

White Paper

Consolidate Traditional and Modern Applications on VMware vSAN

Speed Digital Transformation through Infrastructure Modernization

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Introduction

Organizations are in the midst of a digital transformation unlike anything we've seen before. End-users expect IT to support the real-time needs of the business, but challenges stand in the way. Legacy infrastructure, disparate management silos, and inefficient resource utilization are leading to numerous delays across the data lifecycle that negatively impact the business.

Across industries, these organizations are looking for ways to modernize their infrastructures to better support the real-time needs of the business—and they're turning to technologies that enable IT to consolidate their infrastructures, helping them become more agile and stay within budget. More than ever, they're leveraging hyperconverged infrastructure (HCI).

HCI provides organizations with a complete foundational platform to support the current and future needs of the business on standardized, x86 servers that improves IT operational efficiency. While organizations often start their journeys by leveraging HCI to support tier-2 applications, such as VDI or office collaboration software, as they gain confidence in the technology to support their application requirements, they're increasingly using HCI to support business-critical applications. These applications range from relational databases and data warehouses to container management platforms.

Legacy Challenges

A number of IT challenges are driving the need for a faster, smarter way to support the business. ESG research shows that relative to two years ago, IT environments are still complex, with 27% of IT professionals saying they're equally as complex and 66% saying *more* complex.¹ And as organizations continue down their digital transformation paths, that complexity grows.

But what's driving this complexity?

The increased growth of data and applications are at the top of the list. In fact, of those organizations that say their IT environment is more complex than two years, 30% cite growing data



30% of organizations cite growing data volumes as one of the biggest reasons for their organization's IT environment becoming more complex while **29%** cite the increase in the number and type of applications used by employees.

volumes as one of the biggest contributors to complexity, while 29% cite the increase in the number and type of applications used by employees. Organizations are increasingly turning to modern applications that are optimized for cloud scale, but also continue to use existing legacy applications. This creates a massive challenge for IT to manage, optimize, and maintain legacy infrastructure, along with cloud-based infrastructures. Add to this the fact that data sets in both environments continue to grow and require simplified scaling, and it's no wonder that organizations are looking to standardize on a modern infrastructure to effectively support traditional and modern application requirements while easily scaling to support future growth. This is compelling organizations to prioritize investments that help improve operational efficiency—whether they are looking to improve security/risk management, simplifying business processes, enhancing customer experience and employee productivity, or reducing operational and capital expenditures.

Driving the Need for Data Center Modernization

For some time, organizations have prioritized virtualization as the first step to data center modernization. By consolidating application footprints, organizations have realized operational efficiency gains by improving resource utilization and IT agility, while reducing costs. Further, IT has improved its productivity by leveraging software that abstracts compute, storage, and network resources into pooled entities, which can more flexibly be deployed and consumed. Because

