vSphere 5.5 Top New Features and Upgrade Tips

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Executive summary

The latest version of VMware vSphere has a number of compelling features for companies looking to build modern data centers for service-centric IT organizations. VMware vSphere 5.5 Platform provides a leading virtualization and management platform for organizations to meet the demands of today.

This paper will navigate critical topics for companies using previous versions of vSphere as well as organizations starting the virtualization process. The first objective will explore some of the new features of vSphere 5.5 and give practical guidance on how to use them. The process of upgrading vSphere is rather straightforward when planned out, but guidance along the way is always welcomed. This will be covered as well in the section on upgrading from earlier versions and will include a few scenarios. Finally, a series of specific recommendations for the upgrade process and details about new features are presented to enable successful migrations to vSphere 5.5.

New features

vSphere 5.5 was released on 22-September 2013 and is composed of a few critical components:

- VMware ESXi 5.5.0: The hypervisor that is installed on server hardware

- VMware vCenter Server 5.5.0: This application administers clusters, virtual machines (VMs), permissions, resource utilization and more

- VMware vCenter Operations Manager Foundation: This application provides operations management using VMware patented analytics

Additionally, the vSphere 5.5 Platform is composed of additional applications that provide services to the VMware software-defined data center. Companies licensed at the Enterprise Plus edition of vSphere are entitled to the full complement of these additional products. These applications include: VMware vSphere Replication, VMware vSphere Data Protection, VMware vCenter Orchestrator Appliance, Cisco Nexus 1000V Virtual Ethernet Modules for vSphere, VMware vCloud Networking and Security, VMware vSphere Big Data Extensions and VMware vSphere App HA.

The scope of this paper primarily covers the features related to VMware ESXi 5.5.0 and vCenter Server 5.5.0. Additional product features that complete the vSphere 5.5 Platform will be covered as necessary.

More features – more advanced virtualization

There is no question that VMware virtualization pushes the innovation for virtualization platforms that companies around the world benefit from every day. The features with vSphere 5.5 all align to do more with VMware virtualization and simplify the process along the way.

62-Terabyte virtual disk

For many companies, this is the most anticipated vSphere 5.5 feature and alone may be reason enough to upgrade. From vSphere 5.5, the virtual disk format for use with VMware VMs can now go as high as 62 TB. This greatly surpasses the previous 2-TB limit that has been in use for a long time. Additionally, since vSphere 5.0 introduced the VMFS-5 file system with larger configuration maximums as well, this larger disk geometry will work well for the growing data profiles of today's data centers.

From a fellow VM Admin

"If you deploy the 62-TB VMDK, a few prerequisites need to be in place. For one, you will need the hardware version 10 of the VM and use the vSphere Web Client. This is a new administrative interface for vSphere administrators and for many, this is an operational change.

In my virtualization practice, I've made the time to also implement the vSphere Web Client just to get the newest VMDK format available. It's a small price to pay for the added storage capabilities, but there may be a training issue for other administrators as it's required for VMs with the newest features. "

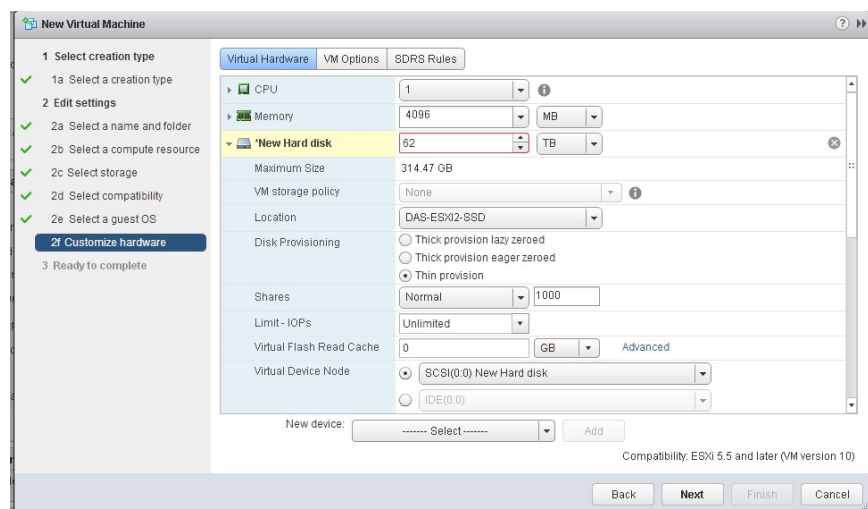Figure 1 shows a 62-TB VMDK being provisioned on a vSphere 5.5 VM:

