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Enterprise Cellular IoT Demands & Opportunities

A Kaleido Intelligence
Survey Report

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Contents



Introduction to the Survey



Private Cellular Networks: Needs, Concerns
& Perceived Benefits



Roaming Opportunities in the Transport &
Logistics Industry



Afterword

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Introduction to the Survey



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Over the past decade or more, considerable interest has risen around the concept of IoT and what it might mean for businesses and end-users impacted by the digitisation strategies applied using IoT technologies. In turn, a plethora of IoT survey reports have been published that typically cover a broad range of topics. In 2022, Kaleido Intelligence recognised the need for a more focused understanding of specific areas of IoT implementation and, as a result, undertook one of the largest survey fieldwork efforts of its kind, examining enterprise perceptions around cellular IoT connectivity in detail.

Despite the fact that much of the revenue and user experience is impacted by the applications and services that are applied in the context of IoT, connectivity remains the bedrock for any deployment. Therefore, it is imperative that the ecosystem serving IoT customers understands where challenges exist, where improvements could be made, and how customers perceive the IoT ecosystem in the context of connectivity. As we shall see later in this report, cellular technology is well-understood as an important enabler of IoT connectivity, albeit with several challenges associated with it.

The end of 2022 saw some 2.5 billion cellular connections deployed globally for IoT programmes, with connections having increased by 26% over 2021. In contrast, the end of 2020 saw only a 12% increased in connection volume, and as a result, it is evident that the overall ecosystem for cellular IoT connectivity is on the path to recovery following the pandemic. Nevertheless, this strong growth highlights that meeting the challenge of 'scaling up': supporting higher volumes of

connections from a technical, service and commercial standpoint is ever more critical for service providers if the ecosystem is to be sustainable. Meanwhile, the introduction of new radio technologies, such as 5G, support for converged cellular-satellite communications systems and private cellular networks, in addition to a vast ecosystem of connectivity service providers, hardware vendors and differentiated regulatory and commercial requirements has meant that cellular IoT is more complex than ever for enterprises to navigate.

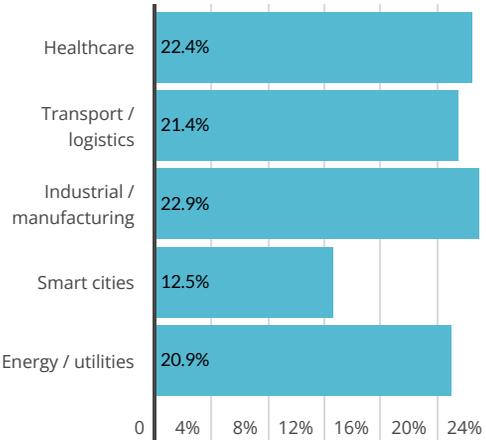
This year's survey has set out to take a deep-dive into where the key pain points in the context of cellular IoT connectivity lie and represents an expansion of the 2022 survey effort. Some 800 enterprises were surveyed during February-April 2023, representing activities in five key IoT industry verticals:

- Transportation & Logistics
- Industrial & Manufacturing
- Healthcare
- Energy & Utilities
- Smart Cities

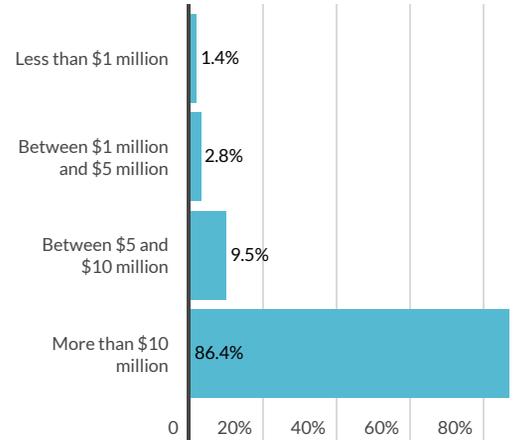
All respondents were all decision-makers at managerial level or higher within their organisation, in addition to having a good knowledge of the cellular IoT ecosystem. In order to understand a broad picture of perceptions, respondents included companies that had adopted cellular connectivity for IoT, in addition to those that had not. The differences, as well as the and consensus in perceptions among these groups and industry verticals, are among the key goals of the study in terms of understanding where the industry can improve and where opportunities to accelerate

the adoption of cellular technology for IoT lie.

