CHAPTER 22

# Virtual Machine Snapshots

The virtual machine snapshots feature in the VMware vSphere environment often acts as a lifeline for system administrators and IT professionals. VM snapshots allow you to capture the state of a virtual machine at any given moment, offering a safety net for troubleshooting, testing new configurations, and guarding against potential errors.

This chapter explores the intricacies of creating, managing, and deleting snapshots. Additionally, we will explore some considerations to keep in mind throughout the process.

## 22.1 What Are Virtual Machine Snapshots?

Virtual machine snapshots are essentially "point-in-time" captures of a virtual machine's state, including its settings, disk data, and system memory. Think of them as being like a camera snapshot of your VM at a specific moment. They let you go back to that state whenever you need to, which can be very helpful for troubleshooting, trying software updates, or backing out changes.

Snapshots are not full backups, but they offer a quick way to save your VM's state without cloning the entire machine. However, they can consume a lot of storage and degrade performance if not managed properly, so it's important to use them judiciously.


L. Patrão, *VMware vSphere Essentials*, https://doi.org/10.1007/979-8-8688-0208-9_22

One of the problems when using snapshots is that administrators often will start using them as backups, which is a big mistake.

Here are some of the benefits of using virtual machine snapshots:

- They can be used to revert a virtual machine to a previous state. This can be useful if you make changes to a virtual machine and don't like them or experience a problem with the virtual machine.
- They can be used to test software or configurations without affecting the production environment. This can be done by creating a snapshot of the virtual machine, making the changes, and then reverting to the snapshot if the changes are unsuccessful.
- They can be used to create a backup of a virtual machine. This can be useful to protect the virtual machine from data loss.

Here are some of the limitations of using virtual machine snapshots:

- They can degrade performance, because the virtual machine's disks are marked as read-only when a snapshot is created.
- They can lead to snapshot management problems, because keeping track of multiple snapshots can be challenging.
- They are not a complete backup solution. Snapshots only capture the virtual machine's state at the time the snapshot is created. They do not capture changes made to the virtual machine after the snapshot is created.

In a word, snapshots provide a safety net that makes fixing mistakes or other problems easier without affecting the whole system.

# 22.2 Snapshot Files

The types of files for snapshots are described next (previously introduced in Chapter 7).

## 22.2.1 Delta Disk Files

A delta disk file (`.vmdk`) is a writeable file accessible by the guest operating system. The delta disk represents the virtual disk's current state and that state when the previous snapshot was taken. The guest operating system stops writing to the virtual disk, and a delta or child disk is created when you take a snapshot, which also preserves the state of the virtual disk.

Two files are on a delta disk. One is a brief descriptor file that provides details about the virtual disk, including its geometry and parent-child relationships. The raw data is in a corresponding file, which is the other one.

The child disks or redo logs are the names of the files that make up the delta disk. Figure 22-1 shows one of the snapshot `.vmdk` files that belongs to the delta files group. It has all the information about the snapshots, parent, and child for Content ID (CID) and snapshot disk files used.

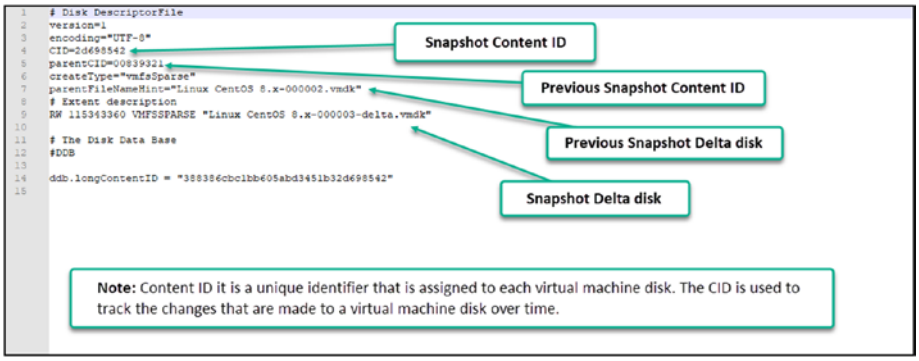


***Figure 22-1.*** *(Snapshots 1 of 14)*

**Note** In managing virtual machine snapshots within VMware, there are several key details to keep in mind that affect how snapshots are handled and stored. These points are crucial for understanding the behaviors and limitations of snapshot technology, particularly in relation to storage and file management. Note the following specifics:

- The value may not be consistent across all child disks from the same snapshot. The file names are chosen based on file name availability.
- If the virtual disk is larger than 2TB in size, the delta file is `--sesparse.vmdk` format.
- With VMFS6, all snapshots will be sesparse regardless of the size.

