

InfoScale Support for Virtual Machines in Nutanix HCI Environments

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Introduction

InfoScale product can now run seamlessly on the virtual machines (VMs) created on the Nutanix hyper-converged infrastructure architecture.

The Nutanix HCI architecture includes each hypervisor host (VMware ESXi or Microsoft Hyper-V), database VMs (User VMs), Storage Controller VM (Nutanix Controller VM), and local disks. Each Controller VM is directly connected to the local storage controller and its associated disks. The Nutanix solution also includes highly dense storage and server compute (CPU and memory) in a single platform building block. Each building block is based on the industry-standard and high performing x86 server technology.

The Nutanix system can co-exist with the existing storage infrastructure and offload workloads from the existing storage platforms, which improves the performance, capability, and linear scalability for InfoScale. This capability delivers a unified, scale-out, shared-nothing architecture with no single point of failure (SPOF). InfoScale can be setup inside the VMs created and hosted on Nutanix AHV Hypervisor.

Benefits of InfoScale and Nutanix HCI integration

InfoScale and Nutanix HCI integration offers following benefits:

- **Simplified Management**
 - Automated application resiliency through monitoring and orchestration
 - Application-aware operations
 - Accelerated private and public cloud adoption
- **Cost-effectiveness**
 - Cost-effective solution with AHV integration
- **Resiliency**
 - Protects mission-critical applications against failures and disaster
 - Protected data with scale and performance, regardless of the choice of hypervisor
 - Migration of workloads between platforms—permanently or in the event of a disaster
 - Adaptive high availability
 - Synchronous and asynchronous replication with DR orchestration between sites for near-zero RTO and zero RPO

Overview

InfoScale Enterprise offers great features such as Cluster File System (CFS), Veritas ODM (Oracle Disk Manager), and SCSI-3 disk-based and server-based I/O Fencing. These features assure performance gains and resiliency.

Veritas InfoScale Enterprise

Veritas InfoScale Enterprise provides an end-to-end solution for enterprise storage management. This solution virtualizes the heterogeneous storage over the heterogeneous servers into logical objects. Veritas InfoScale Enterprise includes the following components and features:

- **Veritas Volume Manager** virtualizes any storage that is exposed to the system. The customer can then choose the desired resiliency level with the software RAID of Volume Manager. Volume Manager can even replicate data across remote sites with its Veritas Volume Replication (VVR) feature. Volume Manager features such as Dynamic Multi-Pathing (DMP), snapshots, Fast Mirror Resync (FMR), and SmartMove migration provide further resiliency and faster recovery of data.
- **Veritas Cluster File System (CFS)** is a highly consistent and resilient file system. CFS provides global namespace across multiple servers. An application can concurrently access data from any of the nodes in a cluster. CFS tuning can improve application caching and data-flow to the storage. With checkpoints and fsck features, data and metadata can be quickly recovered. Further, Veritas File System has demonstrated linear scalability of application performance for a range of common workloads – thus guaranteeing the scale-out compute power for an application.
- **Veritas Cluster Server (VCS)** always maintains cluster membership information and enables building clusters with a large number of servers. VCS allows seamless failover of an application from one server to another server. Customers can count on business continuity and avoid downtime of services during failure or maintenance of servers.
- **I/O Fencing** is a core component of VCS focused on handling a cluster partition event that occurred due to the loss of cluster communication. I/O Fencing consists of two distinct components, Membership Arbitration and Data Protection; together they can deliver maximum data integrity in a cluster environment.
 - **Membership Arbitration** allows only one of the multiple partitions of a cluster to continue operation in case of a network partition. The I/O fencing module uses coordination points such as SCSI3 compliant disks or Coordination Point Servers (CP Servers) for membership arbitration. At the time of a network partition each partition races for the coordination points and the partition that grabs the majority of the coordination points survives, whereas nodes from all other partitions panic.
 - **Data Protection** allows write access only for members of the cluster that survive after arbitration. It blocks non-members from accessing storage so that even a node that is accidentally alive is unable to cause damage to data. Traditionally, I/O fencing uses SCSI3 Persistent Reservation (SCSI3-PR) to ensure that I/O operations from the losing node cannot reach a disk that the surviving partition has taken over.

