Magic Quadrant for WAN Edge Infrastructure

Strategic Planning Assumptions

By 2023, to deliver flexible, cost-effective scalable bandwidth, 30% of enterprise locations will have only internet WAN connectivity, compared with approximately 15% in 2020.

By 2024, more than 60% of software-defined, wide-area network (SD-WAN) customers will have implemented a secure access service edge (SASE) architecture, compared with about 35% in 2020.

By 2024, to enhance agility and support for cloud applications, 60% of enterprises will have implemented SD-WAN, compared with about 30% in 2020.

By 2024, 20% of SD-WAN centralized configuration and troubleshooting will be touchless via an artificial intelligence (AI) assistant, compared with none in 2020.

Market Definition/Description

Gartner defines the wide-area network (WAN) edge infrastructure market as WAN edge products that provide network connectivity from distributed enterprise locations to access resources in private and public data centers, as well as infrastructure as a service (IaaS) and software as a service (SaaS). It is typically procured by senior networking leaders in the infrastructure and operations (I&O) organization and increasingly senior security leaders. This market is evolving from traditional branch routers — often called “customer edge routers” in Multiprotocol Label Switching (MPLS) implementations — used to connect branch locations to the data center to a more decentralized architecture with cloud workloads. It is undergoing dramatic change, driven by the needs of digital business transformation and the demands of line of business (LOB) managers.

WAN edge infrastructure functionality can exist on or off the enterprise premises via physical or virtual appliances and is typically sourced from network equipment providers (and their channels), network service providers (NSPs) or managed network service (MNS) providers. WAN edge infrastructure must be agnostic to the underlying network transport provider and services.

The market for branch office WAN edge functionality continues to rapidly shift from dedicated routing, security and WAN optimization appliances to feature-rich SD-WAN. SD-WAN is replacing traditional branch routers with application aware path selection among multiple links, centralized orchestration and native security, as well as application performance optimization functions. Consequently, it includes incumbent and emerging vendors from multiple markets (i.e., routing, security, WAN optimization and SD-WAN), each of which brings its own differentiators and limitations.

Common attributes of SD-WAN solutions are described in the section that follows.

Core Functionality

- Licensed software:
    - Routing
    - Application recognition
    - Path selection
    - Virtual private network (VPN) and Layer 4 firewall
- Form factors:
    - Virtual and/or physical
    - Edge and headend
- Orchestrator (on-premises or in the cloud):
    - Configuration
    - Management
    - Visibility

Optional Functionality

- Native advanced security
- Cloud gateways
- Application performance optimization

In the North American market, about 60% of WAN deployments have historically been do-it-yourself (DIY). In much of the rest of the world, a managed service approach is favored. In general, we see a trend toward more managed services, even though SD-WAN makes managing the WAN easier. At the same time, this introduces new challenges, with the greater use of internet transport. Large global organizations may prefer a DIY or managed approach, whereas midsize organizations are more likely to favor managed services. Consequently, many companies now compare DIY and managed service options as part of the evaluation process.

Increasingly, vendors are differentiating their SD-WAN solutions in the following categories:

- Ease of use
- Application performance optimization — including WAN optimization, voice optimization, SaaS optimization and ensuring quality of experience (QoE)

- Integration of network and security (SASE)
- Pricing and pricing models
- Cloud onramp for simpler connectivity to cloud workloads
- AI/machine learning (ML)-assisted for troubleshooting
- Support for 5G, Long Term Evolution (LTE) and other cellular wireless use cases
- Orchestration and integration with third-party solutions

Magic Quadrant

Source: Gartner (September 2020)

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may reflect a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

Palo Alto Networks has been added because it acquired CloudGenix.

Dropped

Aryaka was dropped because it failed to meet the inclusion criteria, based on our assessment and data provided by the vendor.

CloudGenix was dropped because it was acquired by Palo Alto Networks.

Oracle was dropped because it failed to meet the inclusion criteria, based on our assessment and data provided by the vendor.

Inclusion and Exclusion Criteria

To qualify for inclusion, vendors need to show relevance to Gartner clients by:

- Providing hardware and software that addresses the enterprise WAN edge requirements outlined in the Market Definition/Description section. Alternatively, they may address this need by using in-house-developed hardware/software to deliver as a managed service.
- Producing and releasing enterprise WAN edge networking products for general availability as of 15 June 2020. All components must be publicly available, be shipping and be included on the vendors' published price list as of this date. Products shipping after this date, and any publicly available marketing information may only have an influence on the Completeness of Vision axis.
- Providing commercial support and maintenance for their enterprise WAN edge products (24/7) to support deployments on multiple continents. This includes hardware/software support, access to software upgrades, and troubleshooting and technical assistance.

