SOLUTION BRIEF

Multi-Cloud Software-Defined Network

VMware SD-WAN by VeloCloud on Intel® Architecture for Scalable WAN Connectivity

Software-defined wide-area networks (SD-WANs) offer a cost-effective approach to handling increased requirements for performance, reliability, capacity, security, and control in connectivity to branch and edge locations. VMware SD-WAN running on Intel® architecture provides a scalable platform that ensures application delivery with consistency from the edge to the data center to the cloud.

The move to accessing applications from the cloud and the dramatic growth in data volumes drives WAN bandwidth requirements and the need for changes in network topologies as well as how networks are deployed and managed. Maintaining connectivity to applications of the WAN and ensuring their performance creates additional complexity for network managers who are also under intensifying pressure to control costs. This pressure is increased with the growth of data-intensive workloads such as analytics, the Internet of Things (IoT), and the use of latency-sensitive online collaboration tools. An IHS Markit survey[1] reports that network managers expect WAN bandwidth usage overall to increase by 20 percent per year, with requirements at branch offices increasing at a rate of nearly 30 percent.

At the same time, network managers are also working to increase manageability and control over the network. They need to deliver secure, reliable, high-performance connectivity to branches and the edge, while also providing the agility to respond quickly to changing business requirements in an environment that is rapidly moving to use applications in the cloud. Traditional approaches to addressing network challenges are coming up short:

- **Private leased lines and multiprotocol label switching (MPLS) networks** provide high quality of service (QoS), but agility is a problem, while growing capacity requirements can make them cost prohibitive.
- **Public networks such as the Internet and 4G LTE** improve on the cost and agility constraints of leased lines and MPLS networks, but they are often constrained in terms of performance, reliability, and manageability.
- **Network devices such as routers and switches** used to provide connectivity require cumbersome device-by-device configuration and lack the tools to enable application policies to ensure performance over the WAN.
- **Hardware platforms used for network appliances** often lack the scalability and performance required to ensure adequate throughput and to run hosted services in virtualized network functions (VNFs).

A scalable approach based on VeloCloud—now part of VMware—and Intel architecture provides the solution that organizations are looking for by combining cloud-delivered SD-WAN from VMware and a range of platform hardware from Intel with tools to ensure and enhance performance. VMware SD-WAN by VeloCloud uses a software-based networking approach to create a virtualized logical WAN overlay that can aggregate multiple links and apply techniques to optimize the routing of traffic between data centers, branch offices, and public clouds, as illustrated in Figure 1. VMWare SD-WAN utilizes all available connections in an active/active model to increase bandwidth utilization and steers traffic over the best available link, keeping up with changing traffic conditions automatically.

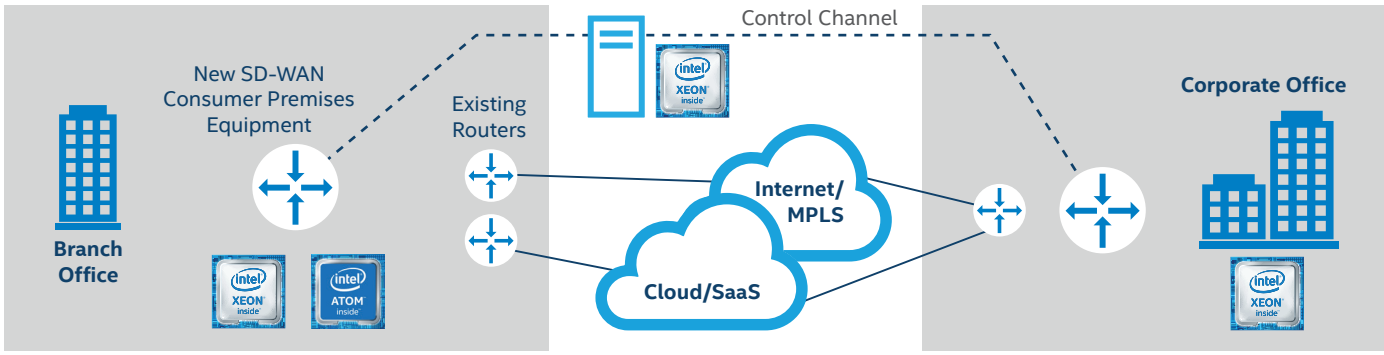

Figure 1. SD-WAN routes traffic across the optimal delivery path using multiple available connections.

