GSMA through a certification process called SAS-UP - the Security Accreditation Scheme for UICC Production - which is quite onerous. This can be avoided completely by relying on the SoC maker and the eUICC manufacturer. By doing so, a Root of Trust is loaded into the SoC directly by the SoC maker, with the eUICC manufacturer then following up later with the MNO profile data. ▶

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This is a two-step process. The SoC maker is responsible for loading securely a key inside each SoC. The eUICC manufacturer is then responsible for preparing the profile data for each specific chip, binding each data to a unique SoC key.

**RD-W: Why is this a two step process? Does that not make it more complicated?**

**LL:** There are three alternative ways to ensure security is maintained. The profile data could be prepared by the eUICC manufacturer and loaded by the SoC maker in a secure environment, but that would then cause a lot of new stock-keeping unit (SKU) numbers and logistical issues for the SoC maker to deal with. Another alternative would be for the OEM to load the profile data in a secure environment. However, setting up that process is expensive and complex for the OEM.

The third alternative is the two-step process created by GSMA, which provides for the loading of sensitive data at the latest stage of device production without any security constraint being needed at the OEM production site. To achieve this, the SoC maker loads securely a unique specific key inside each SoC. The eUICC manufacturer then prepares the data set bound to a specific SoC. Each data set is secured for a specific chip and can only be loaded inside the ►

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***The profile data could be prepared by the eUICC manufacturer and loaded by the SoC maker in a secure environment, but that would then cause a lot of new stock-keeping unit (SKU) numbers and logistical issues for the SoC maker to deal with***



***It is fully certified by GSMA, meaning that both SoC maker and eUICC manufacturer will be audited by GSMA-accredited auditors to ensure that both entities are fully compliant with two-step personalisation process requirements***

chip for which it was prepared. They cannot be changed, cloned or tampered with. The process is designed to avoid any security threat on the OEM side and is the simplest for all the stakeholders.

**RD-W: Is this process certified? If so, what does that mean?**

**LL:** It is fully certified by GSMA, meaning that both SoC maker and eUICC manufacturer will be audited by GSMA-accredited auditors to ensure that both entities are fully compliant with two-step personalisation process requirements. This allows the OEM to receive and load the data in a non-secure environment.

GSMA certification also includes hardware and software certification, meaning that external labs accredited by GSMA have implemented all types of attacks – hardware and logical software attacks – and it passed all these tests. There is then a stamp provided by GSMA to prove that everything was thoroughly checked: production process, hardware and software, and compliance to the RSP standards.

If you don't go through this standard recognised scheme to prove the solution is secure, MNOs will not usually trust that security without themselves looking at the details of what has been done to check the security of the hardware and the software, and of the production process. When a proprietary implementation is used, they have to look in-depth at the details for each implementation to ensure that their sensitive assets are not jeopardised. That is complex and time-consuming to do.

**RD-W: Has this been introduced before, or is this the first time that a two-step process like this has been considered?**

**LL:** It is being introduced for integrated SIM, so it is indeed the first time this process has been launched. We are working with Qualcomm right now as the first certified SoC maker for step 1.

**Thales** is the first certified eUICC manufacturer for step 2.

**RD-W: What are the main benefits for IoT device manufacturers of introducing this process?**

**Stephane Quetglas:** This process enables secure RSP. An iSIM that does not go through this process can only be supported by MNOs if they each create their own security certification process. This is complex and time-consuming to achieve because each potential security issue needs to be studied and tested. At best, this will only be done for a few very large deployments. In practice, it means that the subscription cannot be changed remotely.

In contrast, this standardised process opens up the iSIM opportunity with secure remote SIM provisioning for the whole market and is therefore the only truly scalable approach.

**RD-W: Is this compatible with IoT SAFE?**

**SQ:** Yes, it is. IoT SAFE can certainly work on iSIM because you just need to have a SIM or eSIM functionality. Another interesting point is that you can use this SIM secure enclave to implement more features. A secure enclave within the SoC is also referred to as an integrated tamper-resistant element (TRE) by the Trusted Connectivity Alliance. SoC makers also use the term secure processor unit (SPU).

With IoT SAFE, you can authenticate the device, the cloud, sign transactions, and more but what you can do with an integrated SIM is provide the ►



IoT SAFE functionality plus you can have a secure element approach, which is totally separate from the integrated SIM functionality. That can be used for example for secure boot for the device, so that when the device starts up all the software modules are verified against the initial values that were signed by the device maker. You can check these modules have not been modified or tampered with in any way. You can also imagine working on other value-added services like activating features in the software for the device, which means you can deliver different products with a single piece of software for your customers with features you can monetise. All these kinds of things become possible. On the other hand, when you have an embedded SIM that sits outside the SoC, it is very difficult or even impossible to implement them.

Once you are in the device, then you can add more services. We can talk about IoT SAFE being naturally compatible with integrated SIM but we should say that being inside the device itself means you can provide more security and also a range of new value added services and features that can be monetised, so it opens up a new range of opportunities.

**RD-W: Why does it enable more services to be introduced by being in the secure enclave, rather than as a separate eSIM?**

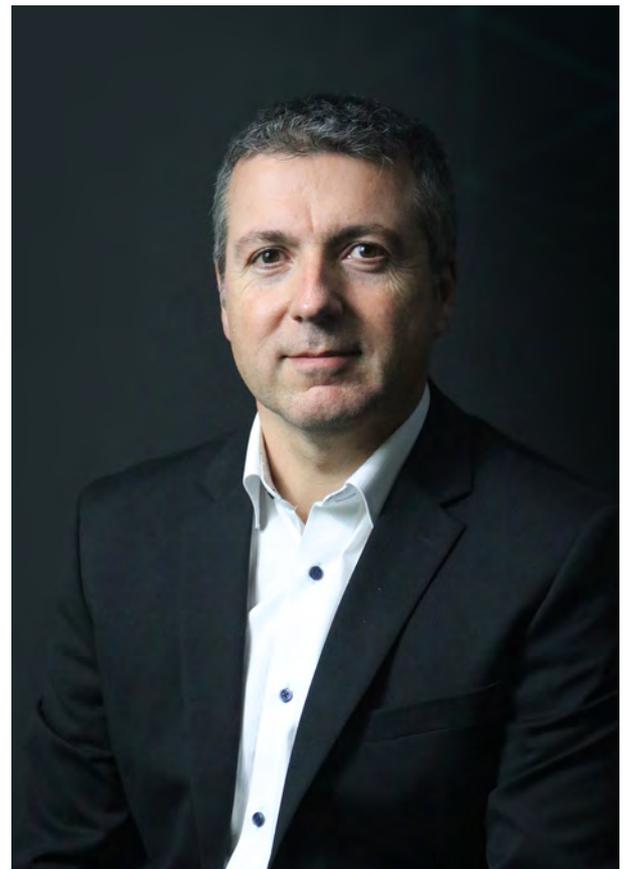
**SQ:** Because typically the eSIM is external to the SoC, so when you start the device all the software within the device will come alive and then, once everything is OK, the device will start connecting to the cellular network and will then switch the eSIM on. On the other hand, if the eSIM is already inside the SoC, everything associated with the eSIM can start up earlier. Externally there are interfaces, so the interface between the external eSIM and the cellular module of the device is standardised. There is not much extra you can do with that. But when you are inside the SoC already, you can start to think about application programme interfaces (APIs), you can work with middleware providers, you can provide a package that is broader and more powerful.

**RD-W: Do you expect the iSIM to replace the eSIM?**

**SQ:** In the very long run - up to 15 years - possibly. Not in the short to medium term though. It takes a long time to add the secure enclave into a chipset and there are different chipsets for different connectivity requirements. Depending on the use case, you may need voice, you may need very high speed or low power consumption. Some options are likely to be introduced much faster than others.

**RD-W: Is the iSIM with integrated IoT SAFE particularly suitable for very small form factor devices? Is it likely to be introduced in these first?**

**SQ:** That makes sense. For the industrial use cases, that would include the sensors that you may need to deploy. In the smart city, you may need a lot of sensors as well. Certainly for wearables. Where you have small objects that deliver value in the industrial space as well as those in the consumer space. ■



**Stephane Quetglas**  
Thales DIS (Digital Identity & Security)

***IoT SAFE can certainly work on iSIM because you just need to have a SIM or eSIM functionality***

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# ANALYST REPORT

LoRaWAN expands to  
cover wide area and  
hybrid networking

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# LoRaWAN focus shifts to wide area and hybrid networking

LoRaWAN is the leading technology in the licence-exempt low power wide area (LPWA) space, accounting for around 270 million end points as of August 2022. The ecosystem associated with the technology is dynamic and evolving. Initially, the technology gained traction in campus area private networks, but now momentum is growing in wide area and public network contexts bringing new network and data management challenges. This report, written by Jim Morrish, a co-founder of Transforma Insights, unpicks some of the detail behind these three stages



**Jim Morrish**  
co-founder  
Transforma Insights

LoRaWAN has two key characteristics that make the technology particularly suitable for certain IoT markets. Firstly, it is a LPWA technology meaning that LoRaWAN connected devices can be battery powered with battery lives of potentially several years and also LoRaWAN networks have the potential to be deployed as wide area public networks, much as cellular networks are currently deployed today. Secondly, LoRaWAN operates in licence-exempt spectrum which means that an end-user or network provider does not need to first procure radio spectrum before deploying a network. In combination, these characteristics make for cheap and easy network deployment to provide connectivity for battery powered sensing or actuating devices that can operate for potentially years with minimal maintenance requirements.

The trade-off for this flexibility lies in LoRaWAN's limited data rates, which are much lower than today's cellular technologies but are often perfectly adequate for IoT devices. By 2030, **Transforma Insights** forecasts that there will be 6.9 billion wide area wireless IoT connections, of which 36% will be traditional cellular technologies while ►



**LoRaWAN is also ideally suited for deployment as a campus area network in agricultural contexts, in support of devices ranging from soil-moisture sensors to temperature sensors in greenhouses, and from storage tank level monitoring to enabling remotely controlled irrigation systems**

4.4 billion will be LPWA technologies. Of this figure, we expect that around two-thirds will be massive machine-type communications (mMTC) connections operating in licenced spectrum and one-third will be connected using licence-exempt LPWA technologies, but this split might vary depending on how quickly licence-exempt wide area public networks are deployed.

