

Rethinking IPX

Why vertical control is the key to future roaming success

A Kaleido Intelligence research paper | An Arelion IPX manifest

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The New IPX Imperative: Doing More with Less

The global IPX market is undergoing significant change, shaped by a combination of technology developments and evolving consumer demands. These trends are driving strong growth in traffic volumes, increasing network complexity and raising expectations for service quality.

Kaleido Intelligence analysis identifies several key drivers:

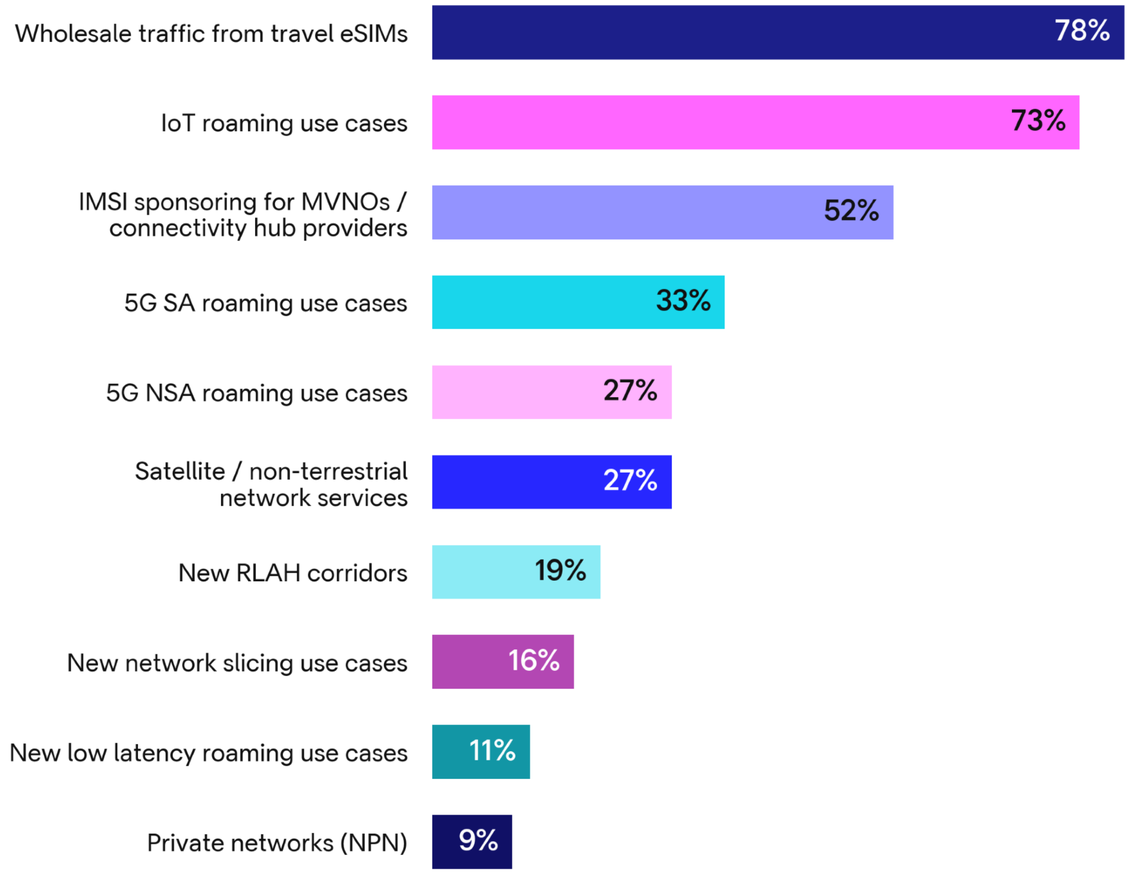
- The travel eSIM revolution: The rapid adoption of travel eSIMs is fundamentally altering consumer behaviour and traffic patterns. Kaleido's 2026 Wholesale Roaming MNO survey found that 78% of operators cite wholesale traffic from travel eSIMs as the single most important driver of roaming revenue growth over the next three years.