## 22.2.2 Flat Files

A flat file is one of the two files that make up the base `disk.vmdk` file. The raw data for the base disk is on the flat disk. This file is not shown in the Datastore browser. You need to use the vSphere console and check in the Virtual Machine folder. This is how you see snapshot files in your vSphere Datastore browser. In Figure 22-2 in the vSphere Datastore browser illustrates how snapshot files are displayed.

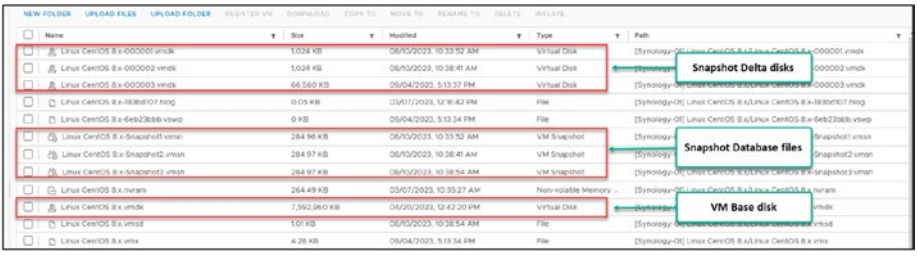


***Figure 22-2.*** *(Snapshots 2 of 14)*

Figure 22-3 shows the files in the Virtual Machine folder. As you can see, the flat file is not shown when you use vSphere Datastore browser. Figure 22-3 also shows the snapshots `.vmdk` files. Those are the files with the CID shown in Figure 22-1.

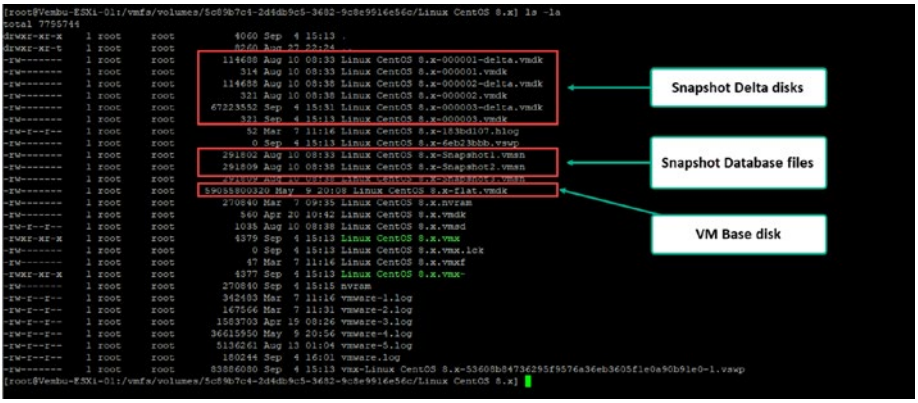


***Figure 22-3.*** *(Snapshots 3 of 14)*

## 22.2.3 Database Files

A database file is a `.vmsd` file is a file that serves as the primary data source for the Snapshot Manager and contains information about the virtual machine's snapshot. This file contains line entries that describe the connections between each snapshot's child disks and previous snapshots.

## 22.2.4 Memory Files

A memory file is a `.vmsn` file that contains the virtual machine's active state. You can go back to a virtual machine state where it is turned on by capturing the virtual machine's memory state. You can return to a virtual machine that is turned off only when using nonmemory snapshots. Compared to nonmemory snapshots, memory snapshots require more time to create. The amount of memory the virtual machine is set to use determines how long it takes the ESXi host to write memory to the disk.