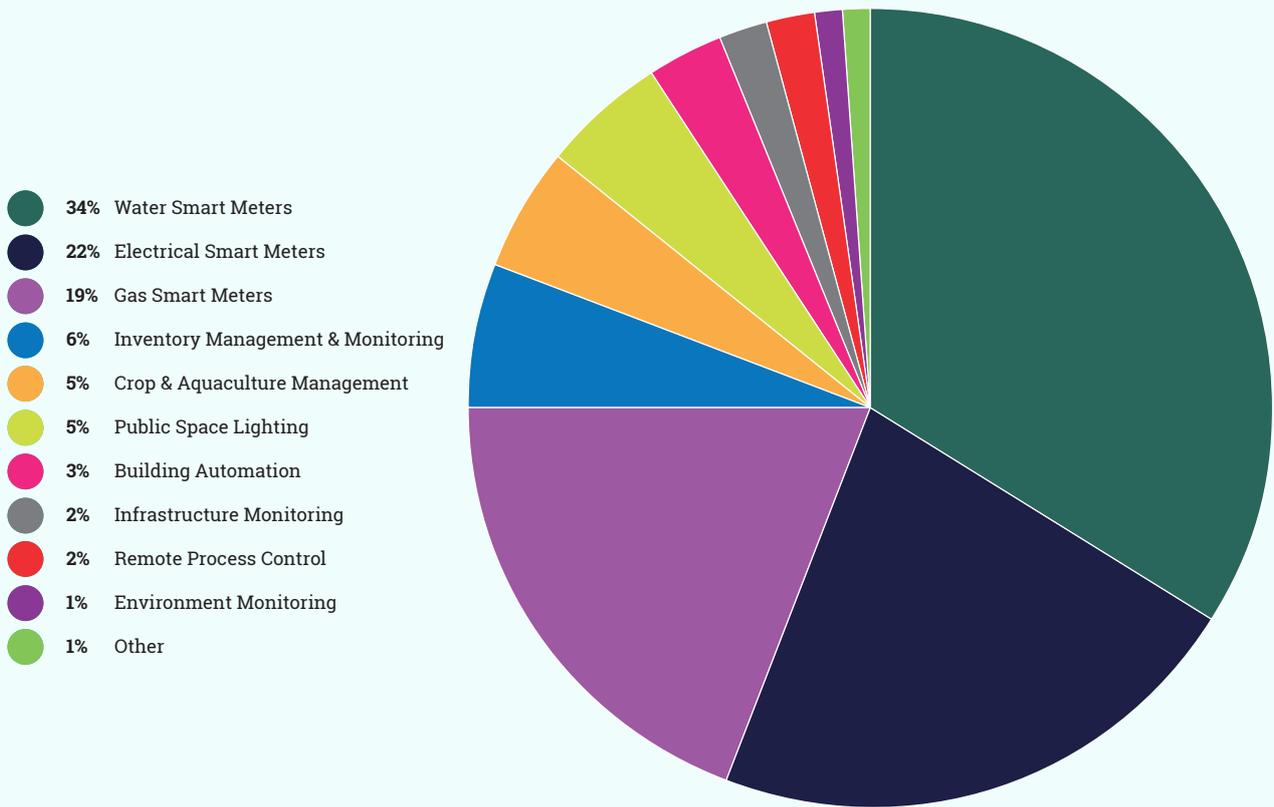
#### **Gaining traction: LoRaWAN in a campus area private network context**

Given the strengths of LoRaWAN as described above, it is unsurprising that much of the early adoption of the technology has been driven by campus area deployments of private networks. It is a simple exercise for any enterprise end-user to deploy their own network, connect devices, and reap significant benefits.

Key scenarios include the deployment of networks to support inventory management

and monitoring, including stock level monitoring and warehouse management systems which can reduce the load on warehouse employees, freeing them up for other higher skilled tasks. Meanwhile, greater knowledge of the stored quantity of goods and their flow enables the optimisation of inventories, allowing businesses to operate with a leaner inventory reducing the space and capital dedicated to inventory, or for a greater variety of goods for a given floor space.

LoRaWAN is also ideally suited for deployment as a campus area network in agricultural contexts, in support of devices ranging from soil-moisture sensors to temperature sensors in greenhouses, and from storage tank level monitoring to enabling remotely controlled irrigation systems. In other enterprise contexts the technology is well-suited to monitoring the location and condition of various assets, enabling building automation solutions, and many other applications. ►



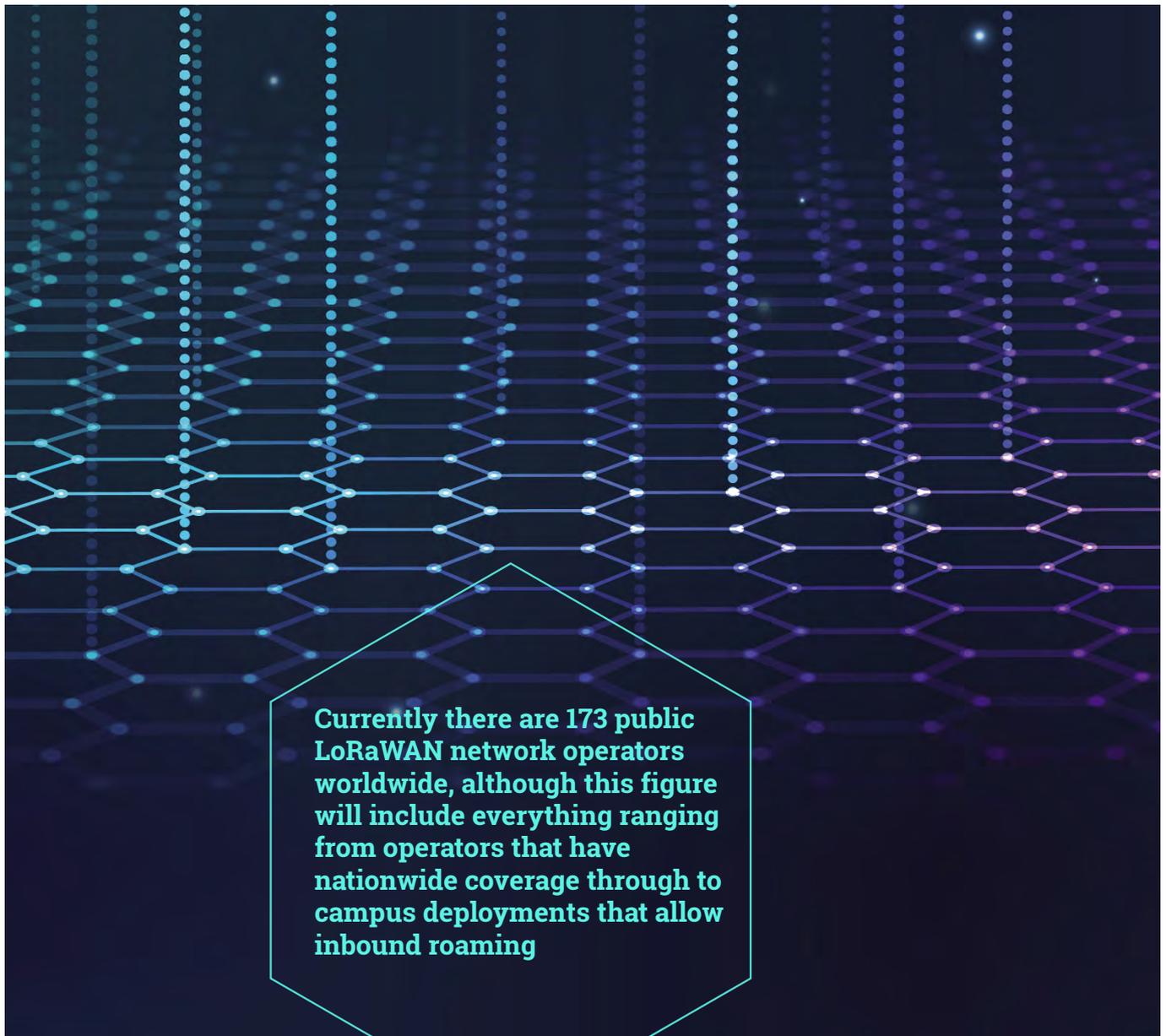
**Figure 1: Licence-exempt private network LPWA connections, year-end 2022**  
 [Source: Transforma Insights, 2022]

However, today’s deployments of LoRaWAN networks have not been exclusively limited to campus area networks. Often networks have been deployed as wide area private networks, particularly to support applications such as smart metering and public space lighting, including street lighting. Deployment of networks for street lighting in particular can unlock new opportunities. For example, in January 2022, Sydney-based **National Narrowband Network Company (NNNCo)** signed a contract with technology provider **Wellness TechGroup**, to provide IoT network coverage to 70,000 smart streetlights in Montevideo, the capital of Uruguay. The project will cover 200 square kilometres and provide smart street lighting to more than 1.3 million people. It will also establish a LoRaWAN network that can be used to support other smart city initiatives, potentially

including applications such as smart parking and road traffic monitoring and control.

To date, a significant driver for the deployment of LoRaWAN networks (and devices) has been for reasons of cost reduction and efficiency. But there are other factors that can drive deployment, including compliance with regulations and worker health and safety

A key factor to note here is that the wide area applications listed above will typically involve many more end points per deployment than will campus area deployments. Accordingly, whilst the centre of mass of the LoRaWAN market activity to date has been campus area private networks, it is in fact wide area private networks that account for the majority of connections. **Figure 1** summarises Transforma Insights market forecasts for 2022, ►



**Currently there are 173 public LoRaWAN network operators worldwide, although this figure will include everything ranging from operators that have nationwide coverage through to campus deployments that allow inbound roaming**

highlighting the applications that comprise today's installed base of licence-exempt LPWA private network connections.

**Extending reach: LoRaWAN as a wide area public network**

Clearly, the deployment of LoRaWAN wide area public networks represents a significant opportunity for the entire LoRaWAN ecosystem since, as is clear from the profile of connections in Figure 1, the largest opportunities in terms of device count tend to rely on wide area coverage. So far that wide area coverage has generally but not exclusively been provided by private networks.

Currently there are 173 public LoRaWAN network operators worldwide, although this figure will include everything ranging from

operators that have nationwide coverage through to campus deployments that allow inbound roaming. Amongst the most significant of these **Orange**, **Swisscom** and **KPN** all offer nominally nationwide LoRaWAN public networks in France, Switzerland and the Netherlands respectively.

