

VMware Cloud on Dell EMC Technical Overview

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VMware Cloud™ on Dell EMC combines the simplicity and agility of the public cloud with the security and control of on-premises infrastructure delivered as a service to data center and edge locations. It is built upon on the latest VMware software defined data center suite, including industry-leading compute, storage, and network virtualization that is optimized for Dell EMC VxRail hyperconverged infrastructure. It's quick and easy to procure and delivers a cloud-style consumption model for a range of use cases.

VMware provides fully automated lifecycle management from the cloud and monitors the health of the entire stack around the clock. The combined software, hardware, and services offering enables customers to focus technology resources on initiatives that differentiate the business, instead of spending time on infrastructure management.

Many thousands of VMware customers depend on hybrid cloud infrastructure - spanning from private data centers and edge locations to public clouds. Only VMware can offer the consistent operational experience across all of these locations, accommodating the geographical demands driven by business or technical requirements.

In the public cloud, customers have embraced VMware Cloud on AWS—the SDDC as a service offering that is jointly engineered by VMware and Amazon Web Services (AWS). But many applications cannot be moved to the public cloud due to business policies or technical constraints, such as latency and bandwidth requirements. For customers that are interested in the combined benefits of a fully managed SDDC that still accommodates the demand for on-prem infrastructure, VMware Cloud on Dell EMC is the answer.

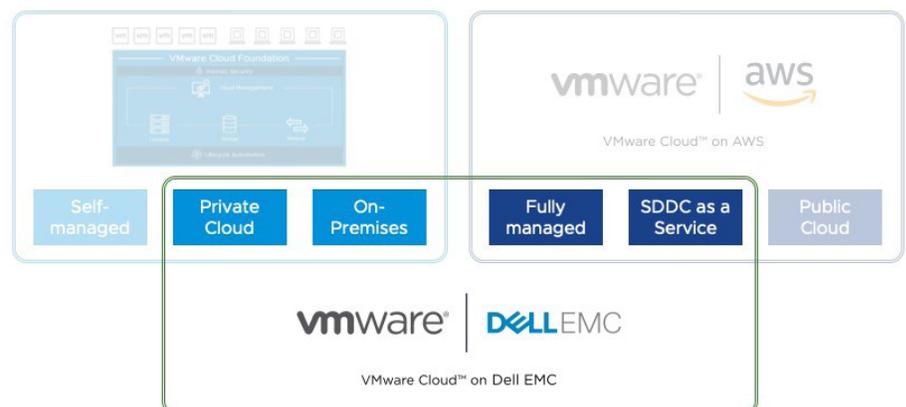


FIGURE 1: VMware Cloud on Dell EMC captures the best attributes of VMware Cloud on AWS and on-premises deployments

Fully Managed VMware SDDC as a Service

The VMware Cloud on Dell EMC offering is built on three main pillars which will be explored throughout this paper:

1. **Hybrid Control Plane:** The hybrid cloud control plane is the primary customer interface that enables provisioning, consumption and high-level resource monitoring. Delivered as a service, there is no software to install.
2. **Rack Infrastructure:** The VMware Cloud on Dell EMC infrastructure rack is built and fully configured in a Dell EMC facility so that it arrives ready to use. The rack is equipped with everything: VxRail servers, high-performance networking, power distribution, secure management and more.
3. **Automated Lifecycle Management:** Automated lifecycle management provides perpetual business benefits, ensuring the latest updates to software and firmware are regularly deployed so that the newest capabilities and highest security are always a fundamental part of the infrastructure.

Top Use Cases

One of the unique attributes of VMware Cloud on Dell EMC is that the service is applicable to data centers and edge locations alike, in both cases offering unique value and functional benefits not offered by existing solutions in the market. As a result, VMware Cloud on Dell EMC enables business transformation or evolution that may have otherwise been stifled by budgetary or management challenges

The following further sums up the benefits that VMware Cloud on Dell EMC brings to the data center and the edge.