## 22.3 How Snapshots Work

When you create a snapshot, VMware vSphere takes a copy of the virtual machine's disks and memory. The original disks and memory are then marked as read-only. Any changes made to the virtual machine after creating the snapshot are stored in a separate delta file.

When you revert a virtual machine to a snapshot, VMware vSphere restores the virtual machine's disks and memory to their state when the snapshot was created. This means that the virtual machine will be restored to the same state it was in when the snapshot was created.

Figure 22-4 shows a simple example of how snapshots and delta files are handled in different situations. When the first snapshot is created, the virtual machine base disk (vmdk) will now be read-only, and then the snapshot creates new `.vmdk` files (delta files) where all the changes are written.

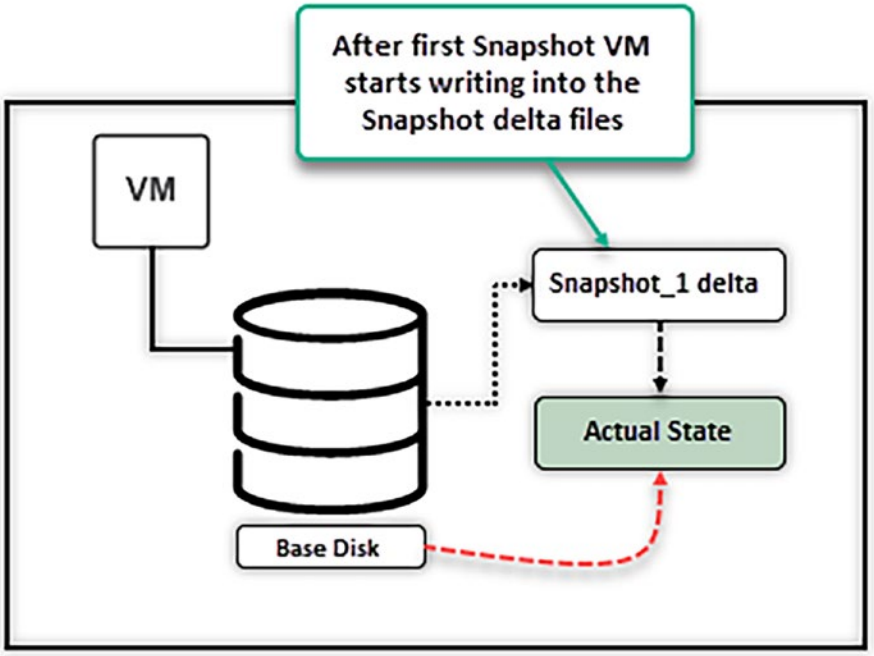


***Figure 22-4.*** *(Snapshots 4 of 14)*

In the example shown in Figure 22-5, we have three snapshots and a VM base disk; the delta files from Snapshots 1 and 2 are read-only, and all the writes are written to Snapshot 3.

But what happens when we delete one of the snapshots? All the snapshot files are deleted and the VM state saved is lost. The change we did in Snapshot 1 should be in Snapshot 2; consequentially, the changes in Snapshot 2 are in Snapshot 3 when we created the latest snapshot. Also, as shown in point 1, VMs only write to the latest snapshot.

What happens when you revert a VM to a snapshot? -e process of restoring a virtual machine to a previous state. When you revert to a snapshot, the virtual machine is rolled back to the point in time when the snapshot was taken. All changes that were made to the virtual machine since the snapshot was created are lost.

Reverting to a snapshot is the process of restoring a virtual machine to its state at a previous point in time. When you revert to a snapshot, the virtual machine rolls back to the moment when that snapshot was taken, and all changes made to the virtual machine after the snapshot was created are discarded. For example, suppose you were working with Snapshot 2 and created a file named 'file `nr 1`' in the VM's guest operating system (e.g., Windows). After this, you created Snapshot 3. All the changes, including the creation of 'file `nr 1`,' are now part of Snapshot 3, which represents your current state.

Understanding the mechanics of snapshots is crucial. It ensures that you don't lose critical data during the revert process and maintains the integrity of your VM's state. With this understanding, let's look at Figure 22-6, which visually demonstrates how snapshot files are organized and how reverting to a specific snapshot affects the current state of a virtual machine.