Product Capabilities

Vendors must have generally available (GA) products that support all of the following capabilities. These capabilities must be supported natively on branch CPE:

- The ability to function as/replace the branch office router/CPE (including BGP, OSPF, support hub and spoke, mesh, and partial mesh topologies for a minimum of a 250-site network) with traffic shaping and/or quality of service (QoS)

- Centralized management for devices (with GUI), including reporting and configuration changes, and software upgrades
- Zero-touch configuration for branch devices
- VPN (Advanced Encryption Standard [AES] 256-bit encryption) and NGFW or Layer 4 firewall with the ability to redirect and orchestrate with a secure web gateway (SWG)
- Dynamic traffic steering based on business or application policy (not limited to only DiffServ Code Point [DSCP]/ports, IPs/circuits or 5tuple) that responds to network conditions (changes in packet loss, latency, jitter, etc.) in an active/active configuration
- At least 200 well-known application profiles included (autodiscovered)
- Application visibility identifying specific traffic that traverses the WAN
- Software (ability to operate as a VNF at the branch or in the network and to be hosted in at least one cloud provider, such as AWS) and hardware form factors

Business/Financial Performance

Vendors must show relevance to Gartner's enterprise clients by meeting the following with their WAN edge infrastructure solution(s) that meet the product capabilities inclusion criteria (from above):

- Demonstrate baseline scalability by servicing at least five customers with active support contracts that have at least 100 sites each.
- Show relevance to Gartner's enterprise clients on a global basis with at least one of the two below criteria with product or products that fulfill the product inclusion criteria:
    - At least 50 WAN edge infrastructure customers with 10 or more production sites each, headquartered in two or more geographic regions (North America, South America, EMEA or APAC) under active support contracts. This means 50 customers with headquarters in one region and another 50 customers with headquarters in a different region.
    - At least 20 WAN edge infrastructure customers with 10 or more production sites each, headquartered in three or more geographic regions (North America, South America, EMEA or APAC) under active support contracts. This means 20 customers each with headquarters in three different regions, for a total of at least 60 customers.

- Meet at least one of the four criteria below with WAN edge infrastructure products that fulfill the product inclusion criteria:
    - Total WAN edge infrastructure revenue of at least $30 million in the 12 months ending March 31, 2020*
    - Total WAN edge infrastructure revenue of $20 million in the 12 months ending March 31, 2020, with at least a 100% growth rate during the previous 12 months
    - At least 30,000 WAN edge infrastructure sites deployed and under active support contracts
    - At least 500 WAN edge infrastructure customers under active support contracts with 10 or more sites deployed each

* Gartner leverages our published market estimates.

Exclusion Criteria

We exclude NSPs, non-NSPs or other providers/vendors that do not own a substantial native capability included in their WAN edge technologies.

Evaluation Criteria

Ability to Execute

Product/Service: Core goods and services that compete in and/or serve the defined market. This includes current product and service capabilities, quality, feature sets and skills. This can be offered natively or through OEM agreements/partnerships, as defined in the Market Definition and detailed in the subcriteria.

Evaluates vendors by looking at their overall WAN edge networking portfolios, including all hardware and software aspects of WAN edge networking. This includes physical and virtual customer premises equipment (CPE), controllers, gateways, and the relevant automation, management and orchestration of those components. We consider the breadth and depth of WAN edge functions that the vendor offers that address common use cases enterprise customers have. We consider product and architectural migration strategies, and the ability to address customers' multicloud deployment requirements, application performance, security, traffic steering and scalability. We focus on the vendor's flagship enterprise offering and/or the products they lead with for enterprise accounts.

Overall Viability: Viability includes an assessment of the organization's overall financial health, as well as the financial and practical success of the business unit. Views the likelihood of the organization to continue to offer and invest in the product, as well as the product position in the current portfolio.

Sales Execution/Pricing: The organization's capabilities in all sales activities and the structure that supports them. This includes sales/channel depth/breadth, pricing and pricing models, estimated market share and estimated growth.

Evaluates sales effectiveness and go-to-market activities of the vendor and its channels. It also includes analysis of how the vendor interacts with its customers and prospects. The second aspect of this criterion includes our evaluation of the cost-effectiveness of the solutions for purchase and support over their useful life, and the ability to recognize and position the most appropriate solution in specific sales situations.