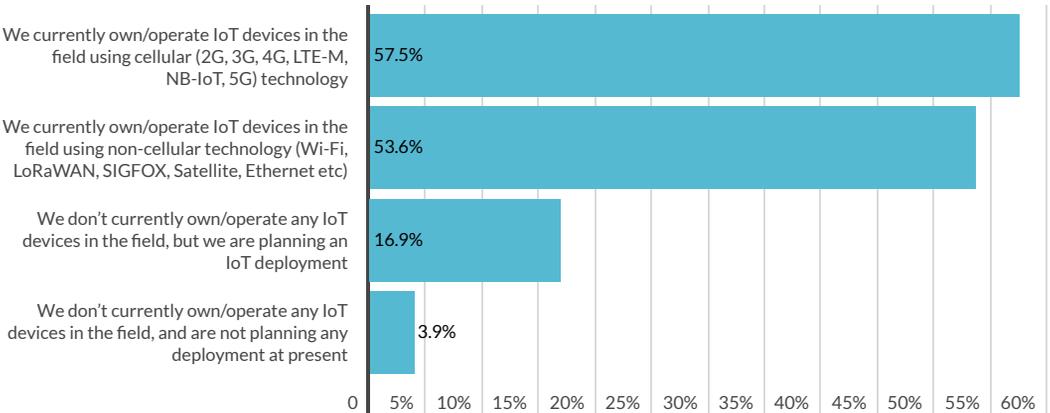
In what market segment does your business unit primarily operate?



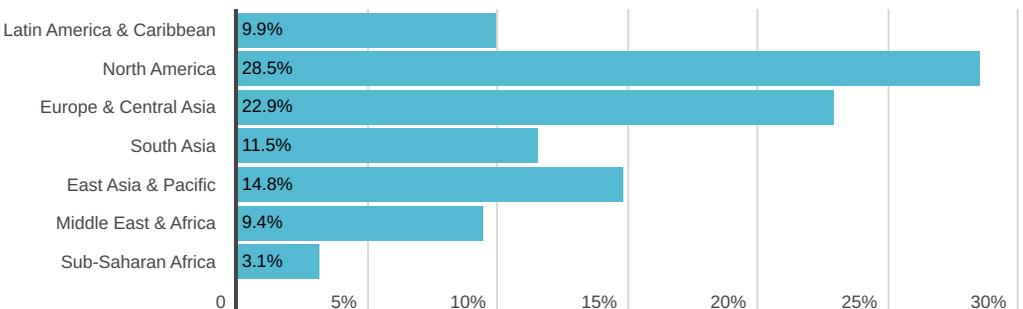
What was your organisation's turnover in 2022?



What is your organisation's current status in regard to IoT?



Where is your business unit based?





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Private Cellular Networks:

Needs, Concerns & Perceived Benefits



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Private Networks Needs, Concerns & Benefits

Private cellular networks represent a significant opportunity for service providers and enterprises alike, owing to the increased flexibility and reliability afforded by cellular technology over alternatives such as Wi-Fi and wired connectivity. As of the end of 2022, Kaleido has found that over 2,500 private cellular networks are in operation globally, with this number expected to increase to nearly 29,000 by 2028. Several factors have contributed to the increase in interest and demand for private cellular networks, including the availability of dedicated spectrum for enterprise use cases in several countries, the absence of 5G network slicing services available to potential enterprise customers, in addition to increased digital transformation initiatives across several industry verticals that require features such as higher bandwidth, better reliability or support for large numbers of devices, or features not enabled through non-cellular technologies, such as the ability to maintain connectivity both inside as well as outside the private network coverage area.