- Massive-scale IoT connectivity: The proliferation of IoT and M2M devices creates a huge demand for global connectivity, contributing significantly to both signalling and data traffic. This is the second-most-cited revenue driver by operators (73%).

- The 5G SA transition: Meanwhile, the shift from 5G Non-Standalone (NSA) to Standalone (SA) architectures opens the door for advanced, low-latency enterprise use cases like network slicing, which are highly dependent on guaranteed network quality.

This explosion in demand, however, is running headlong into the reality of constrained operator budgets. This creates the central strategic challenge for the roaming industry: the need to deliver significantly more value, quality, and capacity with proportionally fewer resources.

MNO Survey: What will drive inbound/wholesale roaming revenues over the next 3 years?



Source: Kaleido Intelligence Wholesale Roaming Survey 2026

MNO Priorities and Challenges for the 5G Era

As operators transition from 5G NSA to 5G SA roaming, readiness is being shaped by a combination of technical, operational, and commercial priorities. While NSA has enabled early 5G roaming through existing LTE infrastructure, the move to SA introduces a more complex but significantly more capable environment, requiring alignment across interconnection, security, signalling, voice, and charging. Survey data from Kaleido Intelligence reveals a clear focus on the foundational elements of quality, performance, and security.

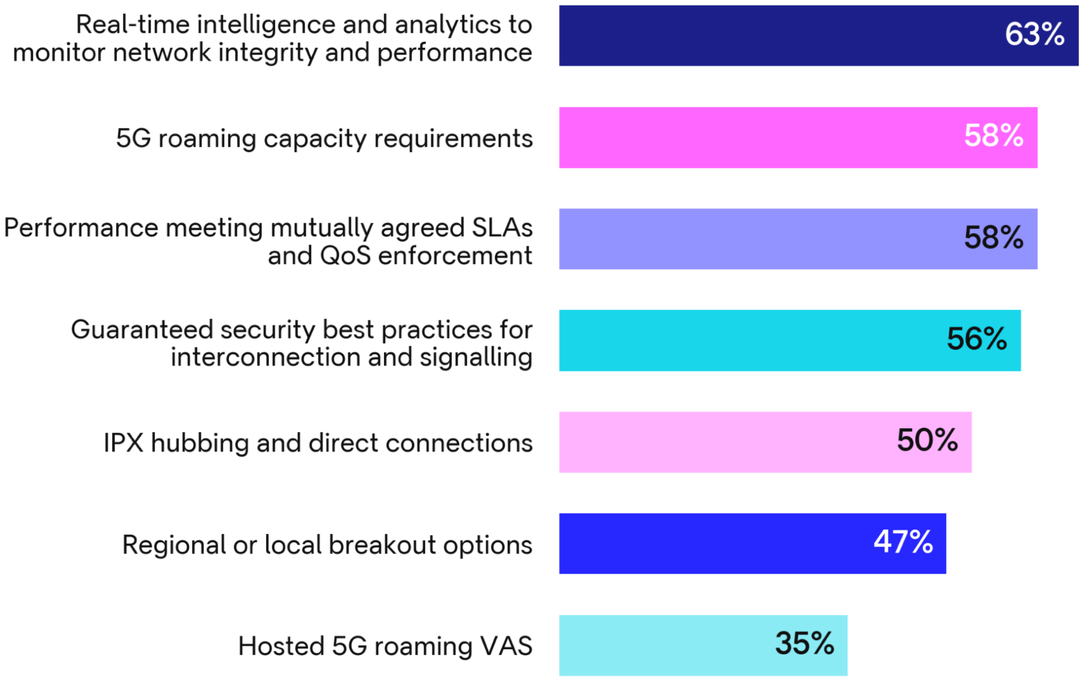
Top IPX Priorities for 5G SA Launch

As illustrated here, when asked about their priorities for launching 5G services, MNOs overwhelmingly pointed to capabilities that require deep network control:

1. Real-time intelligence and analytics (63%)
2. Meeting 5G roaming capacity requirements (58%)
3. Performance meeting mutually agreed SLAs and QoS (58%)

These top priorities, including analytics, capacity and quality, can be managed more easily and efficiently when the provider also has direct control over the underlying infrastructure layer.