However, the deployment of LoRaWAN as a wide area public network technology is rapidly gaining momentum. In this context, it is worth calling out three companies: **Everynet**, **Helium**, and **Senet**.

Recently, Everynet has pursued a strategy to roll-out such networks, starting in Brazil and following with the USA and Indonesia. The company's networks cover more than 50% of the population of Brazil and more than 40% of the population of the USA and Everynet will ►



**Figure 2: LPWA connections, private (licence exempt) and all, 2030**  
 [Source: Transforma Insights, 2022]

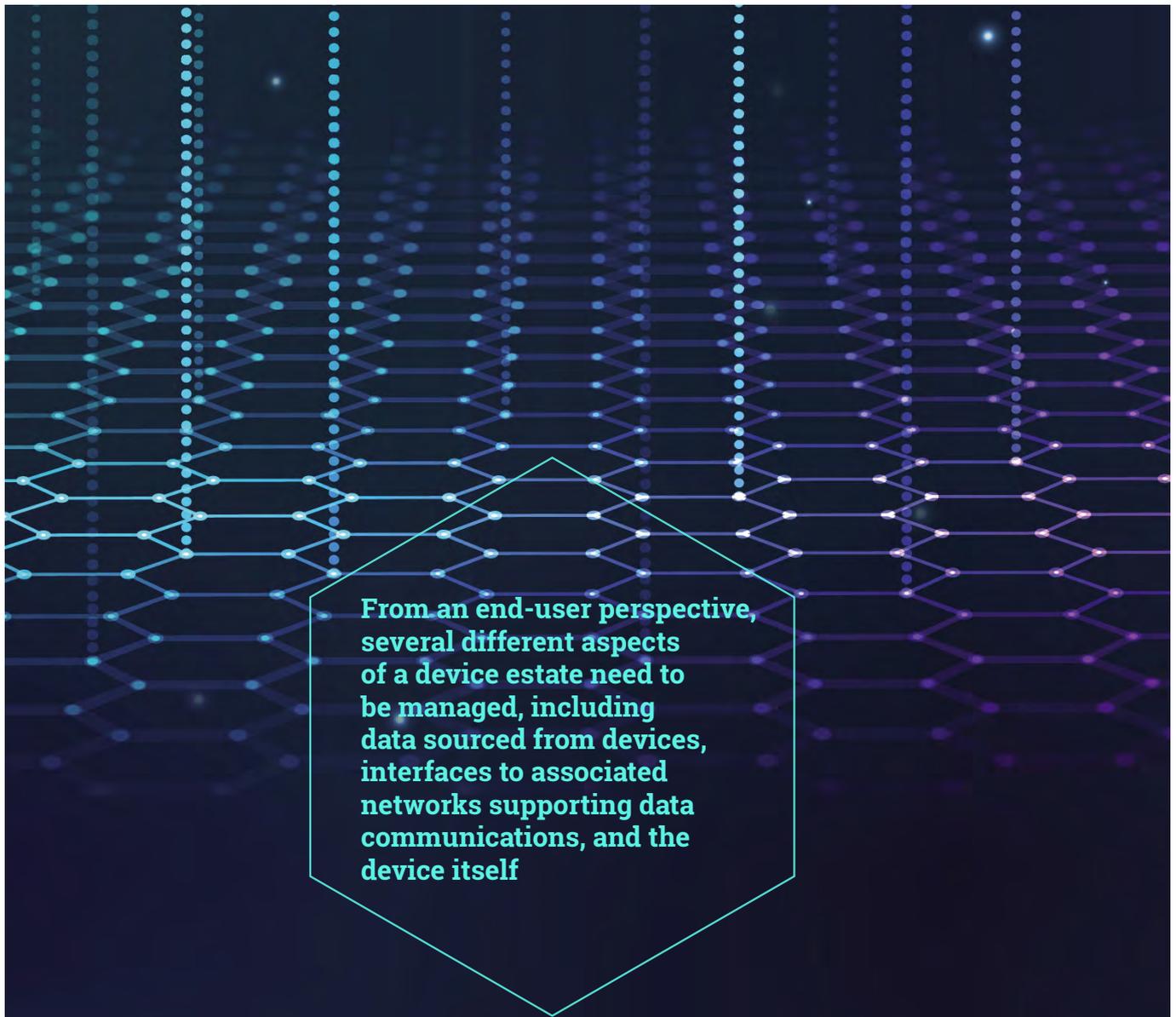
enhance this baseline coverage according to customer demand. Next priorities include several larger European countries.

Meanwhile Helium claims to offer the largest LoRaWAN network in the world. Hotspots or access points can be deployed by any individual or business and offer coverage as part of the Helium network in return for payment, enabled and administered using distributed ledger - Blockchain - technology. Currently the Helium network is comprised of around 850,000 LoRaWAN hotspots. Senet positions itself as a carrier grade network provider and has a two-way roaming agreement with Helium. Senet itself, in September 2022, announced that it is has expanded the build out of its public LoRaWAN network across all five boroughs of New York City.

It is worth noting that a number of satellite operators also offer direct-to-satellite LoRaWAN coverage, supported by the long

range - frequency hopping spread spectrum (LR-FHSS) enhancement to the LoRa standards announced in late 2020. LR-FHSS data rates significantly increase network capacity and robustness to interference. Operators include **EchoStar Mobile, Eutelsat, Fleet Space, Lacuna Space** and **Wyld Connect**.

Such wide-area public networks enable out of the box connectivity and allow for connected solutions can be sold to consumers through normal commercial channels. In addition, many enterprise IoT solutions also rely on wide-area public networks, for example fleet monitoring solutions, asset location solutions, and so on. **Figure 2** highlights the scale of the opportunity. The green colour represents our current forecasts of licence-exempt LPWA solutions deployed as private networks reaching 728 million connections by 2030, whilst the blue colour represents the full market opportunity for LPWA (including mMTC in licenced bands and devices supported by public LPWA networks) reaching



**From an end-user perspective, several different aspects of a device estate need to be managed, including data sourced from devices, interfaces to associated networks supporting data communications, and the device itself**

a total addressable opportunity of 4.4 billion connections. As such, deploying LoRaWAN as a wide-area, public network technology unlocks a significant market opportunity.

### **Implications for network and data management**

Clearly, LoRaWAN network coverage is fast evolving and is supported by a diversity of providers. However, this situation does bring about a range of challenges, not least in terms of how to manage a device estate that might potentially be distributed across many different networks (and network types and network providers). From an end-user perspective, several different aspects of a device estate need to be managed, including data sourced from devices, interfaces to associated networks supporting data communications, and the device itself. For instance, in the case of a supply chain monitoring solution (see p.64) devices might connect to any of multiple private campus networks and public wide area networks. To manage such a device estate efficiently an

end-user will want oversight of all devices and connections from a single interface. The end-user will also want all data to feed in to a single platform so that data from different devices can be combined to support advanced applications and data analytics.

Such analytics could range from relatively simple benchmarking to identify any devices that return readings that are in some way unusual or unexpected, through to artificial intelligence (AI)-enabled dynamic system optimisation. In essence, the combination of data sourced from multiple devices and communicated via multiple networks into a single data platform enables an enterprise application to efficiently span the entire device estate, drawing on data from specific devices (and controlling and actuating those devices) as required. It also allows for significantly more sophisticated analysis of data from individual devices, and from the device estate as a whole, so enabling more effective and efficient management of end-to-end solutions. ►



## LoRaWAN supporting the cold chain: an illustrative scenario

The monitoring of cold chains serves to illustrate each of the three stages of development of LoRaWAN, from a campus private network context to a wide area public network context and highlighting some of the analyses that can be applied to data received from various sensors.

### A campus area private network solution

Significant benefit can be gained from monitoring chillers and refrigerators in retail, hospitality, medical and warehouse contexts. In all these cases a simple LoRaWAN temperature sensor connected to a private network can provide regular temperature readings and help to ensure that refrigeration units are maintaining correct temperatures, so reducing spoilage and waste. Variances in the temperature profile maintained by refrigeration units can be an early indicator of imminent breakdowns and so alert engineers to undertake pre-emptive maintenance before a breakdown occurs. In turn, well-maintained refrigeration units will work more efficiently and so reduce electricity consumption. In hospitality contexts in particular, a temperature sensor can provide useful insight into the frequency with which customers open a specific unit, providing information that can be used to help manage stock levels.

Besides economic benefits, temperature monitoring and control solutions can also unlock sustainability benefits due to reduced wastage of produce and by shifting electricity consumption to periods when more renewable energy is available. Pre-emptive maintenance can enable more efficient field force operations, significantly reducing vehicle mileage and fuel consumption.

### Enhancements using wide area public networks

Extending the reach of monitoring solutions to include supply and distribution networks, including on-board vehicles and in

distribution hubs, allows for significantly enhanced functionality. Such solutions can monitor chilled produce across an entire supply chain, possibly using LoRaWAN connected sensors integrated into packing crates to support temperature sensing at a very granular level and potentially also providing real-time location information. The benefits of such solutions are clear: managers responsible for a cold chain are able to monitor goods at every stage of distribution to identify and potentially take mitigating action if temperatures vary outside of specified bounds. This helps to ensure the quality of goods when they are supplied to customers. In addition, particularly solutions that include location information can help to combat the loss, or theft, of goods in the supply chain.

### Insightful data analytics

Drawing together information provided by sensors across an entire cold chain better enables supply chain optimisation. Potentially real-time demand information sourced from refrigerated cabinets in hospitality contexts can be used to optimise delivery routes so that stocks can be replenished at appropriate intervals. Such an approach can again unlock significant efficiencies in distribution networks and also associated sustainability benefits due to reduced fuel consumption. Sensing demand at a more granular level can allow a hospitality industry supplier to pivot to an as-a-service business model, for instance committing to maintain certain stock levels within a wine chiller.

