

# VMware SD-WAN by VeloCloud

## VMware SD-WAN Edge Platform Specifications

### AT A GLANCE

VMware SD-WAN enables enterprises to securely support application growth, network agility, and simplified branch implementations while delivering high-performance, reliable branch access to cloud services, private data centers, and SaaS-based enterprise applications. VMware SD-WAN is built on software-defined networking principles to address end-to-end automation, application continuity, branch transformation, and security from the data center and cloud to the edge.

### KEY BENEFITS

- **Simplified WAN management:** Zero touch deployments, simplified operations, one-click service insertion
- **Assured application performance:** Transport-independent performance for the most demanding applications, leveraging economical bandwidth
- **Managed on-ramp to the cloud:** Direct cloud access with performance, reliability, and security

### Introduction

VMware SD-WAN™ by VeloCloud® is a cloud-delivered solution for network operators and application owners who want to ensure high application performance and availability for their end users while lowering networking costs. VMware SD-WAN ensures a reliable and resilient WAN, with a choice of connection types, including MPLS, LTE, Wi-Fi, and broadband. VMware SD-WAN combines multiple links and uses traffic steering technology to select the best path for each application to ensure consistent performance and overcome quality issues and outages. It can detect slight degradation that would affect application performance, improve performance over a single link using congestion mitigation technology, and adapt without any noticeable impact on the user experience.

### VMware SD-WAN Components

The VMware SD-WAN solution consists of hosted or on-premises cloud gateways; branch office appliances and data center appliances; a central orchestrator to automate policies; and virtual services insertion capabilities.

#### VMware SD-WAN Edge

Enterprise-class appliances that provide secure, optimized connectivity to applications in any location, including private data centers, public clouds, and hybrid deployments.

- VMware SD-WAN Edge software is zero-touch provisioned from the cloud for secure, optimized connectivity to applications and data.
- The VMware SD-WAN Edge with Dynamic Multipath Optimization™ (DMPO) and deep application recognition aggregates multiple links (e.g., Private, Cable, DSL, 4G-LTE) and steers traffic over optimal links to other on-premises VMware SD-WAN Edges in branch offices, private data centers, campuses, and headquarters.
- They can easily integrate with the existing network via routing protocols and benefit from dynamic learning and automation. Edges deliver highly available deployment with a redundancy protocol.
- They can host VNF services simplifying branch office deployments of network services.

The VMware SD-WAN Edge is available as a hardware-based appliance, a virtual appliance, and on the cloud marketplace on AWS and Azure. It can also be loaded in a VM on a server or as a VNF.

**VMware SD-WAN Gateways**

VMware SD-WAN Gateways optimize data paths to all applications, branches, and data centers along with the ability to deliver network services to and from the cloud. A distributed network of gateways, deployed around the world or on-premises at service providers, provide scalability, redundancy, and on-demand flexibility.

VMware SD-WAN Gateways implement VMware SD-WAN Dynamic Multipath Optimization (DMPO), cloud VPN, and VMware SD-WAN Multisource Inbound Quality of Service between global cloud services (SaaS, IaaS, network services) and each VMware SD-WAN Edge, enabling multiple broadband and private leased lines to appear as a single, high-performance WAN.

**VMware SD-WAN Orchestrator**

A cloud-hosted or on-premises secure and scalable web-based central management tool provides simplified configuration, provisioning, monitoring, fault management, logging, and reporting. The VMware SD-WAN Orchestrator enables the simple implementation of business-based policies for application delivery, simplifying application traffic management.

Using VMware SD-WAN’s zero-touch deployment capability, VMware SD-WAN can be quickly installed. The VMware SD-WAN Edge is shipped to the branch office where non-IT personnel can plug in power and a few cables. Activation, configuration, and ongoing management are all handled in the VMware SD-WAN Orchestrator.

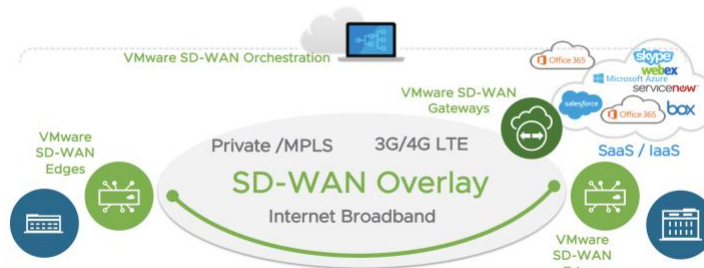


Figure 1: VMware SD-WAN by VeloCloud

**Software Features**

Category	Features
<b>AAA</b>	RADIUS, local authentication and authorization, multitenant 3 Tier RBAC architecture, auditing, roles and privileges
<b>Availability</b>	High availability for VMware SD-WAN Edge, disaster recovery for VMware SD-WAN Orchestrator, multilink for high availability of WAN. Edge clustering
<b>Configuration and monitoring</b>	REST API, SDK (Java and Python), Syslog, SNMP, NetFlow, 3000+ applications/categories, ANPM, application usage, device identification, live mode, zero IT touch activation

