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COVER INTERVIEW

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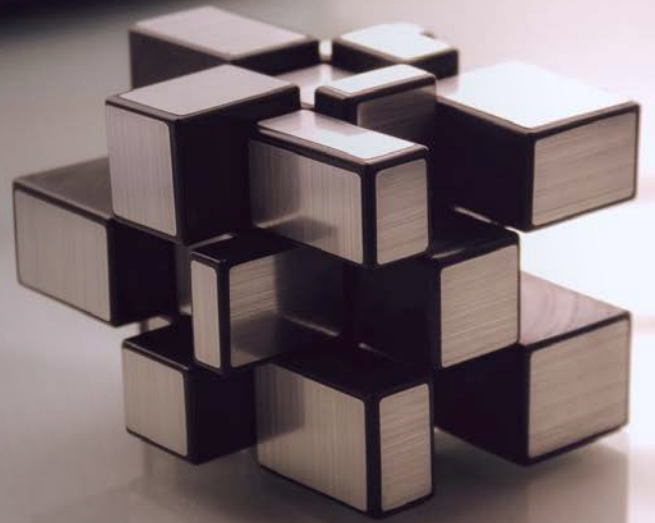
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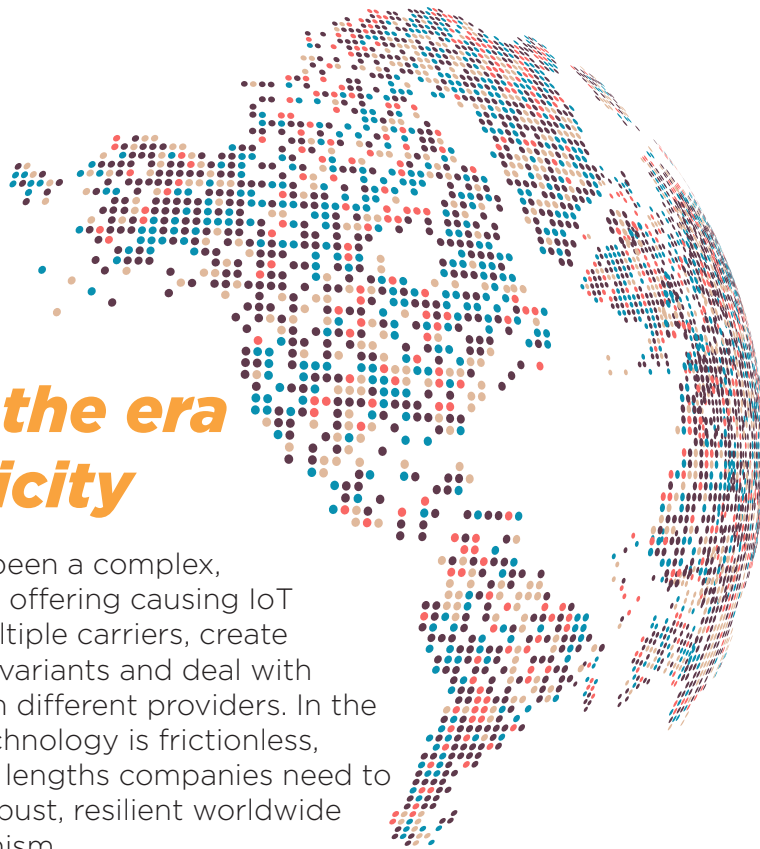
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Welcome to the era of SIM simplicity

Global IoT connectivity has been a complex, fragmented and inconsistent offering causing IoT organisations to manage multiple carriers, create regional or national product variants and deal with inventories of SIM cards from different providers. In the digital era when so much technology is frictionless, standardised and global, the lengths companies need to go to so they can achieve robust, resilient worldwide connectivity are an anachronism



George Malim, managing editor

In **IoT Now** we've consistently bemoaned the lack of simple global IoT connectivity that customer organisations can buy from a single supplier and then forget about. Most IoT organisations recognise that connectivity is essential to their offerings and for many, a cellular link is critical but few actually want to get into the detail of that. Most just want connectivity that is reliable, offers ubiquitous coverage, is reasonably priced and is available from a single supplier so there is only one throat to choke.

Nobody wants to have to manage several carriers in each nation they operate in, handling contracts, dealing with outages, ensuring compliance and apportioning blame when things go wrong. Instead, a single supplier that abstracts away all the complexities is what the market wants. That supplier can make it so cellular IoT connectivity is one thing less to worry about and the IoT organisation can focus on what it does best - the product and service it is introducing.

Recent years have seen important advances in uptake, support and development of SIM technologies that enable greater flexibility for IoT organisations. IoT devices can now be produced

that use an embedded SIM (eSIM) or an integrated SIM (iSIM) that allows for a single stock-keeping unit (SKU) number for global products. The logistics costs that this saves are huge and far greater simplicity is enabled for organisations. eSIM and iSIM aren't for every deployment. Small national roll-outs probably find self-managing one or two operators and handling physical SIM cards viable and slightly more cost effective. However, for mass-scale truly global deployments, the benefits of a SIM that can be configured at the point of deployment, that is offered by a single supplier and that brings all the benefits of optimised coverage, failover to other carriers and billing simplicity is truly compelling.

In this issue, IoT Now introduces **AT&T's** new Global SIM Advanced offering which does exactly what the industry has been looking for. The service uses a version of **Eseye's** AnyNet SIM as well as the company's connectivity management platform to provide resilient, global connectivity to customers. Finally, we have that one-stop cellular IoT connectivity offer we've been waiting for. The good news is that further innovations are in the pipeline with iSIM offerings coming to market, as detailed in the IoT Now iSIM Handbook, extracts of which are on pages 32-45.

Enjoy the magazine!

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Trasna adds device management with IoTerop acquisition

Trasna, a semiconductor and IoT provider, has announced its acquisition of **IoTerop**, an IoT device management platforms and software specialist. This acquisition strengthens Trasna's ability to deliver complete solutions from chip design and SIM manufacturing to cloud-based remote management services. IoTerop's products, which include the Alaska IoT management platform and Iowa software development toolkit, are already deployed across millions of devices globally. This addition to its product portfolio further strengthens Trasna's hardware and software connectivity offer, reinforcing its position as a key player in enabling the growing number of IoT devices worldwide.

IoTerop brings a proven track record in IoT device lifecycle management, with its Alaska and Iowa solutions widely adopted by large-scale connectivity providers and industries such as smart cities, utilities, automotive and industrial IoT sectors. Its products are designed to support the next generation of IoT networks, such as NB-IoT, 5G and Lightweight M2M (LwM2M). The company has been a leading advocate of open standards in IoT, promoting interoperability across IoT ecosystems. For Trans, this move rounds off a year of significant expansion



Stéphane Fund, Trasna

following its acquisition of **Workz** and the opening of a new semiconductor R&D and semiconductor facility in India.

Stéphane Fund, the chief executive of Trasna, said, "Acquiring IoTerop is an important step in our journey to become the leading enabler of IoT connectivity including device management. Its IoT expertise and trusted device solutions complement our growing portfolio perfectly. The addition strengthens our comprehensive offering for customers, enabling them to deploy highly optimised and scalable solutions that make connectivity and device management easier and more secure for everyone." ■

u-blox shifts focus to GNSS solutions, hangs up on cellular business

u-blox has announced the decision to increase focus on its Locate business and phase out its cellular business. This change positions u-blox as a leading and dedicated provider of global navigation satellite system (GNSS) semiconductor solutions in a dynamic and growing market, while retaining its value creative short-range business.

By further focusing on the Locate business, the company says it will be better positioned to drive innovation, use its unique technology assets and address expanding opportunities within the global positioning market, including autonomous vehicles, industrial IoT and tracking applications. u-blox has concluded that phasing out the cellular business is the most viable course of action to ensure the company's long-term strategic focus and operational efficiency. u-blox's cellular business currently has more than 200 employees and generated revenue of CHF 27 million (US\$30m) and an adjusted EBIT loss in excess of CHF 15 million (US\$16.6m) in H1 2024.

"This strategic shift will enable us to unlock even greater potential within the

positioning technology market and accelerate the development of cutting-edge solutions for our customers," said Stephan Zizala, CEO of u-blox. "Our efforts to find a viable path forward for the cellular business did not pan out, including exploring a potential sale, leading us to the decision to phase out this business. We will do our utmost to support our employees, customers and partners impacted by this decision." ■



Stephan Zizala, u-blox

News in Brief

Telenor IoT expands US access with Verizon Business

Telenor IoT customers with connected devices in the US can now get local access to **Verizon Business'** cellular IoT network in the US. This extends Telenor IoT's global managed IoT connectivity service by enabling more flexible access to the US market. This is an important step following the partnership announced in July 2023 between Telenor IoT and Verizon Business, aiming to simplify and enhance connectivity on a global scale.

Telenor IoT provides access to networks in more than 200 countries using a combination of roaming and local access. The partnership with Verizon Business will complement Telenor's global roaming access and give Telenor customers the option of eSIM-based local access on Verizon's network in the US. ■

Augury raises US\$75m from investors

Augury has announced that it has raised US\$75m, with the round being led by **Lightrock** with participation from several of Augury's existing investors – **Insight Partners, Eclipse, Qumra Capital** as well as **Schneider Electric Ventures** and **Qualcomm Ventures**. The new round represents an increase in valuation for Augury, which maintains its position as the only unicorn startup in the Production Health category. Since its last funding round in 2021, Augury has seen a five-fold increase in revenues, tripled customer base among Fortune 500 manufacturers, and expanded its product portfolio from asset performance and reliability to incorporate AI-driven solutions for process optimisation. ■



News in Brief

RespondHealth partners with Microsoft

RespondHealth has announced a new integration with **Microsoft** to bring AI-powered solutions to the healthcare and life sciences (HLS) sectors. This collaboration integrates RespondHealth's real-world health data sources, including patient records from over 200 million Americans, with Microsoft Azure OpenAI Service, to help turn complex data into actionable insights. This offering will provide HLS organisations with new solutions to facilitate and accelerate ongoing evaluation of pharmaceutical efficacy, identify precise patient cohorts for clinical trials, analyse market trends and develop performance optimisation strategies that benefit healthcare stakeholders. ■

Vodafone Business IoT expands connectivity in the Middle East with Mobily

Vodafone Business IoT is partnering with **Mobily** – a Saudi technology, media and telecommunications company – to offer Internet of Things (IoT) connectivity services in the Kingdom of Saudi Arabia. As a result, Vodafone Business IoT's customers will now be able to deploy their connected IoT devices to more places in the Middle East.

This new agreement means that Mobily will grant Vodafone Business IoT's customers access to its extensive network coverage in the country. This means that IoT customers installing and operating connected devices using the Vodafone Global SIM+ will have reliable and secure connectivity that complies with local regulatory requirements. ■



Olivier Pautet, Sequans

Sequans Communications, a provider of cellular IoT semiconductors and modules, and **Soracom**, a provider of cellular IoT connectivity with full MVNO capabilities, have announced the expansion of their partnership. This collaboration aims to simplify the development of IoT projects by offering evaluation kits (EVKs) powered by Soracom's global IoT connectivity. IoT application developers now have access to Sequans' LTE-M/NB-IoT and Cat 1bis technology, combined with Soracom's global connectivity. The EVKs are available in two variants:

Sequans and Soracom expand partnership with new evaluation kits

- LTE-M/NB-IoT (Sequans Monarch2 GM02S EVK): This second-generation LPWA technology from Sequans features ultra-low power consumption and a compact form factor, making it ideal for applications such as smart utility meters, industrial sensors, health and fitness trackers and more.
- LTE Cat 1bis (Sequans Calliope2 GC02S1 EVK): Featuring Sequans' Cat 1bis technology, certified in North America and Europe. It can operate on any LTE network worldwide, ideal for deployments that require global coverage with cross border connectivity, such as connected vehicles, logistics tracking systems and telematics.

"We are thrilled to deepen our partnership with Soracom and provide developers with the tools they need to launch their IoT solutions quickly and efficiently," said Olivier Pautet, the EVP of marketing and strategy at Sequans. "The combination of Sequans' hardware and Soracom's connectivity creates an effective and efficient solution that can make scaling an IoT deployment easier by ensuring a smooth transition from the evaluation stage to full deployment." ■

e& partners with IBM to strengthen AI governance and compliance framework

e& has collaborated with **IBM** to deploy a pioneering, end-to-end, multi-model artificial intelligence (AI) and generative AI governance solution. Announced at the World Economic Forum 2025 in Davos, this collaboration intends to enhance e&'s AI governance framework to promote compliance, oversight and ethical practices across its growing AI ecosystem, reinforcing e&'s commitment to establishing robust governance, risk management and regulatory oversight across its AI usage.

The solution will use IBM's watsonx governance enterprise AI and data governance platform, combined with IBM Consulting's expertise in AI

implementation, build on e&'s commitment to scale AI responsibly and track ROI while addressing compliance requirements, transparency and ethical oversight of AI models.

"At e&, we are committed to leading by example and setting the global benchmark when it comes to establishing robust AI governance practices," said Dena Almansoori, the group chief AI and data officer at e&. "By adopting IBM watsonx governance, we're taking a decisive step forward in our AI journey. This collaboration ensures transparency, explainability and efficiency across our AI operations, raising the bar for AI governance in the industry." ■



Real-time data analytics are growing IoT's impact in rail freight

Freight rail industry set to surpass US\$20bn in IoT revenue by 2032

The freight rail industry has been receiving investments to digitise operations. According to global technology intelligence firm **ABI Research**, revenues for rail car IoT in freight rail will surpass US\$20bn by 2032. "The global railcar telematics market is driven by the increasing demand for efficient, safe and cost-effective transportation systems," said Adhish Luitel, the principal analyst at ABI Research. "This expansion can be attributed to advancements in digitalisation and the integration of IoT technologies due to heightened emphasis on real-time data analytics enabling preventive maintenance."

Vendors like **Amsted Digital**, **Wabtec**, **Nexxiot** and **ZTR** are some of the emerging players in this space within North America. In addition to this, **RailPulse**, a coalition created by railcar owners in North America, including Class 1 and 2 railroads, lessors and railcar-owning shippers, with the goal of

pushing rail digitisation is also driving the adoption of digital solutions.

Unlike Europe, the North American market is underpenetrated when it comes to IoT-based visibility. North America presents a large total addressable market (TAM) of nearly two million railcars. So far, machine vision and sensor-based inspection devices mounted on the side of the tracks, usually at rail-grade crossings, have been at the forefront.

"Rail braking inspections are critical to ensure safety and compliance in the industry. These checks verify that the air brake system is functioning properly across the entire train, which can span over a mile in length. However, the process can be time-consuming as manual inspection for each car requires constant coordination between the train crew and the control centre. This is when IoT technologies can provide efficiency gains," concludes Luitel. ■

Berg Insight forecasts strong growth for IoT connectivity management platforms

Berg Insight has released new findings about the market for IoT connectivity management platforms (CMPs), a standard component in the value proposition from mobile operators and IoT MVNOs around the world. Market dynamics in the IoT CMP market have evolved in recent times as vendors focus on responding to the challenge of declining average revenue per user (ARPU) for IoT connectivity services.

Cisco is one of the largest IoT CMP providers globally. The company has a strong position in all major geographies and partnered with about 60 mobile operators worldwide at the end of 2024. The number of SIMs managed with Cisco IoT Control Center reached about 262 million. **Aeris** ranked as the second largest IoT CMP vendor with 28 mobile operator partners and 84 million connected devices at the end of 2024. The company

took over the loss-making IoT business of **Ericsson** in early 2023 and has since the acquisition managed to modernise and streamline operations, while merging its legacy platform and the IoT Accelerator into a single platform. **MAVOCO** has emerged as a significant player in recent years with more than 10 mobile operator partners at the year-end. MAVOCO's IoT CMP is cloud- and core-agnostic, allowing mobile operators to utilise existing infrastructure to cost-effectively address IoT customers globally. Other IoT CMP vendors with a meaningful number of IoT CMP deployments are **Comarch**, **Nokia** and **Vodafone**, the firm says. IoT CMPs are also a key component in the value proposition from vendors such as **1NCE**, **1oT**, **emnify**, **Eseye** and **floLIVE**, which operate as technology providers for mobile operators, as well as IoT MVNOs. ■

News in Brief

Kaleido Intelligence and MobileSquared announce merger

Kaleido Intelligence and **MobileSquared** have announced their merger, forming a single entity in 2025. This alignment brings together two global authorities in messaging, roaming and IoT market intelligence, enabling the brands to use their combined expertise and shared values.