Then, while in Snapshot 3, you create more files (file `nr 2` and file `nr 3`). Now, you have file `nr 1`, `nr 2`, and `nr 3` in that VM. If you revert from Snapshot 3 to Snapshot 2, you will not see 'file `nr 1`' because it was created after Snapshot 2 was taken and is therefore included in the delta files of Snapshot 3. This change, specifically the addition of 'file `nr 1`,' was saved in the delta files associated with Snapshot 3.

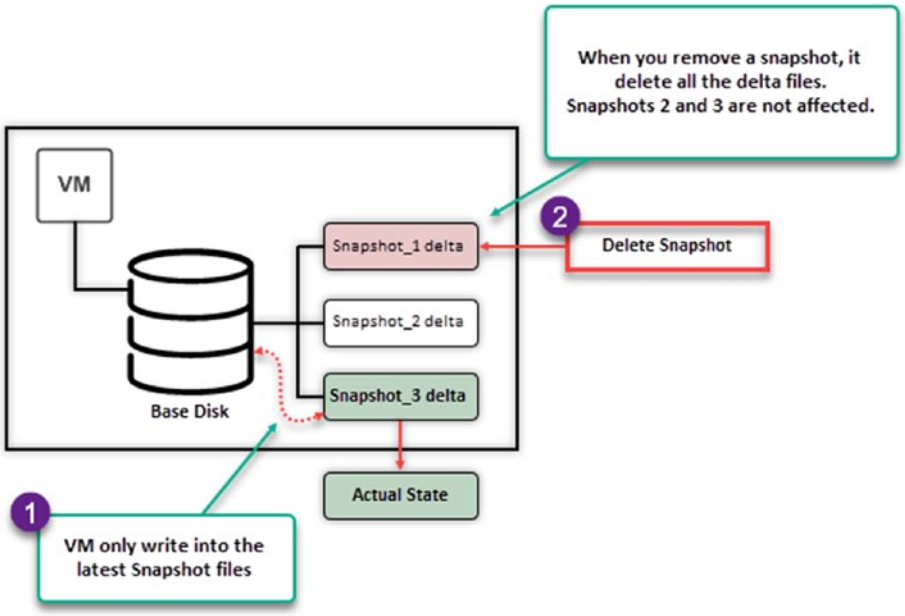


***Figure 22-5.*** *(Snapshots 5 of 14)*

What happens when you revert to Snapshot 3? You will only see the file `nr 1`. Files `nr 2` and `nr 3` are lost when you revert to Snapshot 2.

You can only save files `nr 2` and `nr 3` before reverting to Snapshot 2, by creating a Snapshot 4. Then, on Snapshot 4 you have files `nr 1`, `nr 2`, and `nr 3`, even if you revert to Snapshot 2.

So, that is why it is crucial to understand how snapshots work.

## 22.4 Creating and Managing Snapshots

In this section, we will cover the steps for creating and managing snapshots. Managing snapshots carefully is crucial to avoid issues like snapshot sprawl. We will detail the options available when taking a snapshot, including capturing the virtual machine's memory and quiescing the guest file system for data consistency.

The process of deleting and reverting snapshots will be explained, highlighting the importance of understanding their impact on your virtual machines. The discussion will also extend to disk consolidation, which is necessary when dealing with issues such as orphaned snapshot files or failed snapshot operations. Mastery of these practices is key to ensuring an organized and recoverable virtual machine environment.