Nutanix AHV

Nutanix virtualization offers an attractive alternative to other virtualization solutions while streamlining operations and driving costs out of the data center. It is done by choosing Nutanix HCI and AHV, a built-in, license-free hypervisor delivering virtualization capabilities for even the most demanding applications. AHV provides an open platform for server virtualization, network virtualization, security, and application mobility. When combined with comprehensive operational insights and virtualization management from Nutanix Prism, Nutanix provides a complete solution for virtualization and enterprise cloud.

Prism Element, which is available on each cluster you deploy, integrates this UI with the overall Nutanix solution. You can access Prism Element through each individual Nutanix cluster via the cluster IP or any individual Nutanix Controller Virtual Machine IP addresses. Prism Element requires no additional software; it is built into every Nutanix cluster and incorporates support for AHV.

Prism Central is both a platform and a hypervisor-agnostic management interface, providing an aggregate view of your deployed Nutanix clusters. In addition to allowing you to view and manage the cluster, Prism Central provides insight into VMs, hosts, disks, and containers or pooled disks.

The setup details used for the sanity qualification is as follows:

Hardware Details

- Nutanix Remote Lab setup: NX-3060-G5 (17SM6B050002)
- Hypervisor Version: AHV VERSION NUTANIX 20170830.256

Software Details

- Nutanix AOS (Acropolis OS running on CVM) Version: 5.10.5 LTS
- InfoScale Version: 7.4.1 Update1 (3-node CFS Cluster)
- Guest OS: Red Hat 7.6

Use cases coverage

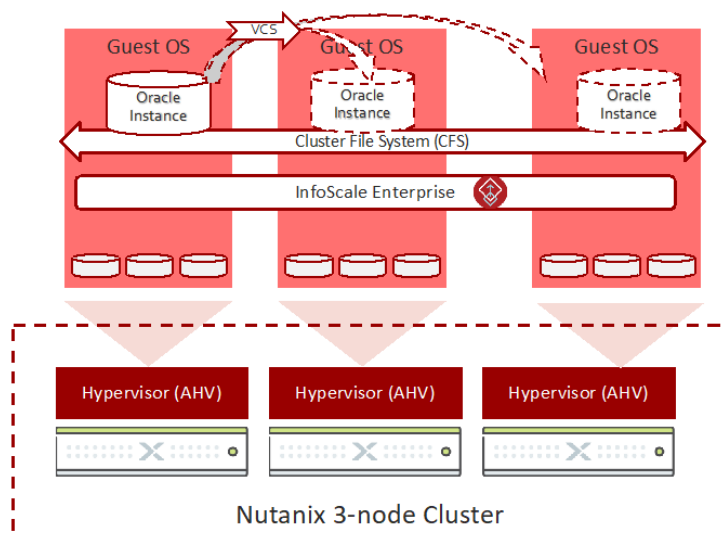
This section covers the use cases that are commonly used and are required in any customer environment to provide high availability, performance, and reliability. These use cases assume a setup where:

- Veritas Cluster Server (VCS) monitors the application using the VCS agents and other components
- Veritas Volume Manager (VxVM) and Veritas File System (VxFS, CFS) provides the storage management for the application data

Use case 1

In this use case, the application data resides on Veritas Cluster File System (CFS), which enables it to be available on all the cluster nodes at the same time, as an Active-Active configuration. In case of a node failure, only those applications that are monitored by the VCS agents are failed over to an available node. Thereby the application downtime is reduced.

InfoScale Enterprise – Application in FF mode hosted on InfoScale



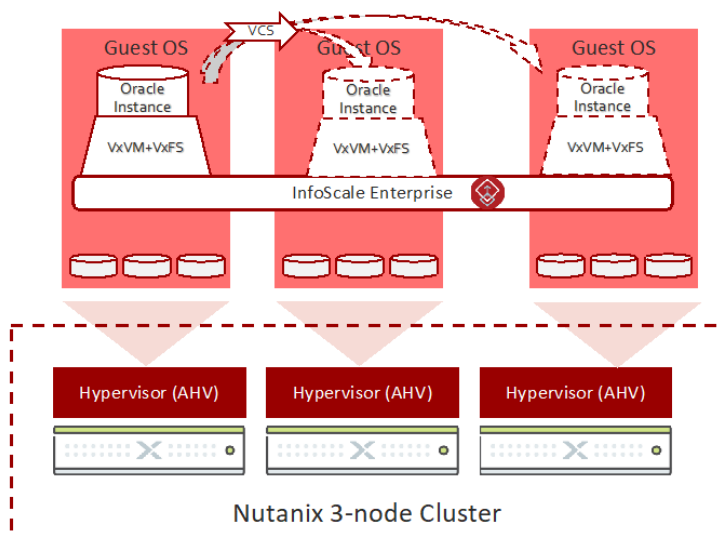
Deployment Scenario:

- ❖ InfoScale running inside VMs on Nutanix Cluster
- ❖ Oracle instance configured using VCS Oracle agent in FF mode hosted on Veritas SFCFS

Use case 2

In this use case, the application data resides on Veritas File System (VxFS), which enables it to be available on one of the cluster nodes where the application is running, as Active-Passive configuration. In case of any InfoScale cluster node failure, the storage infrastructure uses VxFS to failover entire application storage.

InfoScale Enterprise – App in Failover mode hosted on InfoScale



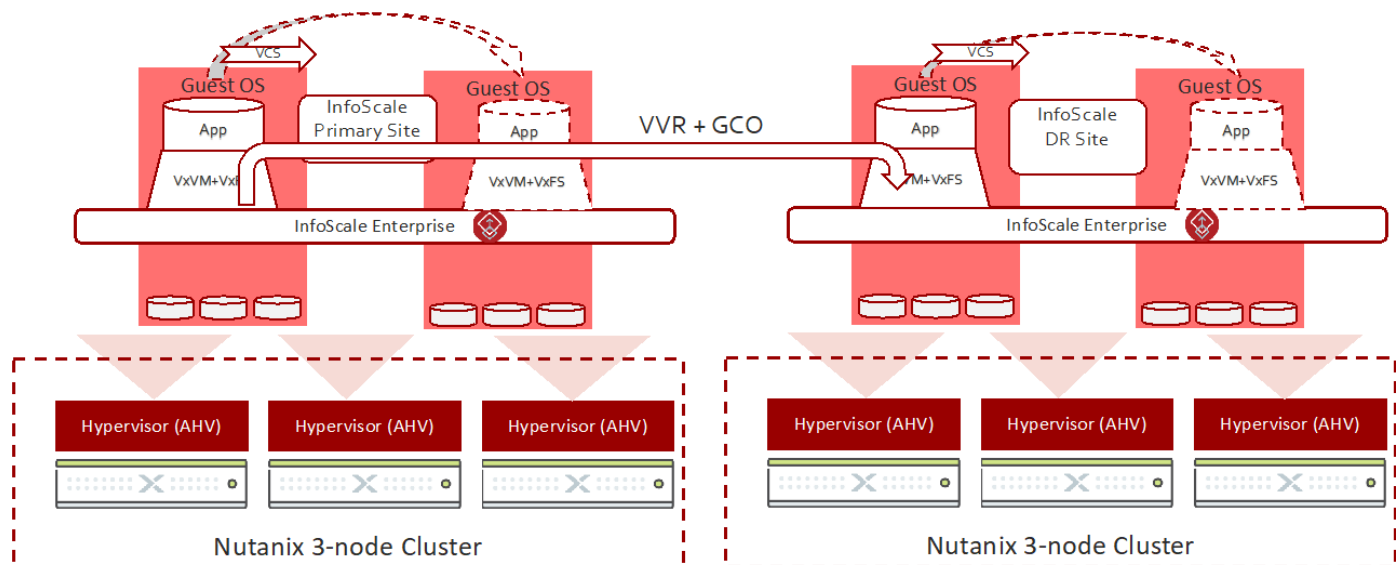
Deployment Scenario:

- ❖ InfoScale running inside VMs on Nutanix Cluster
- ❖ Oracle instance configured using VCS Oracle agent in Failover mode hosted on Veritas SF

Use case 3

In this use case, the application is configured in DR mode using Veritas InfoScale components like Veritas Volume Replicator and VCS Global Cluster Option. This use case prevents application from site-failures and natural disasters.