Data Center

VMware Cloud on Dell EMC delivers a modernized data center infrastructure as a service on-premises for customers seeking an alternative to traditional CapEx-funded infrastructure replacement and/or avoidance of refactoring applications and vendor lock-in when migrating to a specific public cloud provider.

With VMware Cloud on Dell EMC, data center IT teams continue using familiar VMware software and acquired skills, receive a modern hyperconverged service infrastructure on site, retain full control of their workloads, and shed the responsibility of managing their physical infrastructure. The service offers 'cloud-like' monthly billing and requires no CapEx expenditure. Following are the ideal data center use cases for VMware Cloud on Dell EMC:

Data Center Modernization

- Refreshes old infrastructure to hyperconverged technology integrated in VMware Cloud on Dell EMC services infrastructure
- Physical infrastructure management is assumed by VMware
- Existing VMware skills investment is preserved
- Applications / workloads remain close to their end users
- Infrastructure expense shifts from cyclical CapEx spend to 'Cloud Like' monthly OpEx spend

Data Center Consolidation / Relocation

- Allows consolidation of multiple data centers to a single on-premise site
- Relocation of data center(s) to a new site or co-location site offering a modernized infrastructure which is fully managed by VMware and offers monthly billing
- Physical infrastructure management is assumed by VMware
- Existing VMware skills investment is preserved
- Applications / workloads remain close to their end users
- Infrastructure expense shifts from cyclical CapEx spend to 'Cloud Like' monthly OpEx spend

Edge

VMware Cloud on Dell EMC is an ideal service solution for providing fully managed edge computing resources to any industry or vertical that does business on the data center network edge. Traditionally, many of these businesses have adopted some type of device that provides connectivity at a minimum, but often are 'compute enabled' with the ability to provide limited, lightweight application support. For the most part, these devices are limited in function and don't require costly regular maintenance or administration.

With technologies such as the Internet of Things (IoT), the digitalization of retail, advancements in real time analytical decision making and proliferation of application based vendor client interaction, these traditional 'branch router-like' devices are stifling technological growth at the network edge.

VMware Cloud on Dell EMC is a fully managed infrastructure as a service that brings edge computing power to any business or organization, including brick and mortar retail, remote manufacturing, healthcare, and remote offices to name a few. VMware Cloud on Dell EMC managed edge computing provides capabilities for the following scenarios at the edge:

1. Remote Office Automation

- Enables remote office and branch office (ROBO) automation
- Allows relevant applications to be run efficiently near end users
- SD-WAN built in to leverage lower cost/bandwidth links for connectivity
- Fully managed service—no need for localized admin staff

2. Brick and Mortar Retail Stores

- Fully managed service—no need for localized admin staff
- Provides onsite compute power for relevant apps such as IoT, supply chain control, retail digitalization

3. Manufacturing Edge

- Fully managed service—no need for localized admin staff
- Ability to run next generation industrial automation
- Compute power for running process relevant apps such as IoT, real-time process analytics, and supply chain automation

4. Healthcare

- Fully managed service – no need for localized admin staff
- Compute power for patient record processing, imaging storage, instrument telemetry, and IoT for facility asset tracking and maintenance
- Provides infrastructure compliant with healthcare regulations
- Ability to run IoT for tracking of medical equipment, patient medical consumable supplies and patients through wristbands

Key Benefits and Value Propositions

There are numerous benefits to this fully managed SDDC infrastructure as a service, from streamlining the procurement process to eliminating the need to perform day-to-day monitoring and lifecycle management operations. Following is an overview of these advantages over the traditional, do-it-yourself infrastructure deployments.

Procurement Agility

Those responsible for providing data center infrastructure are familiar with the lengthy procurement cycles typically involved: determining configurations and components, obtaining quotes, and coordinating across various departments responsible for budgets and purchasing. With VMware Cloud on Dell EMC, a fully configured rack of hyperconverged servers is built to meet customer resource requirements and is delivered ready to use. This dramatically improves the time to value for new data center deployments.

