White Paper

Benefits of the Consistent Hybrid Cloud: A Total Cost of Ownership Analysis of the Dell Technologies Cloud

Sponsored by: Dell EMC

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EXECUTIVE SUMMARY

Over the past decade, cloud computing has grown to become an integral part of the enterprise IT environment. But this growth has also introduced new challenges. Driven by business strategy and technical requirements, enterprises are now deploying workloads across multiple public, private, and edge cloud platforms. On the one hand, the approach of using multiple cloud platforms — often referred to as a multicloud strategy — enables enterprises to choose best-of-breed solutions for their workloads, optimally deploy business-critical and next-generation workloads, and successfully navigate digital transformation (DX). On the other hand, multicloud strategies have also increased the level of fragmentation within organizations. This includes differences between private and native public cloud environments, as well as the differences between the multiple major public cloud service ecosystems.

The lack of consistency across platforms results in a set of disconnected processes, platforms, and tools within the organization, increasing the complexity of managing deployments across the cloud platforms. In addition, the differences across platforms results in diverging sets of skill set and training needs, as organizations upgrade their competencies. All these translate to additional management and manpower costs and increased total cost of operations (TCO). Without addressing these gaps, multicloud strategies may prove ineffective at scale and limit innovation, as enterprises find themselves burdened with incompatible silos of infrastructure and higher operational expenses. An IDC survey of 500 enterprise IT organizations with hybrid cloud environments revealed that this lack of consistency across cloud platforms is a top challenge with their hybrid cloud environments.

The TCO analysis in this document is based on the Dell Technologies Cloud, which is built on the VxRail hyperconverged platform and VMware Cloud Foundation (VCF) cloud stack. VxRail is built on mature hardware and the pervasive VMware stack and management tools and allows a non-disruptive path to adoption of multiple cloud platforms within an organization. This consistency across cloud platforms is the key differentiator defining the next generation of hybrid cloud — the consistent hybrid cloud platform.

The results here show that the consistent hybrid cloud platform (Dell Technologies Cloud) achieved savings of up to 47% over a five-year period compared with a native public cloud, when evaluated for typical applications being deployed on cloud infrastructure by enterprises today. This underscores how consistent hybrid cloud platforms enable the benefits of cloud at scale, without introducing additional management and overhead cost creep, ultimately reducing TCO.

IN THIS WHITE PAPER

This white paper is an analysis of the TCO of the new paradigm that's being studied and adopted by enterprises: the consistent hybrid cloud. The analysis is based on the cost of operations of the Dell Technologies Cloud compared with running workloads natively on a leading public cloud service provider.

METHODOLOGY

The TCO comparison in this study is based on the infrastructure needs for two typical workload scenarios, across two infrastructure architectures. The workload scenarios used for the comparison are:

- A traditional enterprise mixed IT workload, using the public cloud as a disaster recovery (DR) site
- A horizontally scalable workload, using the public cloud as additional capacity to scale into (bursting) to meet periodic increases in infrastructure capacity needs

The infrastructure choices compared were:

- A native public cloud infrastructure-as-a-service (IaaS) environment, running both the baseline environment and the disaster recovery or burst capacity in the public cloud
- A consistent hybrid cloud environment, running the baseline environment in an on-premises environment that is built on Dell EMC VxRail with VMware Cloud Foundation and using VMware Cloud on AWS as the public cloud location for disaster recovery or burst capacity

To compare TCO, IDC calculated costs for each workload scenario across the following categories of costs: infrastructure and management (resources and tools), management and operations (manpower, training, and professional services), and migration and refactoring. The native public cloud and the consistent hybrid cloud environments were both built to provision an environment running 1,500 virtual machines (VMs). The compute, memory, and storage specifications of the VM were selected to make both configurations close to each other in capability, based on published product information.

SITUATION OVERVIEW

The explosion of data and investments toward DX, as well as a continued focus on controlling operating costs, has cumulatively accelerated the adoption of cloud computing in the enterprise IT world. The specific needs driving the adoption of cloud computing varies across existing "traditional" applications and new "next generation" applications. For existing applications, the priorities are typically cost reductions and improving application and operations efficiency. For next-generation applications, the priorities are typically access to new cloud-native services (such as serverless technologies and containers) and emerging new services in the public cloud ecosystem (like data analytics and AI/ML platforms).