InfoScale Enterprise – App in Veritas Replicator and Global Cluster hosted on InfoScale



Prerequisites and setup recommendations

The setup InfoScale cluster on Nutanix VMs, make sure that the following prerequisites are met:

- Nutanix AHV 3-node cluster is set up
- Required OS images are configured in the Prism Image service
- Each VM is hosted on different node of an AHV cluster
- Network VLAN details for public and private network are available
- VCS cluster heartbeat mode is set to ethernet/UDP
- Storage is configured as storage pool > storage containers > volume groups
- Setup the iSCSI connections to the volume group using the Data Service IP (DSIP) of the AHV cluster, from each InfoScale cluster node

Creating VMs on a Nutanix AHV

You can create a Nutanix VM using the steps listed in the Nutanix documentation:

<https://portal.nutanix.com/#/page/docs/details?targetId=Prism-Central-Guide-Prism-v510:mul-vm-create-acropolis-pc-t.html>

Make sure that you provide values for the following mandatory fields while creating the VM:

- CPU
- Memory
- Boot disk
- vNICs

The image displays two side-by-side screenshots of the Nutanix VM creation interface. The left screenshot shows the 'Create VM' form with fields for Name, Description, Timezone, Compute Details (VCPUs, Cores, Memory), and a checkbox for 'Use this VM as an agent VM'. The right screenshot shows the 'Disks' and 'Network Adapters (NIC)' sections. The 'Disks' section has a table with columns for BOOT, DEVICE, TYPE, ADDRESS, and PARAMETERS, showing a CD-ROM and a DISK. The 'Network Adapters (NIC)' section has a table with columns for VLAN ID, VLAN NAME, MAC, and REQUESTED ... showing a single entry.

BOOT	DEVICE	TYPE	ADDRESS	PARAMETERS
<input type="radio"/>	CD-ROM			SIZE=4.19GiB; EMPTY=fals...
<input type="radio"/>	DISK			SIZE=100GiB; CONTAIN...

VLAN ID	VLAN NAME	MAC	REQUESTED ...
vlan.3180	NR_INT_STA		

Creating storage infrastructure in Nutanix AHV

To configure storage for a VM in shared mode, you must first create a storage pool, then create the storage containers, and then create volume groups.

To create a storage pool, use the steps listed in the Nutanix documentation:

<https://portal.nutanix.com/#/page/docs/details?targetId=Web-Console-Guide-Prism-v510:wc-storage-pool-create-wc-t.html>

To create storage containers, use the steps listed in the Nutanix documentation:

<https://portal.nutanix.com/#/page/docs/details?targetId=Web-Console-Guide-Prism-v510:wc-container-create-wc-t.html>

To create volume group and assigning them to VMs via DSIP, use the steps listed in the Nutanix documentation:

<https://portal.nutanix.com/#/page/docs/details?targetId=Web-Console-Guide-Prism-v510:wc-volumes-enabling-t.html>

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A volume group is a collection of logically related vDisks called volumes, which are assigned to a VM in local or shared mode. The disk assignment is performed using DSIP through iSCSI connections. You must make sure that the iSCSI connections remain persistent in case of reboot. Hence, in case of RHEL 7.x, the '/etc/iscsi/iscsid.conf node startup' must be set to automatic "node.startup=automatic".

Overview

Diagram

Table

+ Storage Container

+ Volume Group

+ Storage Pool

Storage Container

Volume Group

Storage Pool

1 Storage Pool

search in table

Name	Disks	Free (Physical)	Used (Physical)	Max Capacity (Physical)	Disk IOPS	Disk IO B/W	Disk Avg IO Latency
default-storage-pool-78884	24	17.71 TiB	14.32 TiB	32.04 TiB	39	1.97 MBps	0.7 ms

Overview

Diagram

Table

Storage Container

Volume Group

Storage Pool

4 Storage Containers (filtered from 16)

VRTS

Name	Replication Factor	Compression	Cache Deduplication	Capacity Deduplication	Erasure Coding	Free (Logical)	Used	Max Capacity	Controller IOPS	Controller IO B/W	Controller IO Latency
VRTS-Boot	2	Off	Off	Off	Off	8.86 TiB	270.96 GiB	9.13 TiB	10	390 KBps	3.7 ms
VRTS-Data	2	Off	Off	Off	Off	8.86 TiB	52.48 GiB	8.91 TiB	0	0 KBps	0.94 ms
VRTS-Demo1	2	Off	Off	Off	Off	8.86 TiB	1.26 GiB	8.86 TiB	0	0 KBps	0 ms
VRTS-ISO	2	Off	Off	Off	Off	8.86 TiB	7.34 GiB	8.87 TiB	0	0 KBps	0 ms