Likewise, lengthy procurement cycles may prompt customers to over-provision resources in order to avoid having to repeat the process too soon. With VMware Cloud on Dell EMC, it's easy to start with what's needed and then order additional capacity to quickly expand available resources as demand grows. This reduces waste and permits budgets to be allocated elsewhere.

Operational Efficiency

Because VMware Cloud on Dell EMC is a fully managed service, no customer IT resources are used for infrastructure management. Instead of monitoring, planning, and executing infrastructure maintenance operations, valuable IT resources can go towards supporting new business initiatives.

Since VMware Cloud on Dell EMC is built on fully virtualized hyperconverged infrastructure, it's easier than ever to automate virtual infrastructure operations. For example, with NSX-T network virtualization there are no physical VLANs to manage when creating virtual machine networks. Simply add a new network segment, including an IP subnet, in the hybrid cloud portal and see it appear in vCenter Server immediately ready for use. The network engineering group can focus on other activities when they do not have to work on change request tickets from the virtual infrastructure administrators.

Deployment Flexibility

Resources on VMware Cloud on Dell EMC are sensibly sized for typical workloads and deployment use cases, which can vary with a flexible number of hosts per rack. Pricing is also flexible, with 1-year and 3-year subscription terms available.

These factors combine to allow a consistent procurement and operational experience that can span from remote offices to data centers to colocation facilities with ease.

Predictability

With VMware Cloud on Dell EMC, customers benefit by having a single vendor to contact for all aspects of the service lifecycle, from ordering to deployment as well as ongoing support and incident response. No more wasted cycles determining if an issue is hardware or software related, simply contact VMware and they will take care of it all.

In addition to predictable support, VMware Cloud on Dell EMC customers also benefit from predictable costs. The configuration cost covers all Infrastructure hardware, SDDC software, lifecycle management, monitoring, support, and patching and updates. There are no additional usage fees for use of provided infrastructure, deployed VMs, data storage, or API requests.



FIGURE 2: VMware Cloud on Dell EMC service infrastructure rack

Another challenge that data center administrators have typically faced is knowing when to refresh server hardware. If they stretch the cycle out too long they run the risk of encountering hardware failures, degraded performance or lack of support for newer software releases. But refreshing too often is costly not only in terms of procurement but also on operational resources. With VMware Cloud on Dell EMC, customers subscribe to a service, they do not purchase hardware. At the end of the subscription period, typically three years, customers will have options to extend their subscription with existing hardware or enter into another agreement with a refreshed rack deployment.

Performance and Modernization

VMware Cloud on Dell EMC is built on the latest Dell EMC VxRail data center server hardware and VMware SDDC software, offering high performance through modern CPUs and memory, flash storage devices and high-speed networking. Business applications will realize a new level of throughput and responsiveness when they are migrated from aging hardware running potentially outdated infrastructure software.

Data Sovereignty and Efficient Access

In this era of global connectivity and worldwide commerce, businesses may require control over where their valuable data is stored in order to comply with corporate or regulatory policies and/or other legal requirements. Similarly, they must guard against unintentionally becoming subject to the laws of other countries by inadvertently using cloud-based services that are based in other regions. With VMware Cloud on Dell EMC, customers control where their infrastructure is located to ensure compliance at all times.

From a technical aspect, certain applications have latency requirements that cannot be satisfied over a link to the public cloud. Other apps may generate high volumes of data that is not cost effective to send over valuable data center Internet circuits. These are ideal scenarios for a VMware Cloud on Dell EMC deployment, targeted to the exact site in a customer's global enterprise where it can be most efficiently utilized and where applications can be run local to the users that depend on them.

Software-Defined Data Center as a Service

VMware Cloud on Dell EMC is a complete solution for data center infrastructure, and it is based on industry-leading virtualization software technology from VMware and proven hyperconverged hardware from Dell EMC. The software components include VMware vSphere compute, VMware vSAN™ all-flash storage, and VMware NSX-T® networking and security. Dell EMC foundational elements include VxRail hyperconverged infrastructure appliances and high-performance top of rack network switches.