Enterprises typically adopt a mix of public and private clouds, each having distinct set of advantages that are optimal for the specific needs of the targeted workloads. Public cloud is a highly scalable and readily available delivery model for applications and data, coupled with a pay-as-you-grow model. By using public cloud, enterprises don't have to purchase, install, and manage hardware, or risk up-front capital expense (capex) costs for new initiatives with short life cycles. This shift to a pay-as-you-go and operational expense (opex) spend model is a key factor behind the rapid adoption of public cloud. In addition, public cloud is increasingly seen as the source of access to new technologies – AI/ML, blockchain, serverless computing, real-time analytics, and so forth – and an ecosystem of partners,

particularly for new DX initiatives and proof-of-concept projects. The importance of public cloud is reflected in a recent IDC survey finding that 58% of enterprises use public cloud for production application. Further, a growing fraction of these enterprises report using multiple public clouds and private cloud platforms to meet their IT needs.

While public cloud has lowered the bar to access new computing technologies and has provided enterprises the speed, agility, and geographical reach to develop and run new applications, the majority of enterprise applications and data are still on-premises. Security, data governance, data locality, and performance/latency considerations are some specific reasons why private clouds are appealing to enterprises. In certain scenarios, private clouds also offer better cost-performance results when compared with public clouds. Alongside these benefits, private cloud capabilities have also been expanding and many offer access to built-in cloud-native services such as container and serverless.

Because of this variance in needs and capabilities, the ideal choice for enterprises is to embrace both public and private clouds, which would allow for the optimal deployment of workloads and the best-of-both-worlds scenario. Together, these platforms bring to the enterprise environment:

- Dedicated infrastructure to meet compliance and security needs
- Infrastructure optimization from cost-performance standpoint to meet anticipated baseline needs
- Access to infrastructure capacity and new services on demand, to address periodic/geo-specific needs and new initiatives

A holistic strategy would modernize the datacenter infrastructure with a private cloud while still taking advantage of public cloud delivery model. Enterprises should develop a strategy to connect relevant applications in public cloud to those on-premises in order to conform to data governance laws, improve data locality, and so forth. Similarly, on-premises applications can take advantage of the public cloud to provision temporary capacity, extend global reach, and provide multisite disaster recovery.

The Consistent Hybrid Cloud Paradigm — Addressing Multicloud Gaps

The use of multiple public clouds and private clouds offers the best-of-breed environment for traditional and next-generation applications, as discussed previously. However, the lack of consistency between cloud platforms (across leading public cloud platforms and across public and private cloud platforms) introduces its own set of challenges. Key among these are:

- Lack of a unified management framework across the organization's cloud platforms, resulting in duplication of management tools and processes for each platform
- Additional training and skill set requirements, to train the organization and build competence with multiple platforms
- Difficulty in porting data and applications between different cloud platforms

In a recent IDC survey of enterprise IT organizations, 86% of enterprises said they are considering or executing "repatriation" — moving applications from public clouds back to the datacenter — for one or more workloads. This highlights the fact that enterprises are still in the early phase of adoption where they are moving applications between platforms to optimize costs and stay compliant with evolving policies. The lack of consistency across environments acts as an additional barrier in this phase, both for initial deployment and for optimization/reconfiguration across platforms.

The consistent hybrid cloud is a new paradigm that has emerged in the market, as a response to the customer needs and challenges described in the earlier section. The consistent hybrid cloud offers

customers public and private cloud platforms that are unified under a common operating environment and management framework. This allows the organization to operate both its public and private platforms using one set of tools and processes, enabling a single consistent management view across the platforms and the same processes for provisioning across both platforms. In addition, the operating environment consistency allows for easy portability of applications, which is an important capability in the early phase of cloud adoption as discussed previously.