Figure 1

With the larger disk format, a few decisions must be made; namely, how thin provisioning will be monitored and whether any thin provisioning techniques will be used on this very large disk format. The two thick provisioning formats are used to provide small, but measurable, increases in performance but also to pre-allocate the storage ahead of time. VMware KB 1005418 is a good external resource on the differences between thin provisioning and the two types of thick provisioning.

Host configuration maximums

One of the intriguing aspects of virtualization is that the ceiling continues to be raised in regard to capabilities that come with each new release. vSphere 5.5 has continued to push the limit for supported virtual environments with new host-level configuration maximums. With vSphere 5.5, a single ESXi host can have up to 320 logical CPUs. The virtual CPU limit is now 4096. This processor density is very high, but may be necessary for the most demanding virtualized environments.

Additionally the number of non-uniform memory access (NUMA) nodes now supported is 16. Total host-side RAM now supported is 4 TB. While not a configuration maximum, vSphere 5.5 now supports end-to-end 16-Gigabit interfaces for Fibre Channel storage networks. This is a welcome addition for the I/O-hungry applications of today and is a strong boost to critical frameworks like the vSphere APIs for Data Protection (VADP), which can leverage storage fabrics for direct storage backups. All said, ESXi host capabilities now pave the way for incredible features with vSphere 5.5.

Recommended reading

It is recommended that you also read the What's New in VMware vSphere® 5.5Platform PDF document, available at: http://www.vmware.com/files/pdf/vsphere/VMware-vSphere-Platform-Whats-New.pdf

vSphere Web Client

Likely one of the most noticeable changes in a number of areas related to vSphere 5.5 is the increased focus on the vSphere Web Client. The vSphere Web Client serves as an administrative interface for VMware vSphere administrators. It is much improved over previous iterations, with increased usability and performance and exclusive new features.

It's important to note that many of the vSphere 5.5 new features can only be configured on a full, "latest and greatest" configuration. Specifically, configuration items like VM hardware version 10, ESXi 5.5, vCenter Server 5.5 and the vSphere Web Client are required to fully enjoy some of the newest features. Figure 2 shows one of the main pages of the vSphere Web Client:
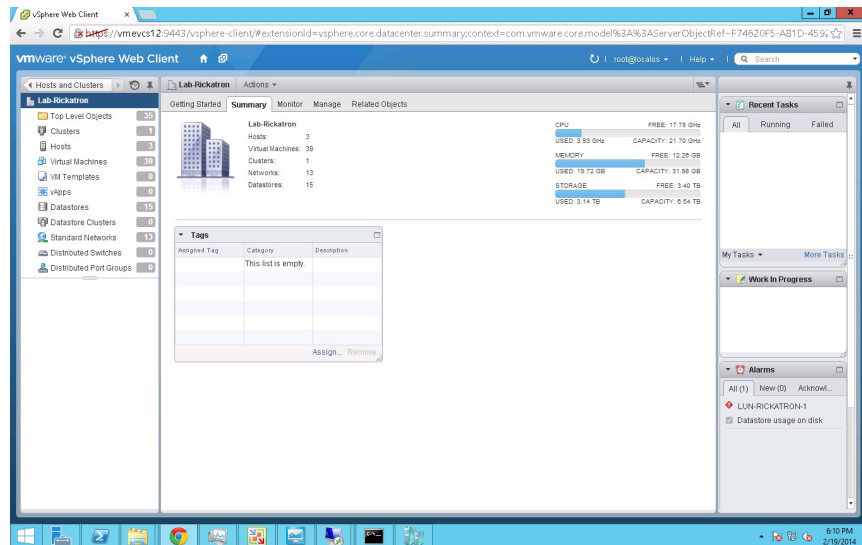
Figure 2

VMware has made it very clear that the vSphere Web Client is the administrative interface of the future, and it can't be emphasized enough that the previous points about configuring some of the latest features will require the vSphere Web Client. The Web Client is a service that is installed with vCenter Server application (installed on Windows) or is also fully available from the vCenter Server Appliance. Decision points on the application and appliance modes will be described later in this paper.