Jon King, chief commercial officer at Kaleido Intelligence, said, "The merger of MobileSquared and Kaleido Intelligence is a natural fit. Both organisations have earned global recognition for delivering meticulous, detailed, trusted insights and data and advisory services. The depth of MobileSquared's expertise in the messaging landscape complements Kaleido's extensive coverage of the roaming and IoT ecosystems."

Nick Lane, the chief messaging officer and founder at MobileSquared, said, "It's amazing news that we can now take our five-year partnership to the next level with the announcement of this merger." ■



AT&T and Eseye introduce Global SIM Advanced to drive seamless IoT connectivity

In many situations, IoT applications are best served by local coverage and extensive international roaming agreements. In other situations, IoT application performance requirements or local country regulations make permanent roaming impractical or impossible. For IoT organisations faced with these scenarios, ubiquitous global IoT connectivity from a single source is the goal, but instead they have had to manage a complex web of contracts and suppliers or simply leave global markets to their local competitors. Now, with the launch of AT&T Global SIM Advanced, an offering that utilises Eseye's IoT connectivity management platform and the AnyNet Federation of mobile network operators, IoT implementations can access enhanced cellular connectivity that goes beyond permanent roaming globally.

IoT managing editor George Malim spoke to Mike Van Horn, the area vice president for products for IoT at AT&T, David Garver, the area vice president for sales and business development for industrial IoT at AT&T, and Nick Earle, the chief executive of Eseye. The days of managing multiple contracts and having to create regional variants of IoT products are drawing to a close thanks to maturing of embedded SIM (eSIM) standards, the growing footprint of connectivity alliances such as the AnyNet Federation, and the emergence of systems that manage the complexities of specific IoT use cases

George Malim: Please can you detail what AT&T is announcing and share the background of how you are working with Eseye?

Mike Van Horn: The first thing to know is that we are the leader in IoT connectivity in the US where we have millions of connections across multiple industries. Our **AT&T** Global SIM, domestic network and extensive roaming agreements are a huge contributor to our success. That said, our corporation continues to urge us to grow swiftly, compelling us to innovate and expand beyond the connectivity options we currently offer.

AT&T Global SIM Advanced is a new addition to our IoT connectivity portfolio that we're announcing at MWC25 Barcelona. It's a fully managed multi-IMSI eSIM solution to give customers reliable, secure global connectivity

beyond permanent roaming when necessary and it includes technology from **Eseye**, who is working with us.

As a customer you can have a single SIM embedded in your device with multiple profiles and international mobile subscriber identities (IMSIs). This allows you to ensure you connect to an optimal carrier for your needs without having to manage multiple national or regional carrier relationships. At the same, you can get greater resilience, future-proofed cellular connectivity and access to Eseye's AnyNet Federation of mobile network operators to maximise global coverage.

Nick Earle: What IoT needs is ubiquitous global connectivity but because of regulatory controls, global coverage is a patchwork of cellular networks. There may be gaps for some customers. ▶

SPONSORED INTERVIEW



Nick Earle
Eseye



Mike Van Horn
AT&T



David Garver
AT&T

Plus, the demand for localised connections in many countries outside the US creates a significant incremental administration burden for customers as they try to stitch together global coverage and manage their connections across large volumes of devices. It's clear that a fully managed service that delivers single stock-keeping unit (SKU) global connectivity will be hugely welcomed in the industry.

This may be new to telecoms but it is not new in other sectors. For example, take aviation. The **Star Alliance** model was triggered by the inability for consumers to book one trip and travel on multiple airlines - a different industry but the same problem - ubiquitous connectivity. Today you can book on multiple partner airlines through the **United Airlines** website, pay once and get the same benefits across all of them such as shared lounges and the ability to earn and redeem UnitedMilePlus miles across all of them. Once this was announced more and more airlines signed up and passenger miles increased as travel became easier.

Having a single eSIM means OEMs with multiple regional or national variants can create devices that can connect to any mobile network, anywhere. This allows them to have a single, global product, with a single SKU number rather than having to have multiple regional and national variants. The complexity of managing the production line, supply chain, warehousing and distribution of multiple variants of the same product has a far greater cost than any mobile connectivity so being able to unify variants into a single product has massive economic advantages for the operator.

GM: Why is this happening now? Hasn't IoT been waiting for straightforward, frictionless, global IoT connectivity for years? ►



AT&T Global SIM has achieved significant success by incorporating its domestic and worldwide network connectivity, allowing customers to roam on more than 600 local operators around the world

NE: In terms of timing, several technical capabilities have emerged to enable this such as eSIM, eUICC and new remote SIM provisioning standards. These developments have increased the demand from customers for MNOs to offer a global solution beyond permanent roaming. Eseye's belief is that it can enable the operators to offer multi-IMSI eSIM as a complementary offer to their single IMSI products. We have the infrastructure, the brand, the technical capabilities, and the trust of thousands of customers - it just makes sense.

MVH: As standards have evolved from SGP.02 to SGP.32 it starts to make eSIM and accessing mobile operator networks worldwide more technically feasible but that doesn't mean it's easy to do. AT&T is leading the charge to make IoT connectivity seamless by driving innovation to stay at the forefront of this tech revolution. That's the impetus behind doing it now. We've supplied automotive manufacturers and others with localised global connectivity for years and we are seeing more of the mid-market and start-ups interested in accessing global markets. Until now, they've lacked the resources to manage multiple operator relationships so there's real value we can bring to the table by providing seamless, ubiquitous connectivity for companies that aren't the largest of the large.

David Garver: We've been thinking about this for at least five years and it's opportunistic now. We're finally seeing a significant opportunity in adding

this type of solution to advance our portfolio because it meets customers' needs around the world. There are a significant number of customers that come to us looking for resilient global connectivity and solutions to enable localisation with high bandwidth use cases. Consider a use case that requires data to be transported quickly from South America to the US and is sensitive to latency. That begs the question of how to localise that traffic to enhance the outcomes of experiences from video streaming to the payment process. For small, medium and large customers this is an opportunity to achieve 100% global connectivity with simpler support and higher device resilience.

There are a handful of companies in the world that have the resources to execute on that model themselves but a whole lot more that don't. We see this as a growth opportunity for thousands of customers.

GM: How is this different from the current AT&T Global SIM solution?

MVH: AT&T Global SIM has achieved significant success by incorporating its domestic and worldwide network connectivity, allowing customers to roam on more than 600 local operators around the world. However, some customers and use cases require the enhanced, lower latency connectivity that localisation offers.

The new AT&T Global SIM Advanced compliments the existing service by striving to have minimal downtime, providing extensive global connectivity for single SKU products, and simplifying eSIM connection management at scale. A key feature is Eseye's orchestration capabilities, which allow dynamic traffic steering and connection updates in response to changing network conditions. This enhanced service aims to offer a fully managed eSIM experience to customers.

NE: The benefits go beyond connectivity; this is also about resilience. Single IMSI connectivity is great until there is an issue somewhere in the system that affects a device or a series of devices. This could be due to the device moving into an area with no signal, a problem in the infrastructure which means you can connect to the tower but not send and receive data. The unavailability of a ►



roaming connection alone is rarely the issue but, when you have three or four ways of getting to the device, that can be the difference between 100% reliability and 99% – for many business cases that 1% is worth way more than 1% in terms of what they can charge and the performance of their offerings. Often, we focus on the technical side of this but the business process disruption and ROI we are bringing is as disruptive to global IoT connectivity as **SAP** was to enterprise software. As demand grows for single SKU global deployments this federated operator approach will become more and more vital.

GM: What are the benefits for AT&T's customers here and is this the future of IoT connectivity?

MVH: Having access to more networks means better coverage, and having multiple IMSIs better ensures resilient connectivity. These advantages enable the use of a single SKU, which improves operational efficiency. The combined benefits of increased coverage, enhanced resilience, and operational efficiencies provide significant value that justifies the premium for AT&T Global SIM Advanced.

In some instances, customers may develop similar solutions independently out of necessity, possibly unaware of the comprehensive solutions we offer. I believe this will greatly expand our reach. Having started on the consumer side of AT&T 24 years ago, I've seen that success often hinges on simplifying things for customers. With one bill, one contract, and one relationship, we are helping create a simpler experience for customers with needs beyond permanent roaming.

DG: Our customers face several challenges today. While pricing is one issue, those with SIMs at the edge struggle with inadequate experiences. Managing multiple carrier relationships is cumbersome. A significant problem is achieving the correct customer experience (CX) to succeed in their markets. Some customers have lost opportunities because local competitors offer better support.

GM: Why have you selected Eseye and what's your longer-term vision?

MVH: We have a high level of trust in what Eseye does and what we can do under our brand. Eseye

has a good brand and strong recognition in the analyst community. We are transparent about Eseye being a technology provider for AT&T Global SIM Advanced.

DG: We conducted a thorough global search for this type of solution and ultimately chose Eseye for its current capabilities, long-term potential, and value-added services that we can offer with multi-IMSI eSIM profiles.

MVH: It's about the new use cases this capability unlocks. The ability to localise on a single platform. While Eseye helps make connectivity seamless, having access to multi-IMSI eSIM profiles is crucial. These multi-IMSI eSIM profiles are about delivering seamless experiences, which is the long-term benefit of having a federation of multi-IMSI profiles.

NE: Our founders, Ian Marsden and Paul Marshall, had the vision 17 years ago that putting the network in the middle of everything creates a network effect that allows value-added services to be shared on a single platform. There's only one platform but, with the AnyNet Federation, there are many members who utilise it to multiply the value they bring. eSIM has made the need for this critical as IoT organisations need to be able to optimise the firmware on their devices, handle demands for low latency, manage customer experiences and ensure their devices are future-proofed with Multi RAT connectivity for the long-term. As Massive IoT becomes enabled these capabilities will become vital for IoT deployment success and ongoing risk mitigation. ■

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Our customers face several challenges today. While pricing is one issue, those with SIMs at the edge struggle with inadequate experiences



AT&T Global SIM Advanced

AT&T Connected Solutions unveils Global SIM Advanced for resilient global IoT connectivity

AT&T is leading the way in bringing the Internet of Things (IoT) to life, integrating reliable IoT connectivity to help our customers drive innovation and stay competitive. To support new use cases driven by new eSIM standards and requirements for more resilient connectivity, AT&T has introduced AT&T Global SIM Advanced, an IoT solution designed to better meet the demands of customers

AT&T Global SIM Advanced uses a version of **Eseye's** AnyNet eSIM and Infinity, a connectivity management platform (CMP) designed to manage multi profiles. The platform provides eSIM orchestration for IoT devices spread across the globe and offers operational efficiencies thanks to advanced automation rules.

What's new with AT&T Global SIM Advanced?

AT&T Global SIM Advanced is designed to be a comprehensive solution with localisation capabilities, which enables businesses to dynamically upload a local network profile so that businesses can comply with regional regulatory requirements and offer performance options for high bandwidth/low latency use cases. The multi-IMSI - international mobile subscriber identity - technology allows devices to dynamically switch between network profiles or according to pre-defined rules. Global SIM Advanced can also be a useful tool to orchestrate fallback options during network outages and the multi-IMSI capability can enhance resiliency - which could be the decider between costly downtime or business as usual. AT&T serves as the single point of contact for IoT customers and

provides an extensive range of network options starting from a single eSIM, giving the customer the flexibility to access the network that best fits their use case.

Managing AT&T Global SIM Advanced settings is straightforward too, thanks to the Global SIM Advanced CMP. Global SIM Advanced CMP provides a centralised interface to manage IoT deployments, offering advanced features like billing, lifecycle management and integration-ready APIs to help businesses optimise connectivity.

In the Global SIM Advanced portfolio, SMARTconnect is an add on feature, a portable software module which provides on-device intelligence to select, manage and optimise connectivity, positioning businesses even further at the forefront of IoT.

Cost efficiency is another critical advantage of AT&T Global SIM Advanced. Its simple and flexible pricing models - including tiered monthly recurring charges and a pay-per-use structure for data - help businesses scale deployments without overextending budgets. This cost-effective approach enables enterprises to invest confidently in IoT solutions that drive results. ►

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Use cases across key industries

While AT&T Global SIM Advanced is designed to be industry-agnostic, it could be especially useful for several key industries:

Cost efficiency is another critical advantage of AT&T Global SIM Advanced



Manufacturing: An intelligent connectivity solution that enables monitoring and remote management of every EV charger across the globe with ease and efficiency. Combined with a low latency connectivity solution to port the customer charging data back to the in-country server thanks to localisation.



Healthcare: Reliable IoT connectivity is a linchpin for healthcare, with wearable devices, remote patient monitoring, and telemedicine, which rely on rock-solid connections to function. AT&T Global SIM Advanced can meet these applications and their demand.



Utilities: From smart meters to grid monitoring, utilities depend on IoT for real-time data collection and tools to manage energy. AT&T Global SIM Advanced can deliver connectivity for critical infrastructure, enabling predictive maintenance and helps utilities make real-time decisions for efficient energy distribution. Over the air (OTA) profile management allows utilities to decide which of their devices remain operational during network transitions.




Logistics and transportation: Businesses benefit from near-global coverage for vehicle telematics and asset tracking, when they can use near real-time updates throughout their supply chain. Network orchestration and high-performance capabilities of AT&T Global SIM Advanced can help reduce latency, enabling better fleet management and route planning, and the Global SIM Advanced CMP 's centralised management capabilities simplify large-scale IoT operations.

Conclusion

AT&T Global SIM Advanced is a transformative solution that empowers businesses to overcome the challenges of global IoT connectivity. By combining advanced eSIM technologies, robust security, and a powerful management platform, it offers a reliable, high performance and scalable solution across manufacturing floors, healthcare facilities, utility grids, logistics networks and more.

As IoT continues to shape the future, the need for innovative connectivity solutions will only grow. With AT&T Global SIM Advanced, businesses gain a valuable connectivity tool that could help give them a competitive edge. ■

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Will 2025 be the year that eSIM goes global?

Embedded SIM (eSIM) has been available in the consumer market for almost a decade but the arrival of the SGP.32 specification opens up applicability of eSIM to IoT deployments. Concurrent innovations in eSIM technology, readiness by global operators to offer frictionless international IoT offerings and greater awareness of the benefits of eSIM in logistics and operations are set to see greater momentum behind the technology this year

IoT is not the same as the consumer mobile market so the same standards and systems that support consumer eSIM can't be applied to IoT

There's a lot of excitement about eSIM because it encapsulates the idea that a device will be able to configure its cellular connectivity at the point of deployment without human intervention. This opens up opportunities for truly global IoT devices, with no need for regional variants. For large-scale, mass-market IoT deployments the significant savings to be made from this alone will far outweigh incremental additional costs for an eSIM-based service from a global provider.

The length of time that eSIM has been available in the consumer market has given IoT observers plenty of time to assess how the technology can be applied to IoT but there have been several parts

of the puzzle missing. IoT is not the same as the consumer mobile market so the same standards and systems that support consumer eSIM can't be applied to IoT. This obstruction is being addressed with the introduction of the SGP.32 specification, which has been designed for IoT.

