VMware IT Outcomes: Data Center Virtualization and Hybrid Cloud Extensibility
CapEx Reductions of up to 49 Percent

Source: Taneja Group, Transforming the Data Center with the VMware Software-Defined Data Center vCloud Suite, Hopkinton, Massachusetts, June 2014.

AT A GLANCE

The data center virtualization and hybrid cloud extensibility outcome reduces capital expenditures (CapEx) through the implementation of compute, network, and storage virtualization together with the adoption of cloud computing, to drive data center consolidation, decrease deployment times, and leverage cloud economics and scalability.

BENEFITS

• Up to 49 percent CapEx reduction
• Virtualization benefits across compute, storage, and network
• Support for traditional and new application types
• Data center consolidation and capacity optimization
• Seamless integration to hybrid cloud

Data Center Virtualization and Hybrid Cloud Extensibility

A software-defined data center (SDDC) based on VMware products and technologies enables data center standardization and consolidation through virtualization of compute, storage, and network, dramatically reducing CapEx and OpEx. This virtualized infrastructure supports traditional as well as new application types such as big data and mobile. With unit costs equal to or lower than public cloud, the SDDC architecture can easily be extended to the hybrid cloud, giving IT greater choice and flexibility.

Adopting a virtualized data center with hybrid cloud extensibility can be achieved in three stages:

1. Compute virtualization and capacity optimization
2. Storage virtualization and hybrid cloud extensibility
3. Network virtualization

The VMware software-defined data center provides unique capabilities that help IT organizations achieve outcomes such as greater data center efficiency, improved security, high availability, and faster delivery of infrastructure and applications.

Stage 1: Compute Virtualization and Capacity Optimization

VMware vSphere with Operations Management

The foundation for a virtualized and standardized data center is VMware vSphere® with Operations Management™, which offers the most trusted virtualization platform together with intelligent operations, performance monitoring, and capacity management.

The following are among the key products and benefits associated with vSphere with Operations Management:

- **VMware ESXi®** – Abstracts server hardware resources and makes them shareable by multiple virtual machines
- **VMware vCenter Server™** – Provides centralized management for the vSphere platform
- **VMware vSphere vMotion®** – Migrates live virtual machines between hosts
- **VMware vSphere Distributed Resource Scheduler™** – Automatically load-balances virtual machines across hosts
- **VMware vSphere High Availability** – Delivers high availability across the entire virtualized IT environment
- **VMware vSphere Distributed Switch™** – Centralizes network provisioning, administration, and monitoring, using data center–wide network aggregation
- **VMware vRealize™ Operations Manager™** – Provides a comprehensive view into what is driving current and potential performance and capacity management issues

### Stage 1 Summary

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<th>CAPABILITY</th>
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<th>FEATURES</th>
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<tbody>
<tr>
<td>Compute Virtualization and Capacity Optimization</td>
<td>vSphere with Operations Management</td>
<td>Compute virtualization with built-in scalability and resiliency, Unified management, Health and performance monitoring, Capacity planning</td>
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### Stage 2: Storage Virtualization and Hybrid Cloud Extensibility

Stage 2 extends the benefits of compute virtualization out to the storage infrastructure. With software-defined storage (SDS), storage services are dynamically created and delivered per virtual machine and are controlled by policy. The VMware SDS model shifts the operational storage paradigm from the bottom-up, array-centric approach of today to a top-down, virtual machine-centric model. As a result, storage services are precisely aligned with application requirements.

The following are among the key attributes and benefits associated with SDS:

- **Hardware agnostic** – SDS can be implemented across a wide assortment of server and storage types as well as vendors, preventing vendor lock-in.

- **Virtual machine centric** – Storage administrators no longer must preallocate storage into LUNs or volumes. Storage is dynamically allocated per virtual machine, eliminating the guesswork associated with LUN sizing and improving storage utilization.

- **Policy driven** – Capture storage requirements in policies. Then, with the ability to monitor and enforce compliance, assign the policies to the workload.

- **Simplified operations and troubleshooting** – Abstract physical storage resources with a common user interface that eliminates the need to rely on multiple vendor tools to provision and manage storage.

VMware offers two SDS solutions: VMware Virtual SAN™ and Virtual Volumes.

**Virtual SAN**

Virtual SAN is a hyperconverged SDS solution designed for vSphere. It pools local hard disks and flash devices into a shared data store consumed at the virtual disk level.