From one of the foremost VMware experts in the world...

"Just like anyone else I was resistant to change when the vSphere Web Client was introduced. I felt that it just wasn't there, however when I forced myself to use it when vSphere 5.5 was introduced I noticed it was a lot more efficient than the C# client. Simple things like adding an NFS datastore to all of your hosts at the same time is what makes the vSphere Web Client awesome. Get used to it now, it is the way of the future!"

- Duncan Epping, Blogger at Yellow-Bricks.com and VCDX #007.

Companies who have spent their time thus far exclusively using the Windows application edition of the vSphere Client (C# Client) will have a learning curve with this new administrative interface. Most users who have upgraded to vSphere 5.5 and have not used the vSphere Web Client previously may find themselves gradually going back and forth or using both interfaces—this is natural for a while.

As a general rule of thumb, the vSphere Web Client effectively has everything that the Windows application has in a similar arrangement, so navigation comes naturally but with the aforementioned learning curve. Companies have long wanted to access vSphere administration out of the Windows-based application, and the vSphere Web Client delivers. One specific feature worth noting in the latest version of the vSphere Web Client is the ability to drag objects around; for example, you can drag a VM into a folder (shown in Figure 3).
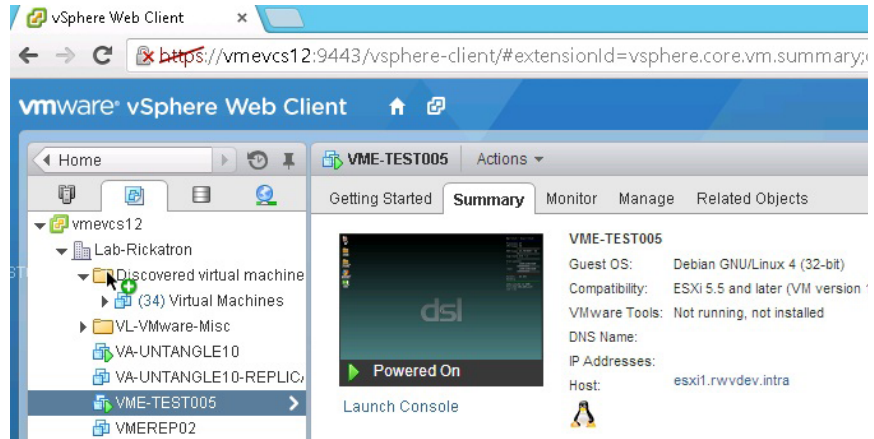

Figure 3

Additionally, with the vSphere Web Client, many familiar actionable tasks are available with a right-click. This includes tasks such as editing the settings of a VM, migrating the VM, using the snapshot manager and opening the console viewer. The console viewer is a browser plug-in that needs to be installed in most browsers, but easily gives access to the VM console for direct interaction. Figure 4 shows the action menus for a VM within the vSphere Web Client:
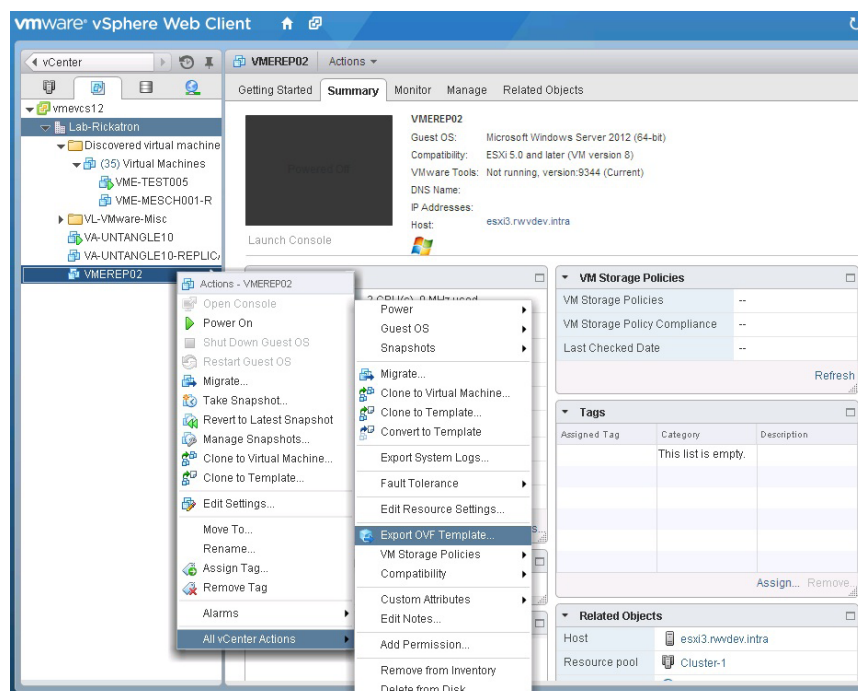

