Optimized Enterprise Internet Services: Mixing Performance and Flexibility

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Summary

Catalyst

Enterprises keep increasing their internet usage. Internet services are quick to order, easy to reconfigure, flexible, and competitively priced – what's not to love? Most of the internet, along most routes, most of the time, performs well enough. However, the global internet infrastructure has caveats to make any enterprise IT executive pause when communication is vital for the success of the business.

An IT department that migrates to internet services but needs performance more like a private WAN can engage with two ideological camps. One optimizes traffic in the core network, which is fast and easy to implement; the other starts end-to-end service conversations, which is more involved. Each camp has merits, and their approaches are often compatible.

This report outlines the qualities of specialist internet optimizers and large network providers. It includes example companies, what each has to offer, and why to engage.

Omdia view

Internet optimization specialists offer extensive intelligence that they collect in real time about the health of global internet routes. They have perfected techniques to select routes based on various criteria (e.g., latency, reliable packet delivery, cost, and other preferences). Some have built-in AIOps to make proactive and even predictive decisions that sidestep internet congestion. This intelligence turns out to be useful in other ways; for example, to detect and alert against distributed denial of service (DDoS) attacks. The intelligence can extend to underlying internet routes to keep traffic out of suspect routes or away from prohibited geographies.

Large network providers have a different conversation on internet optimization and flexibility, which starts with network needs and overall experiences. Their end-to-end network view covers different types of access and different backbones in various combinations. The conversation is likely to extend to services management and migration strategies. Other topics include cloud and multicloud connectivity, security, site hardware, and network functions. Discussions with large network providers are involved, the engagements more complex, and the stakes higher.

Key messages

- Internet optimization specialists and network providers are not mutually exclusive categories. Expereo, for example, operates in both camps, as an optimization specialist and a provider of network access and managed network services. Expereo also sells its services wholesale to other providers. Large network providers invest in their own network infrastructure and also employ a range of optimization tools and techniques.

- Internet optimization specialists address both one-way content delivery and two-way communications. Their services can detect and avoid inefficient ISP peering arrangements and set up better alternatives to make a major performance difference.

- Internet optimization specialists find the best performance on long-haul routes, moment to moment. In scenarios where there are many options, these specialists can find more reliable packet delivery here, lower latency there. Smaller efficiency gains add up.

- Internet optimization specialists can leverage route intelligence to inform other services related to security, such as DDoS attack detection and alerting.

- Large network providers focus on the overall customer experience. On a standard or custom basis, they can often provide edge-to-edge and site-to-site network availability and performance guarantees if the enterprise purchases service packages recommended by the provider.

- There is much complexity in setting up internet access for reliability and performance. Large network providers want to simplify these enterprise decisions, through digital selection tools and offers such as network-as-a-service (NaaS).

- Large network providers can help assess, design, and validate new enterprise network architectures, and can help migrate networks from old to new platforms, services, and configurations. If an enterprise is uncertain how to proceed, or does not have expertise to upgrade, outside service providers can fill the gap.

Recommendations

Recommendations for service providers

Internet optimization specialists, large network providers, and smaller network or hosting providers should each have an ongoing dialogue with others, to explore buy, sell, or partner opportunities. Each has ways to improve service quality, lower costs, and exploit real-time intelligence about the health of the overall public internet. All three parties are interested in more customer opportunities. Each plays to its strengths:

- Internet optimization specialists can select the best internet routes. That intelligence can also detect traffic anomalies and avoid routes based on client-set rules, for security, governance, and compliance information.

- Large network providers pull together many partners. Large providers assemble managed and professional services to build and operate trusted end-to-end enterprise networks.

- Smaller localized service providers control access and the middle-mile network. They can give clients satisfactory local, regional, and global internet experiences.

Recommendations for enterprises

Large enterprises with a growing reliance on internet virtual private networks (VPNs) need to be reasonably comfortable that service will be available and performance consistent. When enterprise sites (such as headquarters and branch offices) are involved, this discussion needs to start at the port and connection level, to make sure their services are backed by quality connections from site to internet backbone infrastructure, covering the access network and the middle mile. There are many network options, so these are complex discussions. Enterprises should expect network providers to develop excellent digital automation that makes it easy to select, buy, and change services. Internet optimization is a separate conversation. It has the potential to speed up internet content distribution from the cloud, and to optimize traffic performance over the global internet. SD-WAN can play an essential part to optimize access. Some SD-WAN has extra WAN optimization features to improve performance throughput.