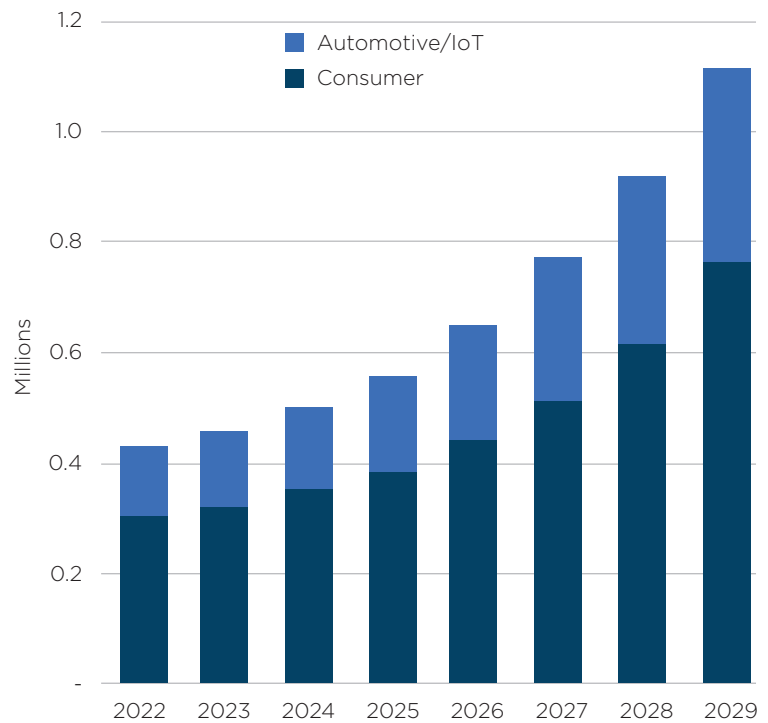
Specifications stimulate uptake

Analyst firm **ABI Research** sees the arrival of SGP.32 as a catalyst for eSIM in IoT and as a foundation for commercial launches of IoT eSIM offerings in 2025. Previously eSIM adoption in IoT had been dominated by the automotive sector, which has been well-addressed by SGP.02. ▶



Figure 1: eSIM Shipments, World Markets: 2022 to 2029

(Source: ABI Research)



In addition to automotive uptake, a significant amount of devices have been shipped with IoT connectivity modules that are eSIM and iSIM-capable, suggesting a buoyant base of devices that are ready to utilise eSIM. **IoT Analytics** has estimated the installed base of eSIM-capable, including integrated SIM (iSIM), IoT connectivity modules reached 650 million in 2023. The firm says that eSIM technology represents a paradigm shift in cellular IoT connectivity, enabling remote SIM provisioning, global connectivity and enhanced security through a hardware-based approach.

Even so, it acknowledges that, in spite of the headline predicted benefits, eSIM adoption has been slower than expected because of remote SIM provisioning (RSP) complexities and divergent standards. The recent eSIM IoT specifications, SGP.31 and SGP.32 from the **GSMA**, are set to help manufacturers and end users overcome these challenges and IoT Analytics forecasts that cellular IoT modules with eSIM technology will experience accelerated growth starting in H2 2025.

That positive prediction is supported by a recent **GSMA Intelligence** survey that uncovered a consensus among operators that enterprise demands for eSIM-enabled solutions will grow across most industries during 2024-2025, with smart cities leading growth. Looking further ahead, operators expect eSIM to account for 37% of the total number of cellular IoT connections by 2030, followed by iSIM at 34% and traditional removable SIM at 29%.

Enhanced security

IoT Analytics concurs, pointing out that 33% of shipped cellular IoT modules were eSIM-capable in Q2 2024. 62.3% of IoT devices continue to utilise physical SIM cards, with the remainder using Soft SIMs technology. In addition, since eSIM

technology incorporates embedded secure elements that protect the integrity of cellular IoT modules, this means that 33% of cellular IoT modules shipped included dedicated hardware-based security. This is significant because eSIMs include embedded secure elements, which are rooted in the cellular IoT modules as unique elements. This enhances the integrity of the modules and the IoT devices into which they become integrated.

The future is integrated

With eSIM uptake set to accelerate thanks in part to SGP.32, attention is now turning to integrated SIM. Analyst firm **Juniper Research** has found in a recent study that iSIMs, which in essence are an eSIM form factor that is built directly into existing device components, eliminating the need for a separate SIM module, are set to be installed in more than 10 million devices by 2026. That's more than 1200% growth from the global device base in 2024 of 800,000.

Juniper Research attributes this to the emergence of GSMA SGP.41/42 specifications which are anticipated to launch by the end of 2025 and will help to standardise and streamline iSIM-enabled device deployment. The GSMA specifications simplify and outline in-factory profile provisioning (IFPP) which allows iSIM profiles to be uploaded to a device during production. IFPP enables manufacturers to ship devices with cellular connectivity already configured to the desired cellular network thereby simplifying supply chain and production processes.

Use cases such as smart energy meters and remote logistics are being primed for immediate adoption, the firm says, predicting that the number of iSIM connections will rise to 210 million by 2028 globally. ■

With eSIM uptake set to accelerate thanks in part to SGP.32, attention is now turning to integrated SIM



Global IoT connectivity being made possible through eSIMs

Global IoT connectivity delivered through eSIMs is made possible through connecting cellular networks across multiple countries around the world, offering seamless connectivity for IoT devices without needing to physically swap SIM cards. This is achieved through storing multiple network profiles on the eSIM, which can be activated remotely depending on the device's location, writes Antony Savvas

“eSIM technology represents a paradigm shift in cellular IoT connectivity, enabling remote SIM provisioning, global connectivity, and enhanced security”

The benefits of using a global IoT embedded SIM (eSIM) include the flexibility to easily switch between networks based on coverage or cost, the scalability to manage connectivity for large deployments of IoT devices from a single platform, and reduced complexity, with no need to manage physical SIM cards or deal with different regional SIM formats.

Additionally, there is enhanced security through securely storing and managing network profiles on the actual eSIM.

Key points about global IoT eSIMs:

- **Multiple network profiles:** An eSIM can store profiles from various mobile network operators, enabling the device to automatically switch to the best available network in a given region
- **Remote provisioning:** Network profiles can be updated over-the-air (OTA), allowing for easy changes to network operators or data plans without physically accessing the device
- **Simplified device manufacturing:** By using a single eSIM, manufacturers can produce devices with global connectivity without having to worry about different SIM card formats for different regions
- **Cost-effective roaming:** By dynamically selecting the best local network, eSIMs can minimise international roaming charges

Companies active in the global IoT eSIM market include the likes of **Wireless Logic, EMnify, Eseye, Cellhire, Enea, 1Global, Truphone, Oasis Smart-SIM, Thales, Sorocom, Zipit Wireless, Onomondo, Velos, Kigen, BICS, KORE Wireless, Melita** and a number of others.

eSIM shipments

According to analyst house **IoT Analytics**, the installed base of eSIM-capable (including iSIM) IoT connectivity modules reached 650 million in 2023. An iSIM, incidentally, is a type of eSIM where an integrated UICC (universal integrated circuit card) with a secure element is manufactured into a system-on-chip (SoC) or system-in-package (SiP), which then becomes integrated into a cellular IoT module.

The analyst firm says: “eSIM technology represents a paradigm shift in cellular IoT connectivity, enabling remote SIM provisioning, global connectivity and enhanced security.”

However, it adds: “Despite the benefits, eSIM adoption has been slower than expected due to remote SIM provisioning complexities and divergent standards. But: “Recent eSIM IoT specifications - SGP.31 and SGP.32 from the GSMA - help manufacturers and end users overcome these challenges.” ▶



Thirty three percent of shipped cellular IoT modules were eSIM-capable at the end of the second quarter last year, says the analyst, meaning they included an eSIM in the module, compared to over 62% using physical SIM cards, with the remainder utilising Soft SIM technology. “This means that a third of cellular IoT modules shipped included dedicated hardware-based security,” the analyst firm adds.

IoT Analytics forecasts that cellular IoT modules with eSIM technology will experience “accelerated growth” starting in the second half of 2025.

Market factors

With any new market though, various factors can affect it. Toby Gasston, mobile core product lead at **Wireless Logic**, says: “When looking at the difference between local and global deployments, it’s easy to forget that any deployment of IoT devices is challenging at scale. For instance, a rollout in a local market requires consideration of a variety of factors, such as coverage, the appropriate technologies and local regulations. These factors can vary significantly based on geographic and technical conditions, from network availability to compliance with specific regulatory standards.”

However, when deployments expand to a multi-national or global scale, the complexity increases

exponentially, he says. Not only must businesses address the same local challenges across multiple regions, but they must also account for additional variables, such as managing diverse regulatory frameworks, roaming agreements and operational differences across countries.

“Moreover, the global connectivity landscape is always shifting, with new technologies, changing market conditions and shifting operator partnerships. The ability to maintain seamless, reliable connectivity while adapting to these dynamic conditions is critical for the success of global IoT deployments,” says Gasston.

Remote SIM provisioning (RSP) can also cause issues. RSP was initially presented as a step change in the market, promising customers the ability to “take control” of their connectivity provider options through the lifespan of their devices.

Covering RSP, the SGP.02 standard was introduced ten years ago. But it became apparent the RSP reality was complex, requiring expensive integrations between providers to make RSP functionality possible. We now have the SGP.32 standard to consider. But while RSP and integrated universal integrated circuit cards and eSIMs serve as delivery mechanisms, they do not resolve issues like contractual ownership changes, or the practicality of end customers managing devices in the field. ▶

“When looking at the difference between local and global deployments, it’s easy to forget that any deployment of IoT devices is challenging at scale”



While connectivity providers can address some of the challenges around RSP and SGP standards, as always, it isn't as simple as that

Confusion

The GSMA developed SGP.02 for M2M communications back in 2014, followed by the SGP.22 standard for consumer devices in 2016. Each had its limitations, prompting the need for a more versatile standard, hence the introduction of SGP.32 in 2023.

Matt Hatton, partner at analyst **Transforma Insights**, says: “SGP.32 has generated significant interest, and confusion, within the industry. While some see it as a panacea for all IoT deployment issues, the reality is more nuanced. But still, there’s been a rush of startups and companies experimenting with this next-generation eSIM standard, particularly in areas where traditional SIM solutions have fallen short.”

While connectivity providers can address some of the challenges around RSP and SGP standards, as always, it isn't as simple as that. “Although 3GPP and GSMA are doing excellent work defining the future of IoT, a recurring issue remains, says Wireless Logic’s Gasston. “Mobile network operators (MNOs) around the world have differing priorities and approaches to making these technologies available in their respective markets. As a result, module manufacturers often find

themselves ahead of MNOs in adopting and implementing new technologies.”

Simplification

A notable advancement in SGP.32 is the introduction of the IoT Profile Assistant (IPA), which pulls profiles from chosen providers. This mechanism simplifies switching operators, addressing the clunkiness of previous standards, and making it easier for businesses to maintain consistent connectivity across their IoT deployments.

“SGP.32 is designed to be more flexible and lightweight than its predecessors. It supports a variety of deployment scenarios without the need for SMS, and offers reduced footprint requirements, making it suitable for constrained IoT deployments,” says Nick Earle, CEO of **Eseye**.

But, as promising as SGP.32 may be, it is essential to understand that many of its capabilities are still just arriving on the market. Therefore, enterprises need to know that any solutions marketed as SGP.32 today, are perhaps pre-standard versions, with some potential interoperability issues. However, some of these challenges can be effectively navigated with proper planning and support. ▶



“Ensuring consistent access point name (APN) settings and properly notifying the current operator to avoid continued billing are just a few of the considerations that businesses need to manage,” says Earle. “Managing the transition from existing standards to SGP.32 will be complex, and will likely require the help of a managed service provider. This approach ensures all aspects of connectivity, including APN settings, local breakout and SLAs [service level agreements], are properly handled.”

Factory provisioning

In-factory profile provisioning (IFPP), according to the GSMA SGP.41/42 standard, allows the loading of device- and region-specific mobile network operator profiles onto eSIMs and iSIMs during device production. This process is designed to be secure, and promises out-of-the-factory connectivity, flexible production, simplified logistics and reduced complexity in supply chains.

IFPP is an alternative to purely relying on in-field provisioning, especially for applications using low power wide area (LPWAN) technologies, including NB-IoT, which rely on devices with finite battery life.

SGP.41/42 specifications, anticipated to launch by the end of this year, have potential use cases such as smart energy meters, remote logistics, the automotive industry, industrial machinery, fixed-wireless access, and consumer electronics.

IFPP manages and integrates eSIM profiles by way of an over-the-air (OTA) profile loader in the manufacturing line. As relevant mobile network or mobile virtual network operator SIM profiles are loaded this way, it allows for dynamic changes to the production line, based on characteristics such as the geographic location into which the IoT device will be deployed.

Because IFPP IoT devices are pre-configured to connect to the most relevant network on activation, there is no need for a bootstrap profile or to push an initial OTA profile update via RSP. This makes the initial deployment of an IoT device easier, and reduces the need for local MNOs and MVNOs to support bootstrap profiles on the home subscriber server (HSS).

While IFPP is not here yet, and won't be in terms of widescale availability until after it is released later this year, it is certainly a technology that manufacturers, operators and IoT business users will be keeping a very keen eye on.

eSIM deployment

KORE Wireless has set out three stages of eSIM deployment:

Evaluating eSIM options: You'll need IoT-grade eSIMs that are remotely programmable based on

the latest GSMA eSIM standards, to ensure full interoperability. You may want to consider integrating eSIM applets for a higher level of secure authentication. When building your eSIM architecture, ensure you're deploying eSIMs from a carrier-agnostic provider. Some carriers may offer eSIMs restricted to their network only, or just multiple carrier options based on their alliances. A true carrier-agnostic eSIM provider will enable you with greater flexibility to switch to your desired carrier network. Your single eSIM solution should also allow access to multiple technologies (2G/3G/4G/LTE, including LPWA) through a single APN, as well as single data bundles via multi-IMSI capabilities. In addition, you'll need to make sure you select the right device – a 2G/3G/4G device will not be able to transfer data on an LTE-M network and will limit your future-proofing options.

Deploying your eSIM solution: After you've selected the right eSIM options for your solution, it's time to get your solution live. From a compliance standpoint, make sure you've done your due-diligence in complying to carrier and government regulations. Consider pilot programmes to gather feedback and measure quality assurance, before moving to a full-scale hard launch.

Managing your eSIM solution: After launch, you need to ensure you have the infrastructure in place to deliver on the promise of your IoT solution. The ability to switch carriers and network technologies at a moment's notice is one of the most appealing aspects of eSIM. But this also introduces the complexity of managing multiple network interfaces, contracts and invoices.

Avoid these complexities by managing your eSIM connectivity with a single provisioning platform that delivers real-time reports, provides proactive thresholds, alerts, and diagnostics. By using a centralised connectivity management hub and a single APN for profile switching, you will simplify day-to-day tasks associated with your solution, leaving your team the freedom to innovate, scale, and grow your solution alongside the changing needs of your industry or market.

Moving forward

While the eSIM market will see more advanced solutions being developed as it evolves, these will likely come with new challenges. Global deployments will demand seamless connectivity across regions. Though evolving standards like SGP.32 will help improve interoperability, addressing non-technical issues like regulatory compliance and ownership rights will remain critical.

Collaboration between industry stakeholders will be essential to ensure that the promise of flexible, global connectivity becomes a practical reality. ■

IFPP manages and integrates eSIM profiles by way of an over-the-air (OTA) profile loader in the manufacturing line



MWC[™]
GSMA

Mobile World Congress Barcelona expected to be bigger and better

Mobile World Congress Barcelona, Europe's biggest technology show, is back in the first week of March 2025. Antony Savvas previews all of the best bits



MWC25 Barcelona returns for its 19th edition at the Fira Gran Via in Barcelona on 3-6 March 2025. The 2024 show at the end February attracted more than 101,000 in-person attendees from 205 countries and territories. It also drew over 2,700 exhibitors, sponsors and partners, including over 1,100 speakers and thought leaders.

51% of attendees this year were at director level and above, of which 21% were from the C-suite. The GSMA Ministerial Programme convened over 180 delegations from 140 countries, including two heads of state, over 70 ministers, nearly 120 heads of regulatory authorities, and over 40 inter-governmental organisations.

Carbon neutral

MWC Barcelona has been certified carbon neutral for the last ten years, and last year, use of the complimentary public transport pass, given to all

MWC attendees, increased by 42% compared to the previous year.

MWC24 Barcelona contributed €502m to the Barcelona economy, according to an economic impact report from show organiser the GSMA, bringing the event's total economic contribution to €6.3 billion since the inaugural 2006 event. The economic impact last year was over twice that of the 2006 event.

Last year's show created 9,200 part-time jobs in the city of Barcelona, an increase of 100 jobs compared to 2023. Cumulative, since 2006, MWC25 Barcelona is estimated to have generated over 160,000 part-time jobs across Catalonia.

Mats Granryd, director general for show organiser **GSMA**, says, "This event is about providing a glimpse into the future and demonstrating how ▶



MWCTM

GSMA

AI, 5G and APIs are unlocking new possibilities, thanks to collaborative initiatives like GSMA Open Gateway.”

