

# Beyond the Basics of SD-WAN: Why Performance and QoS Matter

*While SD-WAN solutions save money, they should also improve the user experience, offer failover and redundancy and ensure reliability and high performance regardless of connectivity source. In addition, they should intelligently direct traffic in real time over any connectivity source, and optimize access to cloud-based software as a service.*

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Software-defined WAN (SD-WAN) technology is often seen as a way to lower wide-area networking costs. It uses the public Internet in addition to and sometimes instead of private lines that use technologies like Multiprotocol Label Switching (MPLS), which directs data efficiently—but expensively—across carrier networks. But that’s only one part of the story. SD-WAN has the potential to improve end-user productivity and satisfaction through improved performance, higher reliability and enhanced quality of service (QoS) for any connectivity source.

When an SD-WAN is installed, the organization has multiple connectivity options for linking remote offices with data centers. There are private lines, such as an MPLS connection, tying each remote office back to the data center. Each remote office and the data center may also connect to the Internet, perhaps over Digital Subscriber Line (DSL), cable modems or wireless. SD-WAN allows enterprises to use all of those connections simultaneously, delivering private-line performance across the WAN.

This paper shows how advanced SD-WAN solutions can deliver superior performance and QoS, create excellent end-user experiences, optimize pathways to cloud applications and save money at the same time.

For each employee needing to access corporate applications, whether it's ERP in the data center or CRM in the cloud, an SD-WAN determines the best way to get packets from one location to another. Use the private lines? Use the Internet? Use wireless? Based on policies and rules, a basic SD-WAN solution finds the most cost-effective and highest performing means. That's a good beginning, but when choosing an SD-WAN provider, organizations should look for advanced solutions that also deliver faster performance, improved reliability and consistent QoS, whether over MPLS, the public Internet or wireless.

Faster performance means improved application response for the end user, boosting productivity and increasing satisfaction. For example, a performance-driven SD-WAN can detect when the employee's application is hosted by a cloud provider instead of in the corporate data center, and send traffic on the most efficient route to that cloud provider's network.

The need for QoS brings reliability into the equation. On their own, Internet and wireless connections are not as reliable as private but costly lines like MPLS. Internet and wireless links are also more likely to have outages, and suffer from jitter and packet loss.

For example, a basic SD-WAN might route application traffic on a path that's experiencing an unexpected slowdown unless it can analyze performance in real time. That frustrates employees, impacts productivity and perhaps even causes packet loss and disruption, which is unacceptable for applications such as Voice over Internet Protocol (VoIP) or video conferencing.

In contrast, a performance-oriented SD-WAN fixes bad connections before users experience degraded service, improving the quality of the underperforming connection so that it performs as well as or better than private lines. It can correct for dropped packets or out-of-order packets that cause quality issues, and can even improve application performance over distance when needed.

## Business benefits of basic SD-WAN functionality

A basic SD-WAN abstracts network hardware and connectivity to reduce complexity, lower costs and improve agility. More advanced SD-WAN implementations do that as well but also improve the end-user experience and deliver QoS over any source of connectivity.

An SD-WAN lets organizations use multiple sources of connectivity simultaneously, whether MPLS, cable modem DSL from a telephone provider or wireless. Adding the Internet into the mix also allows for rapid provisioning of WAN connectivity for new or temporary business locations, and lets remote offices add capacity at minimal cost to accommodate growth.

Every SD-WAN solution offers several fundamental features—capabilities considered to be the basics, the must-have checkboxes. First and foremost is the ability to use any and every available source of connectivity simultaneously, in what's called active-active mode: T1 or MPLS, DSL or cable, wireless or satellite. Any SD-WAN should be able to abstract the connection and add it to the SD-WAN pool.

Second is the ability to intelligently and automatically choose the best way to route traffic over the available connections. This capability should take into account the source and destination of the traffic, which might be in a data center or hosted in the cloud. Any SD-WAN should choose the optimal path to connect the user to the application. It should also take into account the performance characteristics of each connection, as well as the requirements of each application, to deliver the best performance at the lowest cost.