Market status

Private WAN has a place, but the shift is to internet VPN

Enterprises continue in their shift from private WAN services and onto internet VPNs. As shown in Omdia's Enterprise Insights surveys, more than half of large enterprises operate hybrid networks, which mix private WAN and internet connections. Some enterprises shift their smaller branches to hybrid and even all-internet connections; a few choose to rely on all-internet connectivity, even for their large sites. **Figure 1** shows just how pervasive all-internet site connectivity has become for hybrid WAN adopters. Most enterprises that mix WAN with internet use the combination for a few sites. Meanwhile, it is not unusual for all-internet connections to be more than half, even all, of an enterprise's internet connections.

1. Figure 1: All-internet ports dominate site connectivity as people decrease private WAN use

What large enterprise sites use, if not private WAN
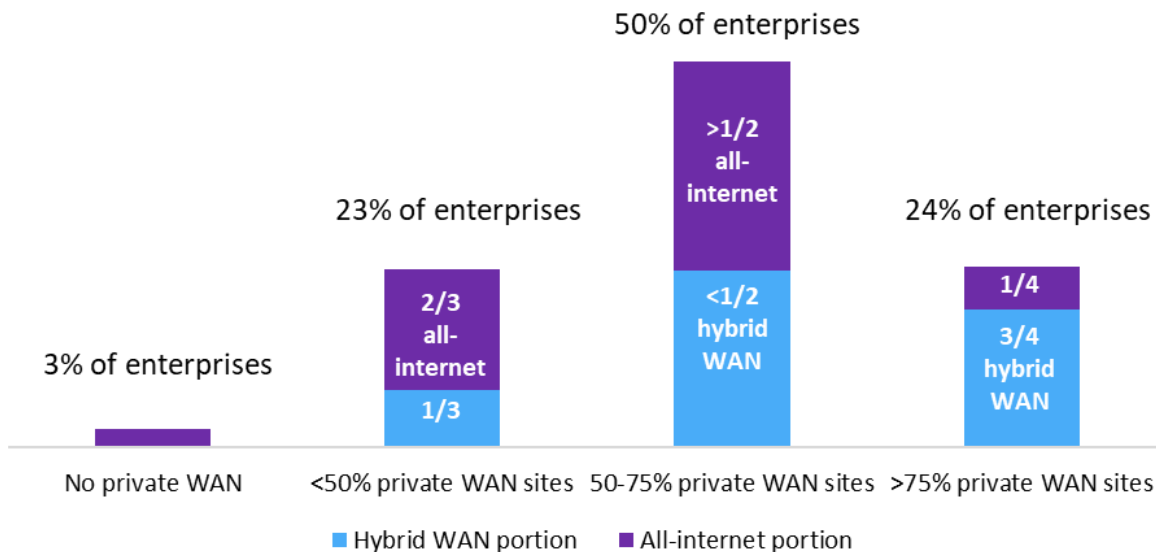
Source: Omdia's Enterprise Network Services Insights Survey, 2021

Private WAN services were designed to meet guaranteed bars of performance. The public internet cannot guarantee the same predictable, high-performance communications between endpoints. Enterprise IT buyers appreciate how flexible and inexpensive internet ports can be. There is no waiting for weeks while an MPLS port and circuit are set up to serve a new location. But those same enterprises also need to be confident that the network will be consistent in handling transactions and applications traffic.

Large multinational enterprises that want to go further down the path of all-internet but need performance can take at least two approaches (see **Table 1**). One is to tap routing intelligence and optimize internet core performance. Suppliers and service providers in this space include larger organizations that leverage intelligence from their content delivery network (CDN) expertise, such as Akamai and Cloudflare. There are

also specialists in the field, such as Teridion and Noction, which work with many types of service providers. Global managed services provider Expereo can optimize for local-to-global network services.

The other option is more of an encompassing strategy – working with a network provider partner. In this case, the partner assembles an internet experience that includes needed global performance guarantees. Most large telcos support internet performance guarantees, either off-the-shelf or on a custom basis.