Figure 4

vSphere Web Client installation

If the vCenter Server application is installed on Windows, then adding the vSphere Web Client is done by mounting the .ISO image and running that installation step (unless it was already installed as part of an upgrade from a previous edition). Note that with vSphere 5.5, the vSphere Web Client is required for the installation. If the vCenter Server Appliance is running, the vSphere Web Client is added by default and can be configured in the core login page (port 5480 on the vCenter Server Appliance). Figure 5 shows the core login page:
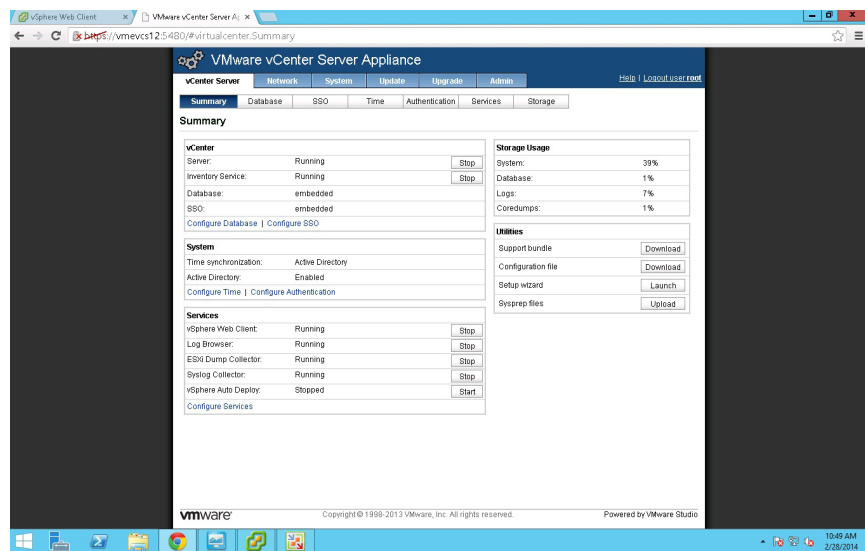

Figure 5

The vSphere Web Client has many improved features, and after using it side by side with the Windows application, it may be an easier transition. It can't be emphasized enough however that the newest vSphere 5.5 features and the hardware version 10 VM format can only be administered in the vSphere Web Client.

vCenter Server: Appliance and application editions

One of the more pressing decisions that VMware customers may face, especially for new deployments, is which way to deploy the vCenter Server application. The application exists in two modes: as an installable application on Windows or as a virtual appliance such as the vCenter Server Appliance (vCSA). There are pros and cons with each approach, and there's no real broad recommendation for everyone to follow. That being said, each approach has its own considerations.

From a fellow VM Admin

"When it comes to deploying core infrastructure and applications, I really want to focus on ease of management. The applications in data centers I've worked with are complicated enough. With vSphere 5.5, the vCSA has really made the administration of this application (vCenter Server) much easier."

vCenter Server as an installable application. This is likely the best choice for organizations who have previously installed vCenter Server as an application on Windows. This will allow a seamless upgrade with cluster settings, history, existing database connections, security configuration and more. All vSphere features are supported with the installable application.