Central systems are also well-placed to monitor electricity tariffs and to optimise the temperature of individual refrigeration units by reducing temperatures immediately before peak tariff periods, so saving electricity consumed during those peak periods. Consumption can also be optimised to make the maximum use of electricity sourced from renewable generation. ■



# How LoRaWAN increases productivity and improves operational efficiency across industries

Traditionally, we think of cellular networks as the solution for the primary mode of wireless connectivity; however, cellular can be ineffective when looking at connectivity solutions for widespread areas or urban locations. Widespread areas, such as buildings, factories and ports, seek secure connectivity solutions with better power consumption for their unique needs. Allowing for the mix of public and private networks, LoRaWAN answers the need for true flexibility, cost-effectiveness, and security. With a similar process of deploying a Wi-Fi network but with fewer gateways, LoRaWAN provides users with a simple network infrastructure that has the ability to connect anywhere



Outside of looking for a cost-effective, reliable, efficient connectivity solution, powering connectivity can pose a challenge. Utilising the power of LoRaWAN can solve a mix of connectivity challenges for things such as sensors and metering across industries, including smart cities, fleet, automotive, agriculture and industrial. There are many IoT implementations where energy is unavailable or unreliable, and battery life has historically been too short-lived to work as a solution.

With all the machines, people and processes required to be monitored, there are a lot of sensors to be deployed, and without connectivity,

it can be a hurdle. For example, in the industrial sector, for safety measures, cranes have a strain gauge sensor that lets operators know which level of strain they are at while carrying heavy objects. These critical sensors for ensuring operational safety are currently read using a wire. The mobile nature of these cranes causes these strain gauges to break often. In order to avoid the negative impact of equipment malfunctions, a more permanent solution was needed to mitigate potential operational disruptions and safety risks.

By managing all necessary devices, networks and sites - both for public and private networks - anywhere in the globe on the same platform, ►

## SPONSORED CASE STUDY





***In certain locations, utility companies distribute gas canisters or gas cylinders to residents***

**KORE** allows organisations to grow as the demand grows. With no limits on the number of devices, providing an edge with border options working including cloud options or using the local instance, our hybrid approach syncs all the information, resyncs and resumes on its own in case of communication failures and supports various types of deployment models.

KORE's LoRaWAN platform, KORA, presents users with benefits such as safety, environmental compliance, efficiency, and productivity. KORA has a flexible environment to work with connectivity beyond simply managing the connectivity of applications; it serves as a hub to manage the messages between devices. Unlike cellular connectivity or Wi-Fi, which requires devices to be connected to an application, KORA has devices sending messages to one streamlined platform allowing the customer to manage their data in one place.

KORE brings together a cross-section of different deployment options from the cloud to on-premise, with a comprehensive end-to-end suite of applications. Whether for government mandates, safety measures, machinery or personnel to track, there's a flexible environment to manage your deployments across multiple networks and providers.

Many industries benefit from these solutions. For example, a leading industrial company needed to use a wireless sensor that could easily measure if objects are level. When the industrial team heard they could use wireless connectivity to measure in real-time, they rushed to integrate KORE's LoRa solution.

In certain locations, utility companies distribute gas canisters or gas cylinders to residents. Making the homeowners responsible for monitoring gas levels, which, if not diligent, can result in a lull of service while waiting for a replacement. Working with a utility provider that proposed uninterrupted gas, KORA connectivity allowed them to measure the contents of the bottle for the homeowner and service the gas when readings measure low for a monthly fee instead of by the bottle.

Needing to manage testing while also deploying two types of necessary communications with their existing devices and legacy systems, a vehicle tracking company used KORA to manage the data ingestion and adaptation between systems stopping any communication that wasn't compatible with their systems and allowing for communications across a central application as well as peer-to-peer.

The KORA solution provides customers with the comfort of knowing that projects will not only start but continue to be managed by KORE or a hybrid of KORE and the customer for years to come.

### The Results

The use of KORE's LoRaWAN platform, KORA, was a success in many different ways. Each use case discussed experienced lowered costs, less energy usage, and higher flexibility. The ability to optimise better power consumption by strengthening battery life to last one to two years as opposed to months has given KORE the ability to lower operating costs for clients. In addition, the use of KORA has given the utility company the ability to provide the comfort of having pipe gas but with a bottle. The vehicle tracking company is on track to reach 30,000 communication devices by the end of this year.

Connectivity should be reliable and available. The future goal is to have cross-networks or multiple networks available rather than a few small carriers. With more flexibility to aggregate all types of networks and provide customers with access to shared networks, location is no longer an obstacle. ■

### About KORE

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

For more information, reach out to KORE to learn how we can help you achieve IoT Connectivity with LoRaWAN. [www.kore.com](http://www.kore.com)



## Zenput always-on temperature monitoring elevates food safety execution

Zenput’s sensors and cloud-based software help some of the world’s biggest brands gain actionable insights into temperatures, expiration dates and other safety and compliance information across multiple sites. With Laird Connectivity, these companies stay nimble and flexible against changing conditions, supply chain delays and additional challenges in the food supply chain

One of the most popular use cases for IoT continues to be in cold chain monitoring. Particularly in the food service industry, the wireless sensor and gateway-based approach is a complete transformation of the legacy systems previously used to monitor compliance. Anything that can be captured digitally can be traced and monitored intelligently, and solutions providers are enabling unprecedented business outcomes via acquisition, monitoring and actionability of up-to-date compliance data.

**Zenput** is an operations execution platform that provides some of the biggest brands in the world with the tools to ensure consistency, compliance and safety in many locations simultaneously. Via its cloud-based platform, brands can gather the information they need to execute flawlessly on their food safety processes, brand standards and other operating procedures that are the difference between success and failure.

Brands accomplish this by abstracting away the outdated, ineffective means of logging and

compliance that are no longer suited for a modern business. Paper-and-pencil compliance checks are no longer enough to ensure consistency and quality with up-to-the-minute accuracy. Manual checks occupy dozens of hours a day across large organisations. They’re vulnerable to errors and inaccuracies and can’t be monitored collectively across locations in a centralised manner. In addition, they lag behind and are infrequent enough that predictive maintenance cues, such as rising temps in refrigeration equipment, may be missed until it is too late.

Zenput’s software is designed to address the specific challenges and objectives of operators in industries like food service. The company’s challenge was bringing the right hardware to the table. Having worked with previous hardware vendors, their offerings presented multiple challenges: inconsistent connectivity, as well as proprietary technologies that amounted to a black box and created supply chain bottlenecks that limited scale-up opportunities for Zenput’s customers. ▶

**Zenput’s software is designed to address the specific challenges and objectives of operators in industries like food service**

### SPONSORED CASE STUDY



**Laird Connectivity's global support team is available to help integrate new data points as Zenput and its customers identify new data points, applications, and new ways to achieve operational excellence**

It therefore needed a partner to provide sensors with reliable, robust connectivity that were customisable and accessible via open wireless standards. It needed the transparency and flexibility offered by a true partner with a product designed for open, accessible development.

### Room to grow

Zenput evaluated, and ultimately selected, **Laird Connectivity's** line of Sentries gateways and sensors to add to its range of supported IoT hardware. The Sentries RS1xx sensors and RG1xx gateways presented the perfect combination of customisation, configurability and durable wireless connectivity. Where Zenput's previous hardware selections were based on proprietary RF protocols that made it difficult if not impossible to troubleshoot connectivity issues, the Sentries series of IoT devices represented a fully- featured, truly useful hardware platform for collecting and acquiring IoT sensor data into the Zenput ecosystem.

Firstly, the protocol: The Sentries sensors and gateways use LoRaWAN as their main connectivity interface. LoRaWAN, a standards-based protocol, allows wireless communications over very long ranges and also performs particularly well in Zenput's customers' target environments. In kitchens, coolers and other RF-reflective environments, LoRaWAN provides exceptional connectivity that resists scattering and other interference issues that can bring down other types of connections. It's a well-documented, growing, and accessible protocol that gives engineers the ability to see what's happening in the connection and troubleshoot issues accordingly.

Secondly, the RG1xx and RS1xx are open, fully-configurable devices that run on a Linux subsystem and present a truly useful development platform. More than simply a hardware offering, they represent a fully customisable, configurable data platform for emerging IoT applications. The RS1xx sensors support multiple RTD sensor options for low, medium and high temperature applications, meaning Zenput and its customers had access to temperature sensing from -100°C to +450°C. They're accessible via the Sentries mobile application for configuration and debug logging, and they're compatible with any LoRaWAN network server or gateway. And the RG1xx gateway is configurable and accessible via a web-based GUI with pre-loaded support for several common LoRaWAN packet forwarders and a full onboard Linux OS.

These two lead to a third critical benefit: As Zenput looked to expand its hardware offerings, it found LoRaWAN IoT devices to provide the most flexibility and resilience to ongoing supply chain challenges. With its previous selection of proprietary hardware and a proprietary RF protocol, the lock-in factor limited original equipment manufacturers (OEMs) who wanted options to expand their device portfolios. But with

standards-based devices, Zenput and its customers could mix and match LoRaWAN gateways and sensors as needed in the face of supply chain shortages and other unpredictable global factors. If one vendor's hardware suddenly becomes unavailable, it's as simple as integrating another standards- based piece of hardware that utilises the open and available LoRaWAN standard. No longer constrained and bottlenecked by availability, Zenput had the freedom to adaptively respond to challenges and continue to mix and match in its sensor and gateway network based on availability, not on a limited set of proprietary options.

### A tailor-made system

Laird Connectivity's Sentries RG1xx gateways and RS1xx sensors served as the next generation of Zenput hardware, giving customers a universal protocol for their IoT applications and a deeply customisable route forward for gathering actionable IoT data. Utilising a gateway with open RF standards means the ability to bring more sensors on more devices to the table: and as Zenput's use cases expand and more sensors are needed for new applications, it can rely on the transparent and accessible LoRaWAN standard as a compatibility guarantee for new devices.

Zenput brings operations excellence to customers in some of the biggest brands in the world, including **Taco Bell**, **Dominos** and **Chipotle**. The platform offers a real-time look at conditions across multiple locations on a growing number of measurables and gives operators visibility and control over processes like temperature checks, expiry dates, predictive maintenance, and ultimately a higher quality offering for their customers.

The Sentries RG1xx gateways and RS1xx sensors provide robust connectivity, multiple backhaul routes to the cloud (Wi-Fi, Ethernet, and LTE) and full access for configuration and debugging. In addition, the gateways and sensors represent a clear and open route to expanding sensor applications in the future with well-established and accessible protocols that help Zenput expand its core business.

Laird Connectivity's global support team is available to help integrate new data points as Zenput and its customers identify new data points, applications and new ways to achieve operational excellence. Laird Connectivity's Sentries series is the opposite of a closed, proprietary ecosystem that locks in OEMs and creates barriers to development. Rather, it serves as an open platform for development and a door to the future of actionable IoT intelligence.