This year’s event

Of the 2,700-plus exhibitors and sponsors this year, over 80% re-booked for 2025 in the two weeks following the close of the show. This year’s edition will feature the likes of **Accenture, Amazon Web Services, China Mobile, CSGi, Dell, Google, Hewlett Packard Enterprise, Honor, Huawei, iconectiv, Intel, Meta, Microsoft, Nokia, Qualcomm, Samsung, ZTE** and **Xiaomi**.

The Global Mobile (GLOMO) Awards return to MWC Barcelona for 2025, marking a significant milestone – their 30th anniversary. The GLOMOs have become synonymous with industry leadership, celebrating the most impactful advancements and contributions to the sector. With over 200 independent judges and 33 awards spanning various categories, the GLOMOs have recognised innovation and achievement in the mobile and digital industries.

This year, the GLOMOs are introducing a new seventh category – Marketing Excellence. This category, said GSMA, will recognise outstanding achievements in event activation and marketing campaigns, highlighting the growing role of creative marketing strategies in shaping the future of the digital world.

Under the umbrella event theme of Converge. Connect. Create, this year’s show and conference programme will spotlight technological and digital change across the themes of Our Digital DNA, Game Changers, Enterprise Reinvented, Connect X, 5G Inside and AI+. Participants will engage in summits and discussions, including the GSMA Ministerial Programme, which focuses on transformative policies and practices for the industry.

New for this year, MWC25 Barcelona will feature stages named in honour of trailblazers and tech luminaries, including Katherine Johnson, Guglielmo Marconi, Alan Turing, and Hedy Lemarr. Industry titans, technology pioneers and CEOs from companies like **Agility Robotics, the B-Team, Bharti Enterprises, Lenovo, the London Business School, Telefonica, Telstra, TIME** and **Women in AI** will deliver keynotes – with many more to be announced.

Start-up ecosystem

The event will also feature the 4YFN platform, which has helped power the startup ecosystem for over ten years. Under a dedicated show theme of AI XL, including AI technology keynote speakers, 4YFN will host seven programmes designed to turbocharge the business plans and visions of startups and investors: Digital Health, Green Tech, Fintech, Universities Spin Off, Founders, Investors, and Corporate Innovators.



The 4YFN Awards will recognise five finalists in categories including Digital Health, Green Tech, Fintech, Digital Horizons, and Mobile Frontiers, with an overall winner announced at the show on 5 March 2025.

Hall 6 will feature the MWC conference district, dedicated to bringing leaders together across a range of collaborative networking areas, auditoriums and VIP lounges.

Talent Arena

Public-private foundation Mobile World Capital Barcelona is bringing Talent Arena to MWC25 Barcelona, a hub for learning, networking and career development, co-located at Fira Montjuic. Talent Arena will bring together developers, leading tech companies, and educational institutions, creating a dynamic environment for learning, networking and professional growth in digital technology. Spanning three days, attendees will immerse themselves in workshops, live technology demos and multiple hackathons. Also, it is offering over 200 expert speakers sharing their insights on the digital talent ecosystem, emerging technologies and industry trends.

Talent Arena will address key topics such as artificial intelligence, software engineering, cloud computing, cybersecurity and future technologies around quantum computing, microchips or NewSpace. Additionally, themes related to sustainability and the management of digital talent, in an increasingly demanding environment, will also be discussed.

Here comes the Woz

Among the 200 speakers at Talent Arena are **Apple** co-founder Steve Wozniak, former world chess champion and AI promoter Garry Kasparov, **Google** vice-president of product Xavier Amatriain, open-source expert and former ►

Talent Arena will address key topics such as artificial intelligence, software engineering, cloud computing, cybersecurity, and future technologies around quantum computing, microchips or NewSpace



MWCTM

GSMA

The Sports Tomorrow Congress, an innovation-focused sports conference run by the Barça Innovation Hub (BIHUB), is also being held at MWC25 Barcelona

Microsoft Azure Office executive Sarah Novotny, and the head of AI at **Meta** Cristian Canton. Companies will showcase success stories and technological advancements, providing developers with valuable insights, while attendees will have the opportunity to learn about educational offerings in their sector and tools for excelling in recruitment processes.

Key highlights of the event include the GSMA Open Gateway hackathon, a global initiative designed to foster innovation in programmable networks using APIs, and enabling participants to develop collaborative technological solutions. The GSMA Open Gateway DevCon will also move to Talent Arena. This developer-focused summit, led by the GSMA, will showcase the potential of network APIs and their ability to revolutionise digital experience development.

Sports experts

The Sports Tomorrow Congress, an innovation-focused sports conference run by the **Barça Innovation Hub (BIHUB)**, is also being held at MWC25 Barcelona. The event brings together global experts in R&D and technology to discuss the future of sports.

The event is made possible thanks to a strategic partnership between **FC Barcelona** and GSMA. This year, BIHUB is taking its presence at MWC a step further with a dedicated space at 4YFN, which showcases the startup ecosystem. This will provide startups supported by BIHUB with a new way to present their projects to a global audience. In parallel, BIHUB is also collaborating with GSMA Foundry, the organisation's innovation hub, to work jointly on upcoming projects in this field.

FC Barcelona's Center of Excellence is playing an important role at the 2025 Sports Tomorrow

Congress, by showcasing experiences in relation to talent management for athletes, thus sparking discussions about the present and future of the football industry, said the organisers.

In addition, Diversity for Tech, brought to MWC25 with the sponsorship of EY, brings together thought leaders to inspire and connect through a programme of roundtables and fireside chats to share solutions to help drive progress for equality, diversity and inclusion.

And, with thanks to Barcelona City Council and Mobile World Capital, Beat Barcelona is back for its fourth edition, where you can experience Barcelona's music, tapas and drinks in an atmosphere designed for networking in a relaxed setting. Find it across the two gardens in the upper walkway of Hall 8.1.

Interesting developments

On the run-up to MWC25 Barcelona, there have been some interesting announcements linked to IoT and 5G.

On the industrial IoT/5G front, **Jaguar Land Rover** is accelerating industrial connectivity at its Solihull, UK plant with the implementation of **Ericsson** Private 5G. The networking technology is enhancing the production of **Range Rover** vehicles by supporting business-critical applications, such as vision systems, IoT sensors, and production tools.

Using Ericsson's "high-speed, low-latency, and secure" private 5G solution, JLR says it is setting new standards in modern automotive manufacturing. The deployment of Ericsson Private 5G is a pivotal step for JLR in embracing Industry 4.0. JLR says it is creating a more agile and innovative manufacturing environment to support IoT devices, artificial intelligence and automation, with an eye towards automated guided vehicles (AGVs).

The limitations of traditional wired networks drove JLR to cut the copper, it says, replacing those networks with Ericsson's 5G capabilities. The transformation ensures that JLR's manufacturing processes are not only connected, but also agile and efficient, leading to streamlined operations.

Through the enhanced connectivity, maintenance and production managers can now turn data insights and simulations into tangible operational efficiencies with DataOps platforms such as **Litmus**. Consolidating and analysing data empowers JLR decision-makers on the factory floor to quickly innovate and optimise manufacturing processes. Additionally, private 5G enables JLR to quickly swap and provision new or broken connected tools, significantly reducing downtime and enabling quicker modifications to the production line. ▶





Fujitsu has partnered with Ericsson to deliver the connectivity at the Solihull plant. The collaboration promises to pave the way for JLR to explore additional use cases at its other sites in the future.

Stephen Mason, product manager, manufacturing, global IT at JLR, says: "It is crucial for us to equip our teams with the tools and connectivity necessary to optimise efficiency. Ericsson Private 5G provides a robust foundation for a connected, agile, and data-driven manufacturing environment. This positions us to enhance automation, digitalisation, safety, and sustainability across our operations."

Apples

A more unusual IoT story revolves around apples, and not iPhones. **BeeHero**, a pioneer in data-driven precision pollination, has expanded the application of its Pollination Insight Platform (PIP) to the US apple market, providing growers with actionable, data-driven insights to optimise apple pollination strategies for improved yield and efficiency.

BeeHero's PIP empowers growers to address the unique challenges of apple pollination, where timing and precision are critical to fruit size, quality and overall yield. With more than 100 varieties grown in the US alone, apples are particularly sensitive to the timing and efficacy of pollination, requiring careful coordination between bloom status, hive placement, and pest management to maximise fruit yield and quality.

Additionally, with the loss rate of managed honey bee colonies in the US exceeding 55%, ensuring optimal pollination is more crucial than ever. BeeHero's PIP delivers real-time data and predictive models to guide apple growers' decision-making, ensuring they can achieve the best possible outcomes without exhausting their pollination resources.

With BeeHero's "low-cost" IoT sensors placed throughout apple orchards, growers can monitor bloom progression and identify the optimal time for beekeepers to deploy hives. This ensures that bee pollination activity coincides with peak bloom status, thus preventing over-pollination.

By monitoring foraging activity throughout the bloom progression, PIP also provides insights into the best times for integrative pest management activities, helping growers avoid disrupting pollinators during peak activity periods. The bee activity PIP collects, combined with data on apple variety and yield projection, helps growers make informed decisions on hive placement and density to achieve optimal pollination coverage.

PIP's high-resolution heat maps also deliver visualisation of pollination activity in real-time, enabling apple growers to compare bee activity

directly to yield outcomes. These insights help growers strategically plan for future seasons, helping to support their business over time.

"Apple pollination is a delicate and time-sensitive process in which every moment counts. With PIP, we are equipping growers with the tools they need to make data-driven decisions that impact their ongoing and future seasons," says Itai Kanot, co-founder and chief growth officer of BeeHero. "By applying our advanced sensing technology to apple orchards, we're enabling growers to unlock new levels of efficiency and sustainability."

In relation to the fledgling satellite IoT market, **Eseye**, a provider of global IoT connectivity services, has announced a partnership with **Sateliot**, a leader in the IoT satellite connectivity market. Sateliot is dedicated to delivering reliable and global 5G from space IoT solutions, using advanced LPWAN satellite technology.

The partnership aims to enable seamless and ubiquitous global connectivity in locations where there is no cellular coverage from a mobile operator. It uses the new 3GPP Release 17 (Rel.17) standard to achieve multi-RAT (radio access technology) connectivity to non-terrestrial networks (NTN) from a single SIM solution.

Release 17 standardises using satellites with cellular modems and antennas, enabling connections to geostationary satellites and low earth orbit (LEO) constellations. Even in areas with poor terrestrial coverage, devices can switch to satellite networks, ensuring uninterrupted connectivity on highways, in forests, or in remote locations.

Sateliot is the first company to operate a LEO 5G/NB-IoT satellite constellation, and it claims it can connect 100% of the planet. "Our strength comes from being ahead in operations, sales, and regulatory compliance. While many competitors face challenges like landing rights or sales, Sateliot stands out because we started working on standards early, and have gained strong backing from the industry," says Gianluca Redolfi, Sateliot chief commercial officer.

Adam Hayes, chief operations officer at Eseye, adds: "Customers want their devices to connect, and by working with Sateliot we can extend coverage beyond the current cellular offer."

Last year's February show attendance of 101,000 was above the attendance of the 2023 show, with 88,500 attending then. With further forms of digital transformation to discuss, and the evolving key subject of AI to find out about in the mobile space, you wouldn't bet against a further increase in attendees for this year's show in March.

MWC25 Barcelona returns to the Fira Gran Via in Barcelona on 3-6 March 2025. ■

The partnership aims to enable seamless and ubiquitous global connectivity in locations where there is no cellular coverage from a mobile operator

www.mwcbarcelona.com

TRANSFORMA INSIGHTS

Global Advisors on IoT, AI and Digital Transformation

Every year Transforma Insights publishes its list of IoT 'Transition Topics' highlighting where we expect to see seismic change occurring during the year. This year the list focuses on the application of Artificial Intelligence to IoT, network technology transitions, changing commercial dynamics and the growing impact of IoT regulations.

Transforma Insights 2025 IoT Transition Topics

AIoT

Management and orchestration of
Distributed AI

eSIM orchestration vs connectivity
reseller

Monetising 5G (particularly SA) with IoT

Decision points and pivots in support for
LTE, NB-IoT and public LoRaWAN

Satellite IoT and likely disruption

Impact of regulations on delivering IoT
solutions

Geopolitics and polarisation of markets

Verticalisation of IoT

Market segmentation, channels and
partner programmes

To learn more about the Transition Topics, you can find more details in our press release:
transformainsights.com/news/transition-topics-2025

The Transition Topics will form the basis of a significant part of the research agenda for the Transforma Insights Advisory Service in 2025, as well as sponsored Position Papers and Virtual Briefings. To learn more about our 2025 Research Agenda, or to discuss sponsorship opportunities, please contact us at enquiries@transformainsights.com



ANALYST REPORT
**eSIM/eUICC evolution with
SGP.32 and why it doesn't solve
every IoT connectivity need**

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Introduction

Until 2016, cellular connected devices were authenticated onto a network using a removable plastic SIM card. This wasn't particularly appropriate for many IoT use cases, which required a more ruggedised form factor. The machine form factor (MFF, now MFF2) was launched, comprising a chip to be soldered onto the circuit board of the device. As a result of this change in the physical form factor, it was necessary to develop the capability to change the SIM profile through a mechanism other than physically swapping SIM cards. That mechanism is remote SIM provisioning (RSP), i.e. remotely switching profiles over-the-air without needing to access it physically. This combination of changing hardware and remote SIM provisioning service is collectively grouped under the terms embedded universal integrated circuit card (eUICC) and embedded SIM (or eSIM), writes Matt Hatton, a founding partner of Transforma Insights



Matt Hatton
Transforma Insights

Based on the requirement for remote SIM provisioning, the GSM Association developed a set of standards. The SGP.02 (or "M2M") standard was introduced in 2014, adopting a 'push' model, whereby the MNO/MVNO (or often an outsourced SIM vendor partner such as **G+D**, **Kigen** or **Thales**) controls the process end-to-end. This was followed in 2016 by SGP.22 ("Consumer") where the end user can 'pull' a new profile from a chosen provider down to the device.

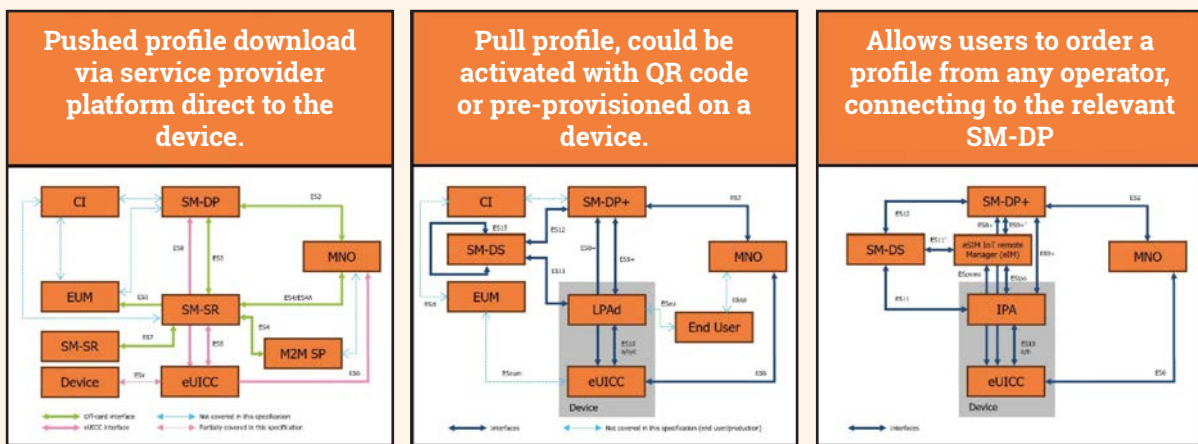
In May 2023 a third variant of the eSIM remote SIM provisioning standards from the GSMA was unveiled. The SGP.32 ("IoT") variant was aimed at resolving some of the limitations of the earlier SGP.02 and SGP.22 versions. The finalisation of the testing and certification processes is due in early 2025 and compliant devices can be expected later this year. ▶



M2M (SGP.02)

Consumer (SGP.22)

IoT (SGP.32)



SM-DP (Subscription Management Data Preparation) – stores eSIM profiles and prepares for download
 SM-SR (SM Secure Routing) – establishes secure channel to the eUICC to manage it.
 SM-DP+ (SM Data Preparation and Secure Routing) – both elements handled through a single platform
 SM-DS (Discovery Service) – optional add on for Consumer, where SM-DP+ address is unknown to eUICC
 LPA (local Profile Assistant – local profile to communicate with SM-DP+ located on SIM or device

Figure 1: GSM Association standards for eSIM remote SIM provisioning (RSP)

[Source: Transforma Insights, 2024]

This report explores some of the implications of the availability of remote SIM provisioning and particularly the new SGP.32 standard.

