

Ensure VoIP and Skype for Business Call Quality and Reliability with NetScaler SD-WAN



For many enterprises, high-quality Voice over IP (VoIP) and Skype for Business are an absolute necessity. Organizations of all types depend on reliable communication to generate revenue, serve their customers and support efficient business processes.

This short paper provides an overview of how the NetScaler SD-WAN solution from Citrix maintains high-quality VoIP and Skype for Business traffic even when individual MPLS and Internet links suffer from interruptions and unreliable performance.

"All these changes we've made to the network over the years have increased the complexity of the WAN to the point where making even small changes requires an enormous amount of work.

Between security, visibility tools, routing and optimization technologies, network managers need to worry about multiple protocols, service chains, QoS and a bunch of other factors. That's why WAN evolution is needed today and that shift is to a software-defined enterprise WAN."

Zeus Kerravala

Network World, The Software defined enterprise WAN is now a business imperative

Most enterprises using VoIP or Skype for Business have experienced low-quality connections and periodic service interruptions that result in garbled voice and dropped calls. This reduces revenue, frustrates customers and employees, raises costs and undermines productivity. Some companies add expensive MPLS capacity or turn to cloud-based voice services to improve their VoIP experience, but these steps aren't sufficient.

Fortunately, NetScaler SD-WAN provides a solution to these problems.

The NetScaler SD-WAN solution from Citrix provides optimized application performance across the enterprise WAN. By combining software-defined WAN intelligence with routing and WAN Optimization, enhanced support for Citrix XenDesktop and XenApp, and deep visibility into application delivery performance, NetScaler SD-WAN delivers the reliability, security, and experience that branch and mobile users expect across enterprise and SaaS-based applications as well as unified communications. This white paper focuses on how NetScaler SD-WAN improves the quality and reliability of voice communications, even when using broadband links or cloud-hosted voice services.

What is a software-defined WAN?

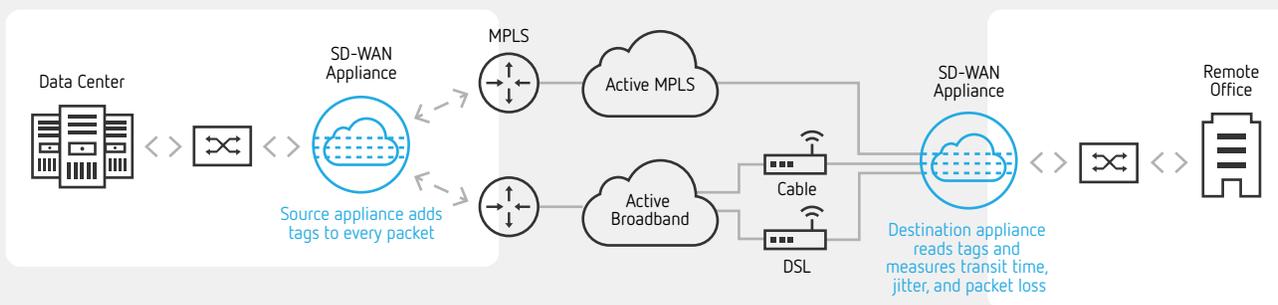
The Open Networking Foundation describes software-defined networking (SDN) as an architecture that "decouples the network control and forwarding functions, enabling the network control to become directly programmable and the underlying infrastructure to be abstracted for applications and network services." This architecture allows networks to be centrally managed, programmatically configured, and dynamically adjusted as traffic flows and application requirements change.¹

Software-defined wide area networking implements these concepts by binding multiple MPLS, mobile, and broadband paths into a single logical path. The physical paths can include MPLS circuits, broadband cable and DSL connections, and 4GE LTE connections. Application traffic is optimized across the multiple physical paths, and dynamically adjusted to provide the highest possible quality of service for high-priority applications.

Figure 1 shows a simple example of a SD-WAN connecting a data center and one remote office.

¹ Open Networking Foundation, Software-Defined Networking (SDN) Definition.

Figure 1: NetScaler SD-WAN appliances measure transit time, jitter and packet loss, then creates a “map” of the performance and health of all paths in the WAN. This information is used to select the most appropriate paths for different types of traffic. Broadband connections can now be used actively for all applications.



SD-WANs: Flexibility and reliability Intelligent path selection

The NetScaler SD-WAN provides intelligent path selection to ensure that voice and video communication uses the best possible path through the WAN. Appliances at the source and destination sites contain a “map” of all available WAN paths between the two locations. The map includes performance and quality data on every path. When an application session is initiated, the appliance at the sending site chooses the highest-quality and lowest latency (best-performing) path or paths available.