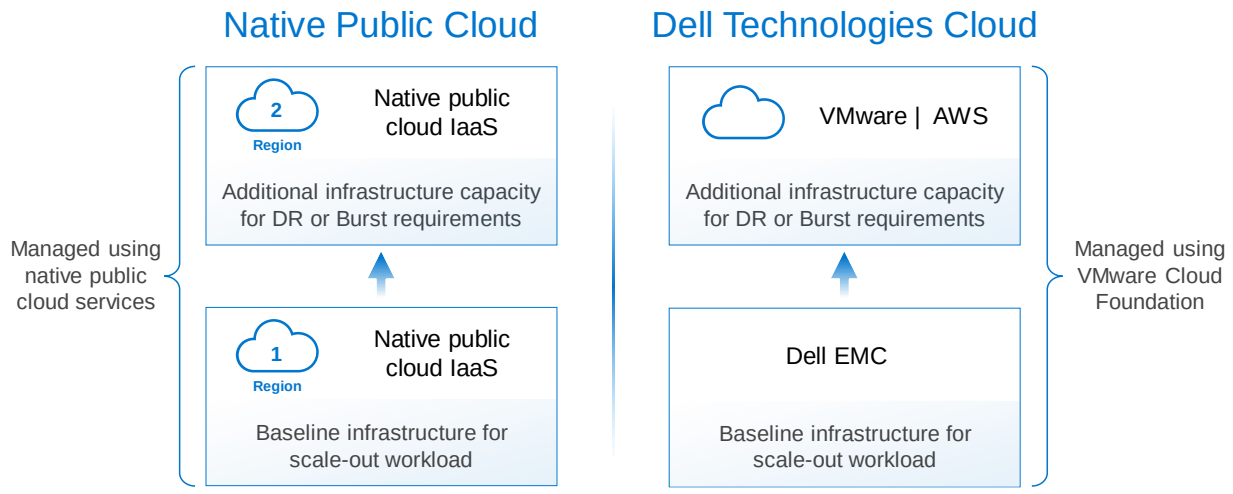
Workload Scenario Selection for the TCO Comparison

As described briefly in the Methodology section, IDC selected common workloads deployed on cloud environments to compare the TCO of native public cloud (a leading public cloud service provider) and consistent hybrid cloud (Dell Technologies Cloud). The workload sets compared were a traditional application set running a disaster recovery in public cloud and a scale-out application bursting to public cloud for its daily capacity needs. Traditionally, the infrastructure used for backup and DR workloads consisted of secondary, offsite deployments. With the advent of cloud computing, more flexible cloud backup and DR services have allowed many enterprises to replace traditional backup methods and employ a hybrid approach where data being generated both on-premises and off-premises can be backed up and recovered using the cloud. Backup and DR workloads are characterized by large storage requirements and regular data transfer needs. An example of such a workload is a traditional Oracle business application set, maintaining a DR site in public cloud.

The second workload included in the comparison is an example of "cloud bursting," which is the usage of public cloud capacity to meet periodic or intermittent increases in infrastructure requirements. These are typically in the case of workloads that are designed to scale out, or expand horizontally, into an extended pool of resources (see Figure 1). An example of such a workload is a virtual desktop infrastructure (VDI) platform, which would burst into public cloud to meet its daily bursts of usage capacity.

FIGURE 1

Infrastructure Options and Workload Breakdown Used for the TCO Comparison



Source: Dell EMC, 2019

TCO COMPARISON

While enterprises recognize the qualitative benefits of the consistent hybrid cloud, many are less familiar with the cost of operations benefits of commercially available off-the-shelf offerings in the market. The analysis in this section is built based on a readily available consistent hybrid cloud solution that is now available in the market and is intended to illustrate the cost benefits of this paradigm. The costs for operating each option were calculated along the following cost components:

- **Infrastructure and management** includes all the raw compute and storage infrastructure cost, any associated installation or support fees, and software licensing or service fees for managing the infrastructure.
- **Operations and training** includes all the manpower or professional services fees associated with managing the infrastructure and the cost of training/competence building with the required tools and services.
- **Refactoring and migration** includes the cost of migrating the workloads from an existing infrastructure to the selected cloud option and of any associated refactoring work that is required as part of the migration.

Description of the Workloads and the Infrastructure Requirements

A description of the infrastructure requirements for the two workload scenarios is discussed in the sections that follow. Both are built on the same baseline infrastructure requirement, which is a steady state environment of 1,500 VMs, with 12TB of customer usable RAM and 75TB of customer usable SSD storage. Each VM consists of 2 vCPUs and 8GB of RAM and the target vCPU-to-physical core ratio is 10%.