<b>Deployment flexibility</b>	Eliminate pre-stage, no CLI, group policies, consolidated ICOM and end customer dashboard, VNF form-factor, multitenant stateless headend, transport group for business policy abstraction, application-aware service insertion on premises or in cloud, RMA workflow, customized application maps
<b>Dynamic Multipath Optimization</b>	Application and network condition aware sub-second steering, jitter/loss correction, fast intelligent routing, intelligent gateway selection, link aggregation, TCP flow optimization, uni-directional link measurements, bandwidth detection
<b>Multitenancy</b>	VMware SD-WAN Controller, VMware SD-WAN Gateway, VMware SD-WAN Orchestrator
<b>Network services</b>	IPv4, DNS, DHCP client, DHCP server, DHCP relay, NAT
<b>QoS</b>	Shaping, policing, per-flow queueing, tunnel shaper, multi-source inbound QoS, rate-limiter, COS aware, outer/inner DSCP tagging, smart defaults, MPLS COS
<b>Remote troubleshooting</b>	Live mode, alerts, events, remote diagnostics (examples: DNS test, ping test, flush active flows, list active flows, paths, VPN tests, packet capture, etc.), PKI infrastructure with certificate management workflows, diagnostic bundles
<b>Routing</b>	OSPF, BGP, static, connected, ICMP probes/responders, overlay flow control, per-packet application aware steering, route filter, route redistribution
<b>SaaS/IaaS</b>	Improved performance for cloud apps, supports well-known IaaS (e.g., AWS, Azure, GCP), Cloud Web Security (e.g., Check Point, Zscaler, Palo Alto Networks, Netskope, Menlo Security, Websense, OpenDNS)
<b>Security</b>	AES256/128, SHA1/SHA2, IKEv2, VPNC compliant IPSec, PKI, segmentation, TLS1.2, SCEP, firewall L2-7, 1:1 NAT, port forwarding, dynamic branch to branch, MAC filtering security service Insertion capabilities: simplified service insertion of third-party NGFW VNF running locally on Edge simplified cloud-based NGFW, AV, IPS/IDS, threat-detection service insertion
<b>VLAN tagging</b>	802.1Q, 802.1ad, QinQ (0x8100), QinQ (0x9100), native
<b>WAN overlay support</b>	Public/private/hybrid transport, cloud and on-premises

## Software Subscriptions Editions

VMware SD-WAN software is based on different subscription editions with different features designed for a wide variety of use cases. They are listed below.

Feature	Standard Subscription	Enterprise Subscription	Premium Subscription
VMware SD-WAN Orchestrator	•	•	•
Dynamic Multipath Optimization (DMPO)	•	•	•
Max number of data segments	1	16	16
Max number of edges supported	50	Unlimited	Unlimited
Partner gateway support (SP only; SaaS access only in Premium)	•	•	•
Advanced features: dynamic routing (multicast/OSPF/BGP), dynamic mesh VPN, hub clustering, customizable business policy		•	•

Virtual services orchestration for next generation firewall deployments on the Edges		•	•
Separate lower-bandwidth tier of 10, 30, 50, and 100 Mbps		•	•
VMware SD-WAN Gateway services <ul style="list-style-type: none"> <li>• Cloud Gateway Service for SaaS and IaaS</li> <li>• Cloud Scale VPN (Branch Edge &gt; Gateway &gt; Branch Edge)</li> <li>• Cloud Gateway Service using IPSec to Cloud Security Service</li> </ul>			•
Cloud Gateway for Non-VMware SD-WAN Site (Branch > Gateway > NVS)		Add-on	•
PCI certified service		Add-on	Add-on
Software upgrade	•	•	•
Upgradeable to a higher edition	•	•	N/A
Mixed editions		• (with Premium)	• (with Enterprise)

VMware SD-WAN is also licensed by bandwidth tier; please see bandwidth tier to platform table below.