The combination of VMware SD-WAN and Intel® platforms offers a solution that can scale as needed, with a consistent approach and architecture. Intel provides a range of platforms and processors to ensure scale along with development tools and a VNF infrastructure for hosting compatible services.

VMware SD-WAN helps network operators respond to security challenges, which the IHS Markit survey identifies as the top concern of network managers by a wide margin. Security functions such as firewalls and intrusion protection can be deployed as virtual services on the VNF infrastructure provided by Intel on the VeloCloud edge device, reducing the need for additional devices in the branch office location. This approach allows for delivery of data protection services quickly and efficiently.

Together, VMware and Intel deliver capabilities that make SD-WAN an important part of network transformation strategy to support changing application needs, with as many as three out of four companies evaluating this approach as part of their move to the cloud[1].

A Simple, Robust Approach to Implementing SD-WAN

VMware SD-WAN uses an appliance called VeloCloud Edge, which provides secure and scalable connectivity to branch locations, such as retail points of sale, clinics, or factories, as shown in Figure 2. The solution aggregates multiple network links such as leased lines, cable and DSL internet services, and 4G networks, abstracting them and managing them as a pooled connectivity resource.

By steering application traffic over the optimal WAN link with packet-level responsiveness, VMware SD-WAN ensures performance and utilization efficiency for all available bandwidth. VMware SD-WAN also provides network segmentation for isolation of traffic across the WAN on the basis of policies by application, location, business group, and other factors. Thus, for example, data traffic for accounting applications could be isolated from general Internet traffic flows, or payment cards traffic could be isolated from all other traffic.

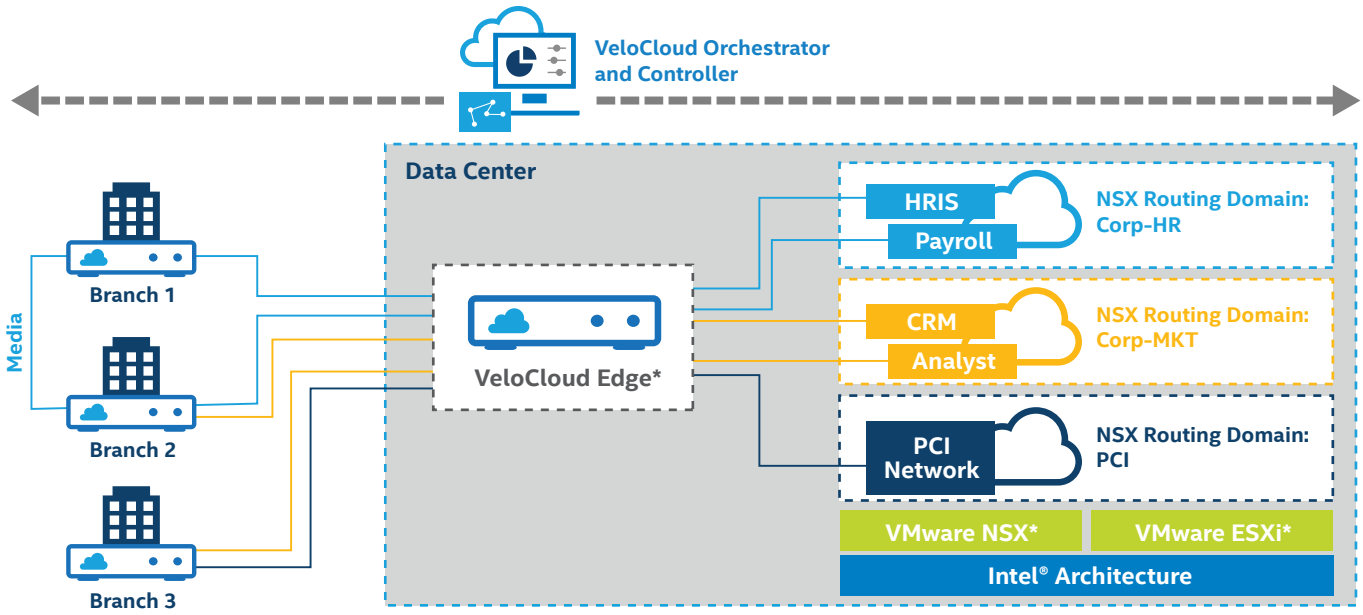

Figure 2. The VeloCloud Edge* prioritizes and segments traffic by application.