Market Responsiveness and Track Record: Ability to respond quickly, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness to changing market demands. This includes how well the vendors offering matches buyer's requirements at the time of purchase.

We assess the vendor's track record in delivering new capabilities when the market needs them in terms of timing and scope. This criterion also considers the vendor's history of responsiveness in terms of changing market demands and addressing limitations. This evaluation is not limited to products as it involves pricing/licensing as well.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message in order to influence the market, promote the brand, increase awareness of products and establish a positive identification in the minds of customers. This "mind share" can be driven by a combination of publicity, promotional, thought leadership, social media, referrals and sales activities.

Focuses on how the vendor is perceived in the market, and how well its marketing programs are recognized. For WAN edge infrastructure, the evaluation focuses on how well the vendor is able to influence and shape perception in the market through marketing activities and thought leadership that drives awareness. An additional indicator for this criterion is how often Gartner clients inquire about a specific vendor in terms of capabilities/reputation or in a shortlist evaluation process.

Customer Experience: Products and services and/or programs that enable customers to achieve anticipated results with the products evaluated. Specifically, this includes quality supplier/buyer interactions technical support, or account support with the vendor. This may also include ancillary tools, customer support programs, availability of user groups and service-level agreements (SLAs).

Looks at all aspects of the customer experience (including pricing, setup, day-to-day production and support), with a heavier weighting on postsales service and support activities. This includes customer's experience with the vendor's WAN edge products and services used in its production environments. This includes initial provisioning, as well as the day-to-day operation and management of WANs, and overall interaction with the

vendor. It also includes the ability to upgrade software and work with technical support to solve problems. Hardware and software quality and how existing customers describe their experience with the vendors' products are evaluated.

Table 1: Ability to Execute Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Product or Service	High
Overall Viability	High
Sales Execution/Pricing	Medium
Market Responsiveness/Record	Medium
Marketing Execution	Medium
Customer Experience	High
Operations	Not Rated

Source: Gartner (September 2020)

Completeness of Vision

Market Understanding: Ability to understand customer needs and translate them into products and services. Vendors that show a clear vision of their market — listen, understand customer demands, and can shape or enhance market changes with their added vision.

Assesses the vendor's ability to look at future needs and drive new ideas into product roadmaps and offerings, taking into account market needs, competitor strengths/weaknesses and vendor core competencies. In this market, we look at the vendor's ability to address the challenges associated with distributed branch office locations. This may involve simplified central management, large-scale deployments, latency/bandwidth challenges, automation, multicloud networking and changing application deployment scenarios. This includes on-premises, IaaS/PaaS, and SaaS architectures; security; openness; choice; and investment protection.

Marketing Strategy: Clear, differentiated messaging consistently communicated internally, externalized through social media, advertising, customer programs and positioning statements.

Evaluates the ability of the vendor to influence the market through its messaging and marketing campaigns. Furthermore, this includes the extent to which the vendor articulates a clear, consistent, relevant and differentiated message that is aligned with end-user needs and with the ability to drive market demand. We look for consistent communication throughout the organization and through its website, advertising, customer programs and positioning statements that align with the product strategy.

Sales Strategy: A sound strategy for selling that uses the appropriate networks including direct and indirect sales marketing, service, and communication. Partners that extend the scope and depth of market reach, expertise, technologies, services and their customer base.

Evaluates the vendor's use of direct and indirect sales to extend the scope and depth of its market reach. Furthermore, this includes the extent to which the vendor articulates a clear, consistent and differentiated sales strategy that engages with defined customer profiles. This includes development of effective go-to-market strategies, alliances and partnerships leveraging VARs, system integrators (SIs), master agents, NSPs, MSPs and OEM resellers, as appropriate. In addition, this includes how the vendor exploits new business models that are emerging due to market and technology transitions.

Offering (Product) Strategy: An approach to product development and delivery that emphasizes market differentiation, functionality, methodology and features as they map to current and future requirements.

Evaluates the vendor's product roadmap around existing and future WAN edge functions. This includes not just raw functions, but the vendor's overall architecture across the portfolio, the uniqueness of the capabilities and value to the end customer. We evaluate product strategy in terms of capabilities such as simplicity, automation, cloud connectivity, self-healing, performance and security.

Vertical/Industry Strategy: The strategy to direct resources (sales, product and development); skills; and products to meet the specific needs of individual market segments, including verticals.