Additionally, all supporting services are currently available for the vCenter Server application that installs on Windows.

vCenter Server as an appliance. This is really the part to decide on: for starters if the vSphere environment is going to be simple and small, as a general recommendation the vCSA is a good fit. Additionally, the vCSA supports decision factors like connecting to Active Directory, compatibility with Site Recovery Manager (SRM) and running plug-ins—especially for the vSphere Web Client. However, the vCSA does have some limitations that are worth noting:

- It supports up to 100 hosts and 3,000 VMs (a substantial increase from 5.0/5.1)

- The only external database that is supported is Oracle (an internal embedded database is available on the vCSA, however)

- The vCSA does not support IPv6

- The vCSA does not support Linked Mode

- Some vCenter supporting services are not available to be installed on the vCSA. This includes Update Manager, Converter, vCLI and Power CLI. The vCenter application supports these services when running on the vCSA; however, the services need to run on a different VM (See VMware KB 2002531).

The decision process takes a lot of factors into consideration, but it's encouraging to see that the vCSA have a lot of features with its ease of administration. Many organizations may use the vSphere 5.5 upgrade as more of a migration than a traditional upgrade; in this situation, the previous environment is simply migrated to an entirely new cluster. This can be done with replication failovers for very quick transitions or storage migration techniques (with or without vCenter). Figure 6 shows how this may be accomplished:
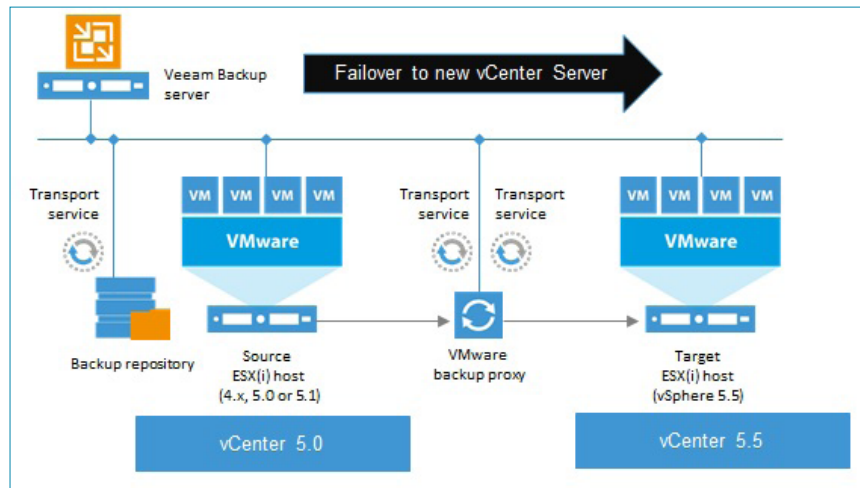
Figure 6

This is an area where Veeam can help!

Many people have used Veeam's replication engine to migrate data centers as well as use the replicated VM as a failover technique. Chances are you've changed a few things with your VMware implementation over the years, and it may be time to introduce an entirely new cluster, storage system, server hardware or even an entire data center.

Using Veeam Backup & Replication™ to failover to a new vSphere cluster gives you a lot of benefits:

• *The bulk of the transfer is done ahead of time*

• *Newer targets are supported (Source ESXi host is 5.0 and target is ESXi 5.5, for example)*

• *The failover process can take only minutes (very quick)*

• *You still have the VMs running on the old cluster in case there is an issue*

For companies who haven't spent much time using some of the newer features, such as the vCSA or the vSphere Web Client, it would be advised to make a lab project to test these features in place so that there are no surprises when going into production.

vCenter Single Sign-On

Arguably one of the more difficult pieces for companies to understand in newer vSphere editions is the vCenter Single Sign-On. At the high level, vCenter Single Sign-On allows various parts of the vCloud Suite to talk to each other via authentication but via tokenization. When you consider the scale of the largest implementations of the full vCloud stack, it becomes clear that a framework like this is needed. Specifically, many companies may assume that this is effectively in place by leveraging Active Directory. If the vSphere implementation is large and in a hosted infrastructure capacity, there may be different organizations in the infrastructure—and that means that Active Directory wouldn't be the best fit.

vCenter Single Sign-On addresses this by providing all of the vCloud components for a unified authentication and authorization framework to operate. That being said, it still is a learning curve and many companies may have held off on upgrades due to a lack of understanding.