- **Hypervisor-converged storage software** – Virtual SAN is embedded in the vSphere kernel, a unique characteristic that makes integration with vSphere seamless and enables optimal performance and scalability.

- **Server-side read/write caching** – Virtual SAN minimizes storage latency by accelerating read/write disk I/O traffic with built-in caching on enterprise-grade, server-side flash technology.

- **Built-in failure tolerance** – Virtual SAN leverages distributed RAID and cache mirroring to ensure that data is never lost if a disk, host, or network fails.

- **Single pane of glass management with vSphere** – Virtual SAN eliminates the need for training on specialized storage interfaces and the overhead of operating them. Provisioning is now as easy as two clicks.

- **Granular, nondisruptive scale-up or scale-out** – Users can easily and nondisruptively expand the capacity of the Virtual SAN datastore by adding hosts to a cluster or disks to a host.
Virtual Volumes
Virtual Volumes brings SDS to SAN and NAS arrays. It exposes virtual disks as native storage objects and enables array-based operations at the virtual disk granular level.

- **Efficient** – VMDK files stored native to the storage array, eliminating the need to preallocate LUNs
- **Highly scalable** – Concurrent support for heterogeneous array types, eliminating scalability limits tied to LUN maximums
- **Support for advanced array features** – Full support for array-based features such as snapshotting, cloning, replication, and encryption

Along with the adoption of storage virtualization, stage 2 extends the SDDC architecture to the hybrid cloud through VMware vCloud® Air™ and VMware vCloud Connector®.

vCloud Air
vCloud Air is a public cloud platform built on the trusted foundation of vSphere. It is compatible with an on-premises data center and includes infrastructure, disaster recovery, and various applications as service offerings. vCloud Air enables users to easily extend workloads into the cloud.

- **Broad operating system (OS) and application support** – Support for more than 5,000 applications and dozens of OSs
- **Seamless network integration** – Enables extension of IT infrastructure to the cloud, beyond the physical limits of a data center
- **Reliability and manageability** – Enables continuity with current mode of writing, deploying, and managing applications when extending to the cloud
- **Comprehensive suite of vSphere management tools** – Architected on the same platform as vSphere and integrated with VMware management tools including VMware vSphere Web Client, VMware vRealize™ Automation™, VMware vRealize Operations™, and vCloud Connector

vCloud Connector
vCloud Connector links the internal private cloud with public clouds, enabling management of a single hybrid environment and back-and-forth workload transfer.

- **Connected clouds** – Transfer workloads between connected clouds with reliability and speed.
- **Unified view** – View, copy, and operate on workloads, including virtual machines, VMware vSphere vApps™, and templates across internal data centers and private or public clouds.
- **Data center extension** – Accelerate workload deployment time without having to reconfigure destination network settings.
- **Content synchronization** – Manage a single content catalog across an entire cloud environment, using Content Sync.

Stage 2 Summary

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<td>Virtualization</td>
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<td>Hybrid Cloud Extensibility</td>
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<td>Broad OS and application</td>
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<td>Seamless network</td>
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**Stage 3: Network Virtualization**

Stage 3 extends the virtualization principles already applied to compute and storage out to the network infrastructure, abstracting network services to create a flexible pool of transport capacity that can be allocated, utilized, and repurposed on demand.

**VMware NSX**

VMware NSX™ is the network virtualization and security platform for the SDDC. It brings virtualization to an existing network and transforms network operations and economics.

- **Agility** – VMware NSX reduces the time—from weeks to seconds—that it takes to provision custom, multilayer network topologies and enterprise-class security services.
- **Cost** – VMware NSX reduces both OpEx and CapEx. Automation eliminates manual configuration from the network provisioning process and simplifies network hardware requirements.
- **Virtualized network** – Similar to a virtual machine for compute, a virtualized network is a fully functional network in a software container, provisioned independently of underlying hardware or topology.
- **Distributed security** – VMware NSX delivers a new model for network security. Security profiles are distributed to and enforced by virtual ports and move with virtual machines.

**About IT Outcomes**

VMware IT outcomes provide a framework that ties select VMware solutions to key results that customers can expect when adopting the VMware software-defined data center vision.

With VMware, IT organizations can achieve critical results, or outcomes, with unique capabilities that help IT respond to business requests quickly and cost-effectively, without compromising security, control, or choice.

For more information on VMware SDDC IT outcomes, visit vmware.com/it-outcomes.

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<td>Distributed network security</td>
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<td>Reduced OpEx and CapEx</td>
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