MNO Survey: 5G Roaming IPX MNO Priorities
What are your specific IPX priorities while launching 5G NSA and SA roaming services?



Source: Kaleido Intelligence Wholesale Roaming Survey 2026

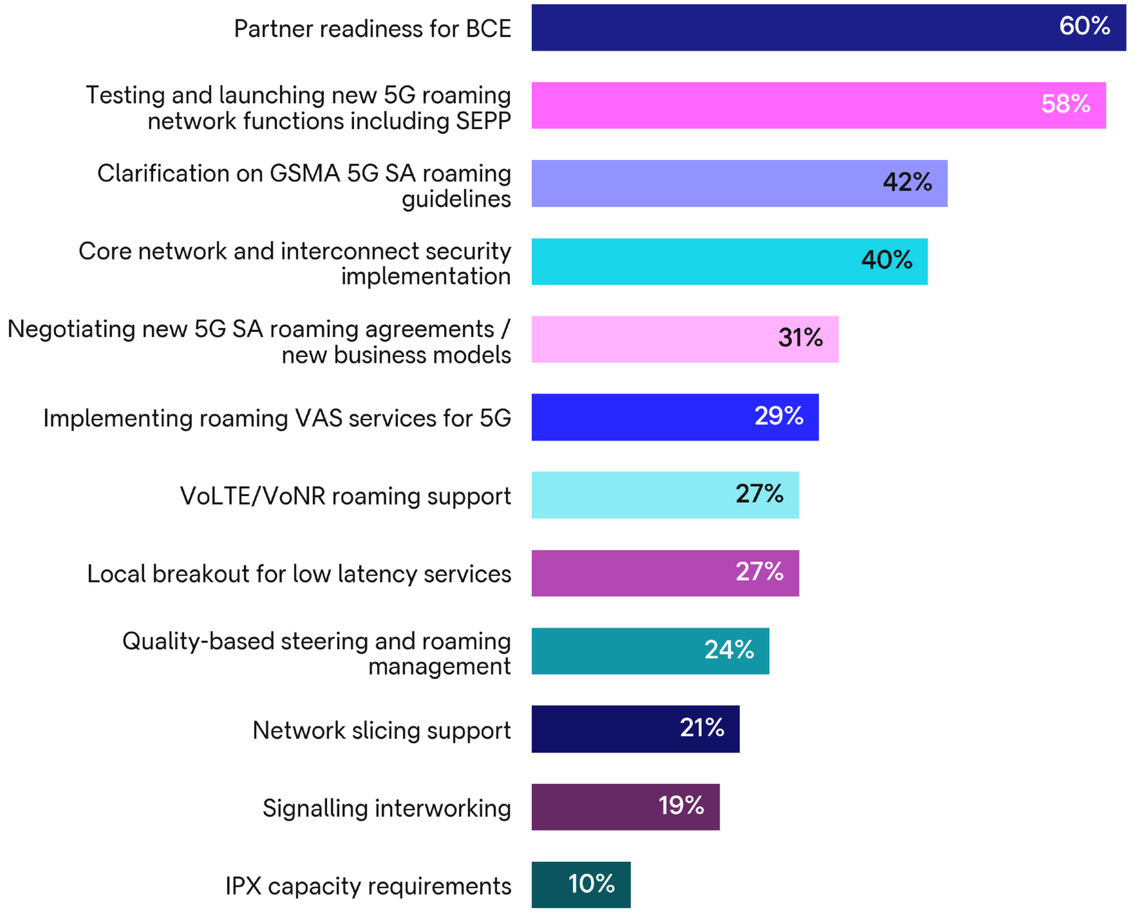
MNO Priorities and Challenges for the 5G Era

Key Challenges in 5G SA Deployment

Simultaneously, MNOs report significant challenges in their 5G SA rollout. The findings highlights a critical gap: operators need partners who are not only technically ready for 5G but can also simplify the immense complexity of launching new network functions like SEPP, security, and settlement in this new environment.