At the same time, centralized monitoring and control over these links using VeloCloud Orchestrator enhances visibility into the performance and reliability of applications over the WAN network in real time. Based on that information, organizations can accurately gauge the impact of their WAN on application performance and responsiveness, to help improve the end-user experience.

The SD-WAN solution based on VMware and Intel technologies accelerates deployment and reduces the cost of secure connectivity to branch and edge locations while improving application performance and reliability. The solution incorporates the following components:

- **VMware SD-WAN Edge** provides application and service connectivity; it is available as a physical appliance or as a virtual instance for installation on Intel architecture-based servers.
- **VMware SD-WAN Gateways** are deployed globally at top-tier points of presence to steer traffic to the cloud and to the Enterprise data centers based on policies received from the edge, eliminating the need for backhauling.
- **VMware SD-WAN Orchestrator and Controller** provides centralized provisioning, monitoring, and configuration of virtual services in the SD-WAN, to optimize data connectivity and flow.

Capabilities and Benefits of the VMware-Intel SD-WAN Solution

VMware SD-WAN using VeloCloud Edge appliances based on Intel architecture delivers a range of capabilities that enhance network operations, as illustrated in Figure 3.

Figure 3. The VMware and Intel solution delivers a range of capabilities for SD-WAN deployments.

Workload-Centric Data Protection

VMware SD-WAN provides security at the edge that is unified across all types of traffic links. It implements network security services such as L4-L7 firewall and intrusion protection as VNFs that are integrated at the per-workload level and that function across multi-site connections. Performance headroom provided by the full range of Intel platforms is instrumental in supporting the processing demands associated with distributed VNFs.

Data traffic is protected using IPsec encryption end to end, from branch to cloud to data center. The system provides automatic setup of VPN tunnels from branches to VMware SD-WAN gateways, as well as dynamic establishment of tunnels as needed between branches. This capability significantly streamlines operations by eliminating manual configuration of each connection.

Dynamic Multi-Path Optimization

VMware SD-WAN recognizes the applications associated with specific traffic flows as the basis for dynamic multi-path optimization (DMPO), which helps ensure that applications' performance needs are met. The system continually monitors WAN operational factors such as the quality of links and data paths as well as circuit capacity to drive real-time dynamic optimization for greater performance.

Application data is steered on a per-packet basis by its priority, built-in knowledge about application requirements, and real-time network conditions. A given data flow can be divided among multiple links to provide faster response times. At the same time, DMPO can provide remediation measures on demand, such as error correction, buffering to correct jitter, and retransmission of dropped packets.

Zero-Touch Deployment

The VMware SD-WAN appliance can be drop-shipped to the branch location where it needs to be installed, and even a non-technical staff member can set up the device in minutes. The cloud-based service can automatically activate as well as handle ongoing configuration and management of the appliance.

To help enable zero-touch deployment, VMware SD-WAN automatically profiles WAN circuits to produce location-specific configuration parameters without manual intervention. This capability dramatically reduces the complexity of deploying SD-WAN at large numbers of branch locations.

Benefits of Intel® Architecture for VMware SD-WAN Deployments

VeloCloud Edge hardware appliances are based on a range of Intel® platforms, using the Intel Atom® and Intel® Xeon® processors, with consistent architecture and capabilities across different capacities of devices, as shown in Figure 4. The capacity of the appliance needed is determined by the throughput demands of the various applications that are being accessed by the branch office users and also by the number of virtualized network services that are running as VNFs on the branch office appliance, such as firewall and intrusion protection services.

With hardware options that support WAN connectivity from 100 Mbps to multi-gigabit speeds, the appliance enables a coherent environment for management, security, and control across branches while balancing needs in terms of capacity and cost.