SGP.32 gives more freedom to customers

Each of the three RSP standards establish slightly different mechanisms for the user or owner of a device to change the SIM profile while the device is deployed in the field. There were several limitations to the first two standards. SGP.02 is managed by the connectivity provider and requires its approval to initiate switches, as well as integration between the SM-DP platforms of the two operators. There is therefore a form of lock-in for the customer to the provider and a lack of control for that customer. Meanwhile SGP.22 was designed for a

device being used by a person. It required the scanning of a barcode (and thus was limited to devices with a camera onboard), manual intervention via an advanced UI, and a device supporting SMS (which some IoT-oriented technologies do not).

SGP.32 solved some of these problems. In doing so it effectively adapted the SGP.22 approach to be managed remotely. Instead of a local profile assistant (LPA), which the user would use directly to initiate profile changes, it incorporates an IoT profile assistant (IPA) sitting on the device, being controlled by an eSIM IoT remote manager (eIM) which is hosted by a network operator or other third party. Using this IPA/eIM, the customer (or someone acting on their behalf) would be able to pull a profile from any MNO/MVNO (assuming that operator agrees). There is no requirement for the current MNO/MVNO to agree to the migration and/or integrate with the would-be recipient operator. ►



What are the implications of the arrival of SGP.32?

In this report we will focus on the impact on the shift from SGP.02 to SGP.32 for enterprise deployments. This is the most significant change, although we do note that for consumer product OEMs a shift from SGP.22 to SGP.32 does offer some alternative options for remotely managing their subscriber devices. Compared to SGP.02, SGP.32 allows a customer to switch its IoT connections (theoretically) to any connectivity provider it chooses without recourse to the operator upon whose SM-SR it resides. Nominally this change gives much more freedom to enterprise customers to 'at the click of a button' move some or all of their connections from one network to another.

Challenges with SGP.32

Transforma Insights notes many significant benefits stemming from the arrival of SGP.32. However, we also note that it is not a magic wand that will solve all the challenges of delivering IoT connectivity. For instance, any enterprise considering making use of SGP.32 should consider the following:

- **This is a brand new technology.** While there have been precursors, in the form of both SGP.02 and SGP.22 (plus proprietary versions of the latter which imitate SGP.32 very closely), SGP.32 is only finalised in Q1 2025. As such there are potential unknowns about how it works in practice. And, we should note, with nearly a decade between its initial introduction and the adoption of new standards, eSIM has been slow and limited in reacting to market changes and needs.
- **Variable support between MNOs.** The extent and mechanism for support of SGP.32 varies between MNOs. For instance, in some cases the MNO will allow a third party to host the eSIM profiles, whereas in the case of others it will not. This lack of consistency can create some complexity for deployments.
- **The need to strike network contracts.** If a device owner wishes to port its connection to another network, it must have a commercial relationship with the recipient connectivity provider. This constrains the appeal of the technology to those customers who have relationships with more than one carrier (and potentially dozens), which might be the case with car makers or other big buyers. For relatively small customers, and/or those connecting devices in many countries, this represents quite a logistical headache, managing potentially dozens of connectivity contracts. It also may require an integration with a new connectivity management platform (CMP), management of a billing relationship with each MNO, management of an inventory of profiles, and the need to maintain relationship with multiple MNO support teams.

- **Negotiating power.** A single customer for relatively small numbers of connections in each market will have limited negotiating power compared to an MNO relying on reciprocal roaming agreements or MVNOs with much larger volumes of devices within in any given market. Therefore in many cases it would be better for the buyer to procure connectivity via a third party acting on their behalf, as a managed service. This means the commercial dynamics will be quite similar to those currently seen between enterprise customers and MNOs/MVNOs today.
- **Back-end integration.** Even where a user might have commercial relationships it's not generally simply a case of switching between providers seamlessly. There will be a requirement for back-end integration and other process changes, for instance to manage VPNs, change APN settings, establish frequency of polling for new profiles, or handle different SLAs. This is a non-trivial task, and one that will need to be performed simultaneously with the eSIM profile switching.
- **Regulatory compliance.** One of the main reasons for using SGP.32 (or any form of RSP) is that it allows for localisation onto a local network and thus ensuring compliance with 'permanent roaming' restrictions. However, SGP.32 does not in itself ensure this. It requires that the profile onto which the connection is localised is itself compliant. Not only that, but there is a much wider set of compliance considerations beyond just localisation of the connection, for instance related to know-your-customer (KYC) or data sovereignty rules.
- **Cost.** There is an additional cost associated with profile switching and profile hosting, which could be as much as USD1/month per profile.

The underlying conclusion regarding SGP.32 is that it is a very useful tool, but it comes with several associated costs. Furthermore, it is one that is best delivered as a managed service with a wrapper around the remote SIM provisioning to address the issues identified above. And, furthermore, one which allows for an on-ramp to what is a new technology.

There will continue to be a diversity of approaches. The arrival of SGP.32 – and the other preceding remote SIM provisioning technologies – provides a very useful set of tools for addressing some of the challenges of cellular-based IoT connectivity. However, we should note that there are numerous other options, each of which might be at least as appropriate.

The use of a single IMSI SIM will often provide perfectly adequate connectivity. In fact, in many ways it will be simpler, with all connections being managed on the same core network and via the same connectivity management platform, rather than localised onto multiple operator networks and managed through multiple ►



platforms. This type of SIM could be a single country IMSI, using a domestic operator, but more likely it will be a roaming SIM, often using an MCC-901 non-geographic country code. Such roaming SIMs can take advantage of national roaming. There are good reasons for localising connectivity using RSP, particularly for high bandwidth use cases and/or where there is a regulatory requirement to do so. But that does not account for the majority of connections.

Beyond this is the option to use a multi-IMSI SIM. Such a SIM includes multiple operator IMSIs pre-loaded onto the device and therefore available for supporting the connection at any time. In circumstances where a device might need only a limited number of options, then the multi-IMSI can be a perfectly adequate solution. And even

where there are regulatory challenges, it can include profiles that are compliant in 'difficult' markets. This is a non-standards-based approach and therefore typically not favoured by MNOs, but many MVNOs do provide such a service. However, it is a tried and tested technology in the market the flexibility of which has been proven for more than a decade. While eSIM might have advantages in terms of compliance and better performance through the use of local profiles, multi-IMSI is typically cheaper, with often better network coverage and availability.

One of the more popular approaches to delivering multi-country connectivity is by way of a multi-IMSI solution which also includes the ability to remotely provision the SIM with additional new profiles if they are required.

Conclusions: Hybrid approaches and the right partner

Transforma Insights expects that devices managed via remote SIM provisioning will grow rapidly over the next decade but will remain the minority of new connections over that period, albeit approaching 50% at the end of it. SGP32 will become the de facto standard for remote SIM provisioning (RSP) based on the fact that it overcomes many of the limitations of SGP.02 and SGP.22. However, there will be numerous scenarios in which other approaches to connectivity will be appropriate. The same is also true of the tried-and-tested multi-IMSI, which will be appropriate for many types of IoT deployments. Combining the two can create a robust and versatile solution. Using an eSIM with a Multi-IMSI SIM as the first profile allows organisations to enjoy the extensive coverage and cost-efficiency of multi-IMSI solutions while also capitalising on the compliance, performance and flexibility of eSIM technology.

The best approach for enterprises wishing to procure cellular-based IoT connectivity is not to 'hit and hope' by trying to pull together their own SGP.32-based connectivity proposition. For all of the reasons stated above, a better approach is to seek out a trusted vendor that has a portfolio of offerings – including SGP32 and other options – from which the most appropriate can be selected. Such a vendor should additionally be able to provide a wider set of support on topics such as compliance, data management and deployment optimisation. ■



Nuh! Digital partners with floLIVE to deliver comprehensive connectivity across Brazil

The business impact of floLIVE

Optimal geographic coverage in Brazil

Full coverage across all three major regional networks ensures unmatched quality of service

One solution for global connectivity

Complete connectivity worldwide, including comprehensive core network, CMP and BSS

A lucrative new revenue stream

Reselling connectivity in Brazil by jumping the hurdles of permanent roaming restrictions

Founded in 2018, Nuh! Digital is a Brazilian mobile virtual network operator (MVNO) committed to promoting digital inclusion. The company provides affordable mobile broadband and eSIM services, prioritising underserved communities and helping bridge the digital divide. Through its collaboration with the 'Internet Brasil' programme, Nuh! Digital supplies free SIM cards to public school students from low-income families, widening educational opportunities and supporting digital literacy

Nuh! Digital was looking to expand its offerings and to become the gateway for Brazilian connectivity, facilitating the success of other MVNOs and enterprises in the region.

The challenge

In Brazil, roaming regulations are a challenging barrier to entry for foreign service providers, requiring companies to have partnerships with local mobile operators instead. Permanent roaming is not allowed, and after a grace period of 90 days, devices are disconnected from the radio access network (RAN) automatically. This makes providing IoT and mobile connectivity services in Brazil a significant challenge. For service providers who want to expand their connectivity services into the region, localised connectivity is essential. However, even with localised connectivity in place, Brazil covers 8.5 million square kilometres, making it impossible for any single MNO to provide comprehensive coverage.

Nuh! Digital had established access to the **TIM** and **Vivo** networks through MVNO agreements. However, to consolidate access to these networks on a single SIM and enable multi-IMSI functionality, it partnered with **floLIVE**. This collaboration included establishing a core network connection with **Claro**, ensuring direct access and comprehensive coverage across all three major networks in Brazil. By utilising floLIVE's

advanced solutions, Nuh! Digital can seamlessly manage connectivity within a unified environment, empowering enterprises and service providers with reliable and scalable operations.

Nuh! Digital started looking for a solid partner already operating in Brazil with the key local MNOs who could expand its coverage, deliver an integrated, scalable and compliant solution to ease operational overheads, and who offered:

Complete core network functionality: While some core network vendors only offer certain components of a core network, Nuh! Digital wanted a complete and comprehensive solution for connectivity, with all 4G components (including: HSS, HLR, DRA, STP, SMSC, PGW, GGSN, PCRD, Radius).

Simplified operations: The solution should include a full CMP to manage devices, providing a single dashboard to manage tasks including SIM provisioning, monitoring and troubleshooting in case of any issues with devices, and easy integration with their BSS through a robust API suite.

A truly global solution: While Nuh! Digital's own devices would be distributed within Brazil, it recognised the global nature of IoT, and wanted to be able to serve its own customers' needs. Any devices manufactured globally would need ►

Nuh! Digital started looking for a solid partner already operating in Brazil with the key local MNOs who could expand its coverage

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connectivity at production sites to perform testing and validation. As a result, on top of local coverage in Brazil, global connectivity was a crucial piece of the puzzle.

A smart business choice: By reselling connectivity services to other MVNOs and enterprises Nuh! Digital would add a direct revenue stream. Additionally, to reduce operational costs and financial risk, a pay-as-you-grow business model was essential — where the business only paid for active devices.

“We chose floLIVE because they understand our vision to be the gateway for Brazilian connectivity. We truly want to bridge the digital divide, and the core infrastructure floLIVE offers makes that seamless — localised connectivity which is completely compliant, global coverage which provides ultimate scalability, and a single vendor that does it all, turning complexity into transparency and control.”

- **Laerte Magalhães**, CEO, Nuh! Digital

The solution

By adopting floLIVE's solutions, Nuh! Digital has positioned itself as a market leader offering nationwide connectivity in Brazil, enabling enterprises and service providers to thrive in a heavily regulated environment but among the largest mobile markets in the world.

Key elements of the solution include:

- **Access to Claro IMSIs:** Nuh! Digital can now offer full coverage across all major networks in Brazil — TIM, Vivo and Claro. This integration allows all networks to operate within the same core network and SIM card, ensuring optimal geographic coverage, as well as offering network switching and traffic distribution if

one or both of their existing network experiences bottlenecks or downtime.

- **Global reach:** By using floLIVE's IMSI library, Nuh! Digital can resell connectivity to other MVNOs and enterprises, providing compliant access to local connectivity in multiple regions. These new customers can manage their IoT deployments globally, without entering into direct MNO agreements — a powerful competitive edge for Nuh! Digital as they streamline operations with one solution.
- **Comprehensive connectivity management:** With seamless CMP integration, Nuh! Digital can now manage their operations efficiently, with one SIM, one contract and one account for global connectivity. The CMP consolidates tasks such as SIM provisioning, monitoring and troubleshooting, reducing complexity down to a single dashboard.
- **Scalable operations:** floLIVE offers a robust infrastructure to allow Nuh! Digital to scale as they grow. A cloud-native model means no capex and all opex, a fully-integrated single solution streamlines operations, while usage-based pricing ensures the business only pays for active SIMs, removing the barriers to scale.

“By utilising floLIVE's advanced infrastructure, Nuh! Digital can now seamlessly expand its services and enable any company to become a global service provider. With floLIVE's multi-IMSI SIM technology, they can now access all three major networks in Brazil for strong local coverage while also ensuring seamless global connectivity. This allows them to offer compliant connectivity to MVNOs and enterprises, empowering them to fully participate in the digital economy - both in Brazil and beyond.”

— **Bill Wark**, senior vice president of Sales America, floLIVE ■

By adopting floLIVE's solutions, Nuh! Digital has positioned itself as a market leader offering nationwide connectivity in Brazil



www.flolive.net



Collaboration is the key to simplified, secure and standardised iSIM implementations

The success of integrated SIM (iSIM) relies on a strong ecosystem to enable simplified iSIM deployment, robust security and smooth progress towards standardisation. IoT Now interviewed Kigen, Murata, Sony and Vodafone Business IoT to learn more about their collaboration and to understand the benefits their efforts are bringing to customers.

Why have Kigen, Murata, Sony and Vodafone Business IoT collaborated to help bring iSIM to market?

Kigen: Kigen, Murata, Sony and Vodafone Business IoT have collaborated to bring iSIM technology to market primarily to address the increasing demand for secure, scalable and efficient IoT connectivity. This strategic partnership is driven by a shared vision to simplify and accelerate the deployment of IoT devices at scale.

From the moment iSIM was introduced, it was seen as a disruptive leap forward, drastically improving form factor and device performance. Over the years, these companies have continued to refine their collaboration, extending beyond the technology itself to address the broader pain points faced by manufacturers. By aligning their expertise, they ensure that the physical integration, logistical processes and secure provisioning of iSIM devices are as seamless as possible.

Kigen contributes its expertise in SIM security, ensuring that iSIM offers robust, tamper-proof connections essential for remote and sensitive applications. By combining their strengths, these companies aim to accelerate the adoption of iSIM technology, creating a more efficient ecosystem for IoT solutions where small size, long battery life and secure, scalable connectivity are paramount.

Murata: This partnership draws on each company's strengths to drive innovation while addressing security, cost efficiency and expanding use cases across various industries.

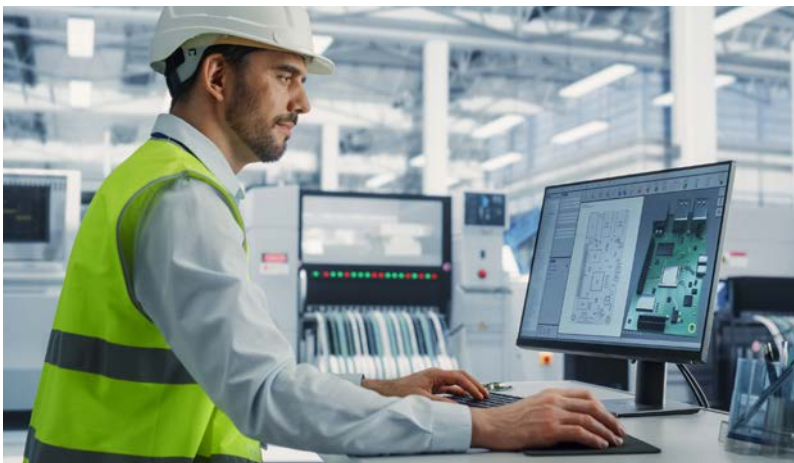
By integrating SIM functionality directly into Murata's iSIM module, the iSIM module enhances security and reduces manufacturing costs associated with traditional SIM cards. The collaboration also aims to accelerate adoption through shared standards and best practices while supporting sustainability initiatives by minimising waste from physical SIM cards. Together, these companies are positioned to offer comprehensive global solutions that cater to the evolving needs of connected devices in an increasingly interconnected world.

