Tintri

TECHNICAL WHITE PAPER

View Composer API for Array Integration (VCAI) from VMware® on Tintri® VMstore™ Platform

Enabling Efficient View Composer Operations in Horizon™ 6 (with View)

Contents

Executive Summary

The View component of VMware Horizon™ 6 brings the agility of cloud computing to the desktop and revolutionizes desktops into highly available and agile services delivered from your cloud. It enables higher levels of availability, scalability and reliability for virtual desktops. Horizon 6 is available in three editions, Standard, Advanced and Enterprise. All the editions include View as a component.

Offered first in VMware View 5.1 as a Tech Preview, and later, in View 5.3 and above, as a generally supported feature for specific partner storage technologies, VCAI leverages storage arrays' native cloning abilities to offload storage operations within a VMware View environment. As a result, VCAI improves provisioning speeds and provides integrated management in View Composer for customers wanting to leverage advanced storage capabilities, like the ones offered by Tintri VMstore systems.

As outlined in VMware's KB article 2061611, the Tintri VMstore, running Tintri OS 3.0 or later, is one of the (very few) certified, officially supported (by VMware) storage systems.

During the VCAI certification process, the following test results were obtained:

Test	Dedicated Linked Clones
2,000 desktops provisioned	1 hour 35 minutes
2,000 desktops recomposed	3 hours 43 minutes
2,000 desktops refreshed	1 hour 12 minutes
2,000 desktops rebalanced[1]	3 hours 51 minutes

The following software components were used to obtain those results:

Software	Version
Tintri OS	3.0.0.5
VMware vCenter Server	5.5.0 Update 1b, Build 1945287
VMware ESXi	5.5.0 Update 1, Build 1892794
VMware Horizon (with View)	6.0.0, Build 1884746
Tintri VAAI plugin	1.0.0.1-2.7

The following hardware was used:

Area	Component	Quantity
Compute	Cisco UCS 5108 Chassis	1

[1] In this test, we rebalanced the pool into another Tintri VMstore (a T540). There's no reason to rebalance pools within one VMstore, since each VMstore is a single datastore.

Area	Component	Quantity
	Cisco UCS B200 M3 Blades (running View Cluster) (2 x Intel E5 2697 v2 @ 2.7 GHz, 12-Core, 256GB RAM)	5
	Cisco UCS B22 M3 Blade (running View Servers, including View Composer) (2 x Intel E5 2420 @ 1.9 GHz, 6-Core, 144GB RAM)	1
Storage	Tintri VMstore T650	1
Network	Cisco UCS 6248UP Fabric Interconnects	2

What is VCAI?

VCAI or View Composer API for Array Integration enables Horizon (with View) to leverage storage array capabilities for offloading storage operations, such as snapshots and clones. This feature allows customers to offload the creation of linked clones to the storage array. It is used in conjunction with linked clone desktop pools and NFS datastores that are exported by NAS storage arrays such as the Tintri VMstore.

What is needed to leverage VCAI?

The following components are required for operationalizing the use of VCAI **with a Tintri VMstore**:

- VMware View 5.3 or later – including the latest, i.e. Horizon™ 6 (with View)
- VMware vSphere 5.1 or later
- NAS storage array that supports VAAI (i.e. listed in VMware's KB article 2061611)
    - The array needs to be certified for **specific** VAAI NAS primitives:
        - Full File Clone – Like the Full Copy VAAI primitive provided for block arrays, this Full File Clone primitive enables virtual disks to be cloned by the NAS device.
        - Native Snapshot Support – Allows creation of virtual machine snapshots to be offloaded to the array.
- NAS storage array vendor-provided VAAI plug-in on each vSphere server in the View Cluster:
    - Tintri VAAI plugin 1.0.0.1-2.6 for vSphere 5.1
    - Tintri VAAI plugin 1.0.0.1-2.7 for vSphere 5.5

What are the benefits of using VCAI?