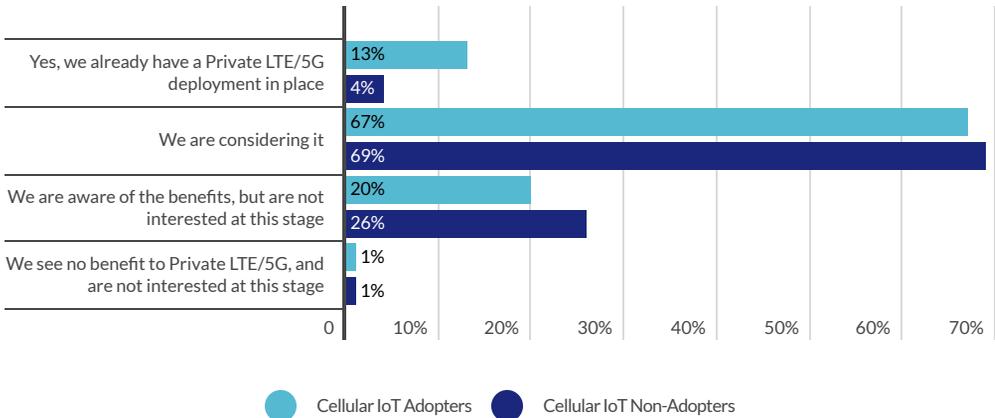
Nevertheless, the deployment of private cellular networks remains a complex process. Regulatory frameworks for spectrum access in countries that have made dedicated enterprise spectrum available are inconsistent, while pricing varies considerably. In many countries, the only route to spectrum access is through MNO channels, which in itself is broadly inconsistent in terms of how incumbent MNOs are approaching the market, and how they price leased access to spectrum.

Meanwhile, the range of devices suited to private LTE or 5G is dependent on support for specific spectrum frequency ranges, which means that hardware choice can pose a challenge to customers.

Finally, enterprises must navigate a complicated ecosystem of actors to build a complete solution, and must heavily rely on third-party expertise. It is certainly the case that while interest in private cellular networks is high, education and understanding of the journey still have some way to go in terms of improvement: in extreme cases, Kaleido has heard of instances where enterprises were unaware that SIM cards are required in order to connect to the private network.

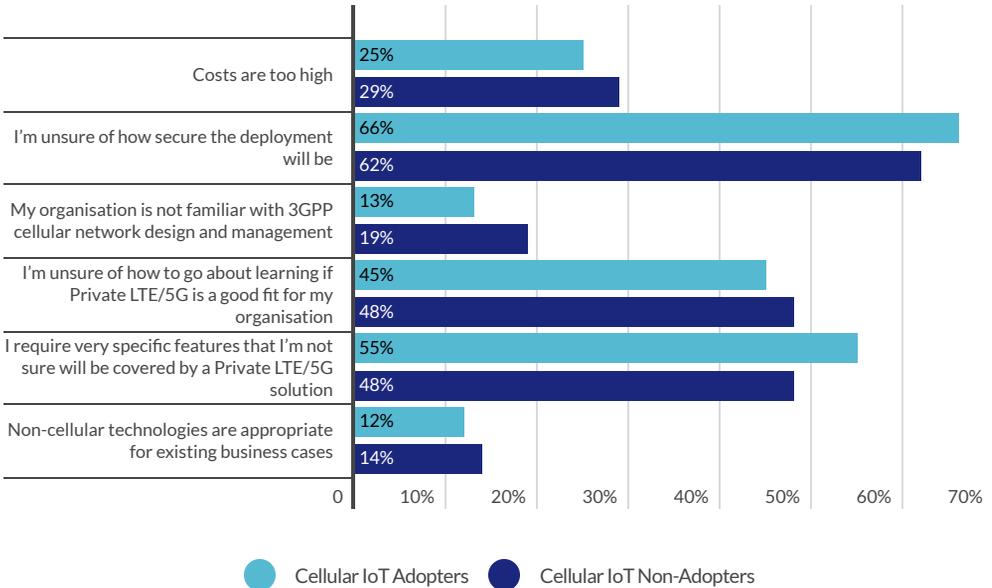
Private LTE or 5G adoption among survey respondents remains relatively low: **13% of cellular IoT adopters reported they have a solution in place, with 4% of cellular IoT non-adopters reporting the same** (it should be understood here that private cellular does not always focus on IoT; thus it is possible for IoT non-adopters to have a deployment). Nonetheless, **interest is considerable: 67% of cellular IoT adopters stated that they are considering a future deployment, compared to 69% of cellular IoT non-adopters.**

Does your business unit have an interest in Private LTE/5G to enhance business operations? (All Respondents)



