Managing Native Snapshots

HX Data Platform Native Snapshots Overview

HX Data Platform Native Snapshots are a backup feature that saves versions (states) of working VMs. VMs can be reverted back to native snapshots.

Use the HX Data Platform plug-in to take native snapshots of your VMs. HX Data Platform native snapshot options include: create a native snapshot, revert to any native snapshot, and delete a native snapshot. Timing options include: Hourly, Daily, and Weekly, all in 15 minute increments.

A native snapshot is a reproduction of a VM that includes the state of the data on all VM disks and the VM power state (on, off, or suspended) at the time the native snapshot is taken. Take a native snapshot to save the current state of the VM, so that you have the option to revert to the saved state.

You can take a native snapshot when a VM is powered on, powered off, or suspended. For additional information about VMware snapshots, see the VMware KB, Understanding virtual machine snapshots in VMware ESXi and ESX (1015180) at, http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1015180

Benefits of HX Data Platform Native Snapshots

HX Data Platform native snapshots use native technology. Native snapshots provide the following benefits:
• **Reverting registered VMs** - If a VM is registered, whether powered-on or powered-off, native snapshots, same as VM snapshots, can be used to revert to an earlier point in time at which the snapshot was created.

• **High performance** - The HX Data Platform native snapshot process is fast because it does not incur I/O overhead.

• **VM I/O independent** - The HX Data Platform native snapshot creation time is independent of the I/O on the VM.

• **VM performance** - HX Data Platform native snapshots do not degrade VM performance.

• **Crash-consistent. HX Data Platform native snapshots are crash-consistent by default** - I/O crash consistency is defined as maintaining the correct order of write operations to enable an application to restart properly from a crash.

• **Application-consistent** - You can select the `quiesce` option of the `stcli vm snapshot` command through the HX Data Platform CLI to enable HX Data Platform native snapshots to be application-consistent. The applications in the guest VM run transparently exactly like they do in the host VM. For details, see the Cisco HX Data Platform Command Line Interface Reference CLI Reference.

  Quiescing a file system is a process of bringing the on-disk data of a physical or virtual computer into a state suitable for backups. This process might include operations such as flushing dirty buffers from the operating system's in-memory cache to disk, or other higher-level application-specific tasks.

  If your system displays quiesce errors, see the following VMware KB article *Troubleshooting Volume Shadow Copy (VSS) quiesce related issues* (1007696), at:

  [http://kb.vmware.com/selfservice/search.do?cmd=displayKC&docType=kc&docTypeID=DT_KB_1_1&externalId=1007696](http://kb.vmware.com/selfservice/search.do?cmd=displayKC&docType=kc&docTypeID=DT_KB_1_1&externalId=1007696)

• **Scheduled snapshots tolerant to node failures** - Scheduled snapshots are tolerant to administrative operations that require a node shutdown, such as HX maintenance mode and HX online upgrade.

  Scheduled Snapshots are tolerant to failures in other HX clusters in multi cluster environments.

• **Unified interface** - You can manage native snapshots created through the HX Data Platform plug-in using VMware snapshot manager.

• **Individual or grouped** - You can take native snapshots on a VM level, VM folder level, or resource pool level.

• **Granular progress and error reporting** - These monitoring tasks performed at Task level for Resource Pool, Folder and VM level snapshot.

• **Instantaneous snapshot delete** - Deletion of a snapshot and consolidation is always instantaneous.

• **Parallel batch snapshots** - Support for up to 255 VMs in a Resource Pool or Folder for parallel batched snapshots.

• **VDI deployment support** - HX scheduled snapshots are supported for desktop VMs on VDI deployments which are using VMware native technology.

• **Recoverable VM** - The VM is always recoverable when there are snapshot failures.

• **Datastore access** - Snapshots work on partially mounted/accessible datastores as long as the VM being snapshotted is on an accessible mountpoint.
Native Snapshot Considerations

Snapshots parameters

- **Native snapshots** - After you create the first native snapshot using the HX Data Platform plug-in, if you create more snapshots in the vSphere Web Client, these are considered to be native as well. However, if you create the first snapshot using the vSphere Web Client and not the HX Data Platform plug-in, then the vSphere Web Client snapshots are considered to be non-native.

- **Maximum number of stored snapshots** - Currently VMware has a limitation of 31 snapshots per VM. This maximum total includes VMware created snapshots, HX Data Platform SENTINEL snapshot, and HX Data Platform native snapshots.

  For details, see VMware KB, *Committing snapshots in vSphere when more than 32 levels of snapshots are present fails with the error: Too many levels of redo logs (1004545)*, at: https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1004545

- **Scheduled snapshots** - Do not have overlapping snapshots scheduled on VMs and their resource pools.