Workload Scenario 1 (Disaster Recovery)

The DR workload scenario is built based on the following assumptions regarding the DR site capacity and backup frequency requirements:

- Frequency of backup – eight times per month
- Storage capacity allocated for DR site – 200% of total storage on primary site
- Compute requirement for DR site – 33% of total compute on primary site
- Initial migration that uses an "enterprise grade" virtual machine migration service to "lift and shift" into cloud environment, and the DR location that is updated by the system administrator

Workload Scenario 2 (Bursting)

The bursting workload scenario is built based on the following assumptions regarding the burst site capacity and frequency:

- Frequency of bursting – 20 times per month
- Duration of each burst extension – 10 hours
- Storage capacity allocated for burst environment – 40% of total storage on primary site
- Compute requirement for burst environment – 60% of total compute on primary site
- Data transfer back to base environment after each burst – 10% of burst capacity allocated
- Initial migration that uses professional services assistance to enable the application to scale out in the public cloud environment

Description of the Cloud Solutions

Consistent Hybrid Cloud (Dell Technologies Cloud)

The Dell Technologies Cloud consists of a VxRail hyperconverged infrastructure platform running VMware Cloud Foundation and the VMware Cloud on AWS. The infrastructure configuration of the VxRail platform is as follows:

- Number of VMs – 1,500
- VM configuration – 2 vCPUs, 8GB of RAM, and 50GB of SSD storage
- Built-in high-availability design consideration to tolerate the failure of any full node in a cluster

On the public cloud side, the solution includes the VMware Cloud on AWS offering. The VMware Cloud on AWS can be scaled on demand in discrete counts of production hosts (three or more), which are based on AWS I3 Bare Metal offering.

One of the trade-offs when using the VMware Cloud on AWS is that infrastructure capacity can only be increased or decreased in discrete counts of hosts. This results in some level of over provisioning of capacity, when the additional infrastructure requirement is not an integer multiple of hosts. The VMware Cloud on AWS also includes NVMe-based SSD, which offers better I/O and throughput than other typical compute services in public cloud (including the compute service used for the comparison in this document). This higher performance available on the VMware Cloud on AWS was not considered for this analysis.

Prices for the Dell Technologies Cloud were provided by the Dell EMC team. For the public cloud portion of the infrastructure, a 20% use of reserved capacity was assumed for the DR scenario. No reserved capacity was assumed for the bursting scenario. Migration to the VxRail platform is executed using automated VMware vMotion operations. Management and operations costs were incorporated based on empirical data from surveys of the market and public domain pricelists.

Native Public Cloud (A Leading Public Cloud Service Provider)

For the native public cloud configuration, a compute service that most mapped to the VM configuration details of the VxRail was selected. To the extent possible, the compute service selected on the public cloud side matched the vCPU to core ratio, memory, and storage capabilities on the VxRail VMs. This same compute service was used for the baseline as well as the DR or bursting infrastructure needs.

For public cloud, the public pricelist published on the website was used for the TCO calculation. Prices were based on the East Coast region for April 22, 2019, and annual price drop of 2.5% was assumed where applicable. In both the workload scenarios considered, a 20% usage of discounted services (based on usage/commitment discounts) was assumed for the baseline infrastructure needs. A 20% usage of discounted prices was assumed for the DR infrastructure, and no discounted prices were assumed for the bursting scenario. Where possible, discounted prices based on the best available commitment discount available was used (e.g., three years, if a three-year usage discount was available). For management and migration related costs, mean price of commercial enterprise-grade management and migration services were used for this calculation.