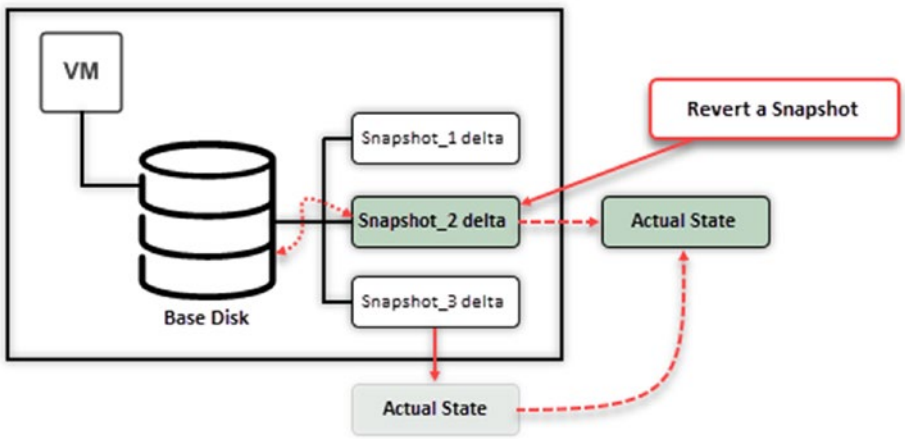


***Figure 22-6.*** *(Snapshots 6 of 14)*

## 22.4.1 Create a Snapshot

Creating a snapshot is a straightforward process. However, don't let the ease of the process lead to snapshot sprawl.

To create a snapshot, right-click your VM, select **Snapshots** in the context menu, and click **Take Snapshot**. Then, as shown in Figure 22-7, you have two options for your snapshot:

- **Include virtual machine's memory**: This option captures the virtual machine's memory state at the time the snapshot is created. This allows you to revert the virtual machine to a specific point in time, even if it

was powered off or suspended when the snapshot was taken. This option is enabled by default.

- **Quiesce guest file system**: This option pauses all writes to the guest file system before the snapshot is created. This ensures that the snapshot captures a consistent view of the file system. This option is disabled by default.

The following are some of the benefits of enabling the *Quiesce guest file system* option:

- It ensures that the snapshot captures a consistent view of the file system.
- It can help to prevent data corruption.
- It can improve the performance of the snapshot operation.

And these are some of the drawbacks of enabling the *Quiesce guest file system* option:

- It can slow down the virtual machine.
- It can disrupt any ongoing operations in the virtual machine.
- It requires VMware Tools to be installed on the virtual machine.

Whether or not to enable the *Quiesce guest file system* option depends on your specific needs. If you need to ensure that the snapshot captures a consistent view of the file system, then you should enable this option. However, if you are concerned about the performance impact or the virtual machine is not actively used, you may want to disable this option and select only the default option. After you make your choice, click **Create**.

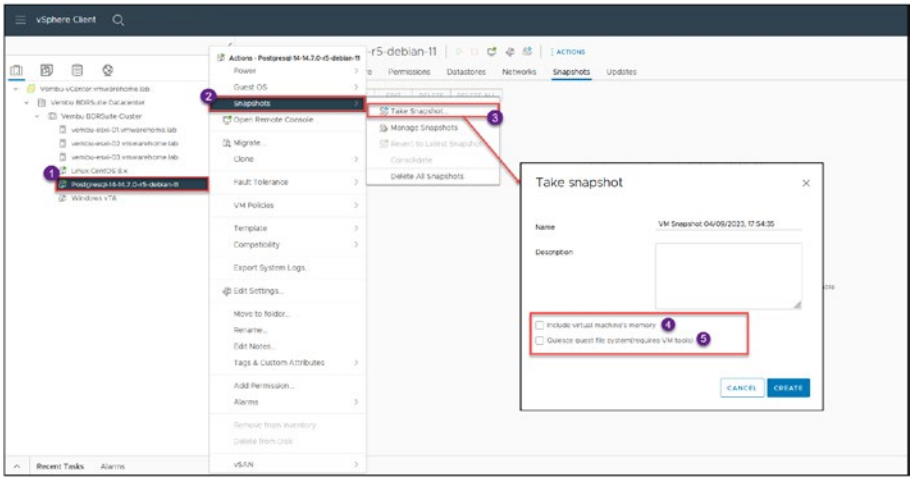


***Figure 22-7.*** *(Snapshots 7 of 14)*

Then, you should see your snapshot in the VM *Snapshots* tab. Figure 22-8 shows the example from the previous section, with three snapshots, and text below Snapshot 3 saying "You are here," referring to the active snapshot.