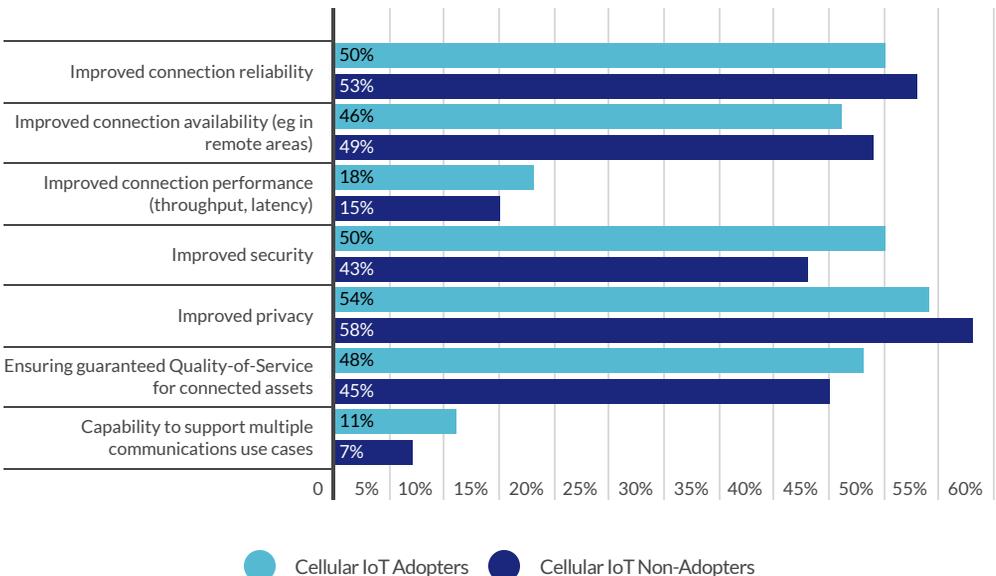
In similar fashion to results produced in 2022's survey, concerns over private LTE or 5G security remain top-of-mind among both cellular IoT adopters as well as cellular IoT non-adopters. From a superficial level, this might seem a bizarre statement to make, considering the fact that private networks are, by design, typically more secure than public networks. On the one hand, this may well speak to a lack of education or understanding in terms of how corporate security policies can be applied to private LTE or 5G networks, while on the other, one can infer that respondents have concerns over the potential security of emerging private network architectures, where the core network is located off-site, or where devices 'roam in' and 'roam out' of private network coverage zones. Nonetheless, the hypothesis over the lack of enterprise understanding and education of private LTE and 5G is confirmed when examining other results: **45% and 55% of cellular IoT adopters stated that they are missing knowledge where deployment suitability as well as features are concerned, respectively.**

What are your main concerns over a potential Private LTE/5G deployment? (All Respondents)