Table 1: Different provider perspectives in optimizing internet connectivity

	Optimization specialists	**Large network providers**
Origins	Some started by offering one-way content delivery. Capabilities expanded to a two-way role.	Many established local-to-global competitors that have handled IP traffic since the commercialization of the public internet.
Network stance	Asset light, which they position as a customer benefit. They draw from all available backbone options.	Position network assets and end-to-end partner ecosystems as part of the overall value proposition.
Network on-ramps	Optimize global/regional traffic. May offer some access/middle-mile options.	Work with access partners to present a range of connectivity options and performance levels.
Value adds	Leverage real-time/historical analytics and other intelligence services. Makes insights available to clients.	Service portfolio holds a large collection of off-the-shelf, value-added, and custom advisory/professional services.
Cost	Standalone optimization subscriptions tend to be attractively priced as a value-add.	Fully assembled service packages, especially with custom components, advisory help, and management responsibility, are not inexpensive.

Source: Omdia

Internet optimization, core, and access

The global internet core is a collection of the world's major providers of wholesale global internet capacity and their backbone routes. Lumen, Arelion, and NTT are among the largest of these providers. AT&T, Orange Business, Tata Communications, Zayo Group, Telefonica/Telxius, Telecom Italia/Sparkle, Verizon, GTT, Deutsche Telekom, and Cogent Communications represent more of the world's major Tier-1 carriers and global public internet backbones.

There are many more providers, and many possible routes between any two major internet exchanges, and different views on how best to take advantage of route diversity and choice:

- Large network providers can refer to endpoints, capillarity, and their managed access; they also have infrastructure ownership and control, and use internal tools to monitor and improve backbone performance.

- Optimization specialists can refer to independence from individual operators and use routing intelligence they have honed over the years. Some optimization specialists completely embrace the openness of the internet; others may have preferred public internet routes or mix private segments into the public internet.

Specialists in the internet optimization realm include Akamai (Global Traffic Management), Cloudflare (Argo Smart Routing), Expereo (Enhanced Internet), Noction (Intelligent Routing Platform), and Teridion (Liquid Network). For this report we have excluded providers such as Aryaka and Cato Networks that offer their own turnkey WAN services, which mix public internet/private WAN resources into them.

The network provider view: From site and access to the core

In serving enterprises, large global network providers see the question of internet optimization and flexibility as more holistic. They focus more on building total customer experiences. Network providers may use a combination of tools to optimize for global performance. They also invest to improve their owned global internet infrastructure. When it comes to enterprise customers' internet traffic, even big global providers can be pragmatic. For general-purpose internet, they let traffic flow over routes that work best regardless of who operates them. Global network providers may give the buyer an option to keep all traffic on their own internet backbone routes. This is sometimes done for security governance or legal compliance.

To the global network provider, optimization is only one aspect. They see the bigger potential issues in the middle mile, and possibly in overloaded access networks. The large network provider needs to consider the whole of an enterprise's networks: local, regional, and global; mixing private WAN, public internet, and managed services; and attachments to data center and cloud connect services. This network provider conversation with enterprises often covers the spread of existing assets and resources, desired migration goals, and setting up a transformation roadmap to reach those goals.

When they engage with a global network provider partner, enterprises' expectations can include factors such as:

- Helping to design, deploy, configure, and maintain network services, site hardware, and related functions

- Reportability and accountability for network services where they choose to offload management

- Flexible contracts that can scale capacity and shift performance up and down, where and when it is needed

- Characteristics of internet optimization, from core to edge.

Characteristics of internet optimization specialists

From global and regional internet core to site and access

Today's internet optimization platforms have different origins. Some focused first on one-way content delivery; some concentrated on connecting cloud resources; others aimed to improve end-to-end performance between sites. They started differently, but their goals ultimately merged. Internet

optimization dynamically finds the best traffic routes for the lowest latency and highest packet delivery. There are many hundreds of public internet exchanges worldwide. The preferred or default peering point for any pair of local or regional ISPs might perform poorly.

Core networks are not the whole story. A local ISP could have excessive router hops and heavily oversubscribed access. That adds latency and drops traffic in access and the middle mile. Optimizing the internet core does not avoid local ISP issues. There are workarounds. When access performance matters, with its Enhanced Internet service, Expereo offers direct connections between customer sites and its nearest hubs. For a client concerned about site-to-cloud or site-to-site performance, a direct link removes the risk of third-party local ISP routing issues.