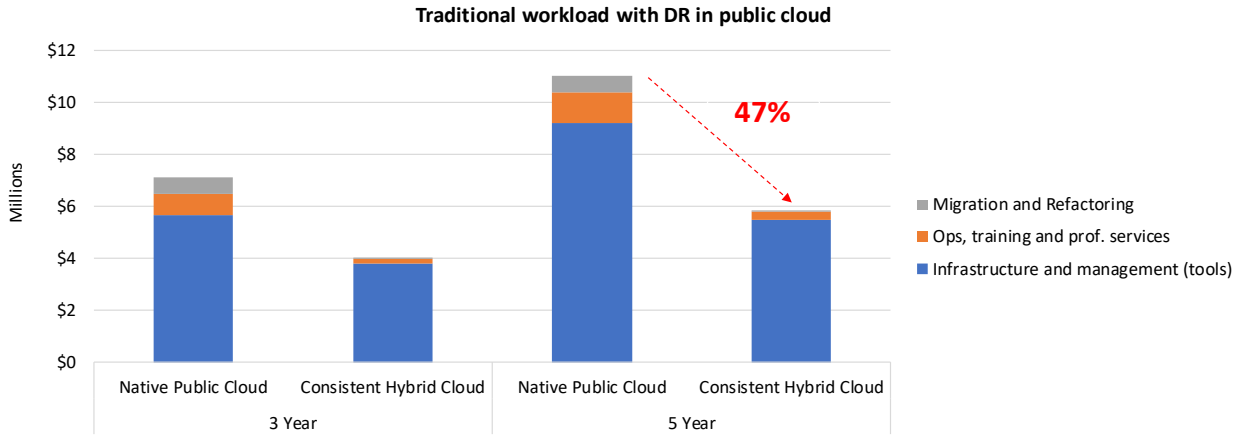
Summary of TCO Comparison

TCO for both these options were calculated for both scenarios, for a three-year and five-year period. The results of the calculation are captured in Tables 1 and 2 and Figures 2 and 3.

As Figure 2 shows, the consistent hybrid cloud results in a 47% lower TCO over the five-year period. As the detailed breakdown in Table 1 shows, the savings are being driven by lower costs across all three factors considered – which is largely enabled by virtue of the familiar VMware-based VCF environment used in the Dell Technologies Cloud. This offers enterprises a near seamless migration path into a cloud environment, without major incremental investments in training, migration, and management overhead. Figure 3 and Table 2 show that in the bursting scenario, there is a 44% lower TCO over the five-year period.

FIGURE 2

Consistent Hybrid Cloud Savings for DR Workload Scenario



Source: IDC, 2019

TABLE 1

Traditional Enterprise Workload with DR in Public Cloud ($)

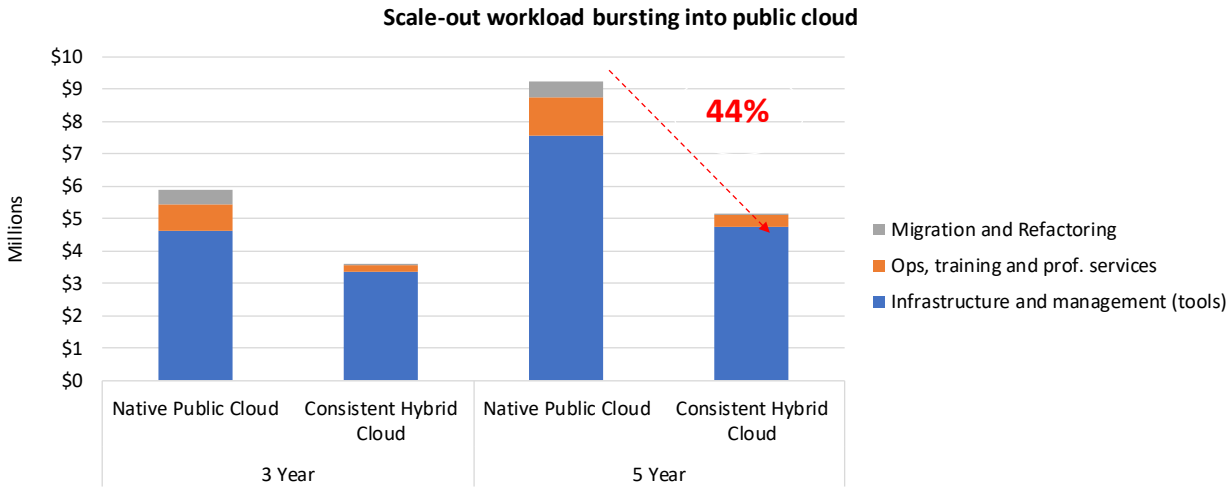
	Three-Year Period		Five-Year Period	
	Native Public Cloud	Consistent Hybrid Cloud	Native Public Cloud	Consistent Hybrid Cloud
Infrastructure and management	5,652,953	3,817,581	9,213,698	5,491,173
Operations and training	819,975	172,333	1,159,125	282,847
Migration and refactoring	622,500	13,125	622,500	13,125
Total cost of operations	7,095,428	4,003,039	10,995,323	5,787,145
Consistent hybrid cloud savings (%)		43.58		47.37