VMs

- **Deleted VMs** - The life cycle of native snapshots, similar to VM snapshots, is tied to the virtual machine. If the VM is deleted, accidentally or intentionally, all associated snapshots are also deleted. Snapshots do not provide a mechanism to recover from a deleted VM. Use a backup solution to protect against VM deletion.

- **HX Data Platform storage controller VMs** - You cannot schedule snapshots for storage controller VMs.

- **Non-HX Data Platform VMs** - Snapshots fail for any VM that is not on a HX Data Platform datastore. This applies to snapshots on a VM level, VM folder level, or resource pool level. To make a snapshot, the VM must reside on a HX Data Platform datastore in a HX Data Platform storage cluster.

- **Suspended VMs** - Creating the first native snapshot, the SENTINEL snapshot, from VMs in suspended state is not supported.

vCenter

- **Ready storage cluster** - To allow a native snapshot: The storage cluster must be healthy, including sufficient space and online. The datastores must be accessible. The VMs must be valid and not in a transient state, such as vMotioning.

- **vMotion** - vMotion is supported on VMs with native snapshots.

  Storage vMotion - Storage vMotion is not supported on VMs with native snapshots. If the VM needs to be moved to a different datastore, delete the snapshots before running storage vMotion.

Naming

- **Duplicate names** - Do not have VMs or Resource Pools with duplicate names within the HX Data Platform vCenter or snapshots fail. This includes parents and children within nested resource pools and resource pools within different vCenter clusters.

- **Characters in names** - Do not use the special characters, dot (.), dollar sign ($), or accent grave (‘) in any guest/user VM name for which you want to enable snapshots.
Disks and datastores

• **VM datastores** - Ensure that all the VM (VMDK) disks are on the same datastore prior to creating native snapshots. This applies to HX Snapshot now and HX Scheduled Snapshots.

• **Thick disks** - If the source disk is thick, then the snapshot of the VM's disk will also be thick. Increase the datastore size to accommodate the snapshot.

• **Virtual disk types** - VMware supports a variety of virtual disk backing types. The most common is the FlatVer2 format. Native snapshots are supported for this format.

There are other virtual disk formats like Raw Device Mapping (RDM), SeSparse, VmfsSparse (Redlog format). VMs containing virtual disks of these formats are not supported for native snapshots.

Login access

• **SSH** - Ensure that SSH is enabled in ESX on all the nodes in the storage cluster.

Limitations

<table>
<thead>
<tr>
<th>Object</th>
<th>Maximum Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snapshots</td>
<td>30 per storage cluster</td>
</tr>
<tr>
<td></td>
<td>VMware limit is 31. One snapshot is consumed by SENTINEL.</td>
</tr>
<tr>
<td>Datastores</td>
<td>8 per storage cluster</td>
</tr>
<tr>
<td>VMs</td>
<td>1024 per host</td>
</tr>
<tr>
<td>Powered on VMs</td>
<td>100 per host</td>
</tr>
<tr>
<td>vDisks per VM</td>
<td>60 per VM</td>
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</tbody>
</table>

**Native Snapshot Best Practices**

**Important**

Always use the HX Data Platform Snapshot feature to create your first snapshot of a VM. This ensures that all subsequent snapshots are in native format.

- Do not use the VMware Snapshot feature to create your first snapshot.

  VMware snapshots use redo log technology that result in degraded performance of the original VM. This performance degrades further with each additional snapshot.

  Native format snapshots do not impact VM performance after the initial native snapshot is created.

  If you have any redo log snapshots, on the ESXi hosts where the redo log snapshots reside, edit the /etc/vmware/config file and set snapshot.asyncConsolidate="TRUE".

- Add all the VMDKs to the VM prior to creating the first snapshot.

  When VMDKs are added to the VM, additional SENTINEL snapshots are taken. Each additional SENTINEL consumes a space for additional snapshots.
For example, if you have an existing VM and you add 2 new VMDKs, at the next scheduled snapshot, 1 new SENTINEL is created. Check the snapshot schedule retention number to be sure you have sufficient snapshot slots available; one for the new SENTINEL, one for the snapshot.

• When creating large numbers of snapshots consider the following:
  • Schedule the snapshots at a time when you expect data traffic might be low.
  • Use multiple resource pools or VM folders to group VMs rather than a single resource pool or VM folder. Then stagger the snapshot schedule by group.
    For example resourcePool1, schedule snapshots at :00, resourcePool2, schedule snapshots at :15, resourcePool3, schedule snapshots at :30.