From a fellow VM Admin

"Previously, upgrading vCenter Server was a piece of cake. But with vCenter Single Sign-On, it made me double-check the release notes more carefully and go through the upgrade drill a few times in a test capacity, which is always a good idea."

Since the release of vSphere 5.1, vCenter Single Sign-On has been a required component, residing on the vCenter Server system as a separate service. vCenter Server really is the conduit to the hypervisor (ESXi) and to the other components of the vCloud Suite. Figure 7 shows a view of the vCenter Single Sign-On architecture.
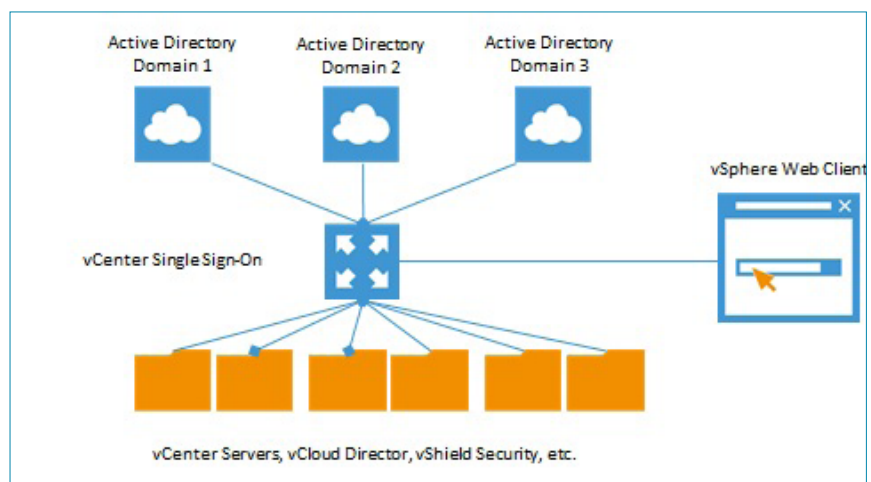
Figure 7

The practical tip regarding vCenter Single Sign-On is to test ahead of time so that there are no surprises or features that have been built around vSphere that stop working after the upgrade.

vSphere Flash Read Cache

Companies also may be wondering how they can deliver additional performance to their vSphere environment by leveraging solid state drives (SSDs). SSDs are becoming a more realistic option with their lower prices and performance benefits that are welcome in today's data centers.

The vSphere Flash Read Cache feature that was introduced with vSphere 5.5 may be just what companies are looking for to give a good boost to read I/O performances for selected VMs and disks. By having this feature built right into the hypervisor, companies can leverage this feature quite easily. The vSphere Flash Read Cache has a few steps to engage that involve both the host and the guest VM. The vSphere Flash Read Cache process is shown in Figure 8:
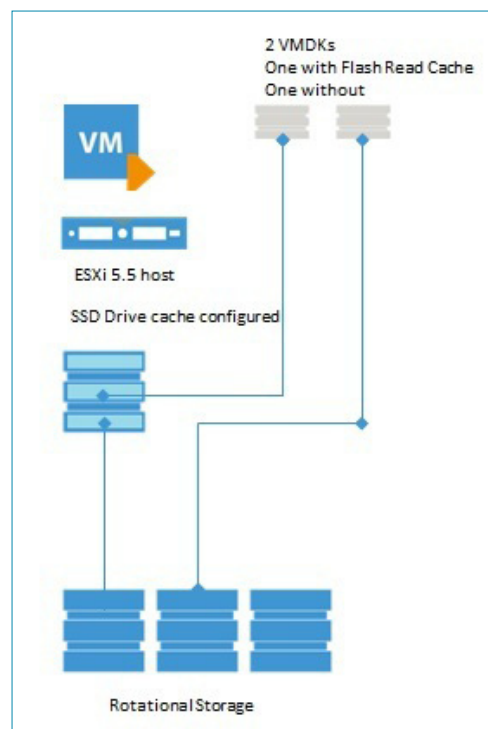

