



How a Ruggedized First Mile Increases SaaS and IaaS-hosted Application Performance

Introduction

Enterprise applications have traditionally been hosted in corporate data centers, relying on private MPLS networks to connect users in branch offices. Application traffic from users in branch offices was first routed to the data center before being routed to other locations or to external partner/supplier networks.

As enterprises accelerate the migration of applications and services to the cloud (SaaS and IaaS), backhauling this cloud-destined traffic through the data center is inefficient, impairing application performance and user productivity.

Multi-cloud architectures and the migration to SaaS and IaaS and adoption of hybrid cloud infrastructure are the primary WAN drivers that heavily influence WAN transformation strategies and the rapid adoption of SD-WAN. According to a recent [Enterprise Management Associates \(EMA\) survey](#):

- 48 percent of WAN traffic is destined for the external cloud (SaaS, IaaS)
- Most enterprises expect cloud traffic to increase over the next three years

- Cloud adoption is the #2 challenge to overall WAN success
- 74 percent are increasing their use of the internet as a primary WAN connectivity option

The majority of network and application performance issues are encountered over the 'first mile', the path between the branch office user and the local internet service provider.

The network can often introduce significant latency, packet loss or jitter, during periods of congestion when there's a low-speed connection from a branch location to a cloud provider.

The term "ruggedized" refers to improving the quality, performance and reliability of the underlying WAN transport service(s) to achieve higher availability and performance by actively managing packet loss, latency, jitter and link brownouts and blackouts. This provides inherent resiliency, ensuring applications perform to service levels and users remain productive regardless of impairments or failures of underlying network transport services. Ruggedization can optionally incorporate WAN optimization to further accelerate performance-sensitive applications.

Why is the First Mile Important for Today's Cloud-first Enterprises?

According to [Gartner](#) the growth of cloud services is staggering, with more than \$228B USD spent in 2019 of which \$100B was spent on SaaS services. Some of the most popular SaaS services include Microsoft Office 365 with over 180 million users and communication and collaboration services such as UCaaS (e.g., RingCentral, [8X8](#)) or video conferencing services (e.g. ZOOM, GotoMeeting or WebEx).

Communications and collaboration applications are, by their nature, particularly sensitive to network latency, jitter and packet loss. They require high bandwidth and excellent network quality to deliver the highest quality of experience to users. Contention, jitter, packet loss, and service interruptions can severely impact the performance of voice and video collaboration applications and can negatively impact employee productivity and customer satisfaction.

Often large data-sensitive SaaS-based applications, like large CAD/CAM design files or database applications, may be hosted in Microsoft Azure or AWS and accessed from remote offices or by partners working in remote client offices. Some locations may be connected by poor quality or low-bandwidth WAN transport services, for example copper ADSL or even 4G LTE which can introduce packet loss and latency, impairing application performance and employee productivity.

Enterprise Challenges with Optimizing the First Mile for SaaS applications

Enterprise IT organizations face a number of challenges when trying to optimize the first mile of their WAN to support a hybrid, multi-cloud environment. Overlooking these challenges can adversely affect application performance and availability, ultimately impacting user experience.

Challenges include:

- Overcoming the effects of packet loss and increased latency when broadband connections become congested

- Monitoring all of the first-mile links around the globe, identifying problems and engaging local internet service providers (ISPs) to diagnose and remediate issues
- Managing the complexity of engineering a diverse mix of underlay WAN transport services across branch sites (MPLS, Broadband, Ethernet and 3G/4G LTE)
- Optimizing application performance and reliability consistency across multiple service or broadband networks
- Prioritizing latency-sensitive cloud applications to deliver a high-quality user experience
- Enforcing security policies for all applications, including applications hosted in the data center, SaaS, or IaaS clouds. This includes differentiating trusted (or whitelisted) applications from untrusted applications
- Minimizing the LAN-WAN traffic bottlenecks that cause congestion

Requirements to Ruggedize the First Mile

Enterprises leveraging broadband to enable direct, local internet breakout access to cloud-hosted applications should expect a ruggedized first mile to support:

- A consistent application end-user experience from anywhere in the corporate network, regardless of the underlying network connectivity and from any fixed, mobile or IoT endpoint device
- A simple intuitive policy management tool for creating application security and business priorities that are intent-based
- Ability to overcome the effects of packet loss without re-transmission of data packets
- Sub-second failover during WAN transport brownouts or blackouts, eliminating interruptions to user applications