• If you have your vCenter running on a VM in the storage cluster, do not take a native snapshot of the vCenter VM. This is related to VMware KB, VMware VirtualCenter Server service fails due to a quiesced snapshot operation on the vCenter Server database virtual machine (2003674), at https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2003674

Understanding SENTINEL Snapshots

When you create the first snapshot of a VM, through either Snapshot Now or a Scheduled Snapshot, the HX Data Platform plug-in creates a base snapshot called a SENTINEL snapshot. The SENTINEL snapshot ensures follow-on snapshots are all native snapshots.

SENTINEL snapshots prevent reverted VMs from having VMware redo log-based virtual disks. Redo log-based virtual disks occur when an original snapshot is deleted and the VM is reverted to the second oldest snapshot.

SENTINEL snapshots are in addition to the revertible native snapshot. The SENTINEL snapshot consumes one snapshot of the total 31 available per VMware limitation.

Using SENTINEL snapshots
  • Do not delete the SENTINEL snapshot.
  • Do not revert your VM to the SENTINEL snapshot.

Native Snapshot Timezones

There are three objects that display and affect the timestamp and schedule of snapshots:
  • vSphere and vCenter use UTC time.
  • vSphere Web client uses the browser timezone.
  • HX Data Platform plug-in, storage cluster, and storage controller VM use the same timezone. This is enforced across the storage cluster. The timezone used by these is configurable. The default is UTC.

The storage controller VM time is used to set the schedule. The vSphere UTC time is used to create the snapshots. The logs and timestamps vary depending upon the method used to view them.
When a schedule is created, the scheduled times are converted to UTC. When you view the schedule through the HX Data Platform plug-in, it displays the controller VM time. When you view a completed snapshot in the vCenter events log, it displays the UTC time.

Because it is possible to have different timezones applying to each object, the event messages and schedules that display in the HX Data Platform plug-in and the vCenter logs might not appear in sync. However, this is only an artifact of the timezones assigned to each display option. When converted to the same timezone, they translate to the same time. For example: 5:30pm PST, 8:30PM EST, 1:30AM UTC are all the same time.

To have vSphere Scheduled Task tab display the same time for a Scheduled Snapshot that you create in the HX Data Platform plug-in, set the storage controller VM to UTC.

To have Scheduled Snapshots run based on local time zone settings, set that timezone for the storage cluster. By default, the storage controller VM uses the UTC time zone set during HX Data Platform installation.

vSphere scheduled tasks lists. If the vSphere and the storage controller VM are not using the same timezone, the vSphere Scheduled tasks tab might display a different time than the scheduled in the HX Data Platform Schedule Snapshot dialog.

vSphere task completed lists. When you configure an hourly snapshot, the snapshot schedule runs between a specific start time and end time. The vSphere Task Window might display a status that a scheduled snapshot was completed outside the hourly end time. This message indicates that vSphere confirmed that the sequence of snapshots are complete.

At the designated hour, vSphere checks if a snapshot should be created and if it is outside the end time, vSphere confirms that a snapshot is not needed, and posts a status message that says the larger task (of taking a series of hourly snapshots) is complete.

Identify and set the timezone used by the storage controller VM

1. From the storage controller VM command line, view the set timezone.
   
   `$ stcli services timezone show`

2. Change the storage cluster timezone.
   
   `$ stcli services timezone set --timezone timezone_code`

   See a timezone reference for timezone codes, such as
   

Creating Snapshots

Before you begin

If you have any redo log snapshots for VMs in the HX storage cluster, edit the ESXi host configuration where the redo log snapshots reside. If this step is not completed, VMs might be stunned during snapshot consolidation.

Redo log snapshots are snapshots that are created through the VMware Snapshot feature and not through the HX Data Platform Snapshot feature.

1. Login to the ESXi host command line

2. Locate and open for editing the file, `/etc/vmware/config`

3. Set the `snapshot.asyncConsolidate` parameter to TRUE.
Scheduling Snapshots Overview

You apply snapshot schedules to storage cluster objects: VMs, VM folders, or resource pools.

You can schedule a snapshot to adjust your backup requirements. For example, you can retain more frequent snapshots of critical data. If there is a disaster, you can restore recent snapshots or create a custom real-time snapshot. For less critical data, you do not need to create frequent snapshots or retain backup copies.

Snapshot scheduling enables you to control the costs of using backup. For each VM in your storage cluster, you can schedule hourly, daily, or weekly snapshots. The maximum frequency for any specific VM is once per hour. Hourly setting is in 15 minute increments.

For example, snapshots are taken each day, given the following settings.