To learn more about Sentries RG1xx gateways and RS1xx sensors, please visit the Laird Connectivity website:

<https://www.lairdconnect.com/rs1xx-sensors>  
<https://lairdconnect.com/rg1xx-series> ■

# TRANSFORMA INSIGHTS

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## INTERVIEW

G+D's Thomas Larsson explains how consumer and IoT eSIM choices will be managed effectively



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# eSIM enters prime time as consumer and enterprise benefits outweigh outmoded operator concerns

With Apple's recent iPhone 14 announcement signalling massive growth in consumer embedded SIM (eSIM) adoption, Thomas Larsson, the director of strategic product management at Giesecke+Devrient (G+D), tells IoT Now that both the consumer and enterprise market are in the prime eSIM era. Larsson invented the eSIM and founded the company's eSIM concept and business in 2009. He has a background in telecoms, mainly focusing on eSIM and IoT.

With the US market leading adoption and forcing consumer uptake of eSIM technology, the benefits of combining remote eSIM management with flexible global connectivity have become so clear that the rest of the world will follow rapidly, Larsson says. To simplify and further accelerate eSIM adoption in the enterprise market, G+D's acquisition of Pod Group in 2021 has created a combined offering that brings together G+D's eSIM management and security capabilities with Pod Group's global connectivity expertise. The companies aim to bring eSIM to all sizes of enterprises and IoT deployments, eradicating complexity, increasing choice, strengthening security and reducing costs

***We're now entering the eSIM prime era in which operators are beginning to focus on eSIM delivery over removable SIM cards***

**IoT Now: What are the challenges eSIM faces as it encourages replacement of the traditional removable plastic SIM? Are you seeing reluctance from mobile operators to embrace the technology?**

**Thomas Larsson:** We're now entering the eSIM prime era in which operators are beginning to focus on eSIM delivery over removable SIM cards. We're past the stage where we're fighting against mobile network operators (MNOs) that are scared eSIM presents a threat to their ownership of customers or to their revenues. Instead, we see MNOs and MVNOs, especially those who are newer and have less limiting legacy, supporting consumer eSIM because of its very attractive digitalised business model. It is now widely accepted that eSIM and eSIM enabled devices are here and MNOs are looking to take advantage of the opportunities it offers.

On the enterprise IoT side, the eSIM benefits have been more of a no-brainer: the use of eSIM-capable embedded SIM in IoT enables more

cellular connected IoT devices and use cases. The enterprise benefits from more cost-efficient, manageable devices and connectivity, and the MNO benefits from more connected devices. The limiting factor for eSIM in IoT has historically been the need for eSIM infrastructure investments only compatible with M2M standards, making eSIM only practical for larger projects like in automotive and large MNOs/MVNOs. With the imminent introduction of IoT eSIM standards capable of reusing the widely deployed consumer eSIM infrastructure, while supporting IoT use cases like remote control, this limitation will disappear.

**IoT Now: What is G+D's role in making eSIM a mass-market reality?**

**TL:** It's not so much about what we can do but more about enabling something that was impossible before. What has made us successful so far is that we're delivering hardware to original equipment manufacturers (OEMs) very early on in the process. We have delivered embedded OS to chips in devices in factories and are able to link ►

**SPONSORED INTERVIEW**



the whole ecosystem end-to-end to the MNOs. Our proactive efforts in standardisation have provided a fundamental cross-industry acceptance. In addition, our legacy of security which has a very long heritage means the industry has a very high level of trust in us.

We provided both the world's first commercial SIM and the first eSIM management system and we're the global leader in embedded operating systems (eOS) with nearly 500 million licences delivered for consumer devices. We're also the global leader in remote lifecycle management with one billion mobile devices managed globally and our systems manage three billion SIM cards in more than 80 countries.

Our background means we understand what is needed to make eSIM successful. Our 99.99% server availability for downloads, for example, makes G+D's eSIM management system the most reliable in the market. This is borne out by the fact that more than 250 MNOs use our eSIM offering and 80% of the top ten car manufacturers trust our connected car solutions. **Apple**, **BMW** and **Deutsche Messe** are among our customer references and G+D has been recognised by **Kaleido Intelligence** as the number one vendor for eSIM management while **Pod Group**, which we acquired in 2021, has been recognised by the research firm as a Kaleido High Flyer in IoT SIM connectivity. ▶

**Thomas Larsson**  
Giesecke+Devrient (G+D)



**Thomas Larsson**  
Giesecke+Devrient (G+D)

MNOs but they are not actively promoted, MNOs that have not changed their back-ends to fully digitise eSIM processes can't realize the full potential of eSIM and in some markets there are simply not enough eSIM enabled or eSIM-only devices to motivate or promote the use of eSIM. One must keep in mind that established MNOs still need to support removable SIM cards in parallel for a long time.

Many device manufacturers are also in a wait-and-see mode. They appreciate the value that eSIM brings to their device, but are reluctant to give up on the globally supported removable SIM card just yet, usually resulting in more costly dual capability devices. However, besides a variety of eSIM-only wearables from various vendors, Apple is now paving the way by launching an eSIM-only mainstream smartphone that will force an entire market to go eSIM prime.

Subscribers also remain unaware of the benefits because of lack of promotion, and they do not see the benefits of eSIM because most MNOs have not made use of the full potential of eSIM yet. Announcements like Apple's help boost the profile of eSIM and create expectation for its availability, we believe momentum is building and the benefits are crystalising for both consumers and MNOs.

**IoT Now: How do you see consumer eSIM capabilities feeding through into use cases?**

**TL:** eSIM allows MNOs to implement fully digital user journeys and processes which will save them money once eSIM market share overtakes removable SIMs and provides consumers with easier new journeys that they will love. These fully digital user journeys ease the onboarding and customer acquisition process and new business opportunities will be possible because of fully digital processes.

Use cases such as try and buy offerings will be possible. A customer could be encouraged to test an MNO's 5G network for a week, for example, or travellers could be offered a local deal. New digital sales channels open up in airports, hotels, trains and ships offering event-based connectivity and the possibility to easily connect additional devices such as trackers, toys or cameras. This will all be fast and easy without lengthy or expensive contracts but often this will generate revenue that didn't previously exist.

MNO churn will be defined by the MNOs' retention strategies, their customer service, their reliability ►

***MNO churn will be defined by the MNOs' retention strategies, their customer service, their reliability and the quality of service and personalisation they offer***

**IoT Now: With Apple's reinforced commitment to eSIM with the newly-launched iPhone 14, is it accurate to state that consumer eSIM challenges have been addressed and eSIM is now the prime SIM option in the consumer market?**

**TL:** The benefits are certainly well understood and G+D and others have done a lot of work over the last decade to ensure standards are in place to support mass market adoption. Without these it is impossible to achieve widespread device and consumer adoption. There are still challenges to overcome and to an extent there is a chicken-and-egg problem to work through. Common obstructions originating at MNOs include: eSIM management solutions are implemented by many



and the quality of service and personalisation they offer. We do not believe the eSIM will increase churn because it helps MNOs keep their customers, fosters the development of new, innovative consumer devices and attracts customers in a user-friendly way. Why would someone who has, for example, used an MNO-app to add eSIM contracts to several family members' phones and devices want to churn suddenly?

**IoT Now: Turning to the enterprise market, what do you see as the key drivers for greater adoption of eSIM in IoT?**

**TL:** In IoT, the challenges of removable SIMs are drivers for eSIM adoption. Aspects such as the form factor of removable SIMs and the cost of adding even a SIM tray to an IoT device are important considerations. Add to these, physical security issues and the need for devices to withstand extreme weather or industrial conditions and it's clear that a SIM slot is both a point of weakness and a cause of additional cost.

The need for physical insertion of SIMs increases the costs of managing remote devices in the field and even the logistics and supply chain costs of inserting SIMs in factories are substantial. This causes unnecessary complexity by requiring regional or national versions of products because the SIM is embedded in the factory which results in multiple stock-keeping unit (SKU) numbers per product that have to be managed, creating complicated inventory requirements.

Beyond the operational challenges, there are also connectivity challenges to take into account. Global roll-outs require multiple operator agreements and platforms to be adopted and inflexibility is inherent to this structure. If you want to change operator, you have to change SIM card and the cost of this can be prohibitive, resulting in vendor lock-in. This means that deployments can be subject to higher roaming costs and enterprises cannot easily change provider if they need better network coverage or want to adopt a lower priced solution from a rival. Don't forget that in contrast to consumer mobile phones, IoT devices have a typical lifespan of five-to-ten years so the freedom to change or leave an MNO contributes significantly to device performance and profitability.

In contrast, eSIM is a factory-friendly technology that enables single SKU products that can be localised over-the-air (OTA) at the point of

deployment. With the SIM embedded, devices are harder to tamper with and better protected from environmental factors, because there is no SIM slot. In addition, devices can be smaller and cheaper because they do not need to accommodate a removable SIM.

Operationally, totally remote management is central to eSIM's value. This is done over one platform with multiple network profiles on a single SIM so it can connect wherever it is deployed. This results in cost efficiencies and future-proofing for all IoT devices. Customised combinations of native and roaming networks are possible and the connectivity can be updated remotely as market conditions or pricing change.

**IoT Now: You mentioned earlier that G+D acquired Pod Group last year. Why did you make the acquisition and what innovations have you made as a result of combining the two companies' capabilities?**

**TL:** Pod Group has more than 20 years of experience in implementing IoT connectivity solutions as an enterprise network operator (ENO) offering customised solutions to give enterprises of all sizes control of their IoT connectivity. The company has access to more than 600 networks in 185 countries so it is ideally placed to offer optimised connectivity to customers. G+D has almost 170 years of experience addressing the trust and security of physical and digital assets so offering a combined eSIM and connectivity enablement proposition is a logical step.