- Flexibility to implement WAN optimization, on-demand to alleviate latency and performance issues with specific applications
- Ability to improve the performance and reliability of applications hosted in public cloud instances
- Self-healing and automated failover of applications
- Ability to granularly steer cloud traffic directly to application providers or to premise-based or cloud-delivered security services, based on business policy

Silver Peak Unity EdgeConnect Ruggedized First Mile Solution

The ability to ruggedize (or harden) the first mile with a cloud-based IaaS virtual instance of an [Unity EdgeConnect™](#) SD-WAN appliance is one of the most effective ways to assure the highest SaaS performance, even when underlying transport services experience a brownout or degraded conditions.

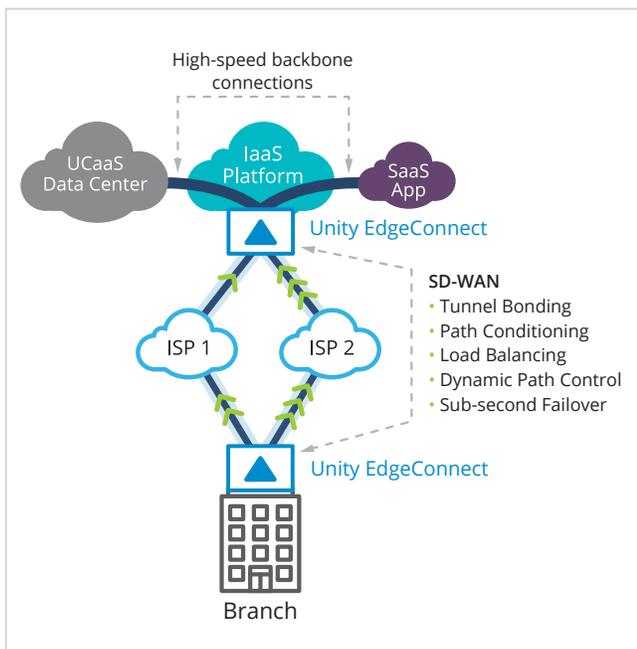


Figure 1: Two SD-WAN appliances work together to improve work together to improve the performance and reliability of traffic in the "first mile" between the branch and the IaaS platform. High-speed backbone connections in the cloud improve network quality and performance over the "last mile" between the IaaS platform and the UCaaS data center.

Configurations like the one shown in Figure 1 extend the SD-WAN fabric to cloud infrastructure. In this architecture, two EdgeConnect appliances "bookend" the connections between the branch office and an instance of an IaaS platform close to the SaaS application hosting data center. Often commercial SaaS applications are co-located in the same locations as IaaS providers. [EdgeConnect path conditioning, automatic path failover, and WAN optimization](#) capabilities assure a ruggedized first mile infrastructure.

Figure 1 shows the branch connected by two broadband services, although in practice the branch could be served by any combination of broadband, 4G/LTE and MPLS connectivity. The performance, quality and reliability of UCaaS and other SaaS application traffic between the branch office and the IaaS or SaaS platform benefits from the following advanced EdgeConnect SD-WAN capabilities that include:

- **Tunnel bonding** — pools multiple WAN transport links into a single logical connection that supports high availability for voice apps, and high quality for mission-critical SaaS
- **Application visibility and control** — identifies and classifies network traffic and intelligently enforces quality of service (QoS) and security policies in accordance with business intent (for example, prioritizing latency-sensitive applications like voice over IP and video conferencing)
- **Path conditioning** — performs forward error correction (FEC) to reconstitute lost packets without retransmitting them and correctly re-sequences packets that arrive out of order
- **Load balancing** — spreads traffic from a single session across multiple links on a packet-by-packet basis to maintain the connection even if a link experiences congestion or a brownout
- **Dynamic path control** — monitors the health and performance of links and assigns the best paths to UCaaS traffic
- **Sub-second failover** — dramatically reduces the potential that a link failure will have a perceptible impact on the experience of UCaaS users

- > **WAN Optimization** — accelerates latency/performance sensitive applications and significantly reduces or eliminates repetitive data transmitted between the branch and the SaaS application for data intensive applications or large data sets
- > **Centralized reporting and orchestration** — helps administrators troubleshoot network problems and manage QoS and security policies at remote locations

Ruggedized First Mile Use Cases

Below are three examples of enterprise use cases where EdgeConnect ruggedizes the first mile.