Storage Container

Volume Group

Storage Pool

4 Volume Groups (filtered from 19)

<>⚙️

VRTS

▶ Name

Disks

Controller IOPS

Controller IO B/W

Controller IO Latency

VRTS-CFS_VG1

20

0 IOPS

0 KBps

1.01 ms

VRTS-VCS-Fencing-Test

3

0 IOPS

0 KBps

0 ms

VRTS-VG1

14

0 IOPS

0 KBps

0 ms

VRTS_demo_vg

1

0 IOPS

0 KBps

0 ms

Summary

> VRTS-CFS_VG1

CloneUpdateDelete

VOLUME GROUP DETAILS

Name

VRTS-CFS_VG1

Number of Virtual Disks

20

Total Size

325 GiB

Flash Mode

Disabled

Initiators

iqn.1994-05.com.redhat:52efeb2ae616
iqn.1994-05.com.redhat:78b939a3b56
iqn.1994-05.com.redhat:aa375b8d51f
iqn.1994-05.com.redhat:d0132e10a89f

Target IQN Prefix

iqn.2010-06.com.nutanix:vrts-cfsvg1-...

Performance Metrics

Virtual Disks

Volume Group Tasks

Volume Group Alerts

Volume Group Events

Default

Additional Stats

Virtual Disk

Total Capacity

Physical Usage

Read IOPS

Read BW

Read Latency

Write IOPS

Write BW

Write Latency

3

5 GiB

0 GiB

-

-

-

-

-

-

9

20 GiB

178.5 KiB

-

-

-

-

-

-

14

20 GiB

27.25 MiB

0

0 KBps

0 ms

0

0 KBps

1.12 ms

0

5 GiB

27.21 MiB

-

-

-

-

-

-

4

5 GiB

27.21 MiB

-

-

-

-

-

-

13

20 GiB

12.52 GiB

0

0 KBps

0 ms

0

0 KBps

1.23 ms

18

20 GiB

12.52 GiB

0

0 KBps

0 ms

0

0 KBps

0.85 ms

Activate Windows

Go to Settings to activate Windows

Creating networking infrastructure in Nutanix AHV

To assign Public and Private vNICs to a VM, you must first create respective VLANs and then create the vNIC under corresponding VLANs as shown in following image.

For more details on network management, refer to Nutanix support portal:

<https://portal.nutanix.com/#/page/docs/details?targetId=Web-Console-Guide-Prism-v510:wc-network-management-wc-c.html>

The image shows two screenshots from the Nutanix AHV web console. The top screenshot displays the 'Settings' page with 'Network Configuration' selected in the left sidebar. The main content area shows a table of network configurations under the 'Internal Interfaces' tab.

Virtual Networks	Internal Interfaces	
new Network	vlan.1153	/ x
NR_INT_DHCP	vlan.3164	/ x
NR_INT_STATIC	vlan.3180	/ x
NR_PROD_DHCP	vlan.0	/ x
NR_PRT_DHCP	vlan.3132	/ x
NR_PRT_STATIC	vlan.3148	/ x

The bottom screenshot shows the 'Create NIC' dialog box. It contains the following fields and options:

- VLAN Name:** A dropdown menu with 'NR_INT_DHCP' selected.
- VLAN ID:** 'vlan.3164'
- Network Connection State:** Radio buttons for 'Connected' (selected) and 'Disconnected'.
- Network Address / Prefix:** 'NONE'
- Buttons:** 'Cancel' and 'Add'.

Creating an InfoScale cluster

Use the Common Product Installer (CPI) to install InfoScale on the systems that you want to configure as InfoScale cluster nodes. For more information on InfoScale installation, refer to the Veritas InfoScale Installation Guide.

After successful installation and configuration of the appropriate InfoScale product, you can configure various applications using VCS agents. Refer to the Cluster Server Administrator's Guide for information on configuring applications and resources in VCS:

https://www.veritas.com/content/support/en_US/doc/79561893-79561899-0/index

During the installation, the installer displays an option for selection of InfoScale Product Component:

```
Veritas InfoScale Storage and Availability Solutions 7.4.1 Install Program
vrts-ntnx-vm1 vrts-ntnx-vm2 vrts-ntnx-vm
  1) Veritas InfoScale Foundation
  2) Veritas InfoScale Availability
  3) Veritas InfoScale Storage
  4) Veritas InfoScale Enterprise
  b) Back to previous menu
Select a product to install: [1-4,b,q,?] 4
```