Measures the vendor's ability to address the unique requirements of particular verticals/industries and to employ the associated sales channels to build a sustainable business advantage.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or preemptive purposes. The plans to bring future differentiated capabilities to market that will enhance the vendor's ability to interact with customers and drive business.

Measures the vendor's ability to address emerging WAN edge requirements, and/or increasing value to enterprise customers. We look at how the vendor invests in new capabilities to move its business and the market forward, with a focus on technologies that are differentiated, unique and offer high value to the enterprise buyer as well as new business/operating models. Specific examples include application centricity, intent-driven networking, security, cloud access, improved management and automation, as well as nonproduct innovations, such as consumption-based pricing and hybrid offerings that bundle product and managed services.

A key attribute in the WAN edge market is vendor innovation in areas that meet emerging enterprise market requirements around the simplified management of hybrid WAN architectures and, increasingly, all internet architectures. Innovation is not limited to products, because it can cover multiple aspects of the vendor's strategy that delivers new capabilities that uniquely differentiates it in the marketplace.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries, as appropriate for that geography, and the ability to grow or maintain the market.

It measures the vendor's ability to address any unique product requirements of particular geographies and to use the associated messaging and partnerships, as well as sales channels to build a sustainable business advantage.

Table 2: Completeness of Vision Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Market Understanding	Medium
Marketing Strategy	Low
Sales Strategy	Medium
Offering (Product) Strategy	High
Business Model	Not Rated
Vertical/Industry Strategy	Low

Evaluation Criteria	Weighting
Innovation	High
Geographic Strategy	Low

Source: Gartner (September 2020)

Quadrant Descriptions

Leaders

A Leader has demonstrated a sustained ability to address changing requirements for enterprise WAN edge. A Leader can drive, shape and transform the market, as well as maintain strong relationships with its channels and customers.

Challengers

A Challenger has demonstrated sustained execution in the marketplace, and has clear, long-term viability in the market. However, a Challenger has not shown the ability to drive, shape and transform the market.

Visionaries

A Visionary has innovated in some key areas of WAN edge, such as automation, SD-branch, AI/ML, SASE, operational efficiency and cost reductions. Visionaries often help transform the market, from driving new ideas, including new business models, to solving enterprise challenges. Although Visionaries often transform the market, they typically lack market share, global coverage and/or complete product capabilities.

Niche Players

A Niche Player has a complete or near-complete product offering, but has limitations, such as geographic reach or vertical market focus. A Niche Player has a viable product offering, but has not shown the ability to transform the market or maintain sustained execution.

Context

Market Forecast

The WAN edge market (which comprises SD-WAN, plus traditional branch routers) is forecast to generate a compound annual growth rate (CAGR) of –3.1% in end-user spending from 2017 through 2024. This is the result of the robust growth of SD-WAN

(+18.0% CAGR) and the decline of traditional branch office routers (−24.9% CAGR). Hence, the major focus in this research is on SD-WAN solutions. The decline is due to the lower average selling price of SD-WAN hardware and software.

Gartner expects continued functional consolidation of WAN edge functions into a single device to cause declines in the number of devices shipped and the total market size. This is evidenced by dedicated WAN optimization and security appliances, which are increasingly delivered as added features as part of SD-WAN. This bodes well for buyers, as multifunction devices typically sell for less than several dedicated devices.

Popular and Emerging Topics

Current Trends

Internet Substitution for MPLS Connections

Many Gartner clients hope to fund their WAN expansion/updates by replacing or reducing the bandwidth of expensive MPLS connections with internet-based virtual private networks (VPNs), often from alternative providers. However, the suitability of internet connections varies by geography, access types and oversubscription levels, and service providers mixing connections from multiple vendors increases complexity. SD-WAN has simplified this approach for the following reasons:

- Due to the simpler operational environment and the ability to use multiple circuits from multiple carriers, enterprises can abstract the transport layer from the logical layer and depend less on their service providers.
- This decoupling of layers is enabling new MNS providers to emerge to take advantage of the above for customers that still want to outsource their WANs.

Automation and Agility

Many WAN changes remain manual and CLI-driven (more than 60% for many enterprises). Thus, in many inquiries regarding WAN, Gartner clients mention a desire to improve automation and agility. In some instances, the focus is on dedicated SD-WAN tools; however, this desire occasionally drives investment in nontraditional tooling, such as Ansible or intent-based networking. Gartner clients report operational savings as high as 90%, when comparing SD-WAN solutions with traditional router-based deployments (administration time of five minutes/month versus one hour/month).