We're now able to bring these capabilities together into Pod Group's ENO ONE IoT connectivity offering which comprises a broad range of global eSIM profiles, including native, roaming and private networks, which can be combined with specialised SIM applets to increase security and ease provisioning. Profiles can be swapped OTA and everything is managed remotely via a centralised platform. Offering this through a single supplier simplifies the IoT supply chain and reduces complexity for entrants into IoT in particular. Enterprises typically want to bring IoT-enabled offerings to market with as much flexibility and as little complexity as possible so they can minimise costs and the management burden while accelerating time to market. Being able to access multiple MNOs and have a single SKU device radically streamlines and economises IoT entry and enables enterprises to optimise their device connectivity right out of the box. ■

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***The need for physical insertion of SIMs increases the costs of managing remote devices in the field and even the logistics and supply chain costs of inserting SIMs in factories are substantial***



# How will consumer and IoT eSIM choices be managed effectively?

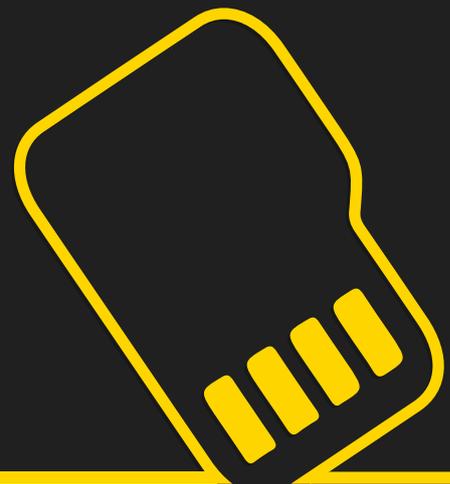
After a lengthy gestation period, 2022 is likely to be the year in which embedded SIM (eSIM) enters the mainstream. In the consumer market, adoption is virtually mandated with the announcement by Apple that its latest iPhone will utilise eSIM but the promise of being able to switch operator at will is not reality yet. There are several hurdles to be jumped over, not least operator reluctance to cede control of the subscriber identity, an important tool for charging and their means to keep ownership of the customer. Regulation and customer demand will ultimately take care of this but there will be several bumps in the road as adoption extends across countries and regions.

In the IoT market, the appetite for eSIMs that enable a device to change operator at the end of a contract or if a better deal or coverage is available is compelling. Doing so over-the-air without truck roll has the potential to positively impact IoT business cases that previously would have been ruined by the need for human intervention in the form of traditional SIM card replacement.

Effective eSIM management of both IoT and consumer devices is essential in order to access the benefits of eSIM but there is little expertise for service providers to draw upon. In this report, George Malim, the managing editor of IoT Now, explores the complexities of eSIM management and how they can be addressed by systems and services available in the market ►



**ABI Research estimates that the removable SIM card supply will be reduced by approximately 50-60 million units in 2023**



It might not look like it, but the era of the traditional SIM card has reached the beginning of the end. **ABI Research** projects that while 4.33 billion SIM cards will be shipped worldwide in 2022, this number is down 8.5% year-on-year. The pandemic, its impact on the semiconductor industry and increasing inflation leading to recession in 2023 are stifling uptake and the consumer market is set to be the hardest hit.

The research firm says its previous expectations of year-on-year growth of 7.2% in the SIM card market have now been trimmed to 1.8%. The macro-economic situation is only part of the reason for this.

“On top of these challenges is the anticipated impact of the first eSIM-only **Apple** smartphone devices,” warns Phil Sealy, the Digital Security Research director at ABI Research. “Although Apple will initially limit deployment of its Apple 14 eSIM-only devices to the US, it clearly outlines Apple’s intentions for an eSIM-only handset portfolio. The impact on the US market as it relates to removable SIM card supply will be clear and more evident in 2023, the first full year of Apple’s eSIM-only device shipments into the region.”

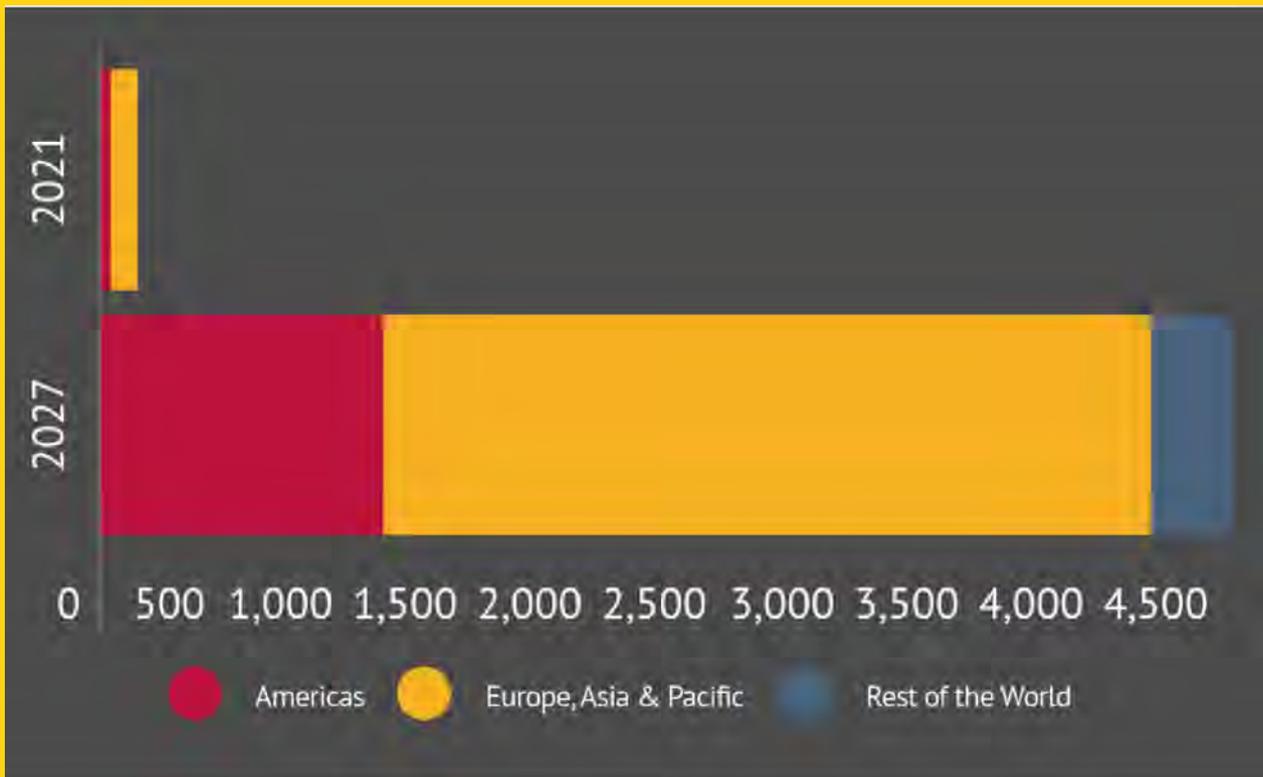
ABI Research estimates that the removable SIM card supply will be reduced by approximately 50-60 million units in 2023 because of the Apple launch and illustrates a clear direction of travel towards eSIM-only

devices across Apple variants. Launches of products should hit Europe and APAC countries towards the end of 2023, reducing demand for removable SIM cards further.

Apple is not alone. In August 2022, **Samsung** released its Galaxy Z Fold4 and Flip4, the company’s first eSIM-enabled smartphones, in Korea. Korean carriers also started their support for eSIM smartphone activation in September 2022.

This move by the consumer market towards eSIM will play a key role in expanding the market. **Kaleido Intelligence** has estimated in a recent study that eSIM connections will exceed 4.5 billion in 2027, driven by consumer adoption. The firm foresees the number of active universal integrated circuit card (xUICC) connections, composed of eSIM and integrated SIM (iSIM) growing by more than 1,400% in the period 2022-2027, with smartphone users pushing growth upwards.

The firm expects that substantial uptake will also occur in the IoT market, predicting that more than 50% of compatible IoT devices will use eSIM in 2024. This growth reflects regulatory developments, heightened awareness of the benefits of eSIM and the generally strong business case that eSIM offers to many IoT deployments. Kaleido Intelligence thinks that more than 50% of cellular IoT devices will use eSIM in IoT or consumer specification by 2026. ►



**Figure 1: Number of active eSIM connections in millions**  
Source: Kaleido Intelligence

Smartphones will contribute to the majority of eSIM-based devices over time, expects **Counterpoint Research**, but the number of IoT and M2M devices equipped with eSIM will grow faster across several applications and different flavours of cellular technologies from narrowband IoT (NB-IoT) to 4G and 5G. The eSIM activation rate in cellular IoT applications will remain high, lowering the usual costs of production and logistics involved in delivering and activating traditional SIMs, alongside savings on space and power.

“Smartphones will lead the charge in terms of eSIM-capable device shipments over the next five years,” confirms Ankit Malhotra, a research analyst at Counterpoint Research. “The launch of the eSIM-only iPhone should act as an inflection point for the industry with other original equipment manufacturers (OEMs) expected to follow suit soon after.”

The smartphone has been playing an important role in increasing consumer awareness of eSIM alongside consumer categories such as smartwatches, laptops and tablets. Cellular connectivity in smartwatches is growing, says Malhotra, which is also helping in increasing the penetration of eSIM-supported smartwatches.

“The adoption of entitlement servers by MNOs worldwide is a testament to the

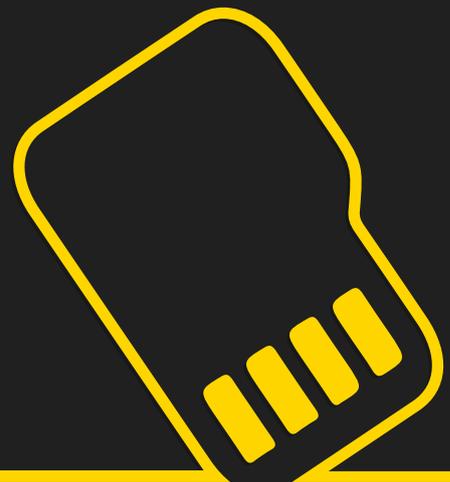
growing number of smartwatches and other companion devices powered by eSIM,” he adds. “Development of newer use cases such as remote work and remote learning will also increase the requirement for cellular connectivity in devices such as customer premise equipment (CPE), routers, laptops and tablets. eSIM capability allows users and service providers to activate and manage connectivity quickly, efficiently and seamlessly.”