Edge / BW	10 M	30 M	50 M	100 M	200 M	350 M	500 M	750 M	1 G	2 G	5 G	10 G
Edge 510	•	•	•	•	•							
Edge 510-LTE	•	•	•	•	•							
Edge 520	•	•	•	•	•							
Edge 520v	•	•	•	•								
Edge 540				•	•	•	•	•	•			
Edge 610	•	•	•	•	•	•						
Edge 620				•	•	•	•	•	•			
Edge 640				•	•	•	•	•	•	•		
Edge 680				•	•	•	•	•	•	•		
Edge 840				•	•	•	•	•	•	• <sup>1,2</sup>		
Edge 2000							•	•	•	•	•	•
Edge 3400					•	•	•	•	•	•	•	
Edge 3800							•	•	•	•	•	•

### Software Support Levels

Software Support Plans	VeloCloud Basic	VeloCloud Production	VeloCloud Premier
Call center	24x7 (Sev1) 12x5 (Sev2, Sev3, Sev4)	24x7 (Sev1) 12x5 (Sev2, Sev3, Sev4)	24x7 (Sev1, Sev2) 12x5 (Sev3, Sev4)
Response time	Sev1: within 1 hour Sev2: within 6 hours Sev3: within 12 hours Sev4: not applicable	Sev1: within 30 mins Sev2: within 4 hours Sev3: within 8 hours Sev4: within 24 hours	Sev1: within 30 mins Sev2: within 2 hours Sev3: within 4 hours Sev4: within 12 hours Sev5: per schedule

1 When a firewall VNF is deployed on Edge 840, the max combined SD-WAN + Firewall throughput is 1 Gbps

2 Maximum SD-WAN performance without VNF on Edge 840 is 4 Gbps; however, the maximum allowed bandwidth license is 2 Gbps

Software maintenance	Yes	Yes	Yes
Federal support	-	Yes	Yes

## Hardware Replacement Services

Hardware Support Plans	VeloCloud Return (RTR)	VeloCloud Next Day (NBD)	VeloCloud Same Day (SBD)
Replacement shipment SLA	Ships next business day after RMA unit returned to factory	Advanced replacement. Ships next business day if RMA request is received by 20:00 UTC	Advanced replacement. Ships same day if RMA request is received by 18:00 UTC

## Physical Edge Specifications (1/2)

### Performance and Scale

Edges	510	510-LTE	520	520v <sub>3</sub>	540	610	620
Maximum throughput (1300-byte) <sup>4</sup>	200 Mbps	200 Mbps	200 Mbps	200 Mbps	1 Gbps	350 Mbps	1.5 Gbps
Maximum throughput (IMIX) <sup>5</sup>	100 Mbps	100 Mbps	100 Mbps	100 Mbps	500 Mbps	200 Mbps	750 Mbps
Small (64-byte) <sup>6</sup>	30 Mbps	30 Mbps	30 Mbps	30 Mbps	150 Mbps	40 Mbps	200 Mbps
Maximum tunnel scale	25	25	50	50	100	50	100
Flow per second	2,400	2,400	2,400	2,400	4,800	2,400	4,800
Max concurrent flows	240K	240K	240K	240K	480K	240K	480K
Max number of routes	100K	100K	100K	100K	100K	100K	100K
Maximum segments	16	16	16	16	16	16	16

### Connectivity

Edges	510	510-LTE	520	520v	540	610	620
LAN / WAN 1G RJ-45	4	4	2	2	2	6	6
LAN / WAN 1G SFP			2	2	2	2	2
L2 Switching Only RJ-45			8	8	8		
Console ports	Mini USB	Mini USB	Mini USB	Mini USB	Mini USB	Mini USB	Mini USB
Integrated Wi-Fi	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated LTE		Yes <sup>7</sup>					
USB ports (3G/4G LTE)	2 (2.0)	2 (2.0)	2 (2.0) + 2(3.0)	2 (2.0) + 2 (3.0)	2 (2.0) + 2 (3.0)	2 (3.0)	2 (3.0)

### Memory, Storage, and Third Party VNFs

Edges	510	510-LTE	520	520v	540	610	620
System memory (RAM)	4 GB	4 GB	4 GB	8 GB	8 GB	4 GB	8 GB
System flash	8 GB	8 GB	8 GB	8 GB	8 GB	16 GB	16 GB
System storage				64 GB (SSD)			120 GB (SSD)
VNF capable				Yes			Yes

### Dimension, Power, Environment, and Reliability

Edges	510	510-LTE	520	520v	540	610	620
Cooling	Fan-less	Fan-less	Fan-less	with Fan	with Fan	Fan-less	with Fan
Mounting	Desktop / Wall-mount / 19-inch rackmount						
Size (W x D x H) in mm	206 x 180 x 39.7 mm		206 x 180 x 51 mm			206 x 200 x 52 mm	
Weight in lbs.	2.0 lbs.		2.6 lbs.			2.9 lbs.	3.1 lbs.