SaaS Optimization

Although WAN optimization is in decline, SaaS optimization isn't. As more and more apps move to the cloud, optimizing the performance in terms of packet loss, latency and jitter over the internet is becoming increasingly important. One obstacle to adopting internet access for enterprise applications is performance and SaaS optimization looks to address this market need (see "WAN Practices to Optimize Application Performance").

Future Trends

Thin Versus Thick Branch

One of the major decisions customers will increasingly need to make in the next few years is whether to select a thick branch with all functions deployed at the customer location or more of a thin branch with some functions on the edge supplemented by functions hosted in the cloud. The former would be for organizations with stronger IT organizations that want more on-premises control. The latter is for leaner IT and, ultimately, more operational flexibility.

Merging of Security and Networking/SASE

At one time, security and network procurements were handled separately. Increasingly, we see network and security decisions being made at the same time and more often with the same solution. This is largely driven by the move to distribute internet access to support cloud applications and change the security perimeter. This goes with the deployment of SD-WAN at the branch locations to manage the internet transport. As part of a desire to minimize branch sprawl, we expect to see more customers looking for vendors with a combined security and networking solution or as part of a broader ecosystem. The deployment model will also be determined by the decision of the thin versus thick branch (see "The Future of Network Security Is in the Cloud").

SD-Branch

Gartner increasingly sees vendors building a common orchestration among the LAN, WLAN, WAN and, sometimes, security, which is increasingly known as SD-branch. It offers increased simplicity in managing WLAN, LAN, WAN and security policies and profiles with a single orchestrated solution. Integrating these domains will increasingly be a differentiating factor for some vendors. Although Gartner still sees customers procuring LAN/WLAN separate from WAN, there is increasing evidence that this may change for certain customer environments.

Leveraging AI/ML

There is a trend to more autonomous and self-driving networks in which AI/ML technologies can be leveraged to adapt to network traffic patterns. The objective is to make networking even easier for Day 2 operations for end users, reduce operating expenditures (opex), increase speed/agility and improve uptime/performance. Although it is still early in many vendors' product development, we are seeing this functionality being incorporated into an increasing number of vendor solutions offering differentiation.

Application Analytics

Application visibility and analytics are becoming more important to get better feedback as to the applications running on the network. Whether this is for on-premises applications or applications in the cloud, enterprises are looking for more details to help troubleshoot, plan and confirm that specific application performance/QoE is being delivered for end users. Increasingly, we see demand for end-user experience metrics from the end user to the actual application, which may be hosted in a CSP.

Remote User Access

With the impacts of Covid-19, remote user access has become critical for ongoing business operation. It has moved from an occasional use model that was not supported with an SD-WAN fabric to an overnight need. We are seeing this move away from remote VPN and

extending the SD-WAN fabrics directly to end users or with zero trust network access (ZTNA) as part of a SASE offering. Although the future of remote working is unclear, workers will be increasingly mobile. SD-WAN vendors are focused on solving this connectivity option going forward.

Cloud Onramp

There are various ways to connect to cloud workloads, whether they are IaaS or SaaS. Depending on how distributed your cloud workloads are will influence cloud onramp options. Options include connecting via a carrier neutral facility such as Equinix, directly connecting to cloud service providers such as Azure or AWS, leveraging a software-defined cloud internet (SDCI) provider, or deploying virtual instances of SD-WAN gateways in various cloud providers. For cloud-first enterprises, how this is supported is becoming increasingly relevant for buying decisions.

5G

5G is hyped technology that some expect to replace wired access WANs. In Gartner's view, due to limited coverage, various 5G technology options with different performance and RF propagation, and few truly unlimited data plans, 5G is still not in a position to transform WAN architectures for at least another two years (see "Don't Expect 5G to Replace Wired Access WANs Anytime Soon"). However, new mobile and Internet of Things (IoT) use cases will take advantage of 5G.

Market Overview

Gartner's view of the market is focused on transformational technologies or approaches delivering on the future needs of end users. It is not exclusively focused on today's market.

This dynamic market, with emerging client needs, has created a deeply fragmented vendor landscape, with large established vendors and smaller providers from multiple segments competing for market share. Differentiation can be:

- **Feature-based —** e.g., ease of cloud connectivity, embedded NGFW or application performance
- **Business-model-based —** e.g., pure subscription or WAN as a service using proprietary technologies
- **Go-to-market —** e.g., direct, master agents, product-focused VARs or SIs as MSPs

Some vendors focus on feature depth on a specific use case or two. Others choose an "all-in-one offering" approach. Scale of deployment and the ability to support complex environments remain differentiators at the high end of the market, where some customers require deployments of several thousand branches across multiple geographies.