All services delivery hardware is factory integrated inside a standard data center rack enclosure that can be positioned right alongside other racks in a customer data center, remote office and edge compute location. Customers are given the choice of using 110 or 220-volt power circuits.

For details on current service infrastructure hardware specifications, search for "VMware Cloud on Dell EMC Datasheet" at <https://docs.vmware.com/>.

Compute

At the foundation of the SDDC infrastructure configuration is hyperconverged VxRail servers from Dell EMC. These dedicated hosts are offered in a range of configurations to satisfy requirements for different types of workloads. Presently, the service offers general purpose and memory optimized host types.

Customers select the number of hosts they require per rack during the initial ordering process. The initial release supports between 3-5 hosts.

The hardware is pre-installed at the factory with the latest VMware Cloud release of VMware vSphere®. This release is compatible with the general releases of vSphere but optimized for use in large-scale cloud environments that are updated at a regular cadence to accommodate new capabilities and to protect against potential security vulnerabilities.

Storage

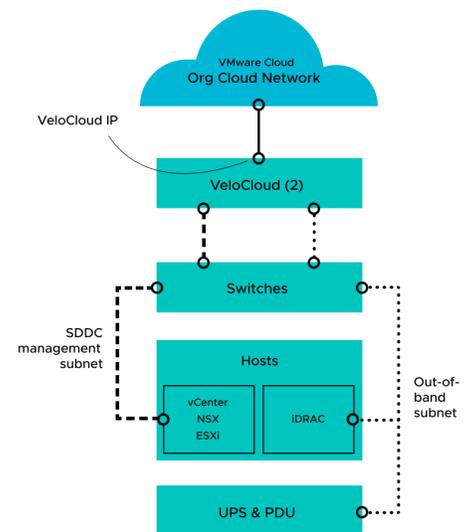
The VMware Cloud on Dell EMC offering is exclusively hyperconverged, which means the storage scales proportionately with the number of hosts in the rack. VMware vSAN all-flash datastores provide extremely high performance for a wide range of demanding workloads. The vSAN datastore is encrypted to protect customer workload data. The memory optimized host type offers double the storage of the general purpose host type and is optimal for applications such as digital video processing.

Networking

The VMware Cloud on Dell EMC physical rack is outfitted with a pair of top-of-rack switches (ToRs) for highly available networking. Every host in the rack has one 10GbE connection to each switch and are configured with “active/standby” teaming policies.

There is also a dedicated management switch in the rack that is connected to the iDRAC ports on each server and to the applicable management ports for other devices, such as the smart PDUs. These connections offer out-of-band access if VMware engineers must troubleshoot unexpected crashes or other situations that cannot be resolved over the primary management network.

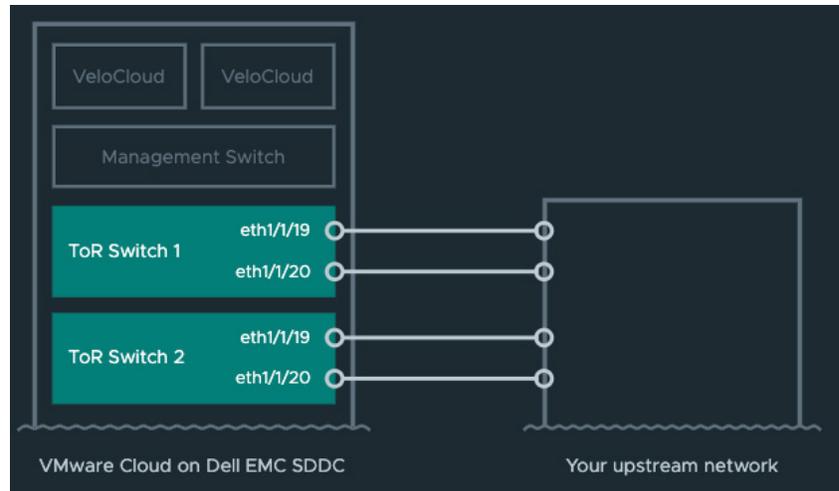
During the ordering process, customers are asked to allocate two IP subnets that do not overlap or conflict with other networks in their enterprise. A /24 CIDR network is used for the SDDC management network – VMware ESXi™, vSAN, and NSX-T connectivity. And for troubleshooting via direct console connections to the equipment, a /26 CIDR network is allocated for the out of band management network; this is used only by VMware engineers.