Power Supply	External: AC						
AC input	Voltage: 100v to 240v auto-ranging, Frequency: 50Hz to 60Hz						
Power Load (Typical / Max)	15W / 40W	15W / 40W	25W/45W	30W/45W	30W/50W	16W/26W	20W/30W
Operating conditions	Temperature (0 °C to 40 °C), Humidity (5% to 85%), Altitude (5,000 m)						
Non-operating conditions	Temperature (-40 °C to 70 °C), Humidity (5% to 95%), Altitude (5,000 m)						
MTBF (25 °C ambient temperature) <sup>8</sup>	40.6 yrs.	40.6 yrs.	22.9 yrs.	22.8 yrs.	22.8 yrs.	22.8 years	

3 The Edge 520v can sustain maximum 100 Mbps (1300-byte) throughput when a FW VNF is actively service chained

4 Maximum performance based on large packet (1300-byte) payload with AES-128 encryption and DPI turned on

5 Internet traffic (IMIX) performance based on average packet size of 417-byte payload with AES-128 encryption and DPI turned on

6 Small packet performance based on 64-byte packet size payload with AES-128 encryption and DPI turned on

7 510-LTE supports additional 2 LTE interfaces through USB for 3 concurrent active interfaces

8 MTBF based on Telcordia SR-332 methodology; excludes system fans in the calculation

## Physical Edge Specifications (2/2)

### Performance and Scale<sup>9</sup>

Edges	640	680	840 <sup>10</sup>	2000	3400	3800
Maximum throughput (1300-byte) <sup>11</sup>	3 Gbps	6 Gbps	4 Gbps	10 Gbps	7 Gbps	10 Gbps
Maximum throughput (IMIX) <sup>12</sup>	1 Gbps	2 Gbps	1.5 Gbps	5 Gbps	2.5 Gbps	5 Gbps
Small (64-byte) <sup>13</sup>	250 Mbps	500 Mbps	400 Mbps	1 Gbps	650 Mbps	1 Gbps
Maximum tunnel scale	400	800	400	4,000	4,000	6,000
Flow per second	19,200	19,200	19,200	19,200	38,400	38,400
Max concurrent flows	1.9M	1.9M	1.9M	1.9M	3.8M	3.8M
Max number of routes	100K	100K	100K	100K	100K	100K
Maximum segments	16	16	16	16	16	16

### Connectivity

Edges	640	680	840	2000	3400	3800
LAN / WAN 1G RJ-45	6	6	6	6	6	6
LAN / WAN 1G/10G SFP+	2	2	2	2	4	4
Console ports	Mini USB	Mini USB	RJ-45 / VGA	RJ-45 / VGA	RJ-45 / Mini USB	
Integrated Wi-Fi	Yes	Yes				
USB ports (3G/4G LTE)	2 (3.0)	2 (3.0)	2 (3.0)	2 (2.0) + 2 (3.0)	2 (3.0)	2 (3.0)

### Memory, Storage, and Third Party VNFs

Edges	640	680	840	2000	3400	3800
System Memory (RAM)	32GB	32GB	32GB	32GB	32GB	32GB
System Flash	16GB	16GB	n/a	n/a	n/a	n/a
System Storage	120GB (SSD)	120GB (SSD)	100GB (SSD)	100GB (SSD)	256GB (SSD)	256GB (SSD)
VNF Capable	Yes	Yes	Yes			

### Dimension, Power, Environment, and Reliability

Edges	640	680	840	2000	3400	3800
Mounting	Desktop/Wall-mount/RMK			1RU Rack Mounts		
Size (W x D x H) in mm	206 x 180 x 51		437 x 249 x 43	437 x 650 x 43	434 x 381 x 44	
Weight in lbs.	6.0 lbs.		12 lbs.	23.5 lbs.	13.75 lbs.	15.74 lbs.
Power Supply	External: AC			Internal: AC		
Redundant Power Supply	No	No	No	Yes (1+1)	Yes (1+1)	Yes (1+1)

AC input	Voltage: 100v to 240v auto-ranging, Frequency: 50Hz to 60Hz					
Power Load (Typical / Max)	35W / 120W	40W / 120W	40W/70W	150W/200W	165W/400W	200W/400W
Operating Temperature	10 °C to 40 °C		10 °C to 40 °C	10 °C to 35 °C	0 °C to 45 °C	
Operating Humidity	5% to 85%		5% to 85%	5% to 85%	5% to 85%	
Operating Altitude	5,000m		5,000m	5,000m	3,048m	
Non-operating conditions	40 °C to 70 °C		-40 °C to 70 °C	-40 °C to 70 °C	-40 °C to 70 °C	
Non-operating Humidity	5% to 95%		5% to 95%	5% to 95%	5% to 95%	
Non-operating Altitude	5,000m		5,000m	5,000m	10,688m	
MTBF (25 °C ambient temperature) <sup>9</sup>	22.8 years		11.5 yrs.	7.0 yrs.	17.1 years	