MNO Survey: 5G SA Roaming Challenges
What do you see as the main challenges in deploying 5G SA roaming?



Source: Kaleido Intelligence Wholesale Roaming Survey 2026

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The LBO Shift: Architecting IPX for Latency, Sovereignty and Cost Efficiency

Local Breakout (LBO) has emerged as a key 5G SA roaming strategy to optimise data traffic routing. Traditionally, roaming traffic is tunnelled back to the home network via an IPX provider. In contrast, LBO routes data traffic directly to the internet through the visited network (VPLMN), rather than backhauling it to the home network (HPLMN).

This reduces latency, optimises bandwidth and improves performance for data-intensive services and applications. LBO also helps optimise network bandwidth by offloading roaming traffic at the visited network's point of presence (PoP), rather than tunnelling it back to the home network. This gives operators greater scalability and flexibility as data volumes continue to grow, driven by bandwidth-intensive applications, IoT devices and wider 5G adoption.

Operators can also tailor routing policies based on factors such as network congestion and traffic patterns. Edge computing is closely aligned with LBO, with local edge infrastructure helping to further optimise roaming traffic routing and processing.

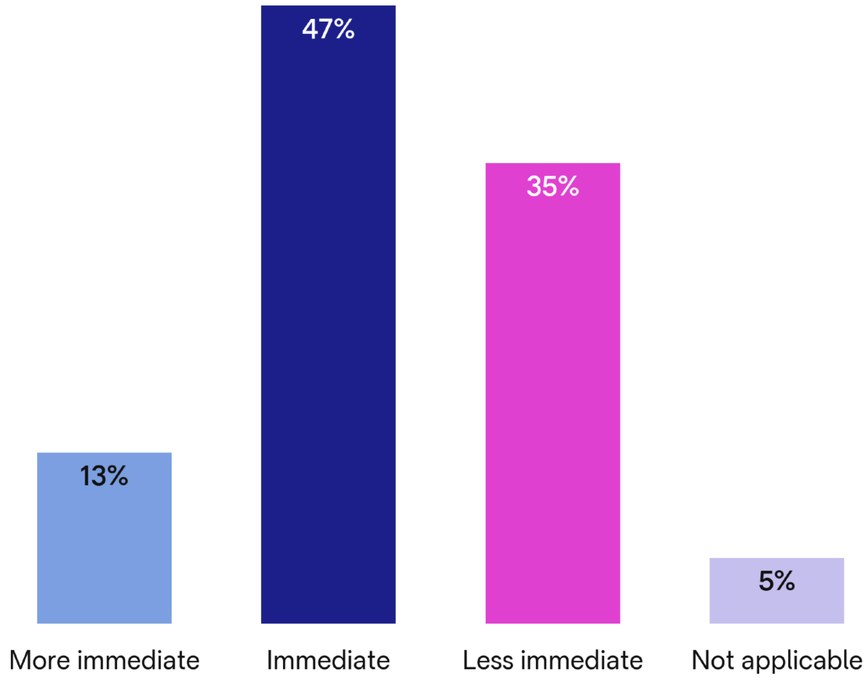


The LBO Shift: Architecting IPX for Latency, Sovereignty and Cost Efficiency

LBO and IPX play complementary roles in improving roaming efficiency. IPX providers can host and route traffic or provide local data services through an LBO gateway, helping operators reduce international data transport costs. The commercial viability of LBO is tightly bound to physical geographic presence. Deploying LBO without localised infrastructure forces operators into complex bilateral arrangements with foreign local tail carriers. Conversely, partnering with an IPX provider operating an extensive global network of on-net PoPs allows operators to terminate user plane data at pre-existing, interconnected edge gateways worldwide, unlocking deterministic low-latency performance without regional transit overhead.

According to Kaleido's 5G roaming survey, demand for LBO/RBO is seen as more immediate for 5G SA than for 5G NSA, largely due to the low-latency use cases enabled by 5G SA. LBO will be increasingly important for services such as data sovereignty compliance, remote healthcare telemetry, private campus network interworking, connected cars, V2X communications, and other low-latency applications where local traffic offload is beneficial. It can also support major events such as the World Cup or Olympics, where local routing and lower latency can help reduce pressure on congested networks.