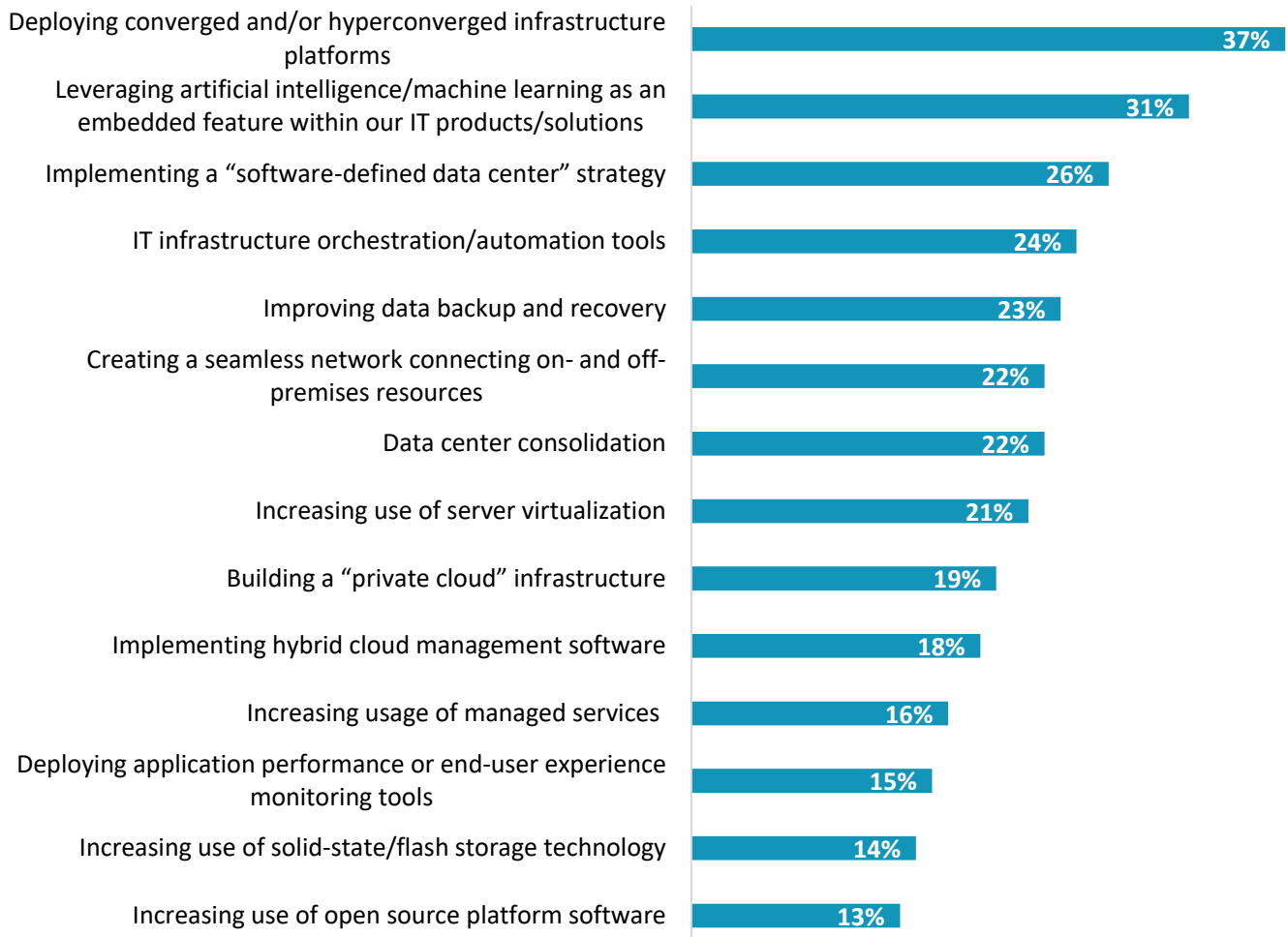
¹ Source: ESG Master Survey Results, [2019 Technology Spending Intentions Survey](#), March 2019. All ESG research references and charts in this white paper have been taken from this set of master survey results.

resources are more optimally utilized, CapEx decreases, and by improving management and IT productivity, OpEx is reduced as well. It should come as no surprise that 21% of organizations view increasing the use of server virtualization as an area of short-term data center modernization where their organization will make the most significant investment this year (see Figure 2). Moreover, 22% view data center consolidation as an area in which the most significant investment will be made.

But just investing in the software doesn't solve the underlying problem. To consolidate, virtualize, and implement a software-defined data center (SDDC) strategy, organizations are turning to hyperconverged infrastructure (HCI). According to ESG research, more than one-third of respondents (37%) said one of their top short-term data center modernization investment priorities is deploying converged/hyperconverged infrastructure platforms. By consolidating storage and compute into an x86-based scale-out architecture, organizations can attain management simplicity, agility, and cost savings. With its faster deployment times, predictable scalability, improved TCO, simplified management, and enhanced service and support, HCI is becoming the top option for organizations looking to consolidate and modernize their infrastructures.

Figure 1. The Most Significant Short-term Investments to Support Data Center Modernization

In which of the following areas of data center modernization will your organization make the most significant investments over the next 12-18 months? (Percent of respondents, N=497, five responses accepted)



Source: Enterprise Strategy Group

Consolidate and Modernize with VMware vSAN

VMware vSAN serves as the anchor of VMware-powered HCI solutions and is a foundational technology in a software-defined data center. Organizations across industries continue to recognize the value of vSAN, enabling data center consolidation and modernization by empowering IT to become strategic enablers as opposed to cost centers.

