



Managing Native Snapshots

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HX Data Platform Native Snapshots Overview

HX Data Platform Native Snapshots is 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 can revert to the saved state.

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 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 HyperFlex Data Platform CLI Guide](#).

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

- **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 snapshot 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.

Upgrade

- HX native snapshots are not supported while upgrade of HX, ESXi, or UCS is in progress.

VMs



Note Ensure that Virtual Machine is not attached to Graphic Processing Unit (GPU).



Note For 3.5.2(a) and previous releases, all powered on VMs use synchronous consolidation (asynConsolidate = false) when taking HX snapshots.

For 3.5.2(b) and later releases, all powered on VMs use asynchronous consolidation (asynConsolidate = true) when taking HX snapshots. If the VM is powered off, the settings remain unchanged.

- **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.
- **VM Size** - The maximum size of the Virtual Machine Disk (VMDK) that an HyperFlex snapshot is 3TB. The time taken to snapshot vary depending on the cluster model, cluster load, and I/O workload on the VM.
- **VM Name** - The VM name must be unique per vCenter for taking a snapshot.

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

Object	Maximum Number
Snapshots	30 per storage cluster VMware limit is 31. One snapshot is consumed by SENTINEL.
Datastores	8 per storage cluster
VMs	1024 per host
Powered on VMs	100 per host
vDisks per VM	60 per VM

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 using the HX Data Platform plug-in, the scheduled times are converted to UTC from the storage controller VM timezone. When you view the schedule through the Web Client Schedule Tasks it displays the tasks in browser time zone.

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 Tasks 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.

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.

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 based on the timezone

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

https://en.wikipedia.org/wiki/List_of_tz_database_time_zones

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`.

```
snapshot.asyncConsolidate="TRUE"
```

Step 1 From the vSphere Web Client Navigator, 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.

Note Ensure there are no non-HX Data Platform datastores on the storage cluster resource pool or the snapshot will fail.

Step 3 Select **Cisco HX Data Platform > Snapshot Now** to display the Snapshot dialog box.

Step 4 Type a name for the snapshot in the snapshot dialog box.

Step 5 Type a description of the snapshot.

Step 6 Click **OK** to accept your configuration.

The Recent Tasks tab displays the status message:

```
Create virtual machine native snapshot.
```

```
The first snapshot
```

Scheduling Snapshots Overview

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



Note If you re-register the vCenter cluster, your HX Data Platform snapshot schedule is lost. If this happens, reconfigure your snapshot schedule.

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

7:45 AM — VM 3, VM 4

8:30 PM — VM2

9:30 PM — VM2

10:15 PM — VM1

10:30 PM — VM2

11:15 PM — VM1

11:30 PM — VM2

12:15 AM — VM1

Notice that the last snapshot is before the ending hour:00.

To schedule a snapshot every hour over 24 hours, set the start time, then set the end time one hour before. For example, hour:15, start 4 PM, end 3 PM. This takes a snapshot at 4:15 PM, 5:15 PM, ... 12:15 AM, 1:15 AM ... 2:15 PM, 3:15 PM. Then restarts the 24 hour cycle. Note: The maximum number of snapshots per VM is 32. So, you could only take an hourly snapshot up to 32 hours.

The schedule snapshot displays the set time for the snapshot based on the current time zone setting for the storage controller VM. So, if a snapshot was set at 7 pm PST and the storage controller VM time zone is changed to EST. The next time you open the scheduler window, it automatically updates to 10 pm EST.

Scheduling Snapshots

-
- Step 1** From the vSphere Web Client Navigator Home page, select the VM 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 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 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 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 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 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. See the following table for more details.

Table 1: VM Power State After Restoring a HX VM Snapshot

VM State When HX VM Snapshot is Taken	VM State After Restoration
Powered on (includes memory)	Reverts to the HX VM snapshot, and the VM is powered on and running.
Powered on (does not include memory)	Reverts to the HX VM snapshot, and the VM is powered off.
Powered off (does not include memory)	Reverts to the HX VM snapshot, and the VM is powered off.

Step 6 If the reverted VM is powered off, then select the VM and power it on.

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.