Figure 8

The ESXi host must have an SSD attached to it locally. vSphere can detect whether or not a drive is an SSD and it is indicated in the data store configuration accordingly. Once the drive is detected, a part of that SSD needs to be allocated for vSphere Flash Read Cache. This host setting enables VMs, if configured, to leverage this high performance read cache. Like many other new features with vSphere 5.5, it's required that you use the vSphere Web Client and hardware version 10 for end-to-end support of this feature. The first of those steps—provisioning a host cache—is shown in Figure 9:
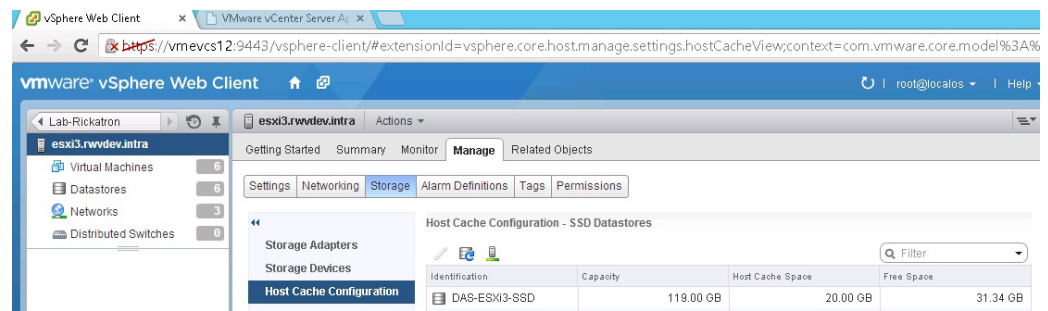
Figure 9

This will enable VMs to be configured to leverage the vSphere Flash Read Cache and each VMDK can be assigned a quantity of this reservation in the vSphere Web Client.

If the vSphere Flash Read Cache is to be deployed in a production capacity, give careful consideration to the consistency of the configuration on hosts. This includes uniform SSD sizes, thoughtful allocation to VMDKs and ensuring enterprise-grade disks rather than consumer-grade disks.

Upgrade tips and specific recommendations

There are plenty of vSphere 5.5 features that companies may employ as use cases—including full support for the latest operating systems, such as Windows Server 2012 R2—in the decision to upgrade. To go about the upgrade there are a few important things to consider:

Read release notes and product documentation

There are a number of products in the vSphere and vCloud Suites, and the upgrade sequence is very important. VMware KB 2057795 is a great starting place for this process. Specific sequencing will vary, depending on what products are in use, but the steps are important.

For example, if vCenter Server, ESXi, vCloud Director and vShield Security products are in use the sequence for upgrade would be:

• vCloud Director

• vCenter Server

• ESXi

• vShield (Edge, App or Endpoint)

Additionally be aware of any obsolete VMFS versions in use. Since vSphere 5.0 introduced the VMFS-5 file system, many organizations may have a few VMFS-3 volumes still in use. These VMFS-3 volumes could be upgraded easily to VMFS-5 or returned to the storage system and new volumes presented. Note that the newest features, such as the 62-TB VMDK, are supported only on VMFS-5 volumes.

It's important to consider additional parts to upgrade on individual VMs such as VMware Tools and VM hardware. These upgrades can be automated with VMware Update Manager, so you can save administrative time.

Be prepared: Test the upgrade offline

The best way to go about the upgrade of vCenter Server is to do it in an offline capacity. Ideally it's with your actual vCenter Server in a virtual lab. Especially if you are coming from older versions of vSphere, you don't want surprises such as not understanding the steps required to set up vCenter Single Sign-On or realizing that the vCenter Web Client is now needed.

Veeam can help here also!

The Virtual Lab is a great feature that you can use in your VMware environment.