After successful installation and configuration, you can check the cluster heartbeat status as shown in the following example:

```
vrts-ntnx-vm1:/root>lltstat -nvv active
LLT node information:
  Node          State  Link  Status  Address
* 0 vrts-ntnx-vm1 OPEN
                eth1   UP    50:6B:8D:9C:5A:3B
                eth2   UP    50:6B:8D:FF:D7:5B
                eth0   UP    50:6B:8D:CF:A0:73
  1 vrts-ntnx-vm2 OPEN
                eth1   UP    50:6B:8D:FE:49:B8
                eth2   UP    50:6B:8D:EC:90:E5
                eth0   UP    50:6B:8D:51:C8:97
  2 vrts-ntnx-vm3 OPEN
                eth1   UP    50:6B:8D:F4:1E:E2
                eth2   UP    50:6B:8D:F5:46:36
                eth0   UP    50:6B:8D:2A:A6:C7
vrts-ntnx-vm1:/root>
```

You can also check the Cluster Global Atomic Broadcast (GAB) status which displays the details similar to the details shown in the following example:

```
vrts-ntnx-vm1:/root>gabconfig -a
GAB Port Memberships
=====
Port a gen    abf620 membership 012
Port b gen    abf684 membership 012
Port d gen    abf621 membership 012
Port f gen    abf671 membership 012
Port h gen    abf688 membership 012
Port m gen    abf68a membership 012
Port u gen    abf6a0 membership 012
Port v gen    abf68c membership 012
Port w gen    abf69e membership 012
Port y gen    abf68b membership 012
```

When you check the VCS fencing configuration status, the details may look similar to the following example:

```
vrts-ntnx-vm1:/root>vxfenadm -d
I/O Fencing Cluster Information:
=====
Fencing Protocol Version: 201
Fencing Mode: SCSI3
Fencing SCSI3 Disk Policy: dmp
Cluster Members:
    * 0 (vrts-ntnx-vm1)
      1 (vrts-ntnx-vm2)
      2 (vrts-ntnx-vm3)
RFSM State Information:
    node 0 in state 8 (running)
    node 1 in state 8 (running)
    node 2 in state 8 (running)
vrts-ntnx-vm1:/root>
```

You can also check the status for the entire cluster after you successfully configure the product and the application:

```
vrts-ntnx-vm1:/root>hastatus -summ
-- SYSTEM STATE
-- System          State          Frozen
A vrts-ntnx-vm1    RUNNING      0
A vrts-ntnx-vm2    RUNNING      0
A vrts-ntnx-vm3    RUNNING      0

-- GROUP STATE
-- Group           System          Probed    AutoDisabled  State
B cvm              vrts-ntnx-vm1    Y         N             ONLINE
B cvm              vrts-ntnx-vm2    Y         N             ONLINE
B cvm              vrts-ntnx-vm3    Y         N             ONLINE
B sg_ora           vrts-ntnx-vm1    Y         N             ONLINE
B sg_ora           vrts-ntnx-vm2    Y         N             OFFLINE
B sg_ora           vrts-ntnx-vm3    Y         N             OFFLINE
B sg_privvol.      vrts-ntnx-vm1    Y         N             OFFLINE
B sg_privvol       vrts-ntnx-vm2    Y         N             ONLINE
B sg_privvol       vrts-ntnx-vm3    Y         N             OFFLINE
B vrts_vea_cfs_int_cfsmount1 vrts-ntnx-vm1    Y         N             ONLINE
B vrts_vea_cfs_int_cfsmount1 vrts-ntnx-vm2    Y         N             ONLINE
B vrts_vea_cfs_int_cfsmount1 vrts-ntnx-vm3    Y         N             ONLINE
B vxfen           vrts-ntnx-vm1    Y         N             ONLINE
B vxfen           vrts-ntnx-vm2    Y         N             ONLINE
B vxfen           vrts-ntnx-vm3    Y         N             ONLINE
vrts-ntnx-vm1:/root>
```

Note: VCS in-guest clustering continues to provide high availability of applications on VMs, in live migration scenarios initiated by the virtualization technology. You can use live migration to perform a stateful migration of a VM in a VCS environment. During this period, you may see notifications if the migrating node is unable to heartbeat with its peers within the LLT default peer inactive timeout.

To avoid false failovers, determine how long the migrating node is unresponsive in your environment. If that time is less than the default LLT peer inactive timeout of 16 seconds, that is `peerinact=1600`, VCS operates normally. If not, increase the peer inactive timeout to an appropriate value on all the nodes in the cluster before beginning the migration. Reset the value back to the default after the migration is complete.