One can realize many benefits by using VCAI. Some of these benefits include:

- **Reduced desktop provisioning times** – VCAI reduces the time taken to provision desktops. When a linked clone pool is created, the cloning operation is offloaded to the storage array (through the storage vendor plugin on the vSphere server). NAS storage arrays, specifically the ones such as Tintri VMstore that operate at VM-level, that are optimized to handle storage array operations such as snapshot creation and clone creation can create these native clones relatively easily and quickly. This cuts down the linked clone pool provisioning time when compared to creating the pools without this feature.
- **Efficient use of resources** – VCAI enables efficient use of resources at all layers in the infrastructure – compute, network and storage.
    - Since the clone creation operation is offloaded to the storage array, the CPU utilization on vSphere servers is greatly reduced. Availability of increased compute resources on vSphere servers can be used to carry out other operations that result in overall improvement of customer experience or to increase VM density.

- Offloaded clone operations means there is no data movement between the host and storage system reducing the network bandwidth utilization.

Until the introduction of the VCAI, customers using NAS arrays for their View deployments could setup their environment in 2 ways:

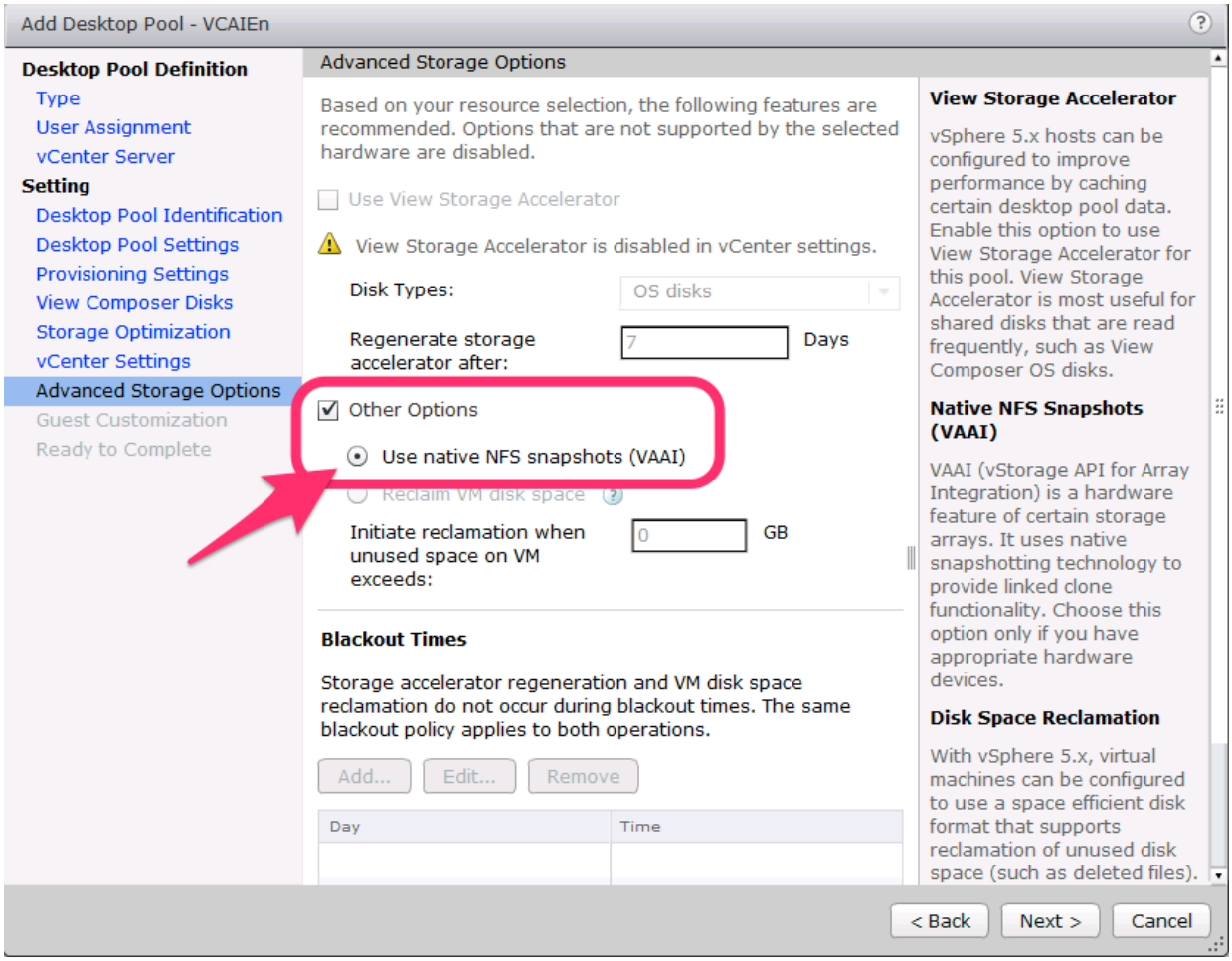
- Automated pool of linked clone desktops which offer storage capacity savings
- Manual pool of full clones with capacity savings achieved by using native features (ex: deduplication, native storage clones/snapshots etc.,) of the NAS Storage array