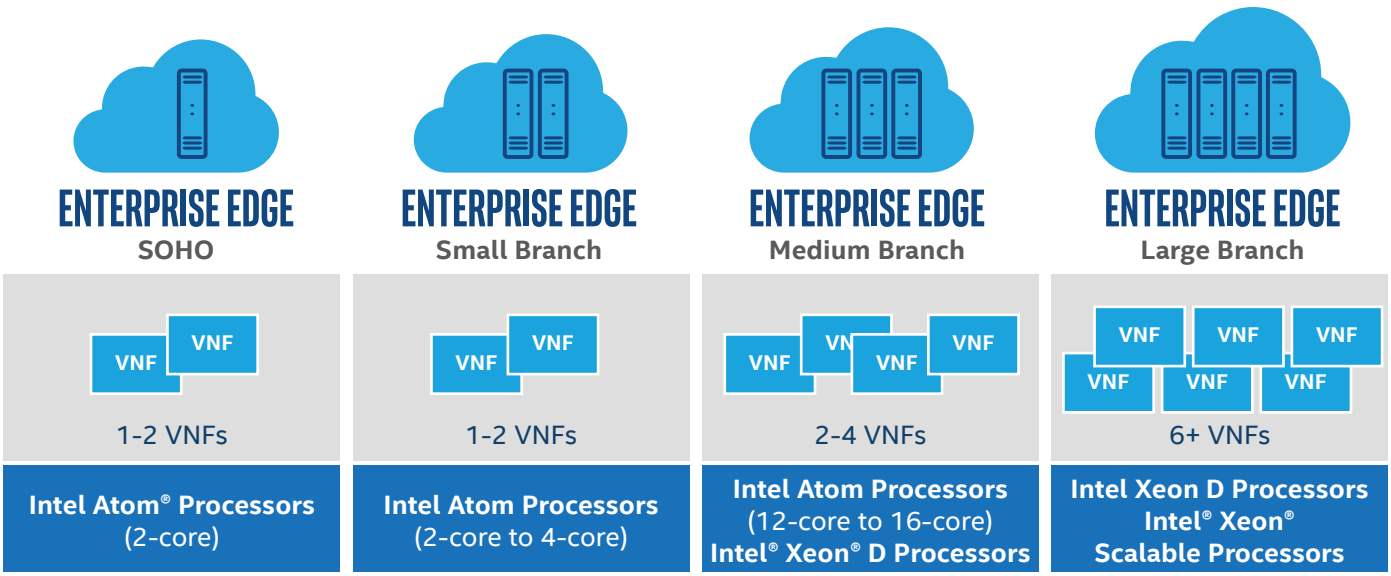

Figure 4. Scalability and consistency across different sizes of branch and edge locations.

This scalability and consistency enables IT organizations to tailor the solution to the specific branch, based on factors such as the number of users at the branch and the types of applications they are using. Intelligent traffic controls optimize utilization of hardware resources, with granular capabilities for prioritizing and shaping network traffic. The breadth of appliances available also provides scale for various sizes of branch locations, as illustrated in Figure 5. This breadth helps network operators meet performance needs in areas such as responsiveness requirements, service-level agreements, and latency sensitivity.