A. IMPROVING REAL-TIME COMMUNICATIONS APPLICATION PERFORMANCE:

An enterprise utilizing cloud-hosted, real-time applications such as VoIP or UCaaS, can provide a better end user quality of experience by directing that traffic to a virtual instance of EdgeConnect deployed in the nearest IaaS PoP. Figure 1 shows a remote branch office with connections through two ISPs to an IaaS platform. Network traffic across this first mile can be sent long distances, making several hops between several tiers of ISPs, with unpredictable levels of contention, packet loss, and jitter. In this architecture, two EdgeConnect appliances “bookend” the links between the branch office and an instance of an IaaS platform close to the UCaaS data center. By extending the SD-WAN fabric into AWS, Azure or GCP infrastructure, all of the EdgeConnect advanced performance features ruggedize this first mile to improve the performance, quality and availability of the real-time applications.

B. INCREASING SAAS APPLICATION RELIABILITY:

A second use case is improving the performance and reliability of enterprise applications hosted in public cloud instances. The architecture shown in Figure 1 that extends the SD-WAN fabric into the public cloud “bookends” the connection between the branch office and an instance of an IaaS platform close to the SaaS co-location data center. By using two appliances, one at the branch office and the other on the IaaS platform the first mile

connection is ruggedized for any SaaS applications hosted within the same data center or in close proximity to IaaS provider, improving network quality, application performance and reliability.

C. ACCELERATING SAAS AND IAAS APPLICATION PERFORMANCE:

The third use case involves an automotive ERP services company which is migrating from MPLS to SD-WAN and currently employs an MPLS Direct Connect service to connect to its customers. The migration to an SD-WAN platform reduces cost and provides the company's automotive manufacturing customers with the flexibility to access their services using broadband instead of MPLS.

Two EdgeConnect-Virtual (EC-V) appliances per customer are deployed in redundant virtual hosts at the company's data center connected to four ISPs. Each of the ERP services company's customers then purchase a cloud orchestrator to manage their individual SD-WAN fabric across all the locations that require ruggedized access. The ERP services company can allocate a specific public IP block to its customers which the EdgeConnect application visibility software automatically recognizes. The ERP services company's end customers direct traffic destined for the ERP online service subnet to their own EdgeConnect appliances which are configured into a separate overlay. Optional Unity Boost™ WAN optimization also helps accelerate performance for distant locations that experience higher latency.

Business Benefits of an EdgeConnect Ruggedized First Mile

Using the Silver Peak EdgeConnect SD-WAN edge platform for ruggedizing first mile connections to SaaS services, enterprises realize three important business benefits:

1. DELIVERING THE HIGHEST QUALITY OF EXPERIENCE TO EMPLOYEES AND CUSTOMERS FOR SAAS APPLICATIONS AND SERVICES

Voice calls are clear, video conferences are sharp, file and screen sharing work better without any

lag, and call center transactions complete uninterrupted, increasing employee productivity and customer satisfaction.

2. INCREASED BUSINESS AGILITY

Enterprises can easily on-board new branch offices faster and increase network capacity flexibly by adding internet connections, gaining the confidence that their SD-WAN platform will automatically utilize the best available paths between SaaS users and their applications.

3. LOWER CONNECTIVITY COSTS

Enterprises can now take full advantage of low-cost internet connections without sacrificing voice, video or data application performance, quality and availability.

Network administrators gain visibility and control, enabling them to manage and plan networks more efficiently.

Cloud-First WAN Transformation begins with a Ruggedized First Mile

The Silver Peak EdgeConnect SD-WAN edge platform significantly improves the performance and availability of SaaS applications to end users by extending SD-WAN technologies and capabilities directly into the cloud. This ensures a reliable and secure end-to-end internet connection from anywhere by ruggedizing the first mile and dynamically steering application traffic to the correct destination within the IaaS platform, providing far better performance, reliability and network quality than before.

Delivering the highest quality of experience to users translates into gains in productivity, customer satisfaction and employee retention, all while making the digital transformation journey easier.



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