Another solution for enterprises is to deploy SD-WAN and balance traffic performance between two or more access providers. Endpoints that have a single connection to the public internet might still resort to WAN optimization, but options are limited.

Services rich in analytics and intelligence

Internet optimization platforms start with intelligence. These platforms gather and process real-time data about performance for thousands of internet routes. This intelligence is a value-add that optimizers want to get into the hands of their subscribers. The data lets customers see the performance results for themselves. Optimizers can also leverage intelligence about the network for other services. Real-time network monitoring can detect and alert against DDoS attacks and can provide automated response triggers. Possible responses might be to blackhole traffic temporarily or redirect traffic if a certain threshold is exceeded. **Figure 2** shows a screenshot example of how gathered internet intelligence is extended into threat mitigation.

2. Figure 2: Example of optimization intelligence extended to threat detection and mitigation
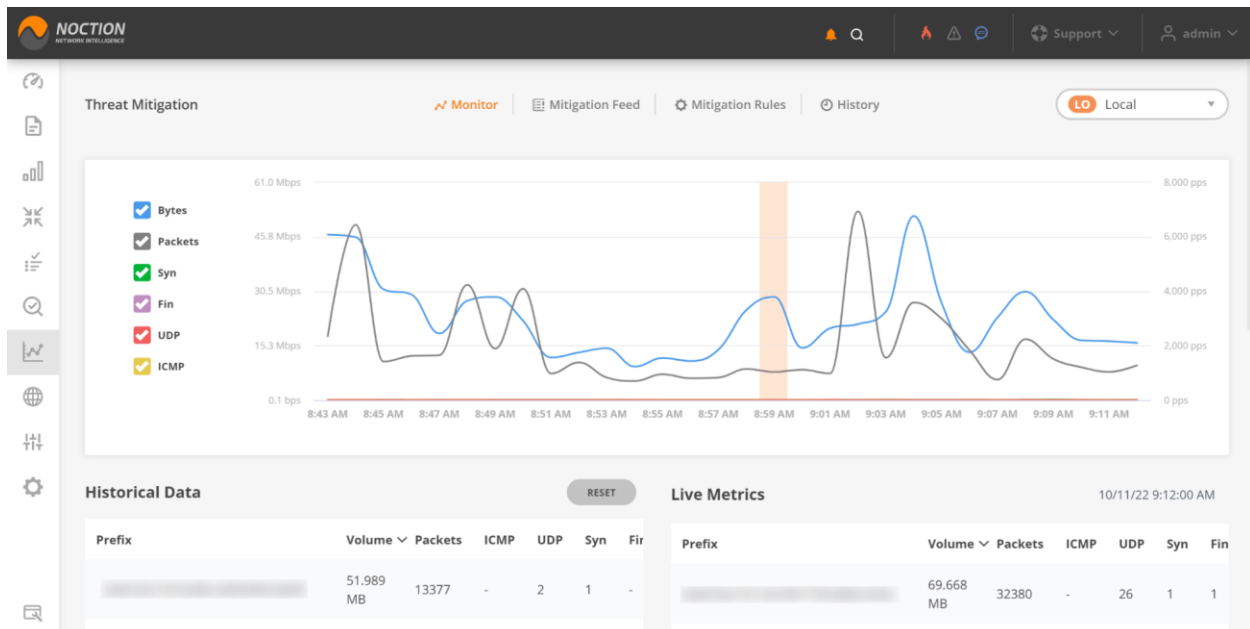
Source: Noction

Expereo executives, for example, point out AIOps that are built into the provider's Enhanced Internet service. The service knows recurring traffic patterns: daily, weekly, monthly, quarterly, and annually. Major world sports events and online shopping days are examples that distort traffic patterns, which the software can anticipate and compensate. When deployed on the edge within the customer's border gateway protocol (BGP) environment, Enhanced Internet also detects DDoS attacks. Clients can set thresholds to send alerts and trigger automated responses; for example, shutting down a port under attack until the client redirects the traffic to a scrubbing center. The Enhanced Internet service focuses its attention relative to the routes its client base uses. An Expereo executive has described that the Enhanced Internet platform "challenges itself:" it constantly tests and evaluates alternatives to check whether the best possible routes are still valid.