**Mind the adoption gap**

**GSMA Intelligence** has reported that there is a gulf now developing between industry progress with eSIM technology and consumer awareness and adoption. The organisation says that good progress is being made on standardisation and the availability of eSIM management platforms and implementation of eSIM in flagship phones and companion devices to the extent that, as of June 2022, more than 260 operators, composed of both MNOs and MVNOs, have launched commercial eSIM service for smartphones. However, fewer than 30% of consumers - on average across eight major countries analysed - are aware of eSIM and this is a barrier to large-scale adoption. Even so, GSMA Intelligence expects around 850 million eSIM smartphone connections globally by 2025, growing to 6.7 billion by 2030. This would account for 76% of the total number of smartphone connections. ▶



**The industry is coming together to create that simplified SIM management capability that eSIM demands**



Smartphone connections only tell some of the story as consumer IoT and the connected things that make up industrial IoT, start to adopt eSIM. The reasons for this are obvious because of the lower cost, greater flexibility and choice, and supply chain and operational efficiencies that well-managed eSIM-enabled devices provide. Counterpoint Research sees huge numbers of devices hitting the market over the coming decade. It predicts more than 14 billion eSIM devices will be shipped between 2021 and 2030, covering all form factors such as hardware-based eSIM (eUICC), iSIM (iUICC), nuSIM and Soft SIM.

Progress towards that figure is underway with 350 million hardware eSIM-capable devices shipped in 2021 across smartphones, smartwatches, tablets, IoT modules and connected cars. In the next five years, the firm says, hardware-based eSIM will remain the dominant eSIM form factor and will account for more than half of the shipments.

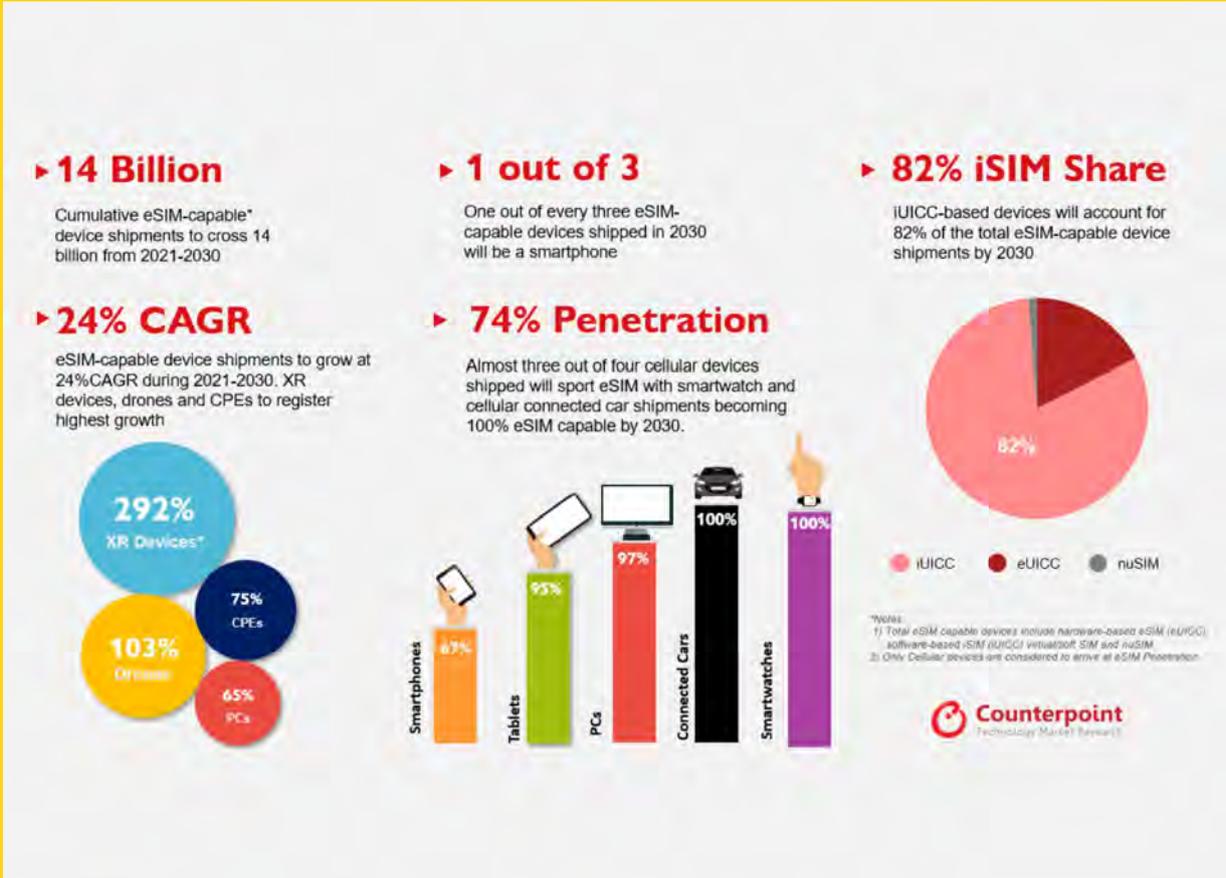
"The physical MFF2/WLCSP form-factor soldered eSIM chip has been the go-to standard for eSIM implementation even with the rise of alternative implementations such as soft SIM and nuSIM over the last decade," says Neil Shah, the research vice president at Counterpoint Research. "However, the iSIM form factor will grow the fastest as the industry stakeholders move forward together to offer end-to-

end support from the SIM enablement and management perspective later this year."

### **SIMs get simpler in IoT**

The industry is coming together to create that simplified SIM management capability that eSIM demands. The emergence of SGP.31/32, an extension of GSMA's consumer embedded UICC specification, called the IoT specification, is forecast to accelerate adoption of eSIM within IoT because it can use the GSMA SM-DP+ architecture. This greatly reduces commercial complexity for customers wishing to switch between eSIM network operator providers. The new specification also provides a path for low power wide area network (LPWAN) devices to adopt standardised remote subscription management capabilities more easily. This IoT specification is anticipated to be completed by the end of 2023.

This simplified architecture is set to see active eSIM connections for cellular IoT devices growing at a CAGR of 80% between 2022 and 2027. "The new specification is on the right path to mitigate the complexity associated with M2M eUICC and will mean that eSIM for IoT is no longer simply for insurance model purposes," says James Moar, the principal research analyst at Kaleido Intelligence. "However, broad consensus among service providers and enablers will be required for it to realise its potential." ►



**Figure 2: eSIM devices forecast and analysis**  
Source: eSIM Capable Devices Forecast & Analysis, Counterpoint Research, June 2022

Beyond the established consumer devices, new opportunities for eSIM are emerging across extended reality, drones, PCs and connected devices in IoT. Counterpoint Research sees the automotive and smart mobility sectors as particularly aligned with eSIM. The firm says a connectivity experience for mobility applications is becoming paramount, particularly for safety use cases such as eCall, the mandated emergency calling capability embedded in all new cars, and the future rise of autonomous driving. Recent collaborations such as that of **G+D** and **BMW** demonstrate the adoption of eSIM by leading players with advanced features.

**Managing the embedded estate**

With five billion eSIM-capable devices set to be shipped in the next five years, according to Counterpoint Research, it's clear that management will be needed to handle hundreds of millions of active eSIM devices. Service providers, enterprises with large mobile device fleets, IoT organisations, MNOs, MVNOs and device makers all need to be have visibility into eSIM activity and to have the capability to enable remote SIM provisioning (RSP) across millions of devices. The elegance and attractiveness of eSIM lies in its ability to support optimised connectivity at each location. This is particularly important for moving IoT devices, vehicles and transport and logistics operations. These traverse

multiple countries and a single MNO may not be the provider of the best connection in any given location.

Therefore being able to switch providers easily is core to the eSIM proposition both in IoT and consumer devices. It also provides an opportunity to try new capabilities. For example, it is anticipated that eSIM could be a foundation for try-before-you-buy offers for 5G and there are immediate applications for roaming users in the consumer market.

"Several major IoT communications management platform (CMP) vendors have in recent time added eSIM management capabilities to their platforms as a tool to simplify logistics and localise connectivity," explains Fredrik Stalbrand, a senior analyst at **Berg Insight**. "Enterprises in the utilities and security verticals are now following in the steps of the major automotive OEMs and adopting eSIMs in a broader set of IoT applications."

That means an increased need for eSIM management around which a growing ecosystem of platform providers is maturing. "The eSIM management landscape went through continuous evolution in 2021 with several new players entering the market," says Malhotra at Counterpoint Research. "In 2020, we evaluated 11 integrated eSIM management players, this has now doubled to 22. eSIM ►



**With Thales having deployed more than 300 platforms so far, the eSIM management platform business is maturing rapidly, delivering a choice and diversity of capabilities to the market place**



adoption continues to increase, with more eSIM capable smartphones in the less than US\$200 price category being launched, and a similar trend in smartwatches. In IoT modules, shipments of eSIM-capable IoT modules increased by almost three times."

This has resulted in a growing list of capabilities for eSIM management platforms to cover starting from the deployment model and GSMA certification through to handling entitlement, security, interoperability, the transactions, time to market, connectivity management and multinational reach. The more devices that are eSIM-enabled, the greater the demand being placed on management platforms.

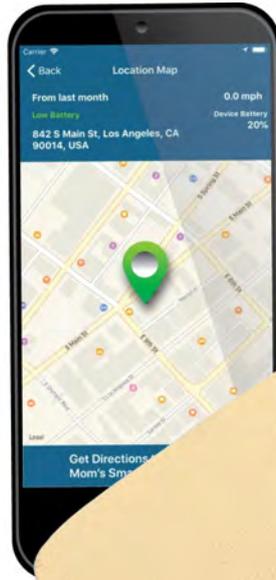
"With the increasing number of eSIM-capable devices, the number of profiles managed by service providers has increased," adds Malhotra. "Therefore, the need for features such as analytics, and campaign management has also increased. Another key trend worth noting was the double sourcing by MNOs and thus interoperability with other service providers, eUICC manufacturers (EUMs) and MNOs also became more important."

The vibrant eSIM management market place is led by **Thales** and **G+D** which are followed by specialist vendors **IDEMIA**, **Truphone**, **Workz**

and **Oasis Smart SIM**. A new breed of IoT eSIM specialists, such as **Kigen** and **10T Tech**, have also entered the market. These are joined by in-house eSIM management platforms offered by MNOs, such as **Telenor**, **Vodafone Idea**, **Jio**, **Airtel**, **STC** and **Tele2**. Counterpoint Research says these are sometimes developed with the help of partners.