- VM 1 hourly snapshots to run at hour:15 minutes, between 10 PM and 1 AM.
- VM 2 hourly snapshots to run at hour:30 minutes, between 8 PM and 12 AM.
- VM 3 and 4 hourly snapshots to run at hour:45, between 6 AM and 8 AM.
- VM 5 daily snapshot to run at 6:00 AM

Each day these snapshots are taken.

- 6:00 AM — VM 5
- 6:45 AM — VM 3, VM 4
Scheduling Snapshots

Step 1
From the vSphere Web Client Navigator Home page, select the VM, VM folder, or resource pool list.
For example, vCenter Inventory Lists > Virtual Machines to display the list of VMs in vCenter.

Step 2
Select a storage cluster VM, VM folder, or resource pool and open the Actions menu.
Either right-click the object or click the Actions menu.

Step 3
From the Actions menu, select Cisco HX Data Platform > Schedule Snapshot to display the Schedule Snapshot dialog box.

Step 4
Select the snapshot frequency.
Click the boxes for hourly, daily, and/or weekly frequency and set the starting days, times, and duration.

Step 5
Set the number of snapshots to retain.
When the maximum number is reached, older snapshots are removed as newer snapshots are created.

Step 6
Unselect existing scheduled items, as needed.
If a previous schedule existed, unselecting items deletes those items from the future schedule.

Step 7
Click OK to accept the schedule and close the dialog.

Setting the Frequency of Scheduled Snapshots

Create a snapshot every hour at specific times, daily at a specific time, or weekly on selected days and times.
Before you begin
Open the Schedule Snapshot dialog box for a VM, VM folder, or resource pool.

Step 1
From the Schedule Snapshot dialog box, select the Enable Hourly Snapshot, Enable Daily Snapshot, or Enable Weekly Snapshot check box.

Step 2
Click the Start at drop-down list to select a start time. Select hour, minutes in 15 minute increments, and AM or PM.

Step 3
For an hourly snapshot schedule, click the Until drop-down list to select an end time. Select hour, minutes in 15 minute increments, and AM or PM. Set the minute to the same value as the Start at time.

The HX Data Platform plug-in creates a snapshot of the VM every hour between the start and end times.

Step 4
Select the corresponding check box to specify Days of the week on which you want to take the snapshots.

Step 5
Under Retention, either type a number or use the arrow button to specify the maximum number of copies to retain for each schedule.

Deleting Snapshot Schedules

Step 1
From the vSphere Web Client Navigator Home page, select the VM, VM folder, or resource pool list.

For example, vCenter Inventory Lists > Virtual Machines to display the list of VMs in vCenter.

Step 2
Select a storage cluster VM, VM folder, or resource pool and open the Actions menu.

Either right-click the object or click the Actions menu.

Step 3
From the Actions menu, select Cisco HX Data Platform > Schedule Snapshot to display the Schedule Snapshot dialog box.

Step 4
Unclick the scheduled options you no longer want.

Step 5
Click OK to accept the changes, this includes deleting previously configured schedules, and exit the dialog.

Step 6
Confirm the schedule is deleted.

Select a storage cluster VM, VM folder, or resource pool. Click the vCenter tabs, Manage > Scheduled Tasks. The previous snapshot schedule should not be listed.

Reverting to a Snapshot

Reverting a snapshot is returning a VM to a state stored in a snapshot. Reverting to a snapshot is performed on one VM at a time. This is not performed at the resource pool or VM folder level. Reverting snapshots is performed through the vCenter Snapshot Manager and not through the HX Data Platform plug-in.

Before you begin
Snapshots of the VM must exist.
Step 1  From the vSphere Web Client Navigator Home page, select the VM level, VM folder level, or resource pool level. For example, vCenter Inventory Lists > Virtual Machines to display the list of VMs in vCenter.

Step 2  Select a storage cluster VM and open the Actions menu. Either right-click the VM or click the Actions menu in the VM information portlet.

Step 3  Select Snapshots > Manage Snapshots to open the vSphere Snapshot Manager.

Step 4  Select a snapshot to revert to from the hierarchy of snapshots for the selected VM.

Step 5  Click Revert to > Yes > Close.

   The reverted VM is included in the list of VMs and powered off. In selected cases, a VM reverted from a VM snapshot is already powered on.

Step 6  Select the reverted VM and power it on.

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**Deleting Snapshots**

Deleting snapshots is managed through the vSphere interface and not through the HX Data Platform plug-in.

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Step 1  From the vSphere Web Client Navigator, select VMs and Templates > vcenter_server > Snapshots > datacenter > vm.

Step 2  Right-click the vm and select Snapshots > Manage Snapshots.

Step 3  Select a snapshot and click Delete.

   **Note**  Delete the SENTINEL snapshot by using Delete All option only. Do not delete the SENTINEL snapshot individually.