With the VCAI, customers can now leverage both the linked clone capability that View provides and the capabilities provided by the NAS storage array.

How do I leverage VCAI in my Desktop Pools?

The workflow of using this feature is as follows:

- Desktop administrator kicks off a create pool operation by selecting a linked clone type pool and an NFS datastore as the storage target for the pool – If the NAS storage array hosting the NFS datastore is VAAI NAS capable, the advanced storage option will enable the use of VCAI and the administrator can select this option. If the NAS storage array is not VAAI NAS capable, this feature is automatically disabled.



- Once the feature is selected, the linked clone pool creation process begins with an offload of the cloning operation to the storage array. The offload is accomplished through a sequence of steps that results in calling the VAAI NAS native snapshot primitive within the ESXi server. Each ESXi server in the View cluster has a NAS VAAI plugin that traps the VAAI call and offloads it to the storage array.

- The storage array creates the clones internally.
- The pool creation operation completes after the clones are created on the storage array.

The feature is also supported on existing pools. The typical use case is one of View upgrades – customers running VMware View 5.0 on VMware vSphere 5.0 upgrading to VMware View 5.1 can use this feature on their existing linked clone pools. The edit pool wizard allows selection of this feature. It is important to note that a recompose/refresh operation must be performed on the pool when this feature is selected through the edit pool wizard. Without a refresh/recompose operation, the clones are still maintained as redo-log based clones and not native storage clones. The workflow for the clone creation with the edit pool case is same as the one described above.

VCAI Disabled vs. VCAI Enabled Test

Using the same hardware and software described above (that was used for the VCAI certification) we also ran a smaller test to assess the true positive impact of enabling VCAI in a pool (leveraging Tintri's VCAI capability). With VCAI enabled, we not only observed faster View Composer operations, but also observed *25% decrease* in peak IP storage network traffic and 50% decrease in the peak NFS file system operations on the Tintri VMstore system.

In order to accurately determine the differences in resource utilization between a VCAI-enabled linked clone desktop pool and a VCAI-disabled linked clone desktop pool, the following configuration was used:

VCAI-enabled linked clone pool

- VMware VAAI for NAS VIB installed (Tintri VAAI plugin)
- Dedicated NFS mount on Tintri VMstore
- VCAI enabled in VMware Horizon (with View) linked clone desktop pool
- View Storage Accelerator (VSA) disabled in VMware Horizon (as of this writing, Tintri OS 3.0 does not support both VCAI and VSA enabled at the same time)

VCAI-disabled linked clone desktop pool

- VMware VAAI for NAS VIB (Tintri VAAI plugin) not installed
- Dedicated NFS mount on Tintri VMstore
- VCAI disabled in VMware Horizon (with View) linked clone desktop pool
- VSA disabled in VMware Horizon (with View) linked clone desktop pool

Test Results

Figure 1 shows the aggregate vmnic traffic comparison for the NFS/IP storage network port group (we trunked the two 10GbE NICs on that host). This information was obtained from the performance tab of the VMware vSphere Client connected to the vCenter that manages these hosts.