Broad Deployment Options

With vSAN, organizations gain a cost-effective, scale-out infrastructure that can meet current business requirements and easily scale to meet future needs. An HCI (compute, storage, memory, and network) solution powered by vSAN enables organizations to evolve their infrastructures using the native tools with which they're already comfortable (e.g., VMware vSphere), which helps IT optimize current investments and reduce expenses.

vSAN runs on industry-standard x86 servers and delivers flash-optimized shared storage. With vSAN's policy-based management, resources are highly available for business-critical applications. Through numerous partnerships with the top OEMs, VMware offers jointly certified solutions, called ReadyNodes, that provide organizations with deployment flexibility in selecting their preferred hardware vendor.

For organizations embracing a hybrid cloud environment, HCI powered by vSAN enables organizations to standardize on the same infrastructure stack in on-premises environments and public cloud environments. By utilizing a consistent infrastructure stack and operating model, IT gains efficiencies through simplified and streamlined day-to-day management, improving IT agility and responsiveness, and significantly reducing operational costs.

Performance, Scalability, and Reliability

VMware vSAN enables organizations to meet the ongoing performance, scalability, and reliability requirements of their key business-critical applications, while controlling costs and better ensuring performance SLAs are met through independent storage cluster resource management. Supporting the latest technologies—from NVMe storage to GPUs—vSAN helps organizations meet the most demanding performance requirements of their consolidated workloads, while meeting the real-time needs of the business.

With vSAN's incremental scalability (scale-up or scale-out), organizations can easily adapt to capacity or performance requirements without sacrificing reliability. While deployment simplicity is a staple of the solution, VMware considers Day 2 operations equally important. By leveraging vSphere Update Manager (VUM) for vSAN and storage components of the server, i.e., I/O controllers, organizations can gain peace of mind knowing applications are deployed on a reliable, software-defined infrastructure foundation.

Secure, Successful Deployments, and Reduced Costs

IT and end-users can rely on a highly available and protected infrastructure that provides intelligent monitoring and alerting. VMware vSAN offers organizations several benefits to ensure a successful deployment, as well as the assurance of business continuity through application availability and protection with features such as vSphere-based snapshots.

The consolidated infrastructure footprint enables organizations to reduce upfront hardware costs, in turn reducing power and cooling costs. And with a smaller hardware footprint comes a reduction in application licensing costs. By deploying numerous applications on the same infrastructure—and utilizing that same underlying hardware—organizations can attain improved TCO and faster ROI. Due to centralized management, day-to-day IT management tasks are simplified, and organizations can experience higher levels of productivity.

Supporting Essential Business Applications

Whether moving a tier-2 application (think VDI) to HCI, progressing to a more traditional relational database (think SQL Server and Oracle), beginning to use in-memory data warehouses (think SAP HANA) and non-relational databases (think DataStax and Cloudera), or utilizing containers with Pivotal Container Service (PKS) or Google Cloud's Anthos, VMware vSAN continues to support essential business applications across the board.

Virtual Desktop Infrastructure for Data Center Modernization

As organizations continue to embrace workforce mobility, the pressing need to satisfy stringent virtual desktop infrastructure performance and reliability requirements is at an all-time high. To maintain a competitive advantage, organizations need agility to swiftly respond to business needs—which means it's vital for employees to work anywhere, at any time, on most any device.

When evaluating VDI solutions, organizations are prioritizing scalability, efficiency, and cost as driving factors. Whether leveraging VMware Horizon View or Citrix XenApp and XenDesktop, organizations can cost-effectively deliver all-flash configurations that provide the speed, simplicity, and scale required by VDI deployments in modern businesses with VMware vSAN.

VMware Horizon View

VMware vSAN enables IT to swiftly deploy and manage a VMware Horizon View virtual desktop infrastructure when coupled with VMware App Volumes. App Volumes uses VMware's Instant Clone Technology with just-in-time desktop provisioning, which reduces storage requirements—lowering storage costs. Organizations gain a faster means of provisioning personalized, fully featured virtual desktops and published applications. Instant Clone Technology, VMware App Volumes, and VMware User Environment Manager enable administrators to quickly spin up desktops that retain user customization, personas, and user-installed apps from session to session, even though the desktop itself is destroyed when the user logs out.

VMware-published performance results highlight the unique advantages organizations can expect in Horizon View environments with an all-flash vSAN configuration. For example, VMware testing of a 1,600 virtual desktop environment measured provisioning, deployment, and recovery times with results highlighting the versatility and performance of a VMware vSAN-based VDI deployment.²

Testing a 1,600 Virtual Desktop Environment in VMware Horizon View*

- 36 minutes to provision 1,600 virtual desktops with Instant Clone Technology, including 8-minute priming time.
- Leveraging deduplication, compression, erasure coding, and sparse swap features, the deployment yielded up to 87% space savings.
- A single-host failure was simulated and the recovery time objective for 208 linked clone desktops was achieved in just 20 minutes.