9 VMware SD-WAN Edges support clustering for multi-gigabit performance

10 The Edge 840 can sustain maximum Gbps throughput when a FW VNF is actively service chained

11 Maximum performance based on large packet (1300-byte) payload with AES-128 encryption and DPI turned on

12 Internet traffic (IMIX) performance based on average packet size of 417-byte payload with AES-128 encryption and DPI turned on

13 Small packet performance based on 64-byte packet size payload with AES-128 encryption and DPI turned on

## Wireless Specifications

### Wireless LAN (Wi-Fi) Specifications

Wi-Fi Capabilities	510 / 510-LTE	520 / 520v / 540	6X0
Wi-Fi Standards	802.11 a/b/g/n/ac	802.11 a/b/g/n/ac	802.11 a/b/g/n/ac
Frequency Bands (GHz)	2.400-2.4835, 5.150-5.250, 5.725-5.850		
Antenna (max data rate)	2x2 MIMO	3x3 MIMO	2x2 MIMO
Max Simultaneous SSIDs	8	8	8
Max Transit Power	23dBm/chain for 2.4GHz, 19dBm/chain for 5GHz		

### Wireless WAN (3G / 4G / LTE) Specifications

3G / 4G / LTE Capabilities	510-LTE-NAEU	510-LTE-AP
Modem	Sierra Wireless EM7455	Sierra Wireless EM7430
Geography	North America & Europe	Asia, ANZ, LATAM
LTE category	Cat-6	Cat-6
Carrier aggregation	Yes	Yes
3G fallback	HSPA+	HSPA+
SIM slots	2 (only 1 active)	2 (only 1 active)
LTE bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 20, 25, 26, 29, 30, 41	1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 38, 39, 40, 41
Antennas	Main and AUX (via SMA connectors)	
Theoretical speeds <sup>14</sup>	300 M Down / 50 Up	300 M Down / 50 Up

14 The 510 platform is limited to maximum 200 Mbps of aggregate throughput

## Virtual Edge Specifications

	2 vCPU	4 vCPU	8 vCPU	10 vCPU
Maximum performance	250 Mbps	1 Gbps	4 Gbps	4 Gbps
Maximum tunnel scale	50	400	800	2000
Minimum memory (DRAM)	4 GB	8 GB	8 GB	8 GB
Minimum storage	8 GB	8 GB	8 GB	8 GB
Supported hypervisors	ESXi 6.0, 6.5U1, 6.7U1, KVM Ubuntu 14.04 LTS or 16.04			
Supported public cloud	AWS, Azure, GCP			
Support network I/O	SR-IOV, VirtIO, VMXNET3			
Recommended host settings	<ul style="list-style-type: none"> <li>• CPUs at 2.0 GHz or higher</li> <li>• CPU support for AES-NI, SSE3, SSE4, and RDTC instruction sets</li> <li>• Hyper-threading disabled</li> </ul>			

**Note:** Performance was obtained using an Intel® Xeon® CPU E5-2683 v4 @ 2.10 GHz (AES-NI) and SR-IOV enabled network adapter using large packet payload (1300-byte).



## Regulatory and Compliance Certifications

<p><b>EMC</b></p>	<p>FCC (US)</p> <p>CE (Europe)</p> <p>R-Mark (Japan)</p> <p>SRRC (China) <sup>11</sup></p> <p>EN32032 (HK)</p> <p>KCC (Korea)</p> <p>NCC (Taiwan)</p> <p>47 CFR, Part 15</p> <p>ICES-003 Class A</p> <p>EN 55022 Class A</p> <p>CISPR 22 Class A</p> <p>AS/NZS 3548 Class A</p> <p>VCCI</p> <p>CNS 13438</p> <p>EN 300-386</p> <p>EN 61000 (Immunity)</p> <p>EN 55024</p> <p>CISPR 24</p> <p>EN 50082-1</p>
<p><b>SAFETY</b></p>	<p>UL 60950-1</p> <p>CAN/CSA C22.2</p> <p>EN 60950-1</p> <p>AS/NZS 60950-1</p> <p>IEC 60950-1</p> <p>GB-4943</p>
<p><b>RoHS</b></p>	<p>Compliant</p>

<sup>11</sup> Not applicable for 2000, 3400, 3800. Also 6x0s series not certified for SRRC China as of today.