For the first 12 to 14 minutes ("Stage 1", marked in light green) of the provisioning operations, the 60GB desktop gold image is being copied to the target NFS datastore for its respective linked clone desktop pool.

In the host with VCAI disabled, that process takes an extra two minutes.

Between minutes 13 and 21 ("Stage 2", marked in light blue), a significant change in vmnic traffic between the two hypervisors was observed. During this time, the linked clone desktops virtual disk files are created. This illustrates the network utilization benefits of VCAI, as the VCAI-enabled host has lower and smoother storage network utilization as compared to its VCAI-disabled counterpart.

Minutes 21 through 25 ("Stage 3", marked in light orange) illustrate the storage network utilization during the time in which the ESXi host finishes customizing the linked clone desktops.

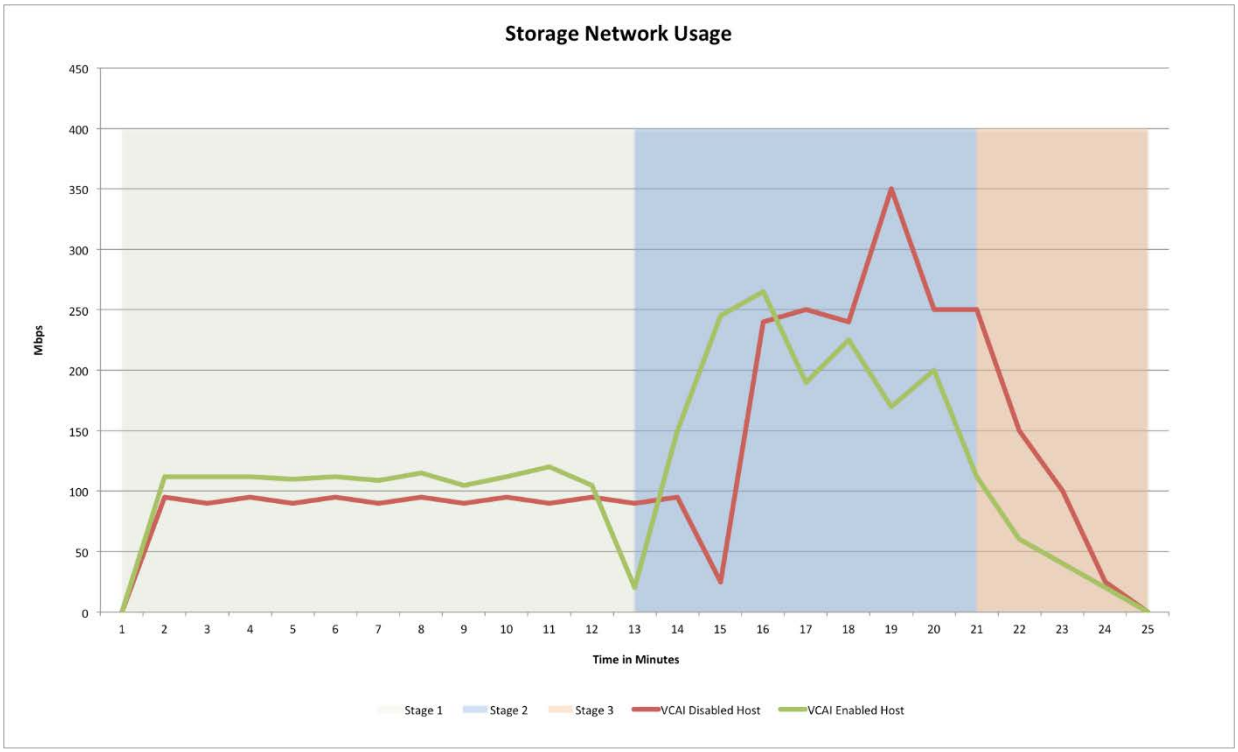


Figure 1: Storage network utilization

Figure 2 shows the IOPS for the two dedicated datastores used during this testing. This information was obtained from the Tintri GUI's real time IOPS chart.