The VMware Cloud on Dell EMC network architecture can accommodate up to two physical connections from each ToR to an existing network, for a total of either two or four uplink connections to the data center. The deployment technician installs either 1GbE SFP or 10GbE SFP+ fiber modules depending on requirements, offering an aggregate connection of up to 40Gbps if both ports on each switch are using the fastest link speed.

The architecture between these environments is a routed, layer 3 (L3) topology and the load will be balanced through equal-cost multi-path routing (ECMP). Therefore, the network devices on the data center side must be routers or switches with routing capabilities. For maximum availability we recommend connecting to two separate network devices.

To enable IP connectivity across these connections, a point-to-point network is configured for each physical link by allocating /30 or /31 networks.



There are several aspects of networking that customers must consider when connecting to VMware Cloud on Dell EMC racks. Each rack includes VMware NSX-T which makes it very easy to create new workload network segments, to enable firewalling and micro-segmentation for enhanced application security, or to stretch existing layer 2 VLANs into the rack.

Traffic from the existing enterprise data center network flows through a layer 3 boundary that can be controlled using existing routing and access lists procedures within an organization. After the connections are established between the data center and the VMware Cloud on Dell EMC rack, routers must be configured with routes to the networks that need to be reachable.

Automated Lifecycle Management

VMware Cloud on Dell EMC is operated by VMware and delivered as a service to customers. Being a service, the offering includes full lifecycle management of all elements in the rack, from the VxRail and network device firmware to the VMware SDDC stack. This alleviates customers from the time-consuming tasks of planning, testing, and executing regular patching and updating. The lifecycle management is fully automated and is an extension of established VMware Cloud operational processes.

In addition to regular patching and updating, the entire rack is constantly monitored for potential issues, service degradation, or hardware failures. VMware site reliability engineers (SREs) have the expertise to diagnose and resolve issues that may arise, and if a hardware component requires replacement, then Dell EMC technicians are dispatched on site in a timely fashion to ensure the rack health is fully restored.

In order to securely connect from the cloud-based management infrastructure to each on-premises SDDC rack, VMware Cloud on Dell EMC includes an HA pair of physical VMware SD-WAN by VeloCloud network devices. This innovative solution makes it easy for each rack to initiate a secure tunnel over any Internet connection without the need for complicated IPSEC firewall configurations. Simply ensure that outbound connections to HTTPS port 443 and UDP port 2426 are allowed and the connection will be established automatically.

Maximum Uptime for Applications

Customers expect VMware Cloud on Dell EMC infrastructure to be reliable and secure, and there are a number of design features that contribute to application uptime.

High Availability Throughout

Resiliency at the hardware layer is achieved by avoiding single points of failure, including redundant top of rack network switches and an HA pair of VeloCloud SD-WAN devices. VMware engineers also have access to out-of-band management for the VMware ESXi hosts, network switches and other devices in the rack.

Smart power distribution units (PDUs) permit individual outlets to be cycled in the unlikely event that a component becomes unresponsive. The infrastructure rack is also equipped with a UPS to accommodate brief power outages or brownouts.

Every rack also includes dark capacity—a spare VxRail host not configured as part of the running cluster. In the event of a hardware-related degradation, the spare node can be activated in order to replace an unhealthy host in the cluster. The impaired node can then be repaired remotely or swapped without affecting application uptime.

In addition to the above VMware Cloud on Dell EMC resiliency features, the SDDC stack naturally includes the proven VMware vSphere availability features such as HA, while data is safely replicated across multiple hosts through VMware vSAN technology.