*Results based on VMware internal testing

² For more information, see: [VMware Horizon 7 on VMware vSAN 6.2 All-Flash](#)

Citrix XenApp and XenDesktop

VMware also conducted performance testing on a VDI deployment that validated its use with Citrix XenApp and XenDesktop with Citrix Provision Services, Citrix Machine Creation Services, and VMware App Volumes. Login VSI was used to test the performance of an optimal configuration.

The key metric reported by Login VSI was VSImax, which shows the number of concurrent sessions that can be active before the infrastructure is saturated. The VSImax calculation is primarily used to provide insight into the potential scalability that an environment can sustain while meeting acceptable performance requirements.³

- For multiple 1,000 desktop tests, the VSImax was never reached when testing the Indexer Knowledge Worker workloads.
- This included 100% concurrency for 1,000 XenDesktops provisioned via PVS; 1,000 MCS Desktops with VMware App Volumes; and 1,000 XenApp sessions provisioned via PVS.
- Testing yielded up to an 80% capacity savings, highlighting the benefits organizations can expect by delivering a positive end-user experience in a consolidated infrastructure footprint.

SQL Server

SQL Server deployments on VMware infrastructure can not only provide organizations with improved availability, better scalability, and easier management, but also assist organizations in helping to reduce their total cost of operations.

With VMware vSAN and VMware vSphere, organizations can create distributed, shared data stores to easily deploy their virtualized SQL Server databases and migrate them to a consolidated, cost-effective infrastructure. Storage policy-based management (SPBM) enables organizations to utilize a unified control plane across all storage services, so that IT administrators can improve productivity while managing SQL Server deployments. SQL on vSAN allows businesses to reduce costs and streamline management, while handling OLTP and OLAP transactions with scalable high performance and capacity for reads and writes.

With VMware vMotion, organizations can non-disruptively consolidate SQL Server databases to ease migrations and reduce licensing costs between clusters, data centers, or clouds. Shared-nothing vMotion allows migrations from non-vSAN-enabled clusters to vSAN clusters, while Cross vCenter vMotion within a single sign-on (SSO) domain allows migrations between non-linked environments, and Long Distance vMotion allows migration across clouds.

In vSAN, features such as Adaptive Resync deliver resource utilization fairness across the entire cluster by minimizing bandwidth consumption and having minimal impact on a SQL Server database workload.

Additional results of SQL Server on vSAN testing performed by VMware showed:⁴

- An 80% reduction in bandwidth consumption with just a 2.6% degradation to the total operations per minute. This bandwidth savings could then be freed up for other applications running on the same cluster.
- vSAN scale-up performance was also validated, highlighting the ability to run an OLTP workload simultaneously on four virtual SQL Server instances, while increasing the number of vCPUs from 12 to 48. The results highlighted near-linear increase in performance from 12 vCPUs (85,984 OPMs on average) to 24 vCPUs (157,162 OPMs on average).

³ For more information, see: [XenApp and XenDesktop 7.12 on vSAN 6.5 All-Flash](#)

⁴ For more information, see: [SQL Server 2016 Database Performance and Improvements on vSAN 6.7](#)

VMware vSAN enables organizations to reliably consolidate SQL Server instances onto a single shared infrastructure, leading to significant CapEx and OpEx savings without sacrificing performance, scalability, and reliability SLAs.

Oracle

VMware vSAN was built around the idea of assigning storage-related settings on a per-VM basis or even on a per-virtual-disk basis, offering administrators prescriptive control over the specific Oracle server based on its role in the data center. Administrators can easily increase the level of failures to tolerate on one Oracle server, while applying policies that focus on limiting I/O resources for another.

With regard to the performance of Oracle running on Hybrid vSAN, internal VMware testing highlighted consistent performance while retaining data resiliency. Through a validated architecture, storage policy-based management granularly controls storage resources for various Oracle Database disks, providing a balance of space efficiency and performance, while eliminating operational and management complexity.