Potential use of internet topology intelligence for trust

Major internet providers update and share information about known internet routes. There is a level of trust that the information is accurate. Through misconfiguration – or sometimes through malicious intent – an internet provider can advertise a false route to peers, overriding correct routing with corrupt information that redirects traffic down a false path.

When false routing information propagates across internet providers, it can divert a deluge of traffic that results in severe degradation or outages. Even if the invalid route handles the load, traffic is still being diverted where it should not go. That can include transit through unauthorized countries and to unauthorized parties in violation of organizations' security and sovereignty policies.

Internet BGP security, and preventing internet traffic routing compromises, is a complex topic. To start, major ISPs cryptographically sign their routes using resource public key infrastructure (RPKI). MANRS, or "mutually agreed norms for routing security," is one initiative where trusted parties can cooperate and keep out potential bad actors.

But it is not that simple. As Noction executives point out, the adoption of best practices among internet players, such as only accepting trusted (RPKI-signed) routes, is a work in progress. In some regions of the world, RPKI-signed trusted BGP is not yet widely used. An internet provider that only accepts valid and signed routes could still have traffic pushed onto its network from an invalid route.

BGP hijacking is mostly an intermittent irritant. In most cases, router misconfigurations are detected within a few minutes, and cleanup takes an hour or two. But there have been a few larger security scares, and cases where cybercriminals have exploited BGP hijacking for personal gain.

Seamless compatibility with private fabrics

Just as it is possible for enterprises to mix public internet and private WANs, network service buyers can mix different types of (optimized and non-optimized) internet along with private network segments. An organization can set up its own routers or SD-WAN, to set up routing policies that send traffic types or applications on different paths.

Shifting global IP traffic into and out of a private WAN, moving IP traffic across a data center interconnect (DCI) provider's links, or pushing IP traffic through a hyperscaler's virtual private cloud does not automatically improve end-to-end performance. As a Noction executive points out, if traffic is optimized across a diverse mix of internet backbones, diverting it into a DCI link is not necessarily going to provide big performance gains. A DCI player's links instead offer value in terms of ease of ordering and managing capacity between specific endpoints at competitive price points.

Profiles: competitor capabilities and perspectives

Select internet optimization competitor and platform profiles

Noction – Intelligent Routing Platform (IRP)

Founded in 2011, Noction is a global specialist focusing on BGP routing optimization for service providers. Its service is compelling to parties that do not have direct global network scale. The company's optimization services offload BGP management for its customers' ports at any capacity. Noction subscribers also include large global enterprises reliant on the public internet. Besides IRP, the company has an additional platform called Noction Flow Analyzer that offers network traffic observability, BGP data analysis, and alerting.

Noction IRP, which as of January 2023 is at version 4.1.1, constantly monitors and troubleshoots global internet status, analyzes BGP routing information along available routes, and selects the best path for customers' traffic in terms of packet delivery and latency. The service includes basic enterprise IP network tools (e.g., traceroute, whois, looking glass), and supplies analytics reports to give its clients insights on routing decisions made by IRP.

Noction continuously develops IRP to meet its user community's needs. One feature in development is a way for customers to avoid invalid routes (i.e., to avoid advertised BGP routes that are not securely certified as owned by a trusted party). Another feature soon to be released is GeoBlocking, which supports company policy, legal liability, and compliance requirements by letting customers specify whether their internet traffic should avoid routes that pass through certain countries.

Cloudflare – Argo Smart Routing

Cloudflare was founded in 2009. The company may be best known for its CDN focus, but Cloudflare also offers a wide range of solutions focusing on security and performance. Cloudflare's portfolio includes content delivery, VPN services, DDoS protection, website security, and a secure access service edge/security service edge (SASE/SSE) offering. Cloudflare Argo Smart Routing service constantly looks for the global internet routes that have the highest reliability and lowest latency available. Argo takes a number of factors into account to determine best routes, including BGP options among transit providers.

Argo Smart Routing is a second-generation service. The first generation of Argo focused on pushing content optimally from Cloudflare PoPs to customer locations. Version 2.0 was released in 2021 and optimizes customer traffic, both transiting into and out of Cloudflare's delivery system. Cloudflare describes the result as global-to-local improvements in latency when compared to general-purpose internet access. The Argo Smart Routing service comes with security protections and analytics that let clients view their performance benefits.