Of course, path quality and performance are always changing, and one of the objectives of software-defined networking is to adjust to changing requirements. To accomplish that goal, the source appliance adds a tag to every packet it sends. The destination appliance reads the tag, and then records the transit time for each packet. By looking at the tags for a sequence of packets, the destination appliance also obtains information on packet loss, jitter and other quality measures related to the path.

The destination appliance then shares these measurements with the other SD-WAN appliances in the network. That allows all of the appliances to continuously update their “maps” with performance and quality data, and to select the best available path for each new session based on current information.

Fast failover

NetScaler SD-WAN technology provides for dynamic routing and fast failover. For example, if an MPLS network experiences a brownout or

blackout condition, the receiving appliance will recognize that packets are missing from the sequence, and within milliseconds shift existing VoIP calls to the best remaining WAN path. Employees and customers don’t perceive any interruption in the call, much less a dropped call.

Scalability and cost reduction

Software-defined WAN technology also makes economic sense. Although individual broadband and mobile paths may suffer from unpredictable performance, they will rarely all encounter performance issues at the same time. Because NetScaler SD-WAN can dynamically shift traffic on a per-packet basis to the best-performing path available, multiple broadband connections can provide the same quality of service as an MPLS circuit. As VoIP, Skype for Business and other WAN traffic grow, enterprises can expand their WAN capacity by adding cost-effective, quickly installed broadband connections instead of expensive MPLS circuits.

In fact, industry analyst firm Gartner anticipates that SD-WANs can reduce the cost of WAN ownership and operation by at least 40%, thanks to lower expenditures on hardware, software and support for WAN equipment in remote offices.²

Software-defined WANs for VoIP: When you absolutely, positively need high quality

The SD-WAN advantages discussed so far – intelligent path selection, fast failover, and cost-effective growth – are equally useful for all types of network traffic supported on WANs. But there are additional features that are particularly important for high-priority, low-latency applications like VoIP.

Prioritization and quality of service

NetScaler SD-WAN technology gives enterprises very granular control over quality of service (QoS) levels for different classes of applications, and even for individual applications. Administrators can assign applications to three general categories: “real-time,” “interactive” and “bulk.” If more precision is required, custom rules can be created that adjust relative priority based on factors like source and destination IP address, IP protocol, DSCP tag and source and destination ports.

This control means that VoIP and Skype for Business sessions can be given top priority over all other applications, or given the same quality of service as other real-time applications such as video conferencing, VDI and application virtualization solutions (including XenDesktop and XenApp), and key enterprise software packages.

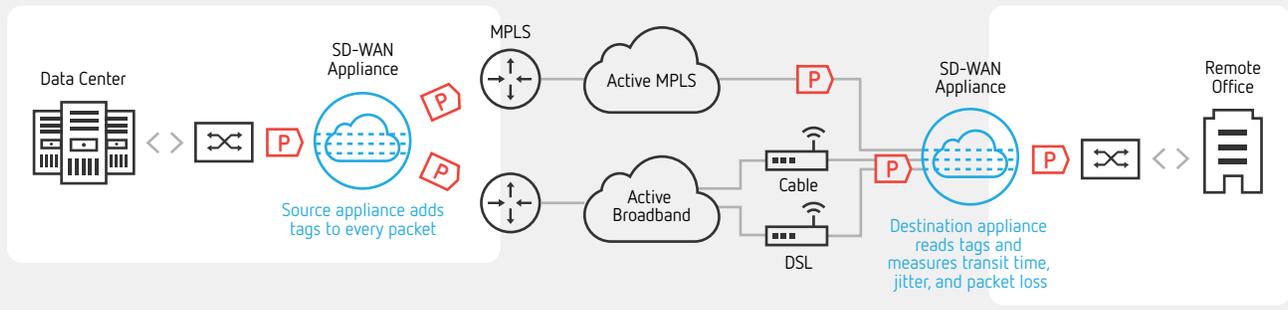
With NetScaler SD-WAN, prioritization and quality of service are managed dynamically. VoIP sessions are initially given the best-performing and highest-quality paths. But if a particular path slows down or experiences excessive jittering or packet loss, NetScaler SD-WAN reassigns the VoIP session to a better-performing path on the fly, without causing any perceptible interruption in the call.

Packet duplication

Packet duplication is another extremely useful feature when conditions absolutely, positively demand high quality. With this feature, illustrated in Figure 2, the SD-WAN appliance at the source location sends duplicate copies of

² Gartner: Technology Overview for SD-WAN, July 2015. For Gartner’s perspective on SD-WANs, see also [I hate my WAN...SD-WAN to the rescue](#).