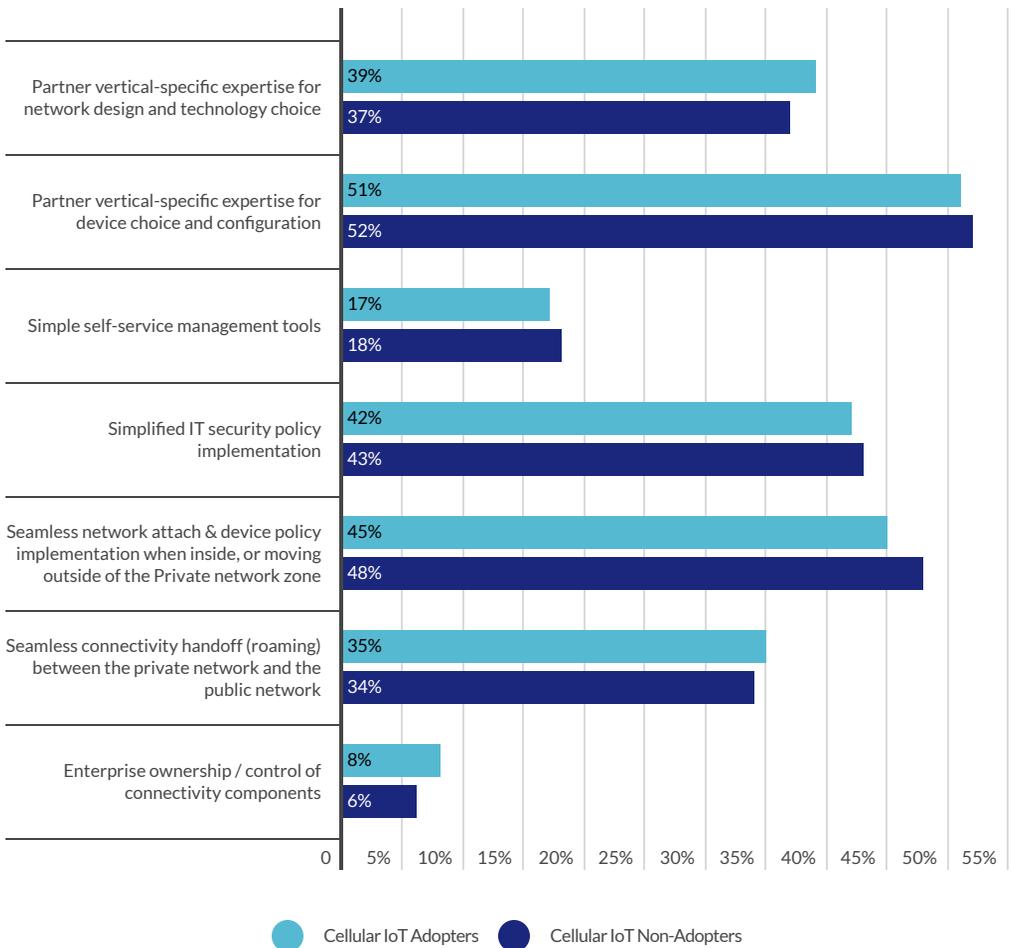
Delving deeper into the data helps build a clearer picture of enterprises' understanding of private networks: **improved security and privacy were cited as key benefits by 50% and 54% of cellular IoT adopters, respectively, and 43% and 58% of cellular IoT non-adopters, respectively.** This serves to support the hypothesis that enterprises are concerned over the security of emerging private network architectures, as described earlier.

What do you perceive to be the main benefits of a Private LTE/5G solution? (All Respondents)



Clear pain points are revealed when asking respondents what the main points for consideration are where private LTE or 5G are concerned. Here, **51% of cellular IoT adopters and 52% of cellular IoT non-adopters reported a need for expertise covering device choice and configuration, which brings back the issue of hardware complexity described earlier in the report.** Notably, a significant proportion of respondents have concerns over network attach capabilities and device policy implementation inside and outside of the private network coverage zone: maintaining both a seamless experience as well as a consistent security policy is evidently top-of-mind where private LTE or 5G deployments are concerned. Both of these factors represent challenges for the industry at large, given the lack of 3GPP standardisation where private and public network attach policies are concerned (some devices must be manually moved between networks, which is not suited to machine-type use cases), while security policy implementation presents a different set of challenges.

What are the most important factors for consideration where Private LTE/5G is concerned? (All Respondents)





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Roaming Challenges & Opportunities:

Transport and Logistics

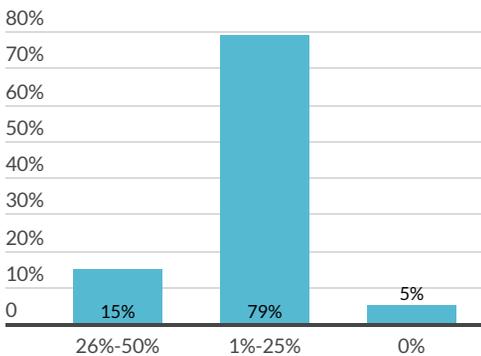


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Roaming Opportunities in the Transport & Logistics Industry