Main collaboration benefits:

- Seamless integration of components, logistics, secure provisioning and connectivity
- Cost and manufacturing efficiency
- Accelerated adoption and use case expansion for iSIM
- Enhanced sustainability
- Faster time to market for new devices with connectivity included

Sony: By joining forces, these industry giants can accelerate iSIM development and standardisation, benefit from their combined expertise to overcome technical challenges and create interoperable solutions that work across different platforms.

This collaboration addresses the market's demand for simplified integration of iSIM technology into IoT devices, reduced time-to-market for iSIM-enabled products and enhanced security features for connected devices. By uniting efforts, this collaboration is paving the way for widespread iSIM adoption, which promises to revolutionise IoT connectivity, improve device security and streamline manufacturing processes. This partnership demonstrates the power of industry cooperation in driving innovation and creating user-friendly solutions in the rapidly evolving IoT landscape. ▶





Vodafone Business: With more customers, traffic, SIM cards and use cases than ever before, the IoT industry is experiencing a large amount of growth and change. However, for some customers and sectors, there are still challenges to be addressed. For example, how do we enable ‘things’ as small as labels to be connected so that manufacturers can track their assets, or how do we increase the battery life of always-on devices like water meters. The integrated SIM (iSIM) tackles these emerging challenges head on, enabling IoT integration in smaller modules for smart labels, and improvements to manufacturing and logistics processes for low power devices.

iSIM impacts the entire value chain – from the chipset and module manufacturers to the connectivity and SIM suppliers. All these stakeholders needed to work together to develop the new iSIM hardware and make it available to customers, without any impact to their connectivity and network security capabilities. Additionally, we are collaborating to improve processes, reduce time to market, support developers with evaluation kits – and more – so that customers can take advantage of the benefits that iSIMs offer.

Hardware manufacturers want reliable IoT connectivity, connecting anything, anywhere, anytime in a secure, simple and scalable way. This means they are looking for an IoT Connectivity provider like Vodafone IoT with global expertise and experience, and the power to innovate. By collaborating with leading industry partners like Kigen, Murata and Sony, we’re able to connect the dots, end-to-end.

How important is it to build the ecosystem around iSIM and ensure all the different elements integrate smoothly?

Murata: Building a robust ecosystem around iSIM technology is vital for ensuring interoperability among various components, including hardware, software, and network infrastructure. Smooth integration enhances user experience by facilitating easier activation and management of connectivity services across devices, leading to greater user satisfaction. Furthermore, a strong ecosystem fosters collaboration among manufacturers, service providers, and developers, establishing common standards that accelerate market adoption of iSIM.

It also creates opportunities for innovation by enabling the development of new applications and services. In addition, maintaining high security standards and regulatory compliance is essential in sectors like healthcare and logistics. Lastly, an integrated ecosystem allows for scalable solutions that can evolve with changing demands. Overall, a well-structured iSIM ecosystem drives operational efficiency while promoting innovation in an increasingly connected world.

Sony: Developing a robust ecosystem around iSIM and ensuring smooth integration of all elements is crucial for its widespread adoption and success.

The importance of this ecosystem cannot be overstated, as it directly impacts the technology’s effectiveness and market penetration.

We see six key reasons why building this ecosystem is vital:

1. **Interoperability:** A well-integrated ecosystem ensures that iSIM solutions work seamlessly across different devices, networks and platforms.
2. **Scalability:** A cohesive ecosystem allows for easier scaling of iSIM technology, enabling its implementation in various IoT applications.
3. **Security:** Integrated elements can provide enhanced security features, crucial for protecting sensitive data in connected devices.
4. **User experience:** Smooth integration leads to better user experiences, encouraging adoption by both manufacturers and end-users.
6. **Cost-effectiveness:** Streamlined integration reduces implementation costs, making iSIM more accessible to a broader range of businesses.

By prioritising ecosystem development, stakeholders can accelerate iSIM adoption and unlock its full potential in the IoT landscape.

Vodafone Business: The SIM card industry requires high security, and precise and agile information exchange throughout the value chain so that high volumes of SIM orders can be fulfilled with the security and low lead times that customers require. As the iSIM is embedded into the module hardware, the SIM manufacturing process, and relationships ecosystem extend to the chipset and module manufacturers. Therefore, we must work together to have the ecosystem and processes in place to achieve the same security standards and lead times that customers expect from the traditional SIM model.

Kigen: For OEMs and device manufacturers, bringing IoT devices to market is a complex endeavour involving months of planning for hardware production, global supply chain coordination and distribution management. These processes are compounded by the need for robust security, energy efficiency and durability, especially as IoT devices are expected to operate securely and reliably for 15-20 years in critical enterprise applications. These factors go to illustrate why all different elements need to be driven by an ecosystem supporting the customer, as we can bring complementary expertise to support scale.

However, to realize iSIM’s potential, all ecosystem elements – from hardware components and network providers to security frameworks and software platforms – must work in harmony. This cohesive ecosystem not only accelerates iSIM adoption but empowers industries such as energy, asset tracking and logistics to utilise IoT solutions with confidence, knowing that the combined expertise of Kigen and its partners provides the secure, efficient connectivity essential for smooth and scalable IoT deployments. ►

iSIM impacts the entire value chain – from the chipset and module manufacturers to the connectivity and SIM suppliers



Every iSIM produced follows the rigorous secure iSIM generation and secure profile distribution where network keys are fused with root of trust credentials offering a hardware root of trust

Key ecosystem advantages:

- Increased innovation opportunities
- Simplified scalability for iSIM deployments
- Improved operational efficiency across the supply chain
- Faster lead times from device design to shipment
- Strengthened market confidence in iSIM

What have been the challenges of this initiative?

Sony: On the standardisation front, establishing industry-wide standards for iSIM has been complex, requiring consensus among various stakeholders. Technically, incorporating iSIM into existing device architectures and manufacturing processes has presented technical hurdles. Building a comprehensive ecosystem that supports iSIM across different platforms and use cases has been time-consuming and resource-intensive.

There are also security concerns: there are critical challenges in ensuring robust security measures to protect sensitive data stored on iSIMs

Another big challenge is market education: raising awareness about iSIM benefits and overcoming resistance to change from traditional SIM technologies takes quite some effort and is not straightforward. On top of that, there are the regulatory compliance requirements which always presents significant challenges: navigating diverse regulatory landscapes across different regions has complicated global rollout efforts.

Kigen: Every iSIM produced follows the rigorous secure iSIM generation and secure profile distribution where network keys are fused with root of trust credentials offering a hardware root of trust. This hardware backed security leverages the strong standards that have made SIM the de facto technology for authentication and provenance in smartphones, compute – the same functionality is possible with true iTRE (integrated Tamper resistant element) into the cellular module.

One way the companies have brought their expertise together is to streamline the physical components and the logical network provisioning so that when their chosen modules get to the production line, they are ready with the capability to personalise the devices with the right connectivity credentials. Working with chipset and module optimisations here means that manufacturers can serve multiple customers of device fleets.

Murata: Standardisation is a key hurdle, as achieving consensus among diverse stakeholders on industry standards complicates interoperability. In addition, there is a need for greater market awareness to educate potential users about the advantages of iSIM over traditional SIM solutions. Integration complexity poses another challenge, as incorporating iSIM into existing systems requires significant engineering efforts to ensure compatibility.

Regulatory compliance varies across regions and can complicate deployment. Security concerns also arise with new technology, necessitating robust protocols to mitigate vulnerabilities. Moreover, while Murata's iSIM module has long-term cost-saving potential, initial investment costs may deter adoption. Lastly, building a cohesive ecosystem that involves collaboration among manufacturers, service providers, and developers is essential but can be difficult to achieve. Addressing these challenges is crucial for successfully bringing iSIM technology to market and realising its benefits in various applications.

Major challenges addressed by this collaboration:

- Lack of iSIM standardisation
- SIM security weaknesses
- Regulatory compliance
- Inconsistent integration of components
- Fragmented logistics

How will users benefit from the work all four companies have done to create an appealing go-to-market model?

Vodafone Business: Thanks to our collaboration to equip customers with iSIM technology, customers benefit from the ecosystem and processes we have put in place:

- Customers can now purchase devices installed with connectivity subscriptions at the point of manufacture, removing the manual SIM card insertion process, and the risk of SIM tampering. ▶



Vodafone Business: SIM security is the main factor for any process related to SIM cards. It determines the manufacturing and information exchange processes that the connectivity providers and SIM manufacturers follow to maximise security and protect customers and their businesses. With iSIMs, all these security processes and procedures have been extended to the chipset and modules manufacturers, impacting their manufacturing and logistics processes. Adapting the processes throughout the value chain and making them efficient has been the focus to make iSIM products available to more customers in a secure manner.

In addition, chipset manufacturers have now added new GSMA security specifications into their chipset developments to store the iSIM information.



- The use of GSMA based solutions to conform with industry standards ensures that iSIMs have the same security levels as traditional SIMs for our customers whilst making deployments easier.
- Simpler manufacturing processes reduce costs and complexity; the amount of inventory needed, materials used, and the number of suppliers customers rely on.
- Processes to create products with lower power consumption, prolonging their lifetime - a critical factor for always-on meters and sensors.
- Smaller hardware can be IoT-enabled, now that we don't need to create space for traditional SIM cards. This allows new use cases like smart labels to become a reality.

We are working hard to ensure hardware producers are embedding iSIMs in all new chipsets and modules, giving customers access to connectivity from the get-go. Having Vodafone's global footprint and our managed connectivity capabilities in the iSIM hardware creates a simpler, secure and more efficient ecosystem.

Kigen: By eliminating the need for physical SIM cards and slots, iSIM technology enables smaller, more power-efficient devices, which is advantageous for IoT applications in healthcare, logistics and smart cities where space and power are often limited. In addition, the remote provisioning capabilities of iSIM reduce the need for manual intervention, meaning that devices can be deployed and managed more efficiently, even across regions with varying network providers. This capability significantly lowers the logistical complexity and cost of deploying IoT devices at scale.

Finally, with Kigen's focus on advanced security, users can trust that their devices and data are well-protected, even as they connect over different networks worldwide. The work of all four companies has created a go-to-market model that is streamlined, secure and designed to make IoT more accessible and effective for businesses and end-users alike.

Significant user benefits:

- Trusted devices and data
- Reduced cost and complexity
- Ability to buy devices with connectivity subscriptions already installed
- Better security thanks to no plastic SIM card
- Enablement of new use cases

Murata: This partnership enables seamless connectivity across devices without the need for physical SIM cards, simplifying the user experience. Enhanced security measures will protect user data and communications, particularly in sensitive sectors like healthcare.

The initiative aims to reduce costs associated with traditional SIM solutions while facilitating faster deployment of iSIM-enabled products. Moreover, it promotes diverse use cases across



industries such as smart cities and logistics, enhancing user experiences. By using Vodafone's extensive network infrastructure alongside Murata's hardware capabilities, users can expect reliable connections globally. Lastly, simplified management through unified platforms will allow for easier remote provisioning and monitoring of devices. Overall, this collaboration enhances the value proposition of iSIM technology by delivering secure and efficient connectivity solutions tailored to modern needs.

Sony: Users will significantly benefit from the collaborative efforts of Kigen, Murata, Sony and Vodafone Business IoT in creating an appealing go-to-market model for iSIM technology.

Customers will enjoy simplified adoption: The unified approach streamlines the integration process, making it easier for businesses to implement iSIM technology. Cost is a fundamental consideration in any design, and as such, the cost-effectiveness of the solutions are of great benefit. Economies of scale and standardised solutions reduce implementation costs, making iSIM more accessible to a wider range of users.

On the technical aspects, enhanced security and device performance will improve. Customers will benefit from collaborative efforts to ensure robust security measures are in place, protecting user data and devices more effectively. Optimised iSIM solutions can lead to better battery life and more efficient connectivity in IoT devices.

Also on the operations side, there are several benefits: compatibility will improve as the ecosystem approach ensures iSIM works seamlessly across various platforms and networks. Time to market will shorten as standardised solutions and support from industry leaders accelerate product development cycles.

In addition, one of the core requirements for global connectivity will improve: users will benefit from improved international roaming capabilities and simplified device management.

This collaborative model ultimately delivers a more user-friendly, secure and efficient iSIM experience for businesses and consumers alike. ■

We are working hard to ensure hardware producers are embedding iSIMs in all new chipsets and modules, giving customers access to connectivity from the get-go



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Executive summary

An archetypal IoT device experience is the Wi-Fi-connected smart washing machine, where the user has to onboard it onto a network themselves. This is not conducive to a world of industrial (and consumer) devices where connectivity needs to be instant, out-of-the-box and without intervention anywhere around the world, such as in global trackers, metering, automotive or products with a global customer base. The need of various connected devices to have smaller form factors, be always-on and fit within cost limitations has led to the innovation of the integrated SIM (iSIM). This technology simplifies and opens up cellular connectivity to new adopters and a new set of buyers that don't need to be IoT connectivity experts.

The iSIM provides an efficient alternative to traditional, cellular SIM cards that allows original equipment manufacturers (OEMs) to integrate SIM functionality into devices rather than requiring enterprises to retrofit cards at the point of deployment. The iSIM is the fusion of the chipset, radio, security and connectivity – meaning the device is connected right away from the time of deployment. ▶

Close to one million iSIMs will soon be deployed with hundreds of millions in deployment by the end of the decade supporting everything from vending machines to ride-sharing vehicles



An ecosystem that enables smooth integration of the system-on-chip, module, secure iSIM package and, of course, the cellular connectivity is needed to abstract away the complexities for device developers, manufacturers, operators and owners. By achieving this, iSIM adoption can be achieved in frictionless, simple processes, greatly accelerating time-to-market for devices and delivering a series of operational, financial and performance advantages.

These benefits include greatly simplified device onboarding because no physical SIM cards need to be installed by local engineers. In addition, there are significant advantages for the IoT or device manufacturer: an iSIM takes away the need for components such as SIM trays and the need for device designs to contain slots for SIM cards. The iSIM itself brings together the chipset, operating system, secure element and connectivity subscription delivering frictionless global connectivity out-of-the-box while simplifying manufacturing and logistics and removing

barriers to entry. Customers are assured of the best available cellular connectivity to fulfil their needs backed by a strengthened trust network.

Close to one million iSIMs will soon be deployed with hundreds of millions in deployment by the end of the decade supporting everything from vending machines to ride-sharing vehicles. iSIMs are cost-efficient, secure and robust and therefore have significant attraction to use cases across the Internet of Things (IoT). Coming to market combined with low power wide area (LPWA) technologies, such as narrowband-IoT (NB-IoT) and LTE-M, iSIM helps to deliver greatly simplified, ubiquitous connectivity to support a new generation of connected devices.

This report sets out how iSIMs can help simplify your IoT deployment and details how leading providers of chipset, operating system, secure element and connectivity are collaborating to provide the market with easily-accessible iSIM capabilities to support mass-market deployments.

Introduction

As enterprises and IoT manufacturers adapt their products to engage with the ever-increasing demand for connected goods and services, there's a need to simplify connection to cellular networks. Organisations want to digitise, automate and modernise their operations, harnessing artificial intelligence (AI) to optimise processes. Secure, robust connectivity is a fundamental enabler of the communication and data flows that IoT devices rely on, and iSIM attributes more closely match the needs of today's connected devices. Traditional SIM cards needed to be installed at the point of deployment, adding cost and management burdens, but iSIM enables devices to be shipped ready to connect out-of-the-box.

iSIM is the next generation of SIM technology with the potential to revolutionise cellular IoT connectivity forever. It moves the SIM from a separate chip into a dedicated silicon area which sits alongside the application processor and/or cellular radio on a purpose-built system-on-chip (SoC). Within this, the secure iSIM package, a digital bundle that binds an operator subscription to a module and loads it into the device's secure enclave, integrates SIM functionality directly into a device's main processor. Importantly, this design provides a higher level of security to protect sensitive data and credentials. In addition, this decreases the number of components in a device, reducing its overall threat surface.