MNO Survey: LBO/RBO - Priority Among MNOs - What are your most immediate 5G SA roaming requirements, from a services deployment point of view? Respondents reporting LBO/RBO



Source: Kaleido Intelligence Wholesale Roaming Survey 2026

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Rethinking the IPX One-Stop-Shop

As the wholesale roaming market prepares for growing volumes of 5G SA and cellular IoT traffic, mobile network operators are placing greater focus on the underlying architectures of their IPX partners. In today's market, two broad and technically viable approaches have emerged for delivering carrier-grade roaming connectivity.

The Horizontal Aggregator Model: Multi-Sourced Portfolios

This approach positions the IPX provider as a broad service aggregator, combining connectivity with value-added services such as signalling security, roaming clearing and settlement, testing and analytics. Delivery may rely on a mix of owned infrastructure, leased capacity and third-party network partners.

This model can offer operators flexibility, broad geographic coverage and access to a wide range of services through a single provider. Importantly, reliance on third-party infrastructure does not prevent providers from promising strong service levels. High availability, redundancy and defined QoS can be designed through appropriate leased networks and multi-provider architectures backed by contractual SLAs.

However, where multiple parties are involved in delivering the end to end service, providers may have less direct control over individual network elements. This can affect factors such as troubleshooting, capacity expansion and response times during major network incidents.



Rethinking the IPX One-Stop-Shop

The Vertical Model: The Quality-First Foundation

The vertical model places greater emphasis on ownership and direct control of the underlying network infrastructure supporting the IPX service, potentially extending from signalling functions such as Diameter and SEPP through to backbone connectivity and points of presence. Indeed, greater infrastructure ownership can provide several advantages:

- Increased visibility and control over end to end service performance and SLA management.
- Faster response to network incidents and capacity requirements, with less dependency on third parties.
- Economies of scale where the same infrastructure supports multiple services and large traffic volumes.
- Access to an extensive footprint of PoPs, edge locations and local breakout capabilities.
- Greater flexibility in optimising routing and network architecture as traffic patterns evolve.

These benefits are not exclusive to vertically integrated providers. Similar levels of availability, geographic redundancy and performance can be achieved through carefully designed multi-provider architectures. Factors such as routing design, redundancy, interconnection points and the location of network systems can be as important as infrastructure ownership itself.

However, Kaleido's analysis suggests that, as traffic volumes increase and service requirements become more demanding, the degree of control an IPX provider has over its underlying infrastructure will become an increasingly important consideration for operators. Providers with large global backbone networks may have an advantage in their ability to react quickly to disruptions, scale capacity efficiently and leverage infrastructure shared across multiple services.

The distinction is therefore less about whether infrastructure is owned or leased, and more about the level of operational control, resilience, reach and cost efficiency that the resulting architecture can deliver.