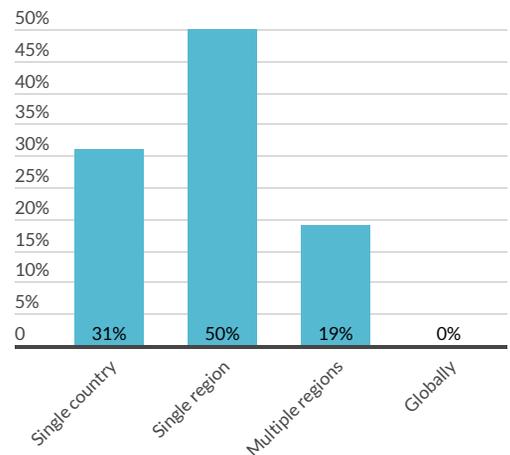
Whether using public or private networks, roaming is a key part of the connectivity ecosystem for transport and logistics, thanks to the mobile nature of many of the industry's assets; international connectivity is required by 95% of respondents, and 69% of future users will need it. Additionally, 56% of respondents put robust international coverage as one of their top 5 most important factors, although it is not scored highly. Roaming agreements are the most common way of dealing with international connectivity requirements, with 70% relying purely on agreements for their international connectivity. Future respondents will be similarly focused, if not more so; 84% of those report they will rely on multiple connectivity providers and leverage their roaming agreements to do so. However, this also needs to be paired with some domestic connectivity, with no respondents reporting that over 50% of their devices would need international connectivity and most only requiring it for 25% or less. This will need to be rectified in conventional ways, typically; while 45% of cellular IoT users report using eSIMs (see in the next section), only 11% report using them to alleviate roaming concerns. In addition, switching profiles may complicate matters, particularly as 42% of respondents wish for simpler BYOC frameworks, which eSIM profiles will make more complex to deploy.

What proportion of your organisation's cellular IoT device fleet requires international or multi-regional connectivity? (Cellular IoT Adopters)



Concerns about roaming could be holding the space back, with 63% of respondents see growing roaming restrictions as one of their top 5 concerns in scaling IoT, with it coming in as the third-ranked concern overall. 60% of respondents also report that keeping a multinational solution safe from regulatory or

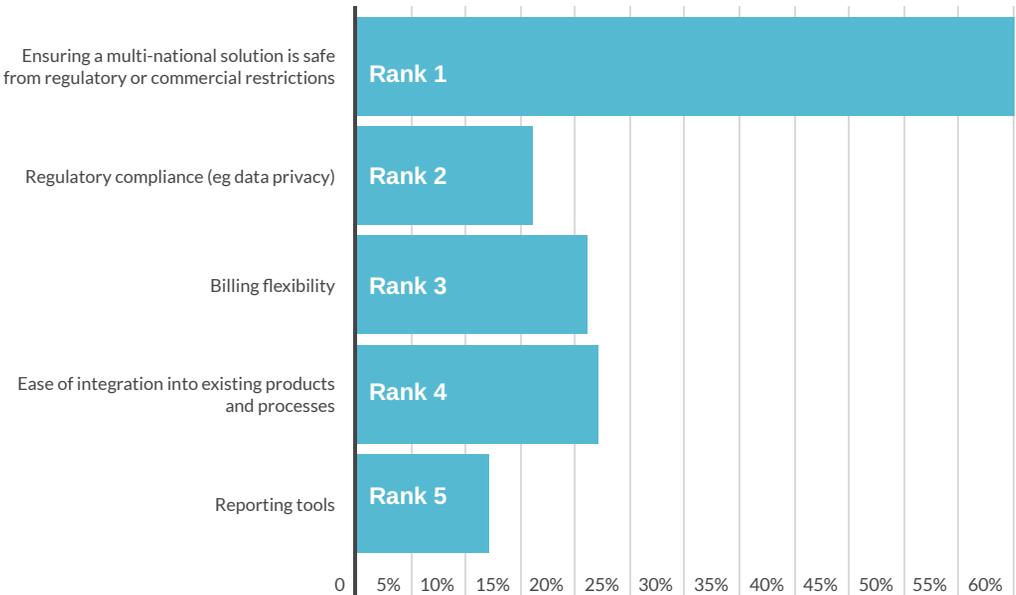
How do you expect your organisation's forthcoming IoT devices to be distributed? (Cellular IoT Non-Adopters)



commercial restrictions is their top most important factor for IoT connectivity, while ensuring coverage in countries with roaming restrictions is ranked second overall in a connectivity partner's desired capabilities. However, robust international coverage is a logical corollary of this, and that factor did not make it into the

top 5 most important factors. This suggests that logistics companies simply expect robust international connectivity, with it not being fully top-of-mind until it comes under regulatory threat.