While Argo Smart Routing does not currently have a feature to detect or avoid suspect BGP routes, Cloudflare does offer specific services that monitor and alert against internet routing threats such as hijacked prefixes and route leaks. Cloudflare continuously develops Argo to support evolving customer requirements. If it becomes a client priority for Argo to check and avoid suspicious internet routing, for example, Cloudflare could build these features into the platform.

Expereo – Enhanced Internet

Founded in 2004, Expereo is a global network and managed service provider. The company first introduced global internet optimization in 2008 to deal with observed peering issues and routing anomalies. In 2017, Expereo acquired a BGP optimization specialist, and its platform became the basis for Expereo's Enhanced Internet service. Enhanced Internet continuously monitors global internet health from its global hubs. It focuses efforts on selecting best-performing routes – meaning the best combination of packet delivery and latency – in real time between the internet's most popular destinations.

Expereo is unusual among peers in internet optimization because the company's expertise also includes sourcing and managing endpoints for multinational enterprises and wholesale partners. Clients may source access from Expereo and connect it to global fabrics in whatever way they wish: source a private WAN, attach to general internet services, or subscribe to Enhanced Internet. Expereo executives note that there is increasing awareness from clients of the importance of optimized internet services to improve network performance and the user experience.

Expereo Enhanced Internet supports global traffic volumes of up to 10Gbps per connection. There are two performance tiers for access to Enhanced Internet. Where clients need the best possible performance, they can use point-to-point links that Expereo can provide between their own sites and the nearest Enhanced Internet hubs. This high-performance option is the most popular with clients because the direct link avoids third-party internet access and middle-mile issues. Sites can also connect to hubs through internet VPNs. This approach optimizes global internet traffic but it does not control quality on the access-to-hub internet segment. Enterprises may of course choose more than one access option at their sites and use SD-WAN as a way to optimize between them.

Select large network provider competitor profiles

Tata Communications

Tata Communications offers a wide portfolio of services that includes global network and unified communications, managed connectivity and cloud, cybersecurity, and value-added services such as managed SD-WAN. The provider has a spectrum of network options from fully private WAN to fully public internet. These include Ethernet and MPLS VPN, hybrid private/internet networking, high-performance internet WAN, and conventional internet services.

Tata Communications' high-performance IZO Internet WAN service draws from an ecosystem of more than 90 ISP network partnerships, reaching more than 150 countries. IZO Internet WAN offers site-to-site for business internet services. It can provide these network performance guarantees across different ISPs, national, regional, and global.

IZO Internet WAN's origins trace back to Tata Communications' long-standing role as a major provider of global wholesale network services. The company's trusted wholesale peering relationships include network interconnection that honors quality of service (QoS). The relationships go deeper, as Tata Communications executives describe having "operational interlock" with its ecosystem of ISP partners.

Tata Communications' more than 90 ISP partners connect directly to Tata Communications' transit services. They are therefore set up to expedite passing customer B2B traffic to the provider's global network. Thanks to its flexible Layer 2 fabric, once on Tata Communications' global network, traffic can traverse between its connected ISPs through a single router hop.

At each of their IZO Internet WAN sites, enterprises choose the level of end-to-end service quality guarantees (e.g., availability and repair intervals, latency, and packet delivery) they want, and can choose to

attach to the service through dedicated or broadband connections. Basic and Standard service tiers offer premium availability and restoration guarantees. Enhanced and Essential service tiers add predictable routing from Tata Communications' global network to add latency and packet delivery guarantees.

Besides performance guarantees for site-to-site communications, IZO Internet WAN has interconnect points that attach at major global cloud locations and data centers. These points connect to cloud providers such as AWS, Microsoft Azure, and Google Cloud Platform, and data center sites from Equinix. Clouds and data centers are destinations for enterprises that need infrastructure, compute, and storage services, and they are home to a huge ecosystem of software-as-a-service (SaaS) providers.