Balancing the Infrastructure Economics

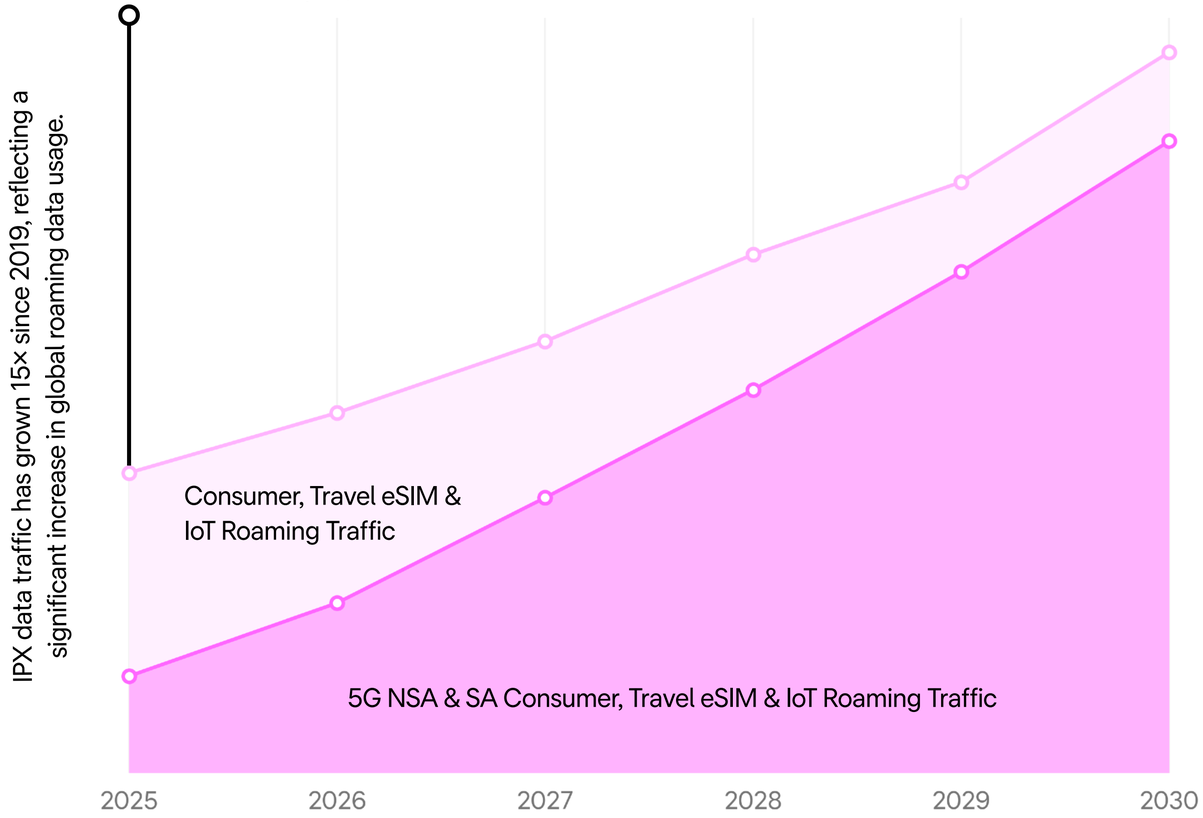
Kaleido Intelligence's research suggests that MNOs should assess IPX partners not only on the breadth of their service portfolios, but also on the architecture supporting those services. Network ownership, redundancy, geographic reach, routing control, edge presence and the ability to manage service performance should all form part of this evaluation. As 5G SA roaming and IoT traffic continue to scale, IPX providers will increasingly be assessed on their ability to combine connectivity, quality, scalability and cost efficiency. Providers with extensive owned infrastructure may benefit from greater operational agility and economies of scale, while well-designed multi-provider models can also deliver high levels of resilience and service quality.

With data traffic forecast to grow by more than 120% by 2030, and 5G SA placing greater demands on latency, reliability and service assurance, multi-provider models may introduce additional cost layers and operational complexity. Where several network partners are involved, maintaining end to end visibility and coordinating performance management can also become more challenging, although these risks can be mitigated through strong SLA frameworks, redundancy and network design.

This means that there is a compelling business case for MNOs to prioritise IPX partners with deep, vertical network integration. This model directly addresses the primary challenges and requirements identified by operators for the 5G era.

Consumer, Travel eSIM & IoT Roaming IPX Traffic Growth, 2025-2030

IPX providers carried at least 12,500 PB of data roaming traffic in 2025 and despite travel disruptions in 2026 is on track to carry 15,500 PB of data traffic in 2026.



Source: Kaleido Intelligence Data Hub 2026

Balancing the Infrastructure Economics

How Vertical Integration Can Address Key MNO Challenges:

- Ensuring quality and performance: By managing traffic on its own backbone, a vertically integrated provider can exercise greater control over routing, Class of Service and IPX performance against SLA and QoS requirements.

- Simplifying complexity and testing: Greater end to end network control can reduce coordination and testing complexity across multiple providers, supporting the validation of new 5G functions such as SEPP.