Using Veeam Backup & Replication to failover to a new vSphere cluster gives you a lot of benefits that can aid you in preparing to upgrade. Take it from Phil on Twitter! He uses the virtual lab to test his upgrade to vSphere 5.1 when vCenter Single Sign-On was introduced and he went into his production system to perform the upgrade with confidence.
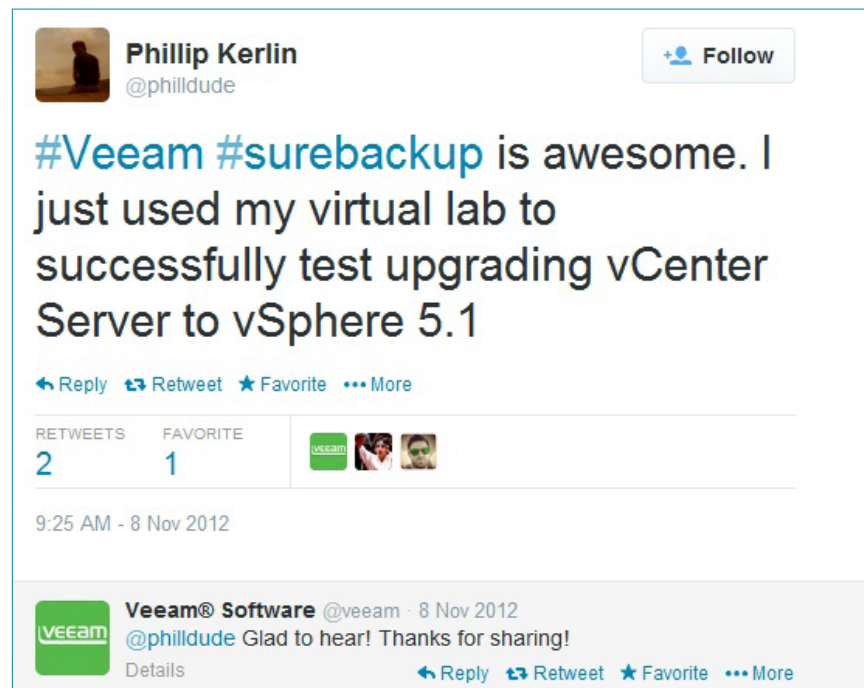

Figure 10

Additionally, it is critically important to check the vSphere Interoperability Matrixes in the environment in which you want to run vSphere. This includes servers, storage systems and guest operating systems—all of which need to be verified as well so that there are no issues with the environment. Even though things like ESXi 5.5 may install and seem to work on a server or storage device, there is no guarantee that advanced features like Storage vMotion, FT, HA, VAAI and more will work.

You can browse the most current VMware Interoperability Matrixes at the VMware website

Use the latest version of vCenter Server

Companies may have downloaded vSphere 5.5 as soon as it became available, but it is important to note that there have been a few minor updates since the initial release. At the time of this paper, vCenter Server (both in vCSA and installable application modes) is at version 5.5.0b. Note that the "b" is a replacement of the "a" version and includes minor fixes but not new features.

In all situations, make sure the latest vCenter Server build is used. For ESXi, the build date is still the original release; use VMware Update Manager to bring it up to date with any available patches. It's recommended to start with the up-to-date version to address any post-release fixes that have been delivered.

Conclusion: Migrate to vSphere 5.5 with success

There are a number of new features with vSphere 5.5, and although this guide hits only some highlights, the point to emphasize is that adequate preparation is necessary. Whether you are interested in creating a virtual lab to test your vSphere 5.5 upgrade or in using a replicated environment to go to an entirely new cluster, it is important to know what your options are and prepare accordingly.

Additionally, Veeam Backup & Replication can assist you in your virtualization journey with Protection for the Modern Data Center™. Veeam Backup & Replication can provide 26 restore scenarios from one agentless backup for your VMware vSphere VMs. Download a trial today or Veeam Backup Free Edition.

About the Author

Rick Vanover (vExpert, MCITP, VCP) is a product strategy specialist for Veeam Software, based in Columbus, Ohio. Rick is a popular blogger, podcaster and active member of the virtualization community. Rick's IT experience includes system administration and IT management, with virtualization being the central theme of his career recently.

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