Verizon Enterprise Solutions

Verizon offers a wide portfolio of national US wireless and wireline services, as well as a wide range of global services. These include network; voice, collaboration, and contact center services; cybersecurity services; a range of solutions for the Internet of things (IoT); and professional and managed services. In network, Verizon offers private WAN and public internet services, and emphasizes its role in supporting hardware and virtualized network functions. It also offers a full range of managed network services encompassing SD-WAN, SD-LAN, gateway services, and managed WAN and LAN.

When it comes to network monitoring and operations, Verizon uses the tools and practices expected of a leading global network operator. The provider constantly monitors, reconfigures, and invests in its network to make sure it offers the best possible experience for clients. Verizon has tools, for example, which let enterprises test and understand how end users experience their services. Enterprises use these tools to get information on the experience of on-site and remote workforces that connect and use corporate resources.

Verizon is also blending the distinctions between public internet and private WAN traffic. The provider is working on a service that gives enterprises more freedom to mix internet access with different types of transport and backbone networks, both public and private. This service will be another useful tool for enterprises to balance their network performance levels, flexibility, and price points for each site.

Verizon executives also point out that internet flexibility and optimization are not just in the network core. There are real benefits to fully managed, end-to-end network services. Local site downtime can be the biggest, most disruptive performance issue of them all. Managed troubleshooting and remediation can make a big difference in how fast issues are resolved.

Executives also point toward flexibility, simplicity, and the ease of use of Verizon NaaS solutions. Verizon NaaS solutions are offered in standard tiers, built based on how enterprises actually consume services. There is flexibility to upgrade or downgrade end locations as availability and performance needs change. The buyer can choose between conventional routers and SD-WAN, virtualized network functions and dedicated hardware, and can put other requirements or restrictions on access preferences. In the end, the simpler, flexible, scalable endpoints of Verizon NaaS can create an internet experience that is easy to use and easy to manage for the enterprise administrator.

Orange Business

Orange Business is a global provider that increasingly focuses on the digital services integration space. The provider describes itself as a network-native digital services company. This means that with large enterprise engagements, for example, client conversations more often start with high-level business challenges: transforming the customer experience, or enabling workforces for hybrid models or mobility, or deploying a complex industry IoT project and leveraging its data intelligence.

Network services remain core to Orange Business. Across networks including public internet, the provider's operations, tools, and policies are designed for optimal experiences. On its global internet backbone, the provider manages client traffic directly. It uses global network optimization tools, including interior gateway protocol (IGP) flexible algorithms (Flex-Algo), and provides premium tiers of internet performance guarantees. This global backbone connects directly into the world's major clouds, data centers, and content hubs.

To reach from its global network to individual enterprise sites, Orange Business has relationships with local ISP partners, some of which peer directly with its internet backbone. The provider's premium internet service tiers can extend performance guarantees from the provider edge to site endpoints. High-performance, resilient internet access can be coupled with SD-WAN's dynamic path selection to improve performance further. For flexibility, Orange Business hosts SD-WAN gateways at the network edge, which direct traffic between SD-WAN, public internet VPNs (IPsec and SSL) and private WAN (MPLS VPN). The same network edge also hosts Cisco ThousandEyes for real-time intelligence on network behavior.

Orange Business aims to make network access ordering as simple as possible for its clients, through digital tools such as its Customer Site Configurator. Through a few clicks, this tool simulates the site based on its type and needs such as uptime, usage, and bandwidth. The tool then gives the client site recommendations with pricing and key information. Whether assembling networks manually or through the configurator, the choice of access options spans dedicated and wireline/wireless broadband; and for network services, internet, MPLS, and hybrid WAN.

While Orange Business handles optimization across access and backbone, its executives point out that it is also vital that partner network routing aligns with client and cloud partner policies. Some SaaS policies, for example, insist on picking up client traffic at the closest possible internet exchange. Other SaaS policies have ISPs that carry traffic to a regional handoff. In some cases, policy compliance is necessary for the client to qualify for SaaS and support guarantees.

Appendix

Methodology

This report draws from new and historic service provider executive interviews along with secondary research. It also draws from past Omdia's Enterprise Insights surveys.

Further reading

Internet aggregators evolve to meet enterprise internet VPN momentum (April 2021)

Enterprise Network Services Insights Survey – 2021 (November 2021)

"While the "Splinternet" is happening, Global B2B internet connectivity has resisted fragmentation" (March 2023)

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