Source: IDC, 2019

Non-infrastructure costs proved to be a key source of savings for the Dell EMC VxRail solution, as management and operations and migration and training/skill set expenses were all significantly lower for both workload scenarios. This is a direct result and key feature of the consistent hybrid cloud approach discussed previously. Hybrid cloud solutions like Dell EMC VxRail that offer an out-of-the-box unified management and operational environment take out much of the risk, complexity, and cost associated with fragmented multicloud or native public cloud solutions. IDC estimated ongoing operations costs to be approximately 67% lower over the total five-year period. Further, migration and training/skill set costs for both workload scenarios were over 90% lower compared with the native public cloud.

FIGURE 3

Consistent Hybrid Cloud Savings for Bursting Workload Scenario



Source: IDC, 2019

TABLE 2

Scale-Out Enterprise Workload with Burst Capacity in Public Cloud ($)

	Three-Year Period		Five-Year Period	
	Native Public Cloud	Consistent Hybrid Cloud	Native Public Cloud	Consistent Hybrid Cloud
Infrastructure and management	4,639,153	3,350,049	7,554,905	4,737,305
Operations and training	780,750	224,114	1,188,750	369,148
Migration and refactoring	480,000	2,625	480,000	2,625
Total cost of operations	5,899,903	3,576,788	9,223,655	5,109,078
Consistent hybrid cloud savings (%)		39.38		44.61

Source: IDC, 2019

Consumption Flexibility Based on Workload Characteristics

For purposes of comparison, the aforementioned analysis assumed a workload with no baseline growth over the planning horizon discussed. This allowed the on-premises configuration to be optimized for the desired usage pattern, without overprovisioning for growth. This would not work for the case of steadily growing workloads or for workloads with an unpredictable scaling pattern. Public cloud, with its pay-as-you-go flexibility, has historically been a good value proposition for such workloads.

With new Flexible Consumption Models delivered by Dell Financial Services, organizations may benefit from similar flexibility for on-premises infrastructure as well. This includes "pay as you grow" options allowing infrastructure optimization for a variety of use cases such as predictable forecasted growth as well as deployment schedules and requirements for preprovisioned capacity upgrades. This also includes the "flex on demand" option, allowing customers to elastically increase and decrease their infrastructure usage, based on predetermined minimum and maximum capacity estimates for the workload. While not covered in the TCO calculations in this study, these flexible consumption options allow customers to achieve elasticity and flexibility with the on-premises component of the deployment. Customers can plan the on-premises infrastructure accordingly and benefit from a usage-based pay-as-you-go billing model that is best suited for the variations in their application's infrastructure requirements.

THE DELL TECHNOLOGIES CLOUD

Dell EMC and VMware offer a consistent and holistic cloud solution that enables organizations to implement a hybrid cloud strategy and realize their vision for modern infrastructure. The Dell Technologies Cloud is a set of robust hardware and software offerings backed up by professional and financial services that help customers transform their IT and mitigate the complexity of hybrid and multicloud environments, which have become the de facto approach.

The Dell Technologies Cloud simplifies deployment of hybrid cloud. It provides the security, control, and reliability of private cloud along with the simplicity, flexibility, and economics of public cloud anywhere from the edge to on-premises datacenters. Dell Technologies provides a broad portfolio of services that will help enterprises formulate a cloud strategy that aligns with business goals. From the initial design of the architecture to installation, deployment, and management of the hybrid cloud, enterprise customers of all sizes can leverage Dell Technologies' expertise and solutions. The Dell Technologies Cloud also provides consistent management and orchestration tools for virtualized and containerized environments across the hybrid cloud. Furthermore, consistent IT services are provided regardless of location (private cloud, public cloud, or the edge) or type of workloads (current generation or cloud native).