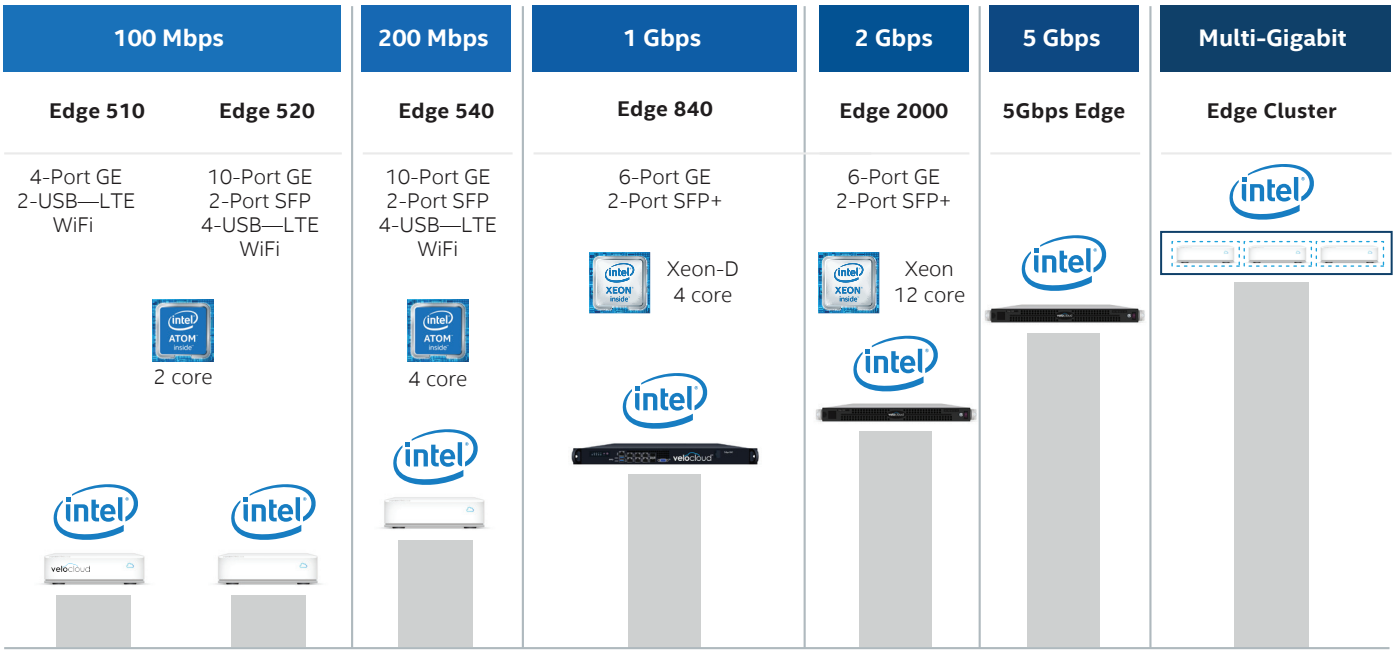

Figure 5. VMware SD-WAN by VeloCloud* edge appliances.