You can also use Veritas Information Operation Manager (VIOM) to manage the InfoScale system and to perform supported operations. For more details refer to the VIOM documentation:

https://sort.veritas.com/documents/doc_details/vom/7.4/Windows%20and%20UNIX/Documentation/

InfoScale Support for Virtual Machines in Nutanix HCI Environments

The VIOM interface displays the host information similar to the following image after full discovery of its managed hosts.

The screenshot displays the Veritas InfoScale Operations Manager 7.4 interface. The left sidebar shows a navigation tree with categories like Server, Availability, Storage, and Virtualization. The main pane is titled 'Hosts' and shows a table of discovered hosts. The table has columns for Name, State, Platform, Architecture, OS Version, SF Version, and Cluster. The hosts listed are vrts-ntnx-vm1, vrts-ntnx-vm2, and vrts-ntnx-vm3, all in a 'Healthy' state. To the right of the table, a 'Properties for vrts-ntnx-vm1' panel shows various system details like Build Version, CVM Master status, Family, Host Prefix, IP, Is Virtual, KMS Configured, MH Version, OS Release, Site, and VCS Version. At the bottom, a 'Recent Tasks' table shows a completed task 'Add organization'.

Name	State	Platform	Architecture	OS Version	SF Version	Cluster
vrts-ntnx-vm1	Healthy	Linux	x86_64	3.10.0-957.el7.x86_64	7.4.1	Test_VRTS_NTNX
vrts-ntnx-vm2	Healthy	Linux	x86_64	3.10.0-957.el7.x86_64	7.4.1	Test_VRTS_NTNX
vrts-ntnx-vm3	Healthy	Linux	x86_64	3.10.0-957.el7.x86_64	7.4.1	Test_VRTS_NTNX

Name	Value
Build Version	7.4.0.200-611
CVM Master	No
Family	Red Hat Enter...
Host Prefix	-
IP	10.16.37.109,...
Is Virtual	No
KMS Configured	No
MH Version	7.4.0.200
OS Release	v7.6 Red Hat
Site	-
VCS Version	7.4.10.000

Name	State	Source	Object	User	Start Time	End Time
Add organization	Completed	vrts-viom-cms	Vrts-Nutanix	root@vrts-viom-cms	Apr 29, 2019 02:46:43 PM	Apr 29, 2019 02:...

VIOM also displays cluster information in the following manner. You can use VIOM to monitor the system and perform various operations like the online, offline, switch of the application service groups.

The screenshot displays the Veritas InfoScale Operations Manager 7.4 interface, specifically the 'Service Group Status' view for the 'Test_VRTS_NTNX' cluster. The left sidebar shows a navigation tree with categories like Server, Availability, Storage, and Virtualization. The main pane shows a table of service groups and their status across three hosts: vrts-ntnx-vm1, vrts-ntnx-vm2, and vrts-ntnx-vm3. The service groups listed are cvm, sg_ora, sg_privvol, vrts_vea_cfs_int_cfsmount1, vrts_vea_cfs_int_cfsmount2, and vxfen. The 'Recent Tasks' table at the bottom shows several completed tasks related to switching VCS service groups.

Name	State	Source	Object	User	Start Time	End Time
Switch VCS service group	Completed	vrts-ntnx-vm1	sg_ora	root@vrts-viom-cms	Apr 26, 2019 03:57:07 PM	Apr 26, 2019 03:...
Switch VCS service group	Completed	vrts-ntnx-vm1	sg_privvol	root@vrts-viom-cms	Apr 25, 2019 06:11:34 PM	Apr 25, 2019 06:...
Switch VCS service group	Completed	vrts-ntnx-vm1	sg_ora	root@vrts-viom-cms	Apr 25, 2019 05:26:25 PM	Apr 25, 2019 05:...
Switch VCS service group	Completed	vrts-ntnx-vm1	sg_ora	root@vrts-viom-cms	Apr 25, 2019 05:12:21 PM	Apr 25, 2019 05:...
Switch VCS service group	Completed	vrts-ntnx-vm1	sg_ora	root@vrts-viom-cms	Apr 25, 2019 05:03:56 PM	Apr 25, 2019 05:...

References

The introduction to Nutanix AHV and its components in this document is derived from the Nutanix documentation available at:

<https://www.nutanix.com/go/are-you-still-paying-for-virtualization>

<https://www.nutanix.com/products/acropolis/virtualization>

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