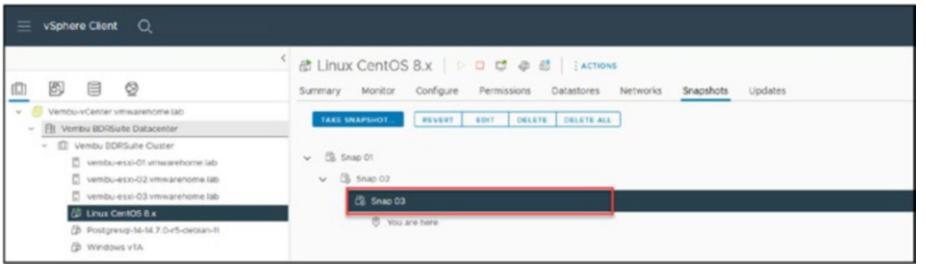


***Figure 22-8.*** *(Snapshots 8 of 14)*

## 22.4.2 Delete a Snapshot

Deleting a snapshot is as easy as creating one. As shown in Figure 22-9, go to the VM **Snapshots** tab, select the snapshot (Snap 02 in the example), and click **Delete**. Confirm your decision by clicking **Delete** in the dialog box.

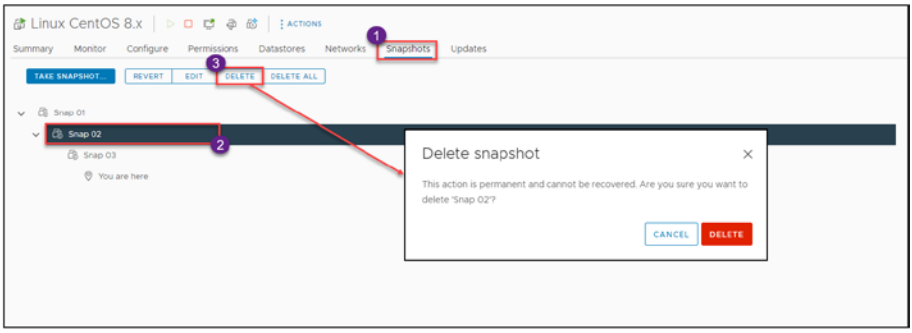


***Figure 22-9.*** *(Snapshots 9 of 14)*

As shown in Figure 22-10, once the snapshot is deleted, the virtual machine is left with only two remaining snapshots. Whether a virtual machine has one, two, or three snapshots, the deletion process is consistent for any number of snapshots.

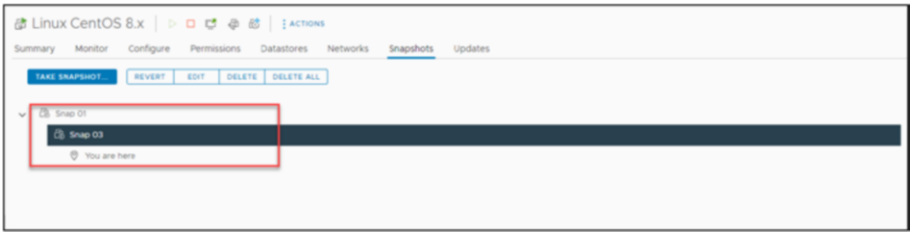


***Figure 22-10.*** *(Snapshots 10 of 14)*

## 22.4.3 Revert to a Snapshot

The earlier section "How Snapshots Work" discussed how reverting to a snapshot works. Here, you will learn how to do it.

On the **Snapshots** tab, select the snapshot and click **Revert**. Before you confirm that you want to revert to the selected snapshot, make sure that you understand how the VM is handled after the reversion (see Figure 22-11):

- When reverting to the snapshot, if you select the option **Suspend this virtual machine when reverting to selected snapshot**, the VM will always revert to suspended regardless of whether the snapshot was taken with the VM powered on or powered off.

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**Note** The suspended option is only when you are reverting a powered-on VM. This option is not shown if you are reverting a powered-off VM.

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- If you create a snapshot with the VM powered on, it will revert with the VM power on, but if the snapshot was created with the VM power off, then the revert will also revert with the VM powered off (VM may reboot).

