



Future of SD-WAN

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Software-Defined Wide Area Network (SD-WAN) is increasingly being adopted by enterprises to efficiently deploy multiple disparate network links, reduce legacy wide area network (WAN) complexity and accelerate branch deployments, improve access to cloud services, deploy WAN links globally, and enhance security in the branch — but these use cases only scratch the surface of SD-WAN potential. The future for SD-WAN is bright and includes use cases for hyperscale; the Internet of Things (IoT); mobility; advanced security; and connecting clients to applications in the cloud via the use of containers, multi-cloud, and hybrid cloud.



REMEMBER

SD-WAN extends the benefits of the software-defined networking (SDN) architecture beyond the data center to the enterprise WAN. SD-WAN abstracts network hardware into a control plane and multiple data planes that can be used with cloud-based management and automation to virtualize enterprise WAN connections and simplify the delivery of services between remote and branch offices to data centers and the cloud.

Hyperscale

SD-WAN enables a hyperscale enterprise WAN through extensive automation efficiency. SD-WAN technologies that leverage horizontal scalability and a

stateless design can scale cloud services to tens of thousands of sites. Ultimately, SD-WAN will enable scale to hundreds of thousands and then millions of objects to support IoT and other use cases.

SD-WAN and the IoT

The rise of the IoT is compelling. By 2020 (that is, now!), there will be between 20 billion and 30 billion connected IoT devices worldwide according to numerous forecasts. By 2025, the number of connected IoT devices could exceed 75 billion and the total economic impact of the IoT could be between \$4 trillion and \$11 trillion according to research by McKinsey Global Institute. Clearly the IoT isn't just the next big thing — it's *the* thing!

The emerging three-tier architecture of IoT comprising sensors, gateways, and the cloud fits very well with the SD-WAN framework. Each sensor would correspond to an endpoint in the SD-WAN context with the IoT Gateway typically being colocated with the SD-WAN edge.

The IoT will cause the number of SD-WAN endpoints to grow to the billions and potentially even tens of billions. IoT promises to not only bring a mass market

for IoT services, but also significantly broaden the number of IoT developers. The open hardware movement has close parallels to the growth of cloud software in making formerly complex technology and processes available to a wide swath of the public. Extending this simplicity into the network is the end goal of SD-WAN.

But extending the scale of the WAN to billions of endpoints presents interesting challenges. One of those is in the collection of analytics. The killer app for IoT is the incredibly rich information, also known as big data, that will tell us how each system in this world operates. The human body alone can easily contribute a thousand variables that would be useful — from the obvious ones like heartbeats to the more specific, like foot pressure points of a runner. Each of these sensors will produce a time series that will need to be aggregated across the SD-WAN to the orchestrator and then acted upon by automated functions with alerts for the human operator. The throughput required may be small, but the real-time nature of the information will require the SD-WAN overlay to manage latency and jitter across a variety of wireless and wired networks.

SD-WAN for Mobility

With the proliferation of smartphones, tablets and laptops, individual users have essentially become their own branch office or remote site, sometimes called micro branches. These users are, of course, mobile, so an incredible diversity of locations must be supported, from a salesperson in a coffee shop to a telecommuter on a train to a field worker on a remote oil rig. The users' mobile device is the SD-WAN edge, so the SD-WAN edge software needs to be easy to deploy on a smartphone, tablet, or laptop. Because the physical location can change dynamically, so, too, does the Internet Protocol (IP) address of the various WAN links. For example, a user at a coffee shop may connect to public Wi-Fi as well as a service provider's cellular network. The network address of each of these links can be dynamic, yet session persistence is required back to the data center and the cloud applications that the user wants to access.



REMEMBER

One of the benefits of SD-WAN for the end user is the ability to use both Wi-Fi and cellular connections based on business policy. The business policy can state that the user can send highly secure traffic only over the cellular connection, but that the user's voice calls can use

Wi-Fi if the link quality is satisfactory, or the device can dynamically switch over to cellular during the call.

Native Advanced Security

SD-WAN also supports native advanced security by providing unified, integrated management for SD-WAN and security functions, including the following:

- **Firewall:** Enhance existing firewall functionality by introducing object groups, zones, and dynamic groups.
- **Uniform resource locator (URL) filtering:** Native integration of URL filtering into the SD-WAN edge using a cloud-hosted URL categorization database.
- **Advanced anti-malware:** Advanced anti-malware web isolation delivered via cloud-based partner gateways.
- **Intrusion prevention:** Cloud-delivered intrusion prevention via service chaining in cloud-delivered SD-WAN gateways.
- **Identity and access management (IAM) and endpoint management integration:** User-based firewall, secure application access, and advanced security enforcement based on user and device posture.

Client-to-Cloud-to-Container, Multi-Cloud and Hybrid Cloud

SD-WAN extends the edge from the branch to the individual client while crossing over the local area network (LAN) Wi-Fi boundary, enabling a unique client-to-cloud-to-container architecture. An individual client can traverse the LAN, hit a network edge, traverse a WAN segment, hit a specific virtual routing and forwarding (VRF) router, and then be plumbed into a container using micro-segmentation.

The cloud landscape is also changing rapidly, with more destination clouds popping up all the time. Additionally, intermediate clouds are beginning to proliferate, including mid-mile, edge, analytics, security, domain name system (DNS), dynamic host configuration protocol (DHCP), and IP address management (IPAM), collectively referred to as DNS, DHCP, and IPAM (DDI), and more.

Finally, SD-WAN enables both hybrid cloud (private cloud bursting into the public cloud) and multi-cloud (individual workloads distributed across disparate public and/or private clouds) environments.

SD-WAN is well positioned to support any cloud project, whether it's hybrid cloud, single cloud, or increasingly, multi-cloud.



TIP

Check out the following resources from VMware to learn more about SD-WAN:

- [VMware SD-WAN by VeloCloud website](#)
- [SD-WAN Overview For Dummies iPaper](#)
- [SD-WAN Enterprise For Dummies iPaper](#)
- [SD-WAN Deployment For Dummies iPaper](#)
- [SD-WAN For Dummies e-book](#)