With Thales having deployed more than 300 platforms so far, the eSIM management platform business is maturing rapidly, delivering a choice and diversity of capabilities to the market place. "G+D is one of the pioneers of eSIM and offers an end-to-end solution for its customers," says Shah. "It offers a guaranteed 99.99% server availability for eSIM downloads and management which has set a new benchmark for other eSIM providers. G+D has also secured more than 250 eSIM management deployments which demonstrates its success in the market."

The confidence to offer platforms that have the resilience to support the billions of active devices both in the consumer and IoT markets is indicative of the importance eSIM operations have to the success of devices, business cases in IoT and the revenue generation capabilities of MNOs. The challenge now is to select the platform that best enables efficient eSIM management for your use case. ■



# GPS tracker shoe insert



## GPS SmartSole powered by ENO ONE helps address healthcare wanderers

Wandering is a serious problem for those suffering from Alzheimer’s disease and dementia, and also affects a lot of children with autism. There are estimated to be 55 million people worldwide living with Alzheimer’s and dementia, while an estimated 1 in 68 children are diagnosed with autism. 60% of people with dementia will wander at least once, and many will do so on multiple occasions. A critical tool is now available to address the problem, thanks to MetAlert and its GPS SmartSole

**Monitoring products such as wristbands, pendants, and ankle bracelets have been deployed with limited success**

Wandering can be dangerous for the patient as they can get lost or injure themselves. In countries with more extreme climates, the risk of being affected by hypothermia or dehydration also comes into play. Frustratingly, wanderers may not respond to calls, hide from those searching for them, and not be perceived as lost by others.

Younger wanderers are even more vulnerable. Children with autism have a high incidence of running away and are drawn to outdoor environments. Worst case scenarios involve children being drawn to places like pools and lakes, where they can drown, and motorways and train lines where they can get into fatal accidents. Naturally, this places a lot of stress on the families and caregivers of both children and seniors.

There are millions of wanderers across the world, putting themselves in danger and causing a lot of stress to their caregivers. In fact, the NYPD alone spends millions of dollars per year tracking missing people. How can we keep track of them when they go missing? Or even better, can we be alerted when they start wandering?

Monitoring products such as wristbands, pendants, and ankle bracelets have been deployed with limited success. As confusion and paranoia are the primary symptoms of these conditions, sufferers often remove objects placed on them with which they are unfamiliar, rendering them useless. Furthermore, these devices are clearly visible and can draw unwanted attention.

### Track patients with dignity

This is where the award-winning GPS SmartSole, developed by **MetAlert**, comes in. Developed in 2014, it is sold in over 35 countries around the world. As well as being used in US nursing homes, by the British **NHS**, and other national care agencies across Europe, it is supported by local Alzheimer Associations and multiple police, search and rescue organisations.

Taking the form of a shoe insole, it can be slipped discreetly into the patients’ shoe. Surveys indicate most do not notice the GPS SmartSole in their shoe and therefore the desire to remove it is taken away, meaning caregivers, parents and spouses are able to monitor their potential wanderers. Furthermore, the ►

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hidden element reduces stigmatisation and preserves the dignity of the patient.

The GPS SmartSole uses a two-way GPS tracking device that uses the power of cellular networks to track the wearer. Multiple caregivers can simultaneously monitor the location of the wearer using an app or online viewing portal. Wandering can even be prevented in its early stages, thanks to the ability to set boundaries called geozones. Email or text alerts will be sent if the wearer crosses these boundaries.

GPS devices have traditionally struggled to send signals through the water-based human body, posing a unique challenge to a device located under the foot. The GPS SmartSole ingeniously uses the floor as a reflector to strengthen the signals sent and received by the GPS device. The SmartSole is able to withstand the incredible pressure placed on it by the human body, while the lithium batteries last up to four days and use inductive charging. To top it off, the SmartSole is sealed and water resistant, enabling it to survive wet weather and the humid environment inside the shoe.

### Connectivity without the complexity from Pod Group

The GPS SmartSole contains the ENO ONE eSIM, an embedded SIM based on an embedded universal integrated circuit card (eUICC) from **Pod Group**, in the form of an embedded chip inserted into a device in the sole to grant the highest hardware robustness. It offers global coverage over different technologies, like 4G/LTE, CAT-M, and LTE-M, with MetAlert able to tap into the low-power cellular options in order to give the SmartSole's battery the highest endurance. The eSIM's ability to roam across multiple networks grants the device the broadest available cellular coverage.

Importantly for applications such as this, where the devices are being used by consumers for a mission-critical purpose, the ENO ONE SIM can be updated over the air (OTA) meaning that networks can be swapped remotely using a centralised platform, ensuring that the optimum connectivity options are available at all times.

With Pod Group offering access to its global network, covering 185 countries, MetAlert no longer has to worry about dealing with different providers in different countries; instead, it manages its connectivity via one pane of glass and one contract allowing access to providers the world over for no extra effort. As providers of its GPS SmartSole solution in over 35 countries worldwide, it was easy for MetAlert to pick Pod Group as its connectivity partner.

Not only connectivity, but also global deployment is made simple and hassle-free with Pod Group. This was absolutely vital for MetAlert, which ships the GPS SmartSole across the world. Every ENO eSIM is

pre-configured with a bootstrap profile, meaning MetAlert no longer has to manually configure each device for their destination. The eSIM is also provided on a neutral remote SIM provisioning (RSP) platform. MetAlert owns the eSIM and is not locked into one vendor. On-SIM applets like Zero-Touch Provisioning mean that upon booting up, the device automatically connects to the nearest network and downloads a dedicated local profile.

Pod Group's acquisition in July 2021 by **Giesecke+Devrient** (G+D), inventors of the SIM and leaders in eSIM management, mean Pod Group is able to draw upon G+D's expertise to provide MetAlert with a simple platform to manage its device connectivity and networks. Using this centralised platform, SIMs can be updated remotely for increased performance or roaming cost-efficiency, while G+D's eSIM technology grants the highest data security to ensure patient privacy.

### The evolution of the SmartSole and future applications

As well as providing the technology to empower family and caregiver monitoring of vulnerable wanderers, there are many more applications of MetAlert technology to come in the near future, powered by Pod Group's ENO ONE solution. In years to come, the GPS SmartSole will be able to connect to private cellular networks with ease. As technology advances, smaller and cheaper devices will be built, allowing them to be attached to different parts of the body.

Today the GPS SmartSole can track a wearer's location. Tomorrow it will collect health data in order to identify patterns and predict outcomes before they happen. Such a device could identify rapid weight gain, allowing caregivers to take steps to prevent obesity. A PE teacher could monitor the oxygen levels of an asthmatic student. The possibilities are endless, and the preventative care and cost-saving benefits for real-time health data monitoring will save lives and medical bills.

"Pod is proud to play a crucial role in contributing to improving peoples' quality of life and safety around the world," says Pod Group's director for PLTE/5G Private Network Proposition & Strategic Partnership Development, Alessio Piussi. "This is a clear example of how ENO ONE can help reduce the complexity of rolling out global, mission critical IoT applications, providing cost effective, reliable and future-proofed connectivity."

"A reliable, global network service is extremely important for our customers where sometimes people's lives might be on the line. We are excited to team up with Pod Group to provide this service with our products," adds Andrew Duncan, a director at MetAlert. "We look forward to developing a mutually beneficial relationship as we roll out our wellness and lifesaving products across the world." ■

**GPS devices have traditionally struggled to send signals through the water-based human body, posing a unique challenge to a device located under the foot**



While we have made every effort to ensure the accuracy of this listing, the pandemic means that many events are changing timing, dates and locations. Therefore please check at the events' websites to ensure details are up-to-date before travelling.

### CES Preview/Consumer IoT Summit

8 December 2022

Virtual Event

<https://www.iot-now.com/event/ces-preview-consumer-iot-summit>

### Industrial IoT, Florida

14-17 February 2023

Fort Lauderdale, Florida, USA

<https://www.iot-now.com/event/industrial-iot-florida>

**IOT SOLUTIONS**  
WORLD CONGRESS  
31 JANUARY - 2 FEBRUARY 2023

### IoT Solutions World Congress 2023

31 January - 2 February 2023

Barcelona, Spain

<https://www.iot-now.com/event/iot-solutions-world-congress-2023>



### IoT Evolution, Florida

14-17 February 2023

Fort Lauderdale, Florida, USA

<https://www.iot-now.com/event/iot-evolution-florida>



### 5G Tech 2023

7-8 February 2023

Kuala Lumpur, Malaysia

<https://www.iot-now.com/event/5g-tech-2023>



### MWC Barcelona 2023

27 February - 2 March 2023

Barcelona, Spain

[www.mwcbarcelona.com](http://www.mwcbarcelona.com)



### The Smart City Event, Florida

14-17 February 2023

Fort Lauderdale, Florida, USA

<https://www.iot-now.com/event/smart-city-event-florida>



### The Things Conference 2023

21-22 September 2023

Amsterdam, The Netherlands

<https://www.iot-now.com/event/the-things-conference-2023-amsterdam>

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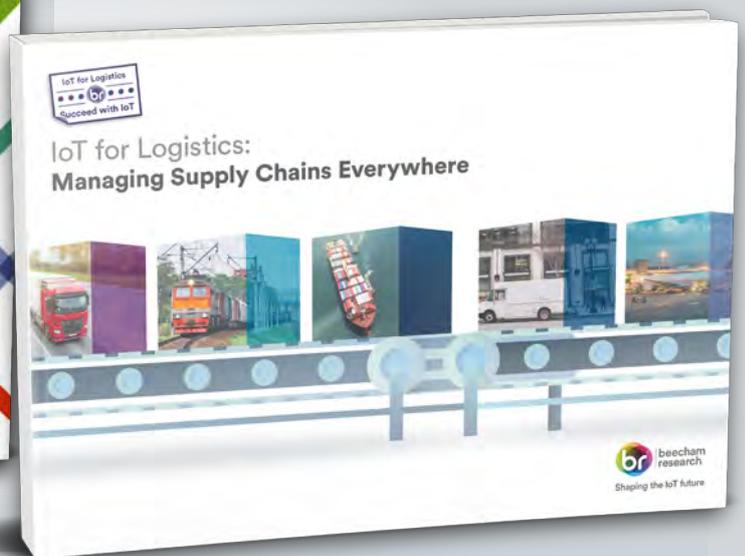
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