When customers shift to Oracle RAC, many may have even more stringent SLAs than a 1:1 Oracle Database deployment, including continued high performance and application availability. VMware's validated architecture for Oracle RAC helps to reduce deployment times, while minimizing risk through integrated technologies that provide desired levels of availability, business continuity, and disaster recovery, including support for Oracle RMAN.⁵

Testing Oracle RAC Performance and Resiliency on Hybrid vSAN*

- Using Swingbench, VMware emulated a TPC-C-like workload across 100 user sessions on a 4-node Oracle RAC deployed in VMware vSAN.
- The maximum number of transactions per minute reported was 331,000 with an average of 287,000. Average reported IOPS was 28,000 and throughput was 304 MB/s with even distribution of performance across all nodes.
- Scalability testing highlighted consistent and predictable scalability as additional nodes were added to the cluster. One Oracle RAC instance produced 155,000 Oracle TPMs, 2 nodes at 199,000 TPMs, 3 nodes at 243,000 TPMs, and 4 nodes at 287,000 TPMs.
- Disk failures, disk group failures, and storage host failures were simulated in the same environment, with performance only momentarily being impacted.
- After each failure, steady state TPS yielded the same values as pre-failure measurements.

*Results based on VMware internal testing

SAP HANA

vSAN-powered HCI provides organizations with the performance, simplicity, and support required to produce positive business outcomes. SAP HANA is a memory-intensive database that must satisfy high levels of performance and concurrency as well as hybrid transactional and analytical processing (HTAP). Working together, vSAN and SAP HANA

⁵ For more information, see: [Oracle Real Application Clusters on VMware vSAN](#)

provide a single SAP HANA VM with up to 6 TB of memory. The result? Organizations store a single instance database with billions of rows completely in memory.

By providing organizations access to all available CPU sockets across the entire cluster, SAP HANA VM density is extremely high on a per-node and per-cluster basis. With a growing hardware ecosystem, vSAN offers organizations the flexibility in selecting a preferred hardware platform, placing them on a path to continued and rapid adoption of next-generation technologies including Intel Optane NVMe solid-state drives (SSDs). VMware gives organizations peace of mind with its commitment to supporting advanced technologies as soon as they're publicly available.

With familiar tools such as VMware vCenter and VMware vSphere, IT can confidently manage the end-to-end data lifecycle, extending through production to business continuity and data recovery. Additionally, VMware provides high availability, integrations with SAP HANA system replication, VMware Site Recovery Manager (SRM), vSphere vMotion, and VMware Distributed Resource Scheduler (DRS). By incorporating VMware vRealize Operations Manager into their environments, organizations maintain cluster and deployment health with comprehensive health checks, capacity reporting/planning, and performance monitoring.

With SAP customers, risk reduction is paramount. VMware provides integrated one-stop support for rapid HCI problem resolution. Moreover, the vSAN ReadyCare initiative, which incorporates vSAN Support Insight and Cloud Analytics, reduces time to resolution by providing IT with proactive and reactive intelligent insights. Essentially, ReadyCare gives IT administrators more time to focus on delivering the SAP application services, rather than dealing with infrastructure management and troubleshooting.

To ensure that a vSAN-based HCI solution is SAP HANA ready, VMware leveraged SAP-provided test tools to validate performance, scalability, and consistency of two different testing environments, both of which were based on 2- and 4-socket SAP HANA and vSAN supported Skylake-based server systems. The environments were configured as 3-host and 4-host clusters with two or four vSAN disk groups per server. Additionally testing validated NVMe and SAS SSD devices that were leveraged for caching to satisfy SAP HANA KPI requirements.⁶

DataStax

DataStax Enterprise (DSE) offers a comprehensive version of Apache Cassandra that includes search, analytics, developer tooling, and operational management, anchored by a unified security model. By combining DSE's distributed, masterless architecture (where multiple servers/nodes are grouped in a cluster) with VMware vSAN, organizations gain agility, performance consistency and scalability, and resiliency to satisfy the requirements of IT administrators and developers alike.

By unifying storage management into a single, consolidated stack, organizations benefit from operational simplicity and cost efficiency. As an organization's data footprint grows, IT can easily scale up vSAN deployments by adding CPU, memory, or disk capacity to a node without the need to upgrade the system, significantly reducing the risk of downtime. Further, vSAN enables organizations to define desired outcomes for Apache Cassandra workloads, and then apply storage policies to satisfy workload requirements. And capacity optimization benefits are achieved by easily applying deduplication and compression across vSAN clusters.