Figure 2: Packet duplication provides high performance and zero packet loss by sending duplicate copies of each packet along separate independent paths.



every packet in the session along different, independent paths.

The SD-WAN appliance at the destination uses the first packet received and ignores the second.

Packet duplication does consume extra bandwidth, but it ensures excellent voice quality, since the fastest delivery time is used for each packet. In addition, the technique also results in network sessions with zero packet loss (except in the extremely rare event that both paths drop the same packet).

Packet duplication, QoS and other performance-enhancing features provided by NetScaler SD-WAN solution ensure high reliability and high quality for VoIP traffic with any mixture of MPLS and broadband connections – even when the quality of the individual paths may not be uniformly high.

Customer success stories

The value of SD-WAN technology can be illustrated by two NetScaler SD-WAN customers.

The Watershed, a substance abuse counseling center

The Watershed Addiction Treatment Programs provides counseling services related to drug and alcohol abuse and heavily depends on VoIP to communicate with its clients. The group contracted with two MPLS networks. However, the quality of calls would deteriorate significantly when either of the two networks experienced a brownout. Calls could not be switched dynamically from the affected network to the healthy one. Similarly, too many VoIP sessions and other applications

sometimes contended for limited bandwidth, which seriously affected call quality.

These issues were a very serious concern to an organization whose mission was to provide outstanding service to clients over the phone.

Fortunately, The Watershed was able to maintain high levels of call quality after implementing the SD-WAN solution. When either MPLS network suffered a brown out, calls could be switched seamlessly to the healthy network. In addition, VoIP traffic was given priority over less latency and loss sensitive applications.

The organization was able to maintain high performance levels for its “mission critical” services.

The life insurance company

When a major life insurance company rolled out VoIP communications for its main call center, it didn't want to take any chances on the quality of service to its customers. The network group was careful to invest in redundant MPLS links and enough bandwidth to support even peak-time VoIP traffic.

Unfortunately, the MPLS networks were not completely reliable. As a result, some VoIP conversations suffered from poor quality. On occasions calls would drop, forcing customers to call back the center and restart their dialogs with a second customer representative who had no awareness of the original discussion. The damage to customer satisfaction was not acceptable to the call center managers.

Implementing an SD-WAN solution ensured that VoIP sessions would be continuously and dynamically routed to the best-performing, highest-quality path available. Call center staff and customers were able to enjoy high-quality phone conversations without interruptions.

And That's Not All...

The NetScaler SD-WAN solution offers even more features that improve the quality and performance of latency-sensitive applications like VoIP, video conferencing VDI, and application virtualization.

Dynamic virtual paths allow direct paths to be defined between two branch offices, reducing latency between the locations and minimizing bandwidth into the data center.

Traffic shaping and dynamic bandwidth reservation provide additional tools for managing quality of service for different classes of application traffic.

Packet reordering and loss mitigation offload packet reordering and retransmission tasks from applications.

NetScaler SD-WAN Center makes the process of configuring WAN policies intuitive and provide customizable dashboards to track the health and performance of WAN paths across the network.

To learn more, please see [The Power of the Next-Generation WAN](#), the [Building a Software-defined WAN with NetScaler SD-WAN](#), and www.citrix.com/sdwan, and contact your Citrix sales professional or authorized reseller.

Tight integration between NetScaler SD-WAN and Skype for Business

After years of hype, Unified Communications is becoming a reality for enterprises and Microsoft is leading the way with Skype for Business. By combining voice calling, video conferencing and chat, Skype has become a key tool in building connections between employees located in different offices or on the move. But with the increased importance of Skype in day to day business has come increased pressure on building a network infrastructure to support it.

Citrix has co-developed a solution with Microsoft to build that support into its virtualization and networking products. XenDesktop customers can locate a Skype server in their own data center and deliver Skype as part of a virtual desktop without needed to incur the latency and security issues of connecting to Skype in the cloud.

And with local media engines in employee computers and mobile devices, users can connect directly to one another in an optimized call without needing to utilize data center resources for rendering the video.

NetScaler SD-WAN further optimizes the Skype communication by building secure connection to support Skype traffic. With an optimized connection, the different traffic types can be separated into individual flows and specialized QoS applied to each type of flow.

- Multi-stream ICA separates control, video, voice and chat communication allowing for individualized QoS and policies.
- Secure dynamic video connections are built directly from user to user, without hairpinning through the data center.

- Packet duplication policies can be applied to voice traffic to eliminate loss and minimize latency.
- Network impairments or outages are quickly detected and routed around so video is highest possible quality.
- Chat communication continues to be directed through the data center so company retention and security policies can be applied.

With NetScaler SD-WAN, enterprises can be confident using Skype for Business as an integral part of their communication strategy.



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