Market Drivers

The WAN edge market is primarily driven by the following factors:

- Refresh of existing branch office router equipment that is at end of support or lacks the desired capabilities
- Renewal of NSP or managed service contracts, where a new service provider also means new equipment
- Changing traffic patterns resulting from increased use of cloud and multicloud resources that render the traditional hub-and-spoke from remote branch to on-premises data center WAN architecture obsolete
- Distribution of internet access to the branch, with security perimeter changes that typically drive new solutions
- Expansion of capacity (i.e., physical build-outs) within existing locations
- The desire to increase agility and automation to address the needs of digital business transformation and reduce opex
- The desire to consolidate more than one branch function, such as routing, security and WAN optimization (e.g., SASE)
- The move to push more functions to the cloud for flexibility and agility

Moving forward, Gartner views SD-WAN and SASE as key technologies to help enterprises transform their networks from fragile to agile. SASE splits functions between on-premises and the cloud, and Gartner expects to see more functions supported in the cloud. The resulting deployments will increasingly become a choice between a thick branch with more functions operated locally, and a thin branch with more functions operated in the cloud. Increasingly, we see the consolidation and integration of network and security functions to be drivers of such decisions.

Vendor Landscape Changes

Just a few years ago, the WAN edge market was dominated by a few suppliers with long histories of providing routing. Security and WAN optimization was often provided by separate dedicated appliances, and, even when device consolidation was available, the cost savings were small.

With the acceptance of SD-WAN and the demonstration that routing has become commoditized, companies that offered adjacent solutions are now aggressively competing.

This Magic Quadrant covers well-known incumbent vendors, as well as a number of smaller suppliers. We estimate that the WAN edge market has about 80 suppliers, and more are likely to enter the market. We expect this market to remain fragmented during the next few years, with some acquisitions. Acquisitions may come in the form of small vendors combining to achieve scale, vendors looking to enter the space, and consolidation among networking and security vendors. Going forward, we expect networking and security consolidations to drive M&A activity. As we look out five years, more than 10 mainstream suppliers are likely to remain.

Recent M&A activity in this space includes Palo Alto Networks' purchase of CloudGenix and HPE's announcement of its intent to acquire Silver Peak. Although it is not the acquisition of an SD-WAN vendor, Fortinet also acquired Opaq Networks.

Market Recommendations

I&O leaders responsible for building and operating WANs should:

- Build a hybrid WAN architecture with SD-WAN products, if they have a mix of public and private applications. If all applications are in the cloud, then leverage an all-internet solution focused on dedicated internet access (DIA) offerings.

- Shortlist at least two vendors (for example, a small vendor and a large vendor) in addition to their incumbent WAN edge vendors for significant WAN expansion or router refresh.

- Quantify the total cost of ownership (TCO) of an SD-WAN deployment. Savings may fund an early refresh; however, a detailed, end-to-end, life cycle analysis is required (see "Technology Insight for SD-WAN," "Toolkit: Calculate the Before-and-After SD-WAN Expenses" and "Fact or Fiction: Does SD-WAN Really Save You Money?"). WAN edge solutions more commonly have opex-friendly business models, with a strong shift from upfront capital expenditures (capex) to annual license subscriptions. This may dramatically increase TCO. To perform a proper evaluation comparison, quotes should include all platform, license and support costs for a three-year baseline.
- Choose WAN "as a service" for their next refresh, if they are looking for an MNS, prefer opex to capex, or prefer to rent, rather than own their equipment (see "DIY vs. MNS: Enterprises Must Reassess Their Network Sourcing Model to Prepare for SD-WAN" and "Debunk the Misperceptions About Network as a Service").
- Evaluate NSP and non-NSP — such as MSPs, independent software provider (ISP) aggregators and SIs — options (see "Market Guide for Managed SD-WAN Services"), if choosing managed SD-WAN.
- Favor WAN edge vendors that can facilitate automation. As a key part of vendor evaluation, include an evaluation of the operational model of any new WAN edge solution to determine potential savings and differentiation among competing vendors.

- Leverage ISP aggregators who can ease the procurement and management of internet access circuits (see "4 Steps in Selecting ISP Aggregation Services") in highly distributed organizations.
- Evaluate SD-branch solutions to simplify the management of their LAN, WLAN, WAN and security for small branch offices.