A third requirement is centralized orchestration, where the entire distributed SD-WAN can be administered, tuned and optimized from a single location, saving costs by lowering the need for local IT intervention.

And still a fourth basic SD-WAN function is zero touch provisioning (ZTP), where new physical or virtual appliances and connections are automatically added to the network and abstracted into the WAN with a minimal amount of human interaction and manual configuration. The days of labor-intensive, error-prone command-line interfaces are over with ZTP.

Any basic commercial SD-WAN solution should deliver connectivity abstraction, robust path selection, centralized orchestration and ZTP. Those capabilities certainly help businesses save money on branch office connectivity—which is often the main driver of SD-WAN initiatives. Beyond the immediate cost savings, however, more advanced SD-WAN solutions can dramatically increase end-user productivity by offering superior performance, QoS, and SaaS and PaaS cloud connection optimization.

## Advanced SD-WAN unleashes the full potential

Employees and other users are sensitive to the performance of their applications. Whether it's a local application that needs to pull data from a remote server, a browser-based CRM or ERP system, or a remote terminal session, speed matters. Slow or unresponsive software is frustrating. Dropped connections, bad audio or video, and time-out messages can be maddening for users as well as damaging for the business. If end users learn that their WAN connections to applications are unreliable, they'll avoid using important tools like remote sessions and video conferencing, causing even more harm to the organization.

Advanced SD-WAN technology goes beyond the basic features—path selection, ZTP, central orchestration, and so on—to truly improve the connections and guarantee an excellent user experience with QoS over broadband. One such capability is adaptive forward error correction (FEC), a sophisticated technique used to benefit streaming media, such as VoIP or video conferencing, across dynamic networks. FEC detects when the network connection is not robust and injects redundancy into the packet stream

to allow for seamless recovery from dropped or out-of-sequence packet arrival. In addition to FEC, broadband QoS features in advanced SD-WAN solutions offer packet order correction, plus advanced path selection with sub-second failover.

Cloud awareness is an advanced feature that is becoming increasingly important to many organizations. Many enterprise applications today are hosted in a software-as-a-service or platform-as-a-service cloud, such as Amazon Web Services, Google Cloud Platform or Microsoft Azure. Advanced SD-WANs intelligently connect end users and remote offices to those applications via the best direct path to the cloud host, improving the user experience and reducing the amount of traffic flowing from the remote offices to enterprise data centers.

An SD-WAN should also be able to support WAN optimization techniques, such as data compression, to reduce the amount of traffic flowing over the network. Highly sophisticated solutions do this in a single device rather than requiring multiple devices from multiple vendors. This allows WAN links over the public Internet to offer throughput and performance closer to what's delivered by T1 and MPLS private lines.

Encryption and traffic segmentation are other common optimization features that can be delivered by a performance-oriented SD-WAN, giving IT managers more confidence in the security of traffic routed over the Internet.

A key factor in reliability is redundancy, which provides resiliency in the event of a link failure. Some advanced SD-WAN solutions allow tunnel bonding, using multiple pathways—such as MPLS and DSL or DSL and cable—simultaneously to offer redundancy for key connections. In addition, advanced SD-WAN systems that use multiple links can fail over quickly: Traffic that is going over a failed link can be redirected to the active link, often recovering in less than one second, ensuring the quality of the end user's experience.

## Performance, reliability and QoS matter

When organizations evaluate SD-WAN solutions, clearly the basics must be covered, including robust path selection, ZTP and centralized orchestration. Every mainstream SD-WAN on the market offers those capabilities and can save companies money on the WAN connectivity.

But to unleash end-user productivity through improved performance, reliability and QoS, organizations need to go beyond the basics and look at the enhanced value advanced SD-WAN technologies offer. And they should also look to the future: Even if SaaS and PaaS are not part

of an enterprise's IT mix today, they likely will be tomorrow, meaning companies need to make sure their SD-WAN can leverage and be optimized for cloud-hosted applications.

When it comes to delivering QoS and performance to the enterprise, the SD-WAN and Hybrid WAN solutions from Silver Peak offer many advanced capabilities—and that's just the start. Download the technical paper to learn more.



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