This leaves enterprises free to ship devices that already include SIM functions so they can be configured remotely to access connections wherever they are deployed. Key benefits include easy management of device fleets with no need for installation of local SIM cards. This greatly simplifies product manufacture and stocking because it removes the need to create regional variants of products. Products with iSIMs can have a single stock-keeping unit (SKU) number rather than previously requiring national or regional variants to be manufactured and distributed. ►



Projected Growth of xSIM-capable Device Shipments (2020-2030)

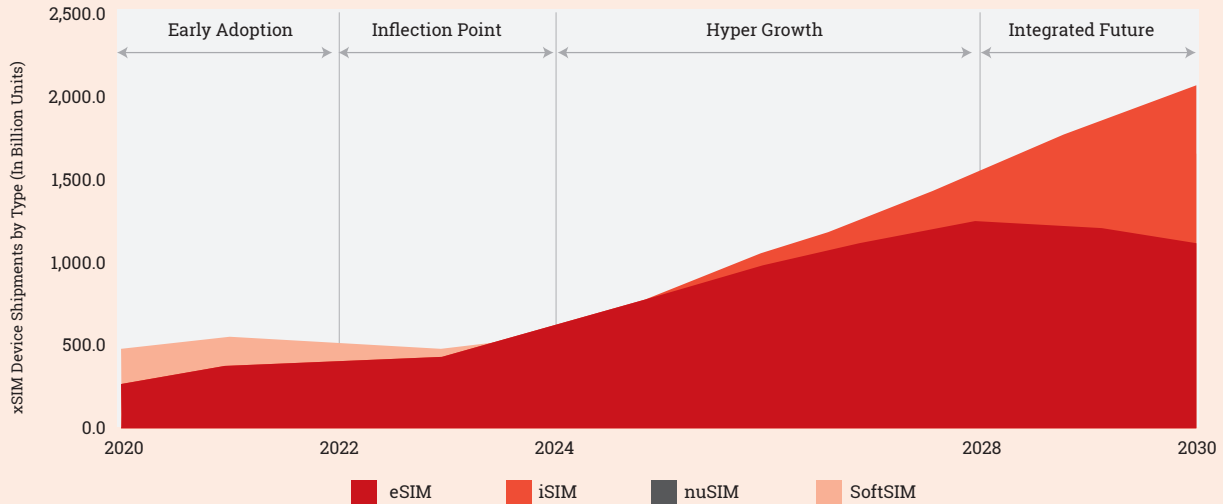


Figure 1:
Source: Counterpoint Research

iSIM benefits spur high-volume adoption

The blend of cost efficiency, manufacturing and operational simplicity, low power consumption and form factor optimisation that iSIMs offer will see massive growth in the uptake of cellular technology. Analyst firm, Juniper Research, projects that the global number of iSIMs installed in connected devices globally will increase from 800,000 in 2024 to more than 10 million by 2026¹. That prediction only scratches the surface of the upside with the firm estimating that the number of iSIM connections will grow to 210 million by 2028.

Others see greater headroom. Kaleido Intelligence predicts iSIM connections will grow to more than 300 million shipments in 2027². From that point onwards, iSIM growth accelerates as organisations become more familiar with its benefits and the ecosystem around iSIM continues to make iSIM more accessible by providing simplified iSIM offerings that bring together the chipset, operating system, secure element and connectivity as a consolidated offering. This combined approach simplifies procurement and helps to accelerate time-to-market for IoT deployments, delivering competitive advantage and helping to support greater profitability.

By 2030, Counterpoint Research also expects iSIM-capable devices to account for a significant portion of the cellular device ecosystem³ as iSIMs realise their potential to bring more efficiency to devices by lowering costs, size and complexity. In **Figure 1**, the firm projects that iSIM-capable devices will see shipment volumes rise at a CAGR of 160% in the period 2024-2030. Figure 1 illustrates the immense market appeal of iSIM with iSIMs in two billion devices by 2030. This growth comes while technologies such as nuSIM struggle to achieve sufficient

volume to be noticeable on a chart of this scale (it is expressed as a very thin grey line above iSIM towards the upper right half of the chart) The chart also shows the adoption of Soft SIM dwindling in the mid-2020s.

iSIM presents positive disruptions to IoT device design

This growing appeal underlines how iSIM is increasingly being seen as a disruptive technology for IoT. Integrating SIM functionality onto a chip enables OEMs to build tuned products and connected experiences supported by global networks with the security features needed to protect people and data everywhere. IoT use cases have unique requirements which the iSIM approach supports. These include SoC optimisation, extended battery life, and secure and robust connectivity. ▶

Benefits of the Integrated SIM

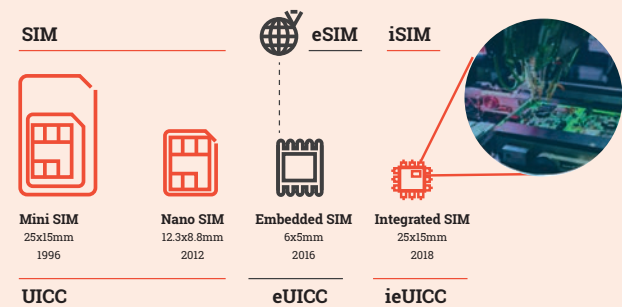


Figure 2: iSIM in comparison to other SIM variants

Source: Kigen

¹ <https://www.juniperresearch.com/press/pressreleasesover-10m-global-isim-devices-forecast-within-two-years/>
² <https://kaleidointelligence.com/esim-connections-to-exceed-4-5-billion-in-2027-driven-by-an-expanding-consumer-market-kaleido-intelligence/>
³ <https://www.counterpointresearch.com/insights/over-9-billion-esim-capable-devices-to-be-shipped-by-2030/>



Time to market for IoT-connected products

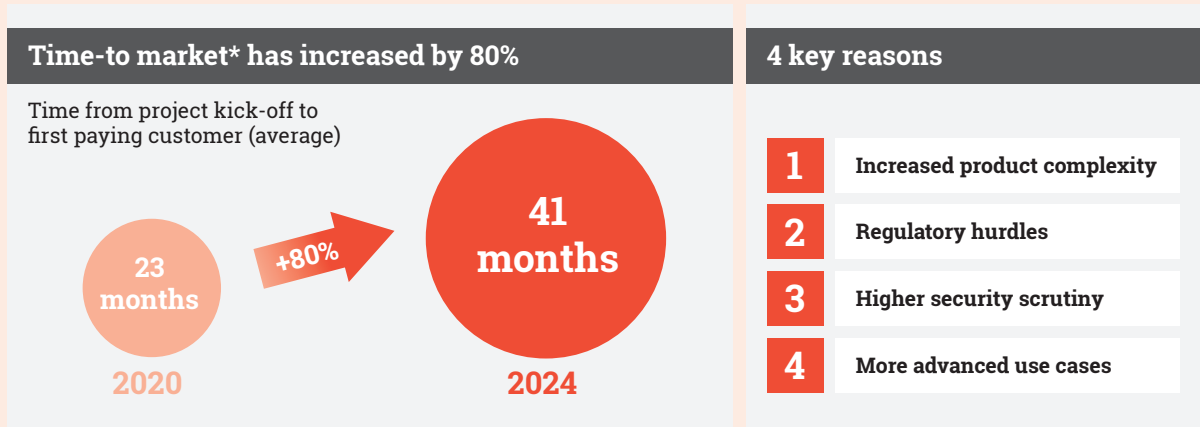


Figure 3: Time-to-market has increased but iSIM can help reverse the trend

Source: IoT Analytics

Cost benefits drive appetite for iSIM

iSIMs bring strong benefits that simplify the production, deployment and design or repurposing of connected devices, such as:

- Reduced bill of materials (BOM) costs
- Reduced costs of product development
- Reduced total cost of ownership (TCO)

By doing away with physical SIM card slot, product developers benefit from reduced BOM cost of overall design and achieve more compact end devices. Moving away from physical SIMs also increases the tolerance to environmental, vibrational and temperature cycles. However, some of the tacit costs of product development concern logistics, purchasing and production costs. iSIMs simplify the upfront negotiating and purchasing of separate physical SIM contracts, which is a huge saving in time to market.

In the macroeconomic climate of higher inflation, recent component shortages, and international trade policies, manufacturers are sensitive to import or export costs on components as well as long lead times, added complexity in meeting more robust certification, field trials and commercial regulatory compliance that can delay product introduction. Consideration also needs to be given to the volume of devices likely to be deployed and whether they need installation and maintenance.



Simplifying the connected product journey

IoT Analytics surveyed OEMs for their time to market for connected products in 2023 – from project kick-off to the first paying customer – and found, averaged over 41 months, an 80% climb since 2020. Deeper analysis reveals a richer picture. IoT has moved from the experimental to the commercial phase, meaning development now includes robust and more sophisticated systems testing, lab and field trials as well as the greater involvement of business departments alongside IT and technology units.

Increased time to market, however, is undesirable and organisations want to streamline development to ensure they can offset the effects of greater complexity, compliance with regulations and greater emphasis on security and data protection, as detailed in **Figure 3**. iSIM can help accelerate time to market by combining SIM functions onto the SoC, reducing the number of components required and the number of vendors involved. This reduction in product complexity, coupled with the security benefits that iSIM brings is expected to contribute to a reversal in the trend for long product development cycles.

Another aspect critical for OEMs' success with connected products is implementing secure connectivity. A study by Juniper Research predicts that the global installations of iSIM in connected products will grow more than 1,200% by 2026 because OEMs are starting to adopt iSIM technology because of the secure foundation for connectivity it enables to be built into the device from the start. Extensive work is being done by mobile industry trade body, GSMA to encapsulate iSIM security into standardisation efforts. Another upcoming GSMA specification is in-factory profile provisioning (IFPP) with SGP.41/42, which is anticipated to launch by the end of 2025. This is set to help improve the iSIM ecosystem and processes ▶

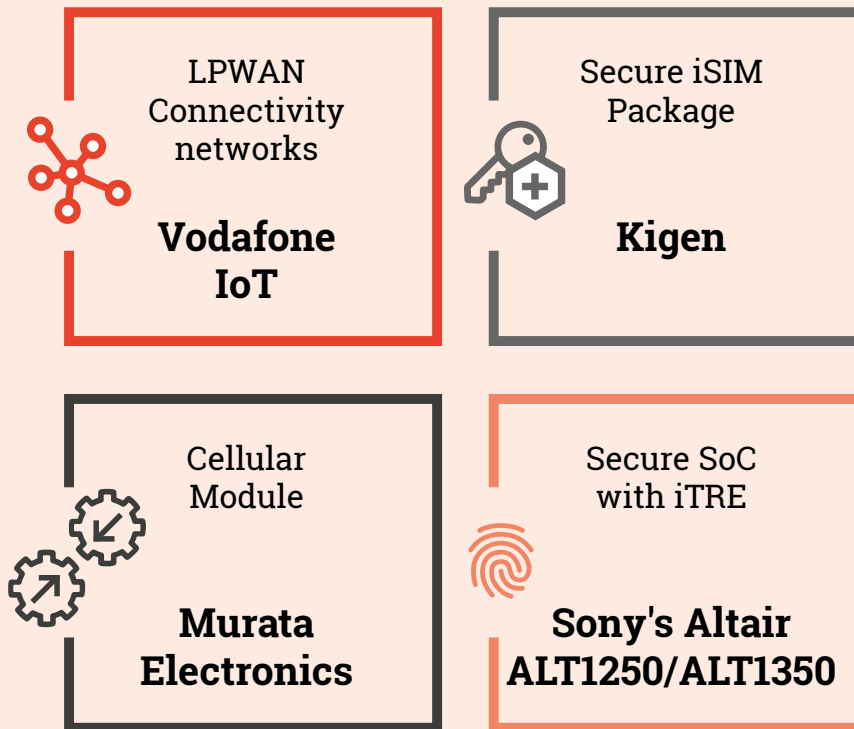


Figure 4: Simplifying adoption for connected product OEMs with iSIM

iSIM convenience is the key to growth

iSIM's capabilities appeal to customers across the spectrum of IoT from basic devices with limited network requirements that need to be deployed at scale globally to more complex devices that rely on the flexibility of iSIM to support roaming use cases with rich data requirements. The technology is also ideal for organisations that have adopted cellular connectivity and are aiming to make their products smaller and reduce complexity.

iSIM is also attracting deployments from organisations that need a product that works everywhere seamlessly and from those that need to address connectivity in scenarios that involve constrained on-device space. Simplification of the traditional SIM management and operational burden is essential and iSIM addresses those requirements.

Typical use cases benefitting from iSIM include:

- **Asset tracking and monitoring**
Smart labels in logistics applied to hired items such as chainsaws can benefit from the simple global connectivity that iSIM offers, thanks to the small form factor that iSIM offers.
- **Healthcare**
Wearable monitoring devices that need compact solutions and secure data communication are adopting iSIM because of the improved security and the compact iSIM package that enables more appealing devices to be designed for patients.

- **Industrial automation**
Robots and machines utilise iSIM to support uninterrupted operations with secure connectivity and no dirt or moisture ingress from traditional SIM card slots.
- **Energy and utilities**
Utilities are using iSIM in meters and in EV charging stations to ensure sensitive data on demand can be communicated and that devices can have long in-service lives. The improved security helps protect customer data and power efficiency helps to ensure long in-service life for meters.
- **Sustainable transport**
From buses and trains to smart city networks iSIMs are connecting devices to manage traffic flows and optimise journeys. By ensuring devices can connect in the event of a network failure, mission critical devices can be connected.
- **Fleet management**
Ride-sharing organisations and automotive OEMs are using iSIMs to ensure vehicles can connect regardless of location and for extended service lifespans. The small form factor and the integration of the iSIM into the device helps accommodate SIM functionality in compact vehicles such as scooters. ▶



Each company's role in the offering is detailed here:

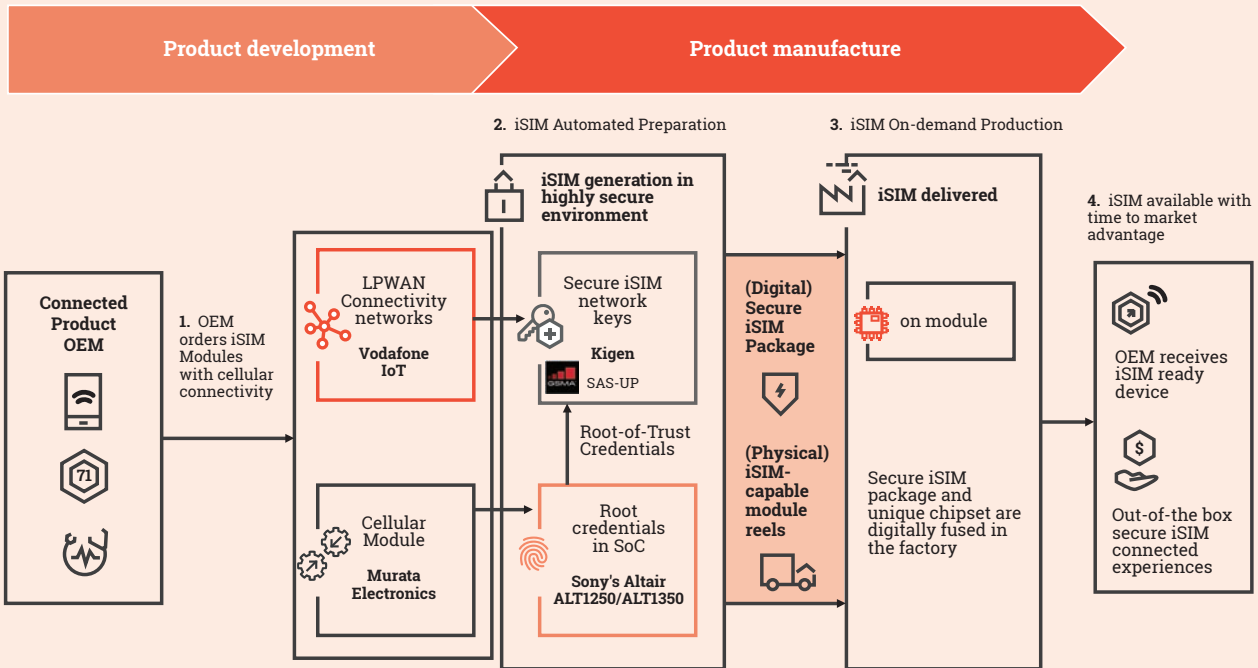


Figure 5: How the partner ecosystem supports customers in the adoption of iSIM

An integrated ecosystem

The mature ecosystem that has developed during iSIM's five-year lifespan has collaborated to prioritise convenience for customers. The iSIM ecosystem is the bedrock upon which iSIM-enabled solutions are being built and the enabler of the massive cellular IoT projects

of the future. Among the advanced vendors recognising the need for this are Sony's Altair ALT1250/ALT1350, Kigen, Murata and Vodafone Business which have been collaborating to remove friction from iSIM operations from the chipset to the connections. ▶





SONY Altair

Sony

Sony Semiconductor Israel is a leading provider of cellular IoT chipsets. The company's cellular IoT chipsets are the smallest and most highly integrated LTE CAT-M and NB-IoT chipsets on the market, featuring ultra-low power consumption, hardware-based security, and a carrier-grade integrated SIM (iSIM), all 5G ready. With a commitment to the highest quality and end-to-end security approach, the company's Altair all-inclusive cellular IoT chipsets offer long battery life and fast time to market.