By balancing vSAN's enterprise-class resiliency features with the application-level resiliency of the DSE-delivered Cassandra replication, organizations can be assured their data will be highly available and secure. vSAN provides the ability to create an active-active data center with stretch clustering for DSE Cassandra workloads, while data-at-rest encryption ensures

⁶ For more information, see: [SAP HANA on Hyperconverged Infrastructure \(HCI\) Solutions Powered by VMware vSAN](#)

those workloads are protected. Business continuity is ensured through self-healing in the event of a failure, while backup and recovery can be monitored and managed through DSE Operations Center.

VMware conducted validation testing to demonstrate vSAN's ability to satisfy globally distributed cloud applications for production environments. Performance testing validated cluster functions, including expected performance consistency and predictable latency for typical workloads in production environments. Scalability testing highlighted near linear scalability as nodes were added to an existing cluster without impacting latency. Operational testing highlighted negligible performance impact when adding and removing a DSE node. And resiliency and availability testing showcased how, when combining vSAN's storage-layer resiliency with DSE's peer-to-peer design, organizations could achieve limited performance and data availability impact under predictable failure scenarios.⁷

Cloudera

Cloudera Enterprise delivers a quick, simple, and secure data platform anchored by Hadoop. By marrying Cloudera Enterprise with VMware vSAN, organizations gain the foundational deployment flexibility, performance, scalability, and resiliency to support big data workloads.

With vSAN-powered HCI, organizations gain an infrastructure that efficiently utilizes compute and storage resources, and a single storage namespace enables multiple data-driven applications to point to the same data store (which can be used for analytics and real-time insights).

Failure protection is key to Cloudera's flexibility on vSAN. By specifying a failure to tolerate (FTT) level of one, vSAN provides additional protection across the big data cluster by maintaining two copies of data. If a host goes down, availability is not impacted. This is especially important regarding upgrades—keeping one active current copy of data available while hosts are upgraded on a rolling basis. With Host Affinity, data can be pinned to the host running a VM and runs without any replication at the vSAN layer. This helps reduce operational storage overhead and improve performance by reducing the write I/O workload. Whether adjusting FTT levels or leveraging Host Affinity, organizations gain freedom of choice based on their requirements by prioritizing operational simplicity or deeper levels of protection with added replication overhead at a vSAN layer.

Internal VMware testing highlighted the ability to support numerous Hadoop-based workloads on vSAN. VMware tested performance using two industry-standard MapReduce benchmarks, TeraSort suite and TestDFSIO, three Spark-based analytic programs from MLlib using spark-perf, and an IoT Analytics Benchmark to simulate streaming performance for sensor data, including iotgen, iottrain, iotstream. In all scenarios, results highlighted the difference in performance when leveraging FTT of 0 vs FTT of 1. For I/O intensive workloads, Host Affinity significantly improved time to completion, primarily due to the reduced I/O amplification attributed to running vSAN without any replication.

In summary, vSAN offers the configuration flexibility organizations desire in supporting big data workload requirements, depending for example on resiliency and/or performance requirements.⁸

Pivotal Container Service

Pivotal Container Service (PKS) accelerates hybrid and multi-cloud adoption by operationalizing Kubernetes. When paired with VMware vSAN, the purpose-built container solution can simplify deployment and management of Kubernetes clusters across application lifecycles, while improving IT agility. With PKS on vSAN, Kubernetes clusters can be deployed easily on HCI and by integrating Kubernetes storage classes with vSAN's SPBM, IT can perform granular storage management and (in

⁷ For more information, see: [DataStax Enterprise on VMware vSAN™ 6.7 All-Flash for Production](#)

⁸ For more information, see: [Cloudera Distribution Including Apache Hadoop on VMware vSAN](#)

the future) exercise control on a per-container basis. For developers, it's all about storage abstraction—reducing the complexity of consuming storage by making it available through code.

With organizations looking to containers for the promised benefits of agility and portability, vSAN enables them to integrate the latest technologies, like NVMe storage, on a per-application basis. Consuming complementary VMware vSAN services, like vCenter, vSphere, and NSX, helps to simplify operations. For networking specifically, with the help of VMware NSX-T, there is no need to know about the underlying network architecture and networking remains isolated between namespaces. The deployment, upgrading, and scaling out of the networking infrastructure can all be easily managed in its association with Kubernetes clusters. Additionally, resources can scale independently within clusters, meaning containerized applications can increase storage or memory to address capacity or performance needs. Altogether, organizations can rapidly deploy applications and easily manage them for improved operational efficiency across a unified, resilient control plane.