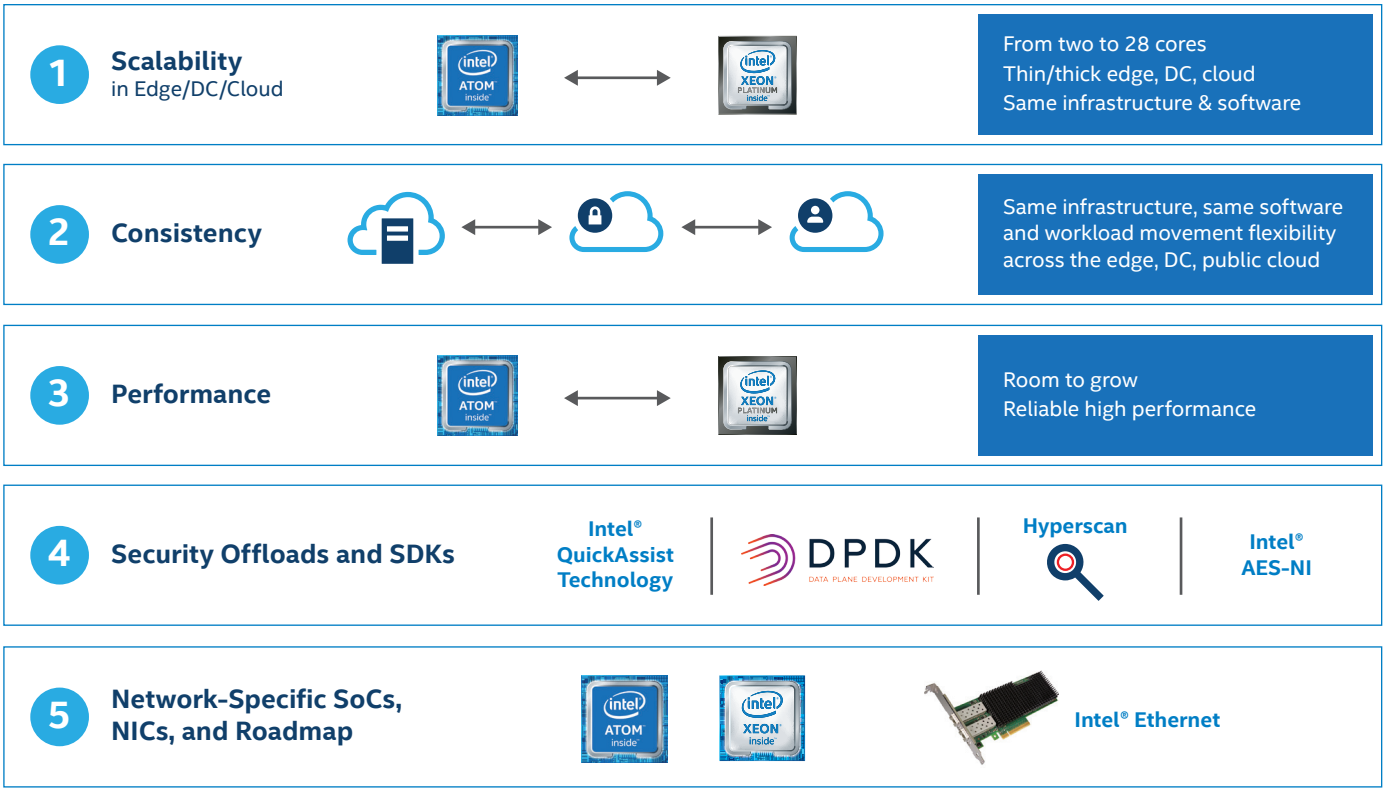

Figure 6. Intel® architecture benefits and advantages for uCPE/SD-WAN edge.

Using Intel architecture to host the VMware SD-WAN appliance offers a number of advantages. Responsiveness is enhanced with the ability to perform functions such as accelerating encryption in hardware. Scaling edge devices across Intel® platforms helps meet evolving network throughput requirements. Integration with the VMware management and provisioning framework reduces operational complexity and supports configuration across all locations.

Co-engineering by VMware and Intel has built optimizations into the solution using the Intel developer tool set, taking advantage of capabilities built into the Intel platforms used for the SD-WAN appliances, as illustrated in Figure 6. The Intel developer tools include the following:

- **Data Plane Development Kit (DPDK)** is a library of open-standard software drivers originally developed by Intel that drive up packet-processing performance by routing network packets around the Linux* kernel.
- **Intel® QuickAssist Technology (Intel® QAT)** provides a software-enabled foundation for security, authentication, and compression, significantly increasing performance and efficiency.
- **Intel® AES New Instructions (Intel® AES-NI)** accelerates key parts of the encryption algorithm in hardware, making pervasive, end-to-end encryption possible without degrading performance.

Conclusion

VMware SD-WAN uses Intel architecture to drive development that enables network transformation, optimizing the use of diverse WAN links as a virtualized logical whole while increasing performance, scalability, and security. Intel platforms provide a set of development tools that are used to optimize the performance of the SD-WAN appliance, as well as a consistent architecture across Intel Atom and Intel Xeon processors that can scale to meet the demands of applications.

Emerging use cases and mega changes such as 5G are increasing the need to run both existing and new enterprise edge workloads (e.g., IoT, analytics, and ADC), on SD-WAN appliances and other edge devices. Therefore, enterprises should deploy edge devices with sufficient computing headroom to accommodate upcoming requirements in order to avoid having to change or upgrade these devices in the future.

With the VMware and Intel solution, networks become more agile, dynamically adapting to changing application needs, providing easy access to cloud-based services, and simplifying the deployment of new locations. The combined hardware and software appliance is explicitly designed for zero-touch deployment that removes the need for on-site IT. Once the SD-WAN solution is deployed, operations are simplified with real-time monitoring, analytics, and reporting on network activity. With VMware SD-WAN on Intel hardware, network managers now have a streamlined, flexible, and robust route to transform their networks to meet their application deployment and performance goals.

Learn More about the VMware and Intel partnership

www.intel.com/vmware

www.vmware.com/partners/strategic-technology-partners/intel.html

Solution provided by:

[1] https://technology.ihs.com/602230/three-out-of-four-companies-evaluating-sd-wan-as-enterprises-embrace-the-cloud-ihs-markit-survey-says.

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