The Dell Technologies Cloud portfolio consists of two consumption options — Dell Technologies Cloud Platforms and Dell Technologies Cloud Datacenter-as-a-Service (DCaaS) offering and VMware Cloud on Dell EMC. These enable a flexible range of IT and management options with tight integration and a single vendor experience for purchasing, deployment, services, and financing.

Dell Technologies Cloud Platform. The foundational hardware and software components of Dell Technologies Cloud Platforms are VMware Cloud Foundation and Dell EMC VxRail HCI appliance. The jointly engineered effort creates a compelling solution that greatly simplifies deployment and life-cycle management of hybrid cloud. VMware Cloud Foundation provides a complete set of software-defined services for compute, storage, networking and security, and cloud management to run enterprise apps — traditional or containerized — in private or public environments. VxRail, Dell EMC's hyperconverged infrastructure platform is highly scalable and can support the most demanding

workloads and applications, thanks to features such as NVMe cache drives. With VMware Cloud Foundation shipping natively on Dell EMC VxRail, Dell Technologies Cloud Platforms offer the industry's first jointly engineered, hybrid cloud infrastructure stack tightly integrated with VMware's flexible, full-stack HCI architecture for a rapid and simple deployment of hybrid cloud.

Thanks to the combination of robust HCI platform (VxRail), cloud management/orchestration tool (VMware Cloud Foundation), and full-stack integration, Dell Technology Cloud solution offers a simple and secure path for enterprises to embrace hybrid cloud. VxRail and vSAN are market leaders in the HCI market, so enterprise customers can rest assured that they are buying leading-edge products. VMware's leadership in software-defined stack at both datacenters and clouds is also well established. Thus, the combination of these two solutions is a compelling proposition for customers looking to implement a hybrid cloud architecture.

Dell Technologies Datacenter-as-a-Service. The DCaaS offering (previewed as Project Dimension at VMworld 2018 US and named VMware Cloud on Dell EMC) consists of cloud infrastructure installed on-premises in organizations' core datacenter and edge locations and consumed as a cloud service. This new fully managed DCaaS offering combines the speed and flexibility of the public cloud with the security and control of on-premises infrastructure. VMware Cloud on Dell EMC is co-engineered and delivered by Dell Technologies; the ongoing service is fully managed by VMware. This allows IT organizations to eliminate the need for basic tasks, such as infrastructure management and maintenance, while lowering up-front costs with subscription-based pricing. Additionally, the familiarity of VMware Cloud tools on trusted Dell EMC VxRail hyperconverged infrastructure provides peace of mind through a best-of-breed enterprise solution. This new paradigm empowers organizations to focus on business innovation and differentiation.

FUTURE OUTLOOK

Cloud first and cloud native are the building blocks of modern IT architecture. Application developers, IT administrators, and corporate executives must develop their strategies around cloud, which has become the default environment for deployment, operation, and consumption. Enterprise customers must realize that, like any other technology, cloud computing has evolved from public cloud to hybrid cloud. Multicloud has become the de facto approach, although it brings inherent complexity and challenges. The IT industry realizes both the potential and challenges of hybrid cloud, and enterprise technology leaders such as Dell EMC are continuously innovating to help enterprises push forward in their digital transformation. The consistent hybrid cloud solution is a testament to the continued momentum in this innovation and DX enablement effort.

ADVICE FOR THE IT BUYER

Hybrid cloud is the optimal architecture for enterprises, and enterprises must prepare for it. IDC's TCO analysis shows clear TCO advantages for a consistent hybrid cloud solution, Dell EMC VxRail, compared with a leading native public cloud service for two workloads commonly deployed on cloud environments. The public cloud offers clear benefits compared with traditional IT environments, including improved flexibility and scalability and easier access to innovative technologies, to name a few. However, many organizations that have migrated at least some workloads to the public cloud have also experienced added costs from both infrastructure and non-infrastructure perspectives.

While hybrid cloud offers great promises, including clear TCO advantages, it is also intrinsically complex. Therefore, you must consult with a trusted partner, take control of the hybrid cloud environment, seek out a vendor with proven cloud solutions, and implement a consistent organization-wide strategy. A carefully planned out hybrid cloud strategy will help enterprises cut costs, increase employee productivity, deliver innovative products, enhance customer experience, and much more.

About IDC

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