Whenever VMware performs automated lifecycle management operations, there is never downtime for running workloads. VMware vMotion and DRS will safely move running VMs from one host to another. In a scenario where the cluster is highly utilized, dark capacity will be temporarily brought into the cluster during lifecycle management operations to ensure resources are adequate for running workloads at all times.

Architected with Strong Security Principles

Infrastructure security also contributes to application uptime, preventing unwanted intrusions and unauthorized configuration changes. VMware Cloud on Dell EMC architecture includes several security benefits.

Customers no longer have to keep track of security bulletins for potential vulnerabilities related to their deployments because VMware Cloud on Dell EMC includes full lifecycle management. When security patches are needed, they are thoroughly tested by VMware engineers before being automatically rolled out widely. This is a major time and cost saver for customers, as they do not need to maintain a test or staging environment for assessing the impact of new patches. Nor do they need to plan and schedule patching and updating operations across their infrastructure, which can be a time-consuming task.

Role-based security also ensures that permissions to manage the infrastructure layer are tightly controlled, preventing accidental or malicious propagation of critical credentials. Customers have access to a reduced administrator role that can fully manage workloads but not the underlying hosts.

Networks are segregated, with workload network segments for customer VMs and management networks for the infrastructure appliances and interfaces. By not commingling this traffic, risk is reduced.

Finally, customer data is protected by vSAN datastore encryption with encryption keys maintained in the tamper resistant trusted platform module (TPM2) present on each host in the cluster. Also note that customers are responsible for data protection—VMware does not make copies of data, nor does VMware intrude into customer VMs or virtual disks.

Consistent Operations

VMware Cloud on Dell EMC is part of the VMware hybrid cloud, so customers can seamlessly migrate their applications, leverage existing IT staff skillsets, and adapt their proven automation tools and processes.

Integration with Existing VMware vSphere Deployments

Each VMware Cloud on Dell EMC rack includes a vCenter Server® Appliance (VCSA) for management of the underlying infrastructure and workloads. Customers have the option of using Hybrid Linked Mode (HLM) to integrate the existing vSphere environment and present a single pane of glass for workload management.

Workload Migration

Once the VMware Cloud on Dell EMC rack is deployed and the networking is configured to integrate with existing data center networks, administrators can take that integration a step further and extend existing VLANs into the new rack through a layer 2 VPN (L2VPN). This allows the new rack to run workloads that use IP addresses from an existing on-prem network.

If L2VPN is configured, it is possible to perform zero-downtime live migrations with vMotion from existing infrastructure onto the new rack. This is critical for applications that cannot be easily re-addressed or cannot be disrupted until a later time period.

Cold VM migrations, manual uploads of ISO images and VM templates are all also possible and do not require a L2VPN.

Partner Ready for VMware Cloud

A new program called “Partner Ready for VMware Cloud” enables third-party software vendors to validate their application/infrastructure component for all of the VMware Cloud platforms, including VMware Cloud on AWS and VMware Cloud on Dell EMC. With this program, a single partner solution can be deployed across a wide range of VMware Cloud platforms ensuring a consistent user experience for customers. For more information on this program, please see: <http://www.vmware.com/go/partner-ready>.

Conclusions

Business and technical drivers are fueling the demand for on-premises infrastructure at data center, colocation, branch office, and edge locations. VMware Cloud on Dell EMC is an on-premises, fully managed SDDC as a service that is based on the latest VMware Cloud infrastructure software and Dell EMC VxRail hardware. The offering includes everything customers need, including the SDDC software stack, physical rack, network equipment, hyperconverged servers, and power distribution.

The VMware hybrid cloud is the best solution for today’s applications because customers continue to benefit from consistent processes, staff skills, and third-party integrations regardless of location. VMware Cloud on Dell EMC is quick and easy to deploy, and the lifecycle is fully managed by VMware, which enables valuable IT resources to focus on supporting business initiatives instead of infrastructure management.