- Delivering scalability and cost efficiency: Providers with large backbone networks can leverage economies of scale across shared infrastructure, supporting cost-efficient capacity growth and reducing reliance on third-party capacity.



Arelion: Vendor Profile

Summary

Arelion, formerly Telia Carrier, is a pioneering global connectivity provider, having been instrumental in the creation of GRX and the IR.34 standard. The company operates one of the world's most connected IP backbones (AS1299), with a network spanning over 80,000 km of optical fibre and more than 370 Points of Presence (PoPs) globally.

Operating as a neutral IPX provider, Arelion serves a diverse customer base, including MNOs (e.g., Telia Group, Orange Poland), MVNOs (e.g., LycaMobile, 1NCE), core network providers (e.g., Cirrus Core Networks), and CPaaS providers (e.g., Sinch). Arelion's core strength lies in its wholly-owned and managed global network, which provides end-to-end control over service quality, scalability, and cost-efficiency. Its IPX services are delivered over this backbone with a guaranteed SLA of 99.999% availability.

Key Service & Product Updates

- 5G SA Roaming Enablement: Arelion is actively trialling 5G SA roaming solutions aligned with GSMA specifications. Arelion offers both a hosted SEPP (Security Edge Protection Proxy) and an IPX SEPP model to support the transition to 5G SA.
- Value-Added Services: Arelion has formalised its VAS offering through a strategic partnership with Cellusys. This allows Arelion to provide a comprehensive suite of solutions, including hosted signalling security (SS7, Diameter, GTP), Steering of Roaming, Welcome SMS, and advanced network analytics.
- Analytics and Intelligence: The company offers a roaming analytics solution providing near real-time visibility (with 5-minute intervals) into traffic flows, partner performance, and network events. Customers can access data and manage services through the ”MyArelion” customer portal.
- IoT and Cloud Connectivity: Arelion’s IPX backbone supports IoT and M2M use cases by separating device traffic from the public internet. The network provides direct, high-quality transport paths for device management platforms and supports cloud-based core networks for MVNO clients.
- Network Security: The IPX network is built with robust, multi-layered security, compliant with GSMA IR.77. Security measures include protection against DDoS attacks, spoofing, and unauthorized route advertisements. The integration of Cellusys's signaling firewall further enhances this protection.

Network and Infrastructure

Arelion’s IPX services (SS7, Diameter, HTTP/2 and GRX/S8) are delivered over its fully managed, geographically diverse MPLS core network. The infrastructure is designed with no single point of failure, utilising logically and physically separated "Red and Blue" DWDM backbone networks to ensure resilience. Arelion's ownership of its network allows for rapid capacity scaling from 100 Mbps to 400 Gbps to meet customer demand.

About

Kaleido Intelligence

Kaleido Intelligence is a specialist consulting and market research firm with a proven track record delivering telecom research at the highest level. Kaleido Intelligence is the only research company addressing mobile roaming in its entirety. Our Mobile Roaming & Connectivity research service covers industry leading market intelligence and publications on Wholesale & Retail Roaming, travel eSIMs, 5G Roaming, IPX, Private Networks, IoT MVNOs, IoT Roaming and Roaming Analytics & Fraud. Research is led by expert analysts, each with significant experience delivering roaming insights that matter. In 2025, Kaleido Intelligence completed its merger with Mobilesquared, expanding its capabilities and reach across the telecom research landscape.

For more information on this market study or if you would like to subscribe to Kaleido's roaming research, please contact the team at: roaming@kaleidointelligence.com

Arelion

Arelion solves global connectivity challenges for multinational enterprises whose businesses rely on digital infrastructure. On top of the world's #1 ranked IP backbone and a unique ecosystem of cloud and network service providers, we provide an award-winning customer experience to customers in close to 130 countries worldwide.

Our global Internet services connect more than 700 cloud, security and content providers with low latency. For further resilience, our private Cloud Connect service connects directly to Amazon Web Services, Microsoft Azure, Google Cloud, IBM Cloud and Oracle cloud across North America, Europe and Asia.

Discover more at arelion.com, and follow us on LinkedIn and X.

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