- Evaluate vendors with strong orchestration with cloud providers to simplify distributed cloud access for cloud-first companies and evaluate SaaS optimization capabilities to ensure a consistent, high-performing, end-user experience.

- Run a pilot to test the SD-WAN solution in a production capacity to validate performance in a real-world environment. Ensure that at least one critical site is tested with the solution deployed, before any final decision is made.

DIY customers should research solutions with a strong AI/ML focus to enhance Day 2 operations.

Extended Market Definition

Characteristics of the Market

Typical business outcomes: The fundamental business outcome is connectivity between enterprise users, applications and services that reside in distributed locations (both on-premises and off-premises). Locations include headquarters, branches, corporate data centers, colocation/hosting facilities, SaaS providers and cloud service providers. Increasingly, buyers require improved agility, automation, orchestration, flexibility and application control.

Market: WAN edge infrastructure provides network functions that support connectivity for distributed locations (typically branches). This market includes functionality that Gartner defines as traditional routers, security appliances, WAN optimization controllers (WOCs), WAN path controllers and SD-WAN. For the purposes of this research, we focus mainly on SD-WAN, because that is where the solutions are gravitating. They are the most relevant to customers making WAN-buying decisions.

Typical buyers: In the enterprise, CIOs, CTOs, the vice president of I&O, the director of networking, and network and telecom managers are typically the buyers of WAN edge infrastructure. Branch managers, enterprise architects, and security personnel are strong influencers in larger enterprises as well. Increasingly, we see security personnel playing prominent roles in the selection process.

How buyers shape their buying decisions: When selecting WAN edge infrastructure, buyers typically focus on several factors, including vendor incumbency and familiarity, feature/functionality, pricing options, performance, form factor, deployment options, ease of management, visibility/analytics, customer support/experience, overall product architecture, vertical focus and geographical strength. The solution set is strongly influenced by changing traffic patterns affecting the enterprise WAN.

Deliverables: The primary deliverables include network functions that enable connectivity for users at branches. Typical network functions include edge routing, security and VPN, WAN optimization, and SD-WAN. These functions are increasingly delivered to the enterprise as integrated or as a software instance of these functions (e.g., a VNF) and, less frequently, as dedicated hardware appliances (such as routers, WOCs, security or SD-WAN edge devices). These may reside at the customer premises, in provider points of presence (POPs) or as a network-based/cloud service.

How providers package, market and deliver: Buyers typically source their WAN edge infrastructure products directly from network equipment suppliers, or via a network or MSP (that is, as a managed service). WAN edge infrastructure can be procured via purchase, leasing, rental, term-based or subscription-based pricing models. Furthermore, there is a diverse set of deployment options for these networking functions, including via hardware appliances, software (e.g., VNF) or cloud-based services.

Characteristics of WAN Edge Solutions

WAN edge solutions are characterized by the following elements:

Physical interfaces: This refers to physical interfaces to plug into the service providers' circuits. Ethernet is rapidly becoming the default connection, and link speeds are increasing to multigigabit speeds. Flexible options beyond just Ethernet offer more value to customers.

Physical topology: Traditional hub-and-spoke WAN architectures are no longer suitable for most enterprises. Easy to implement mesh and partial mesh topologies are becoming increasingly relevant. Enterprises are altering their WAN architectures in support of new digital business initiatives and the adoption of public cloud services (e.g., SaaS, IaaS and PaaS). The rationale is that migration of applications to the public cloud can lead to distinct challenges, including:

- Network performance problems, as traffic is backhauled; this typically increases latency and congestion.
- WAN expenses increase due to backhauled internet traffic with cost of paying for bandwidth twice (MPLS to the data center and from the data center to the internet).

Routing, WAN Optimization and Security

With part of the first phase of SD-WAN, we saw some SD-WAN deployments deployed behind traditional routers. However, as SD-WAN routing functionality has improved and, in most cases, has become equal to traditional routers, vendor products have been proved, and traditional routers are reaching end of life. We see SD-WAN operating as the main WAN edge function in customer networks going forward.

Gartner is seeing two approaches from vendors

- They are natively incorporating multiple functions into their solutions (e.g., SD-WAN, WAN optimization and security).
- They are partnering with other point solution vendors.