VMware has validated a 4-node vSAN cluster to support PKS 1.0 and documented the configuration in a vSAN reference architecture. For the PKS 1.0 configuration, a single Availability Zone (AZ) is leveraged to reflect one vSAN cluster. This makes the storage class definition and Persistent Volume Claim (PVC) simple. Four different virtual machine groups are utilized to support the infrastructure, networking with NSX-T, PKS VMs, and deployed Kubernetes. The verified solution architecture enables organizations to embrace fast deployments, maintain performance consistency through deep integration with SPBM, and improve operational efficiency with a unified control plane that enables simplified management. The unified control plane enables operational savings by reducing operational silos that are commonly prevalent in globally distributed organizations that maintain both traditional and cloud-native applications in separate legacy and public cloud infrastructures.⁹

Google Cloud's Anthos

Google Cloud's Anthos enables organizations to embrace hybrid cloud application deployment and management through a consistent operational and management experience on-premises and in public cloud environments. With Google-pioneered tools in Kubernetes, Istio, and Knative, and paired with VMware vSAN, organizations can seamlessly maintain legacy applications while building and managing modern applications. A key component of Anthos is GKE On-Prem, which enables organizations to benefit from Kubernetes and cloud services in on-premises environments.

By deploying Anthos on vSAN, organizations gain additional benefits associated with SLA flexibility, high availability, simplified management, and additional data services such as SPBM. vSAN SPBM lets IT define policies for container storage in real time through vCenter. With available data services like snapshots, cloning, encryption, deduplication, and compression, organizations can ensure container volumes are granularly managed, and through GKE On-Prem integration, the storage can easily be consumed as code. This means developers have unprecedented access to the underlying storage infrastructure to ensure their application storage requirements are adequately met.¹⁰

The Bigger Truth

Many organizations have seen benefits from deploying HCI in their environments, and the pervasiveness of the technology is giving them confidence to reliably support the next wave of business-critical applications and workloads. Starting with tier-2 applications like VDI; moving to relational database applications powered by SQL Server and Oracle Database, in-memory databases like SAP HANA, and analytics and big data applications anchored by DataStax and Cloudera; through to containerized applications powered by Pivotal Container Service and Google Cloud's Anthos, organizations are recognizing the consolidation and efficiency gains within IT and can share those benefits with other areas of the business.

⁹ For more information, see: [Pivotal Container Service \(PKS\) on VMware vSAN](#)

¹⁰ For more information, see: [Google Kubernetes Engine \(GKE\) On-prem on VMware vSAN](#)

Organizations are placing their trust in VMware vSAN to support their infrastructure consolidation journey. With vSAN's proven ability to meet and often exceed customer expectations with even the strictest of application SLAs, organizations gain peace of mind knowing their agility, performance, reliability, and cost requirements are met with a future-proof platform.

Key Takeaways

- Consolidating infrastructure and application footprints is essential to achieving IT operational efficiency and agility.
- Benefits of VMware-powered HCI allow simple evolution to full stack and hybrid cloud, with consistent operations from edge to core to cloud, and intrinsic security for data at rest and in flight, all while using existing virtualization tools and staying native to an organization's hypervisor.
- VMware vSAN offers freedom of choice through various consumption models and well-established OEM partnerships, while independently scaling resources and adapting to current workload demands.
- VMware focuses on deployment and provisioning for Day 1 operations, and high availability and business continuity for Day 2 operations, including v-Sphere-based snaps.
- Through storage policy-based management (SPBM), organizations realize a unified control plane across all storage services, so IT administrators can improve productivity while managing application deployments across environments.
- With VMware Storage vMotion, organizations can non-disruptively consolidate database footprints to simplify migrations and reduce licensing costs between clusters, data centers, and clouds.
- VMware vSAN is an ideal platform that can meet an organization's infrastructure consolidation goals, as well as mixed workload deployments such as business-critical applications, VDI, databases, big data, analytics, and container management platforms.
- With vSAN, customers can future-proof their infrastructures for a growing number of applications within their environments, embracing hybrid cloud by standardizing on the same infrastructure stack that spans on-premises and public cloud environments.

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