What are your top 5 factors that are most important where IoT connectivity is concerned? (All Respondents)



That said, there is still a long way to go with its implementation; 45% of respondents think that a simplified technical model for integrations is lacking in the current ecosystem, and 42% say the same about the use of preferential operator contracts and BYOC arrangements. International connectivity itself may not be the primary concern in some circumstances, but the ability to simplify roaming and accommodate alternative connectivity is something that a sizeable minority of respondents want. There is also a desire for connectivity partners to be seen as independent, with a carrier-agnostic partner being ranked as a top 4 capability that respondents look for and selected by 47% of respondents to be in their top 5 capabilities. This is, however, moderately less important for those who would consider using or do use an MNO directly for their connectivity requirement, possibly because they

rely on that MNO's existing roaming agreements. Above all else, respondents want high-quality connectivity, noted as the top technical feature adopters reported influenced their choice of connectivity provider. This, coupled with the requirements for carrier-agnostic partners, would potentially require a degree of sophistication in roaming steering based on use case-dependent criteria, such as low latency or signal strength, in order to minimise the required transmit power. This makes it important for roaming providers to be able to gauge connectivity requirements not just on availability and agreements but use case-specific criteria. In the long run, this should put MVNx players at an advantage, as these providers are more likely to be able to negotiate more flexible terms with their roaming partners than MNOs, who will have more restrictive peer agreements in place.

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Instant global connectivity for an asset management company

Asset management | USA



Context

Our client is an asset management company from the US that integrates wireless Bluetooth and Cellular technologies into assets – allowing automated operations and improved efficiencies through the logistics lifecycle. They are a full stack IoT Platform as a Service (PaaS) startup, offering turnkey solutions for serialization, continuous inventory, logistics, and anomaly traceability for industries such as pharmaceutical, healthcare, and retail.

They have developed a printable, ultra-thin GPS tracker, that has a battery life of approximately 5+ years at a fraction of the cost of traditional trackers. Their trials, some of which are with some of the world's leading automotive and logistics companies, are being powered by BICS.

Challenge

- **To centralize their domestic and global roaming providers**, to avoid managing multiple and complex agreements
- **NB-IoT and LTE-M capabilities**, to tackle the regular power issues on their devices, which are battery powered and need to send small amounts of data over long distances
- **An easy to deploy, manage, and troubleshoot solution** that enables them to operate and scale with agility across continents



Instant global connectivity for an asset management company

Asset management | USA

Solution

- **Better reliability with lower power consumption:** Through leveraging BICS' LTE-M and NB-IoT capabilities, which also improves their global coverage
- **A single global partner:** Thanks to BICS' relationship with operators around the globe, our client can deal with BICS only for their connectivity needs, optimizing resources and further saving on costs
- **Self management portal:** BICS simplified their operations by giving them full visibility and easy management of their connected assets on a global scale. The powerful diagnostic tools and testing abilities also mean both deployments and troubleshooting can take place seamlessly.





Instant global connectivity for an asset management company

Asset management | USA



Results



Higher flexibility: BICS offers them a customized solution and plan, to match their unique business needs, further increasing their business' agility thanks to the flexibility to evolve the partnership as priorities change



One-in-all solution: BICS enables instant global connectivity, fully compliant and highly secure; which can be managed from one place, and through a unique partnership



Improved compliance, security, and QoS: BICS provides outstanding QoS, and the highest security routes thanks to our fully owned global infrastructure - with no compliance challenges



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Afterword



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About the authors



This survey report would not be possible without the support of its sponsors. Kaleido wishes to thank the sponsors of this study, who, along with Kaleido and IoT Now, are supporting our vision of enabling business decisions across the enterprise sector through inspiring, educational and accessible insights.



Kaleido Intelligence is a specialist consulting and market research firm with a proven track record delivering telecom research at the highest level. Kaleido provides insightful business analysis, market projections, recommendations and growth strategies for global mobile operators, telecom vendors and IoT service providers.

Kaleido covers industry-leading market intelligence and publications on IoT Roaming, eSIM, Connectivity Management Platforms, Private Cellular Networks and Mobile Telecoms Fraud & Security. Research is led by expert analysts, each with significant experience delivering insights that matter.

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