It is not mandatory, and regardless of how the snapshot was created and how the revert is done, it is always recommended to reboot your VM before making any changes.

As explained in the "Delete a Snapshot" section, you will lose any changes you made to the VM state. To save any changes, create another snapshot before reverting to another snapshot.

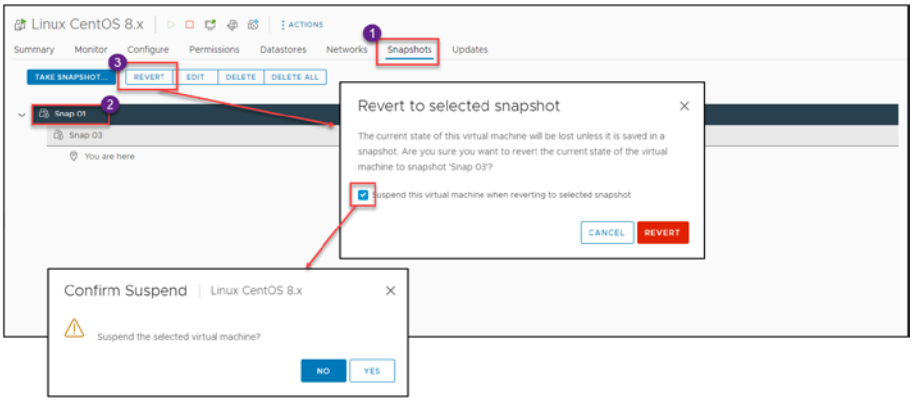


***Figure 22-11.*** *(Snapshots 11 of 14)*

After you revert the VM to the snapshot, the Actual State will change for the specific snapshot.

## 22.4.4 Consolidate Disks

The option to consolidate disks is available only when there is an issue with the snapshots or the delta files.

The *Consolidate* option is used to merge snapshot delta disk files into the main virtual machine disk file when certain conditions arise. Here are the scenarios when you might need to use the *Consolidate* option for a virtual machine:

- **Orphaned snapshot delta files**: Sometimes, due to various reasons like backup operations or failed snapshot deletions, delta disk files (snapshots) can remain even after the Snapshot Manager shows no existing snapshots. These are often referred to as "orphaned snapshots."

- **Backup software**: Many backup solutions use VMware's snapshot technology to capture a point-in-time state of a VM. If the backup software does not correctly delete the snapshot after the backup, you might need to consolidate the disks.
- **Failed snapshot operations**: If a snapshot operation (create, delete, or revert) fails, it might leave behind delta files. In such cases, you might see a warning in the vSphere Client indicating that disk consolidation is needed.
- **Performance issues**: If you notice performance degradation and find multiple snapshot files in the VM's datastore, it might be time to consider consolidation, especially if these snapshots are not actively needed.
- **Storage warnings**: If you receive warnings about the VM's datastore running out of space and you identify unnecessary snapshot files consuming space, consolidating can help free up Storage.

To check if consolidation is needed, in the vSphere Web Client, you can check the virtual machine's *Tasks and Events* tab for messages indicating that disk consolidation is needed. The *Summary* tab for a VM will also show a warning if consolidation is required.

The following are things to keep in mind when consolidating snapshots:

- The consolidation process will generate IOPS on the underlying storage array. If the process is started while the virtual machine is powered on and if the virtual machine requires intensive I/O, performance degradation may be noticed.

- If you have multiple snapshots, you can consolidate them all at once. However, it is recommended to consolidate them one at a time so that you can monitor the virtual machine's performance after each consolidation.
- Consolidation can take many hours to complete depending on the size of VM disks and the snapshot delta file size.

While consolidating, there will be some storage I/O, so performing this operation during off-peak hours or maintenance windows is a good idea to minimize any potential performance impact.

## 22.4.5 Delete All Snapshots

Suppose you need or want to merge all the snapshots into the VM disk and the *Consolidate* option is not available (as just described, it is only available in case of one of the listed errors). In that case, you can select the option **Delete All** on the *Snapshots* tab, as shown in Figure 22-12.