Sony Semiconductor Israel provides low-power and cost-efficient chipsets for a range of industrial and consumer IoT applications such as trackers, smart meters, smart labels, mHealth, wearables and vehicle telematics. The company's cellular IoT chipsets are commercially deployed on the world's most advanced cellular networks.

Kigen

Kigen

Kigen, a global leader in secure eSIM enablement is widely recognised as a pioneer in iSIM technology. iSIM technology is enabled through the fusing of secure network connectivity, the root of trust, and communication module, and hence Kigen's role as an iSIM vendor is realised in unison with its ecosystem partners. As a company, Kigen was shaped by the realisation that for IoT solutions to scale and deliver the economic promise of digitalisation and automation, cellular security adoption needed to be adapted to wider electronics manufacturing. iSIM technology embodies this vision, and Kigen remains focused on supporting OEMs with a streamlined experience for adoption and manufacture.

Kigen supplies iSIM OS and the digital delivery of the secure iSIM Package. With the later, OEMs can digitally receive their choice of connectivity with their preferred cellular module ready to be fused in the factory of their choice. This shift lays the path for manufacturers to bring robust, carrier-grade security to enable manufacture at their own or ODM or contract manufacturer's factory – a setup that is far more prominent in mass manufacture of electronics.

Kigen iSIM OS and iSIM secure package solutions are built with high-growth markets of massive IoT, such that enterprises can leverage strong security even at the most constrained size, power and cost envelope. Kigen's iSIM digital delivery optimises how manufacturers and enterprises can assist with prototyping, sampling, field and market trials with multiple customers and regions, depending on the customer's needs.

muRata

INNOVATOR IN ELECTRONICS

Murata

Murata produces ceramic-based passive electronic components and solutions including communication modules and power supply modules. The company is committed to the development of advanced electronic materials and leading edge, multi-functional, high-density modules. Murata sees a key value of iSIM in the ability to create very small-sized modules and combining these with iSIM capability in the same form factor.

The small size is particularly important for customers creating devices that have space constraints such as wearables in the healthcare market. The company's vision is to participate in this partnership to make it easy for manufacturers to purchase tens of thousands of modules that already incorporate an iSIM and reap the rewards of unified purchasing of chipset, secure element and connectivity.

Bringing the iSIM onto the module is a complex process that has taken more than a year to achieve and provides organisations with large deployments with the ability to get to market simply and quickly. ►



Vodafone Business

Vodafone is a leading European and African telecoms company. We provide mobile and fixed services to over 330 million customers in 15 countries, partner with mobile networks in 45 more and have one of the world's largest IoT platforms. In Africa, our financial technology businesses serve almost 79 million customers across seven countries – managing more transactions than any other provider.

Vodafone's purpose is to connect for a better future by using technology to improve lives, businesses and help progress inclusive sustainable societies. We are committed to reducing our environmental impact to reach net zero emissions by 2040.

Vodafone Business has been at the forefront of IoT innovation, providing secure and reliable global IoT connectivity through iSIM. By building relationships with hardware and software partners, and leveraging their expertise in LPWA technologies, Vodafone Business is creating a new IoT ecosystem that enables customers to connect more devices to new applications, wherever needed. This initiative supports a wide range of use cases, from smart meters to remote patient monitoring, enhancing operations and efficiency.



Conclusion

By bringing these discrete capabilities together into an integrated offering, product manufacturers' concerns regarding iSIM complexity can be allayed. The combined offering greatly simplifies device design, manufacturing, deployment and operation while addressing security and regulatory requirements. We will be exploring each of these in greater detail in forthcoming sections of the IoT Now iSIM Handbook 2024 and look forward to presenting you with in-depth technical detail and use case examples to help illustrate the processes and technologies that support iSIM and which are making hyper-scale deployment a reality. ■



AloT will change the dynamics for cellular connectivity in IoT

Artificial intelligence (AI) and the Internet of Things (IoT) are among the most transformative technologies of our era. As they are increasingly integrated, the concept of AloT — the convergence of AI and IoT onboard IoT devices — has gained prominence, writes Transforma Insights

AloT will be particularly impactful in the context of wide area wireless connectivity, principally due to its potential to reduce the amount of bandwidth required when compared to equivalent (non AI-enabled) IoT solutions. Clearly this can potentially reduce the revenues that a mobile network operator may generate from an IoT (now AloT) device, but it will also unlock more opportunities for deploying AloT in contexts in which an equivalent IoT solution may not have been viable.

For hardware and IoT solution providers, AloT is a clear opportunity to differentiate offerings by enabling lower-cost wide area connectivity.

Introducing AloT

IoT devices generate large amounts of potentially valuable data, and AI can be applied to this data in various locations, such as cloud data centres, edge networks, and even directly onboard the IoT devices themselves. Each of these methods can unlock significant value and new insights from IoT data.

The term 'AloT,' specifically refers to the use of AI applications deployed directly onboard IoT devices.

Implementing AI on IoT devices offers several key benefits, such as improved performance, enhanced compliance, better privacy and security, ►

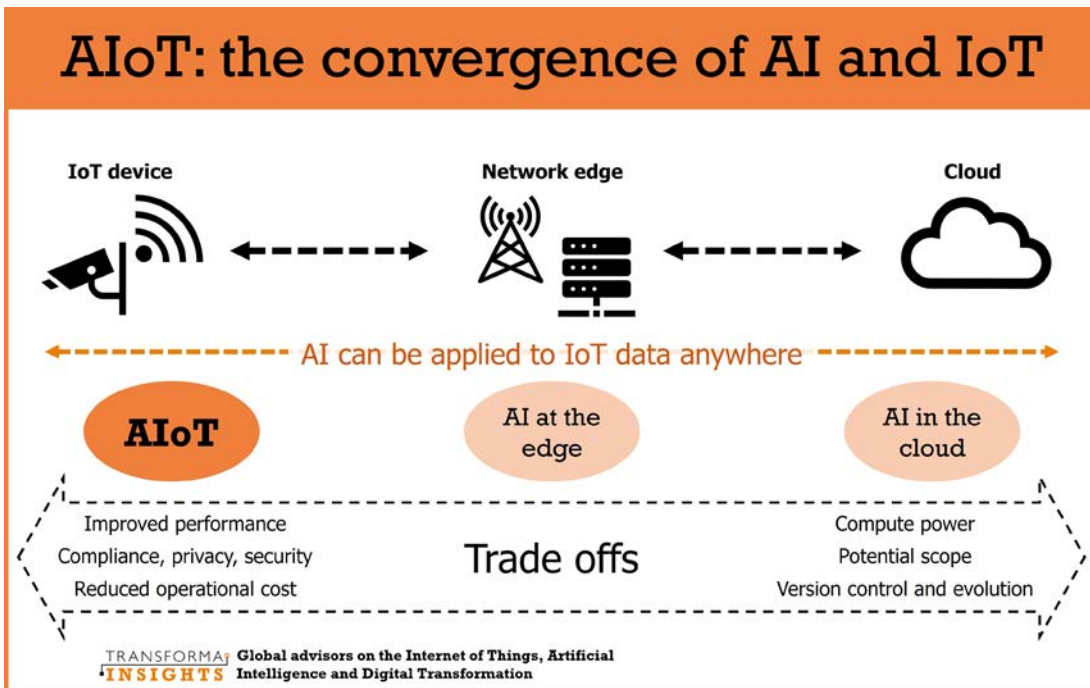


Figure 1: The benefits of AIoT

Source: Transform Insights

and potentially lower operational costs. These advantages are explored in more detail below.

On the other hand, applying AI to IoT data in cloud environments utilises the greater computing power available there. It also broadens the scope of AI applications, enabling them to pull data from multiple IoT devices across various locations, and potentially integrate this with other data sources — IoT and non-IoT alike — to support more complex analyses. Cloud-based AI deployment also simplifies AI application management, particularly for version control and algorithm updates over time.

As a result, AIoT (AI deployed on IoT devices) is often not standalone. In many cases, AIoT devices generate data that is further processed with more advanced AI algorithms in cloud or edge environments, or both.

As described in **Figure 1**, the deployment of AI on board IoT devices can potentially unlock

significant benefits. In the following paragraphs we discuss these in more depth.

AIoT can improve application performance

AIoT can enhance the performance of IoT applications by enabling the analysis of a larger volume of high-resolution data inputs. For instance, in AI-powered CCTV systems, AIoT algorithms can process high-resolution video feeds locally, eliminating the need to transmit significant amounts of data to remote servers for analysis. This approach allows for more detailed video analysis compared to basic redaction-at-source or compression techniques that might otherwise be employed.

By enabling alerts, analytics and applications to run closer to the data source, AIoT can significantly improve response times. This is particularly crucial for applications like autonomous vehicles and industrial emergency ▶

AIoT can enhance the performance of IoT applications by enabling the analysis of a larger volume of high-resolution data inputs



AIoT will be particularly impactful in the context of wide area wireless connectivity, principally due to its potential to redact data at the edge

stop mechanisms, where any delay in data processing could have serious consequences. These systems require real-time decision-making and cannot afford the latency introduced by remote processing.

Additionally, AIoT enhances the resiliency and uptime of IoT applications, ensuring they continue to function even if a wide-area network connection fails. This reliability is essential for autonomous vehicles and critical industrial processes but also benefits a range of less mission-critical applications, such as AIoT-enabled HVAC systems, by improving their efficiency, user experience and overall value proposition.

AIoT can enhance compliance, privacy and security

AIoT can enhance privacy by processing data locally, ensuring that personal information remains on the device and is not transmitted externally. For example, an AIoT-powered smart speaker can interpret voice commands directly on the device, eliminating the need to stream audio — along with potential background conversations — to remote servers. When external data transmission is necessary, such as for triggering a web search, the information can be anonymised to protect user privacy.

In enterprise settings, AIoT applies similar principles to safeguard sensitive or confidential data. By keeping more critical information within corporate boundaries, it can strengthen security, enhance compliance and reduce the risk of data exposure.

AIoT can reduce operational costs

AIoT helps reduce operational costs in multiple ways. It enables advanced on-device performance monitoring, optimisation and predictive maintenance, enhancing both efficiency and the overall value of IoT applications.

By performing complex analyses locally, AIoT minimises the need to transmit large volumes of data to remote servers, significantly cutting communication costs particularly for data-intensive applications. This is particularly beneficial

for systems that would otherwise generate substantial amounts of data requiring external processing.

AIoT also makes IoT deployments more viable in marginal situations, reducing human resource costs. For example, AIoT-enabled CCTV cameras can monitor low-activity or restricted areas in industrial settings, transmitting only essential data when activity is detected. This reduces bandwidth usage while lessening the need for security personnel to oversee such locations manually.

Additionally, integrating AI directly into IoT devices lowers reliance on cloud-based processing and storage, further reducing associated costs.

AIoT and wide area wireless connectivity

AIoT will be particularly impactful in the context of wide area wireless connectivity, principally due to its potential to redact data at the edge.

Redaction at the edge refers to the potential for AIoT to filter data gathered by an IoT device, transmitting only critical information over wide area connections and potentially in a highly refined form. Redaction at the edge enabled by AIoT can result in potentially massively reduced requirements for connectivity bandwidth. For instance, the Town of Cary, NC, USA, has deployed CCTV-based monitoring for a pickleball court, so that anyone planning to use the court knows in advance whether the court is in use or not. AIoT deployed on a CCTV camera enables the necessary analytics to be undertaken locally, with only extremely limited information (whether the court is in use, or not) being transmitted over a wide area connection. In fact, in this specific case, the camera is connected using the LoRaWAN low power wide area (LPWA) technology, rather than using a 4G or 5G cellular connection which might more typically be associated with connecting a CCTV camera.

The Town of Cary's pickleball courts are an extreme case, but the same concept can be applied in the case of many CCTV (and other) IoT applications, so that local processing using AIoT can be used to ensure that only the minimum amount of bandwidth is required to support IoT devices. For instance, a CCTV camera installed on ►



For hardware and IoT solution providers, AloT is a clear opportunity to differentiate offerings by enabling lower-cost wide area connectivity.

the perimeter of an oil refinery in Alaska may use AloT to ensure that a video feed is only transmitted in the case that a moving object is sensed. A more sophisticated solution may elect not to transmit data in the case that the moving object in question is identified as a polar bear, and so on.

On the one hand, redaction at the edge will inevitably reduce potential connectivity revenues for providers of wide area wireless connectivity, since AloT devices are likely to require less bandwidth than their traditional (non AI-enabled) IoT counterparts. But, on the other hand, AloT may enable IoT to be deployed in new contexts - for example, our Alaskan CCTV camera may be a viable opportunity for direct to cell satellite connectivity if it is enabled with AloT, whereas without onboard AI the required bandwidth may render an equivalent IoT solution uneconomic.

For hardware and IoT solution providers, AloT is a clear opportunity to differentiate offerings by enabling lower-cost wide area connectivity.

AloT will be a disruptive technology for IoT markets

The convergence of AI and IoT as AloT has the potential to increase the performance of IoT applications, enhance compliance, privacy and security, and enable reduced operational costs both for the connected devices and also for network connectivity.

AloT will be particularly impactful in the context of wide area wireless connectivity, both reducing the revenues that a mobile network operator may generate from an IoT (now AloT) device, but also unlocking more opportunities for deploying AloT in contexts in which an equivalent IoT solution may not have been viable.

For hardware and IoT solution providers, AloT is a clear opportunity to differentiate offerings by enabling lower-cost wide area connectivity. ■

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Our pick of the IoT industry's upcoming events



MWC Barcelona 2025
 3-6 March 2025
 Barcelona, Spain
<https://www.iot-now.com/event/mwc-barcelona/>



TMC Annual Meeting & Transportation Technology Exhibition
 9-12 March 2025
 Orlando, Florida, USA
<https://www.iot-now.com/event/tmc-annual-meeting-transportation-technology-exhibition/>



Embedded World 2025
 11-13 March 2025
 Nuremberg, Germany
<https://www.iot-now.com/event/embedded-world-2025/>



Hannover Messe 2025
 31 March - 4 April 2025
 Hannover, Germany
<https://www.iot-now.com/event/hannover-messe-2/>



DTX Manchester 2025
 2-3 April 2025
 Manchester, UK
<https://www.iot-now.com/event/dtx-manchester-2025-the-norths-biggest-digital-it-event/>



National Cyber Security Show
 8-10 April 2025
 Birmingham, UK
<https://www.iot-now.com/event/national-cyber-security-show/>



LogiPharma 2025
 8-10 April 2025
 Lyon, France
<https://www.iot-now.com/event/logipharma-2025/>



GITEX AFRICA
 14-16 April 2025
 Marrakech, Morocco
<https://www.iot-now.com/event/gitex-africa-2/>



Intelligent Manufacturing Kuala Lumpur
 14-16 May 2025
 Kuala Lumpur, Malaysia
<https://www.iot-now.com/event/intelligent-manufacturing-kuala-lumpur/>



The Battery Show Europe
 3-5 June 2025
 Stuttgart, Germany
<https://www.iot-now.com/event/the-battery-show-europe/>



Intelligent Automation North America
 4-5 June 2025
 Santa Clara, California, USA
<https://www.iot-now.com/event/intelligent-automation-north-america/>



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