Deployment Options

We see several deployment methods available for the enterprise to consume network functions:

- **Dedicated hardware appliance —** This is the traditional style of deployment, in which a single network function is delivered as a turnkey, integrated hardware appliance. Although still common, the trend is to move aware from this option as on-site technology becomes obsolete or inefficient. If retained, we do see the trend of at least the on-site router migrating to an SD-WAN solution.
- **Multifunctional integrated platform —** This platform combines proprietary hardware and software to deliver multiple functions, such as WAN optimization, routing and security. This can be deployed in two ways:
    - Native functionality by the vendor
    - Partnership by the vendor with another best-of-breed solution that is tightly integrated
    - Examples include FortiGate appliances; Silver Peak Unity EdgeConnect, with Unity Boost; and Versa's VOS.
- **Virtualized network function —** This is a software-based instance of a network function that can be delivered on an x86-based computing platform. Nearly all routing, WAN optimization and SD-WAN vendors deliver a VNF and/or VM version of their software.
- **uCPE —** This multifunctional platform supports a network function virtualization (NFV) architecture, designed around industry standards to run multiple virtual functions, with possibly different vendors' functions in the same device. The platform allows multiple VNFs to be installed, and typically makes use of industry-standard x86 devices, rather than function-specific appliances. Juniper Networks' NFX and Cisco ENCS are examples of a hardware uCPE platform. Universal CPE is one delivery method for an NFV deployment with the functions residing on-premises. With the goal of increasing the agility of enterprise networks, enabling them to respond to changing needs more rapidly in a more on-demand manner and avoid vendor lock-in. Today, uCPE is primarily a carrier-driven technology, and has adoption challenges with pricing, performance, standard orchestration and networking integration. We see SASE limiting the future adoption of uCPE.
- **Cloud-based OTT —** Network function is delivered via a cloud platform, and the enterprise subscribes to the functionality. An example is Aryaka, which provides WAN optimization and other application performance functionality. We are also seeing security delivered in this model, which will drive adoption of the thin CPE model.

- **SASE —** This involves integrated networking and security with networking delivered from a lightweight branch levels and security delivered in the cloud from a cloud security company. Most companies deliver this as an orchestrated service chain with third-party security companies, but vendors such as Palo Alto and Cisco in this research have native capabilities. Gartner is increasingly seeing this architecture delivered from a single vendor, and to achieve that, may spur more acquisitions such as Palo Alto's purchase of CloudGenix.

Consumption Models for WAN Edge Infrastructure

Enterprises consume WAN edge infrastructure functionality in multiple ways, including:

- **DIY —** Enterprise owns and manages WAN edge functionality itself.
- **NSP —** NSP manages the WAN transport and, optionally, the WAN edge equipment.
- **MNS —** Managed NSPs include SIs, MSPs and ISP aggregators that managed the WAN edge equipment and may resell third-party access or, in some cases, enable bring your own access (BYOA)
- **Hybrid —** This is a combination of at least two of the above.

On a global basis, most WAN edge infrastructure is provided as a managed service, either via an NSP, SI, MSP or ISP aggregator. Conversely, in North America, the predominant way of managing WAN edge infrastructure for a large enterprise is DIY. Overall, Gartner sees the trend for more MNSs, and the growth is expected to come from non-NSP providers. We also see an increasing trend of co-management, in which the client retains control over business policies and the MNS provider controls how those policies are enforced.

In this research, we focus primarily on WAN edge functionality that can address multiple consumption models.

Evidence

Gartner analysts conducted more than 3,000 Gartner client inquiries on the topic of WAN between 1 July 2019 and 30 June 2020.

Gartner analysts conducted more than 1,000 Gartner client inquiries on the topic of SD-WAN between 1 July 2019 and 30 June 2020.

Market size forecast sources are from "Forecast: Enterprise Network Equipment by Market Segment, Worldwide, 2017-2024, 2Q20."
All vendors in this research responded to an extensive questionnaire regarding their current/future data center networking solutions.

Analysts reviewed Gartner Peer Insights data for this market.

Gartner analysts reviewed publicly available information online.

Social Media Conversation Analysis: Gartner conducts social listening analysis leveraging third-party data tools to complement or supplement the other fact bases presented in this document. Due to its qualitative and organic nature, the results should not be used separately from the rest of this research. No conclusions should be drawn from this data alone. Social media data in reference is from 1 August 2016 through 30 April 2020 in all geographies (except China) and recognized languages.

By default, social media sources considered for analysis include Twitter, Facebook (publicly available information only), aggregator websites, blogs, news, mainstream media, forums and videos (comments only); unless and until specified.

Ritesh Kumar Srivastava and Ayush Saxena from the Social Media Analytics Team contributed to this research.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service, and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.