Between minutes 13 and 21, ("Stage 2", marked in light blue) a massive increase in NFS file system operations is observed on the VCAI-disabled host. This increase directly corresponds to the increase in vmnic utilization shown in Figure 1 and illustrates the increased workload on the hypervisor during VCAI-disabled provisioning.

This difference illustrates the benefits of the Native NFS snapshot primitive for VAAI being used on the VMstore Platform to natively clone and create the linked clone desktops when VCAI is enabled.

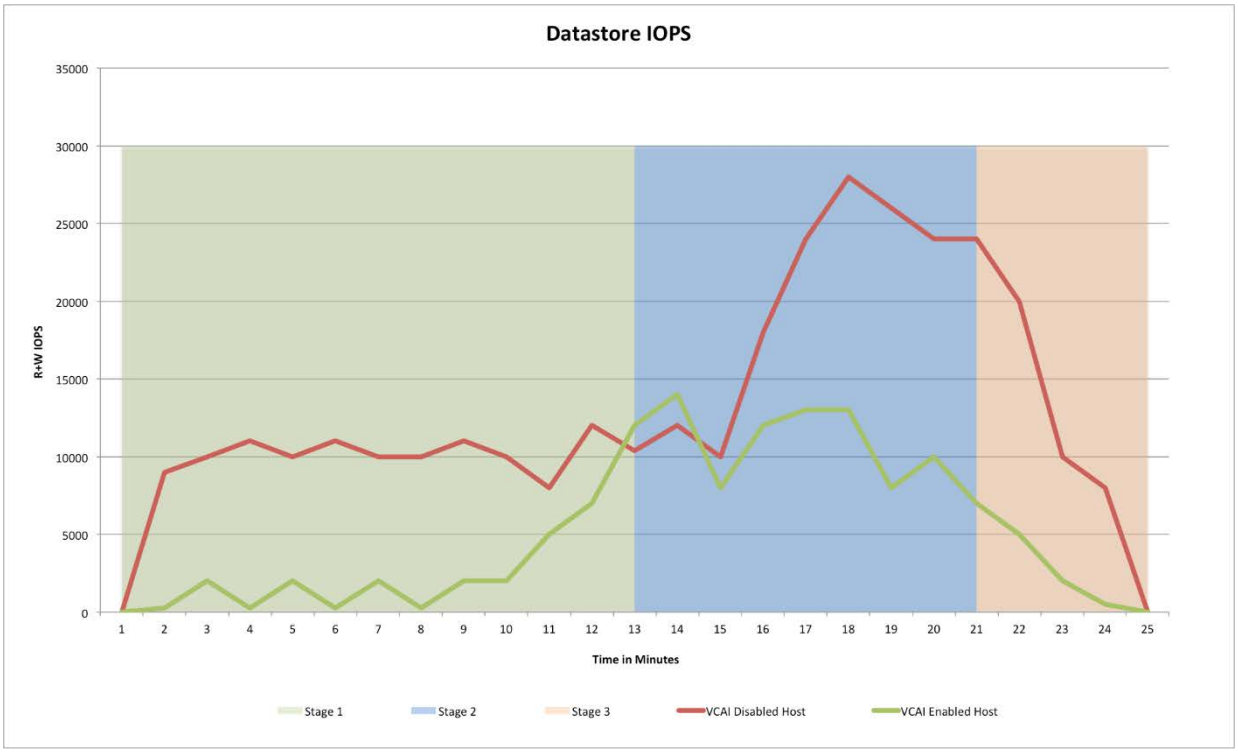


Figure 2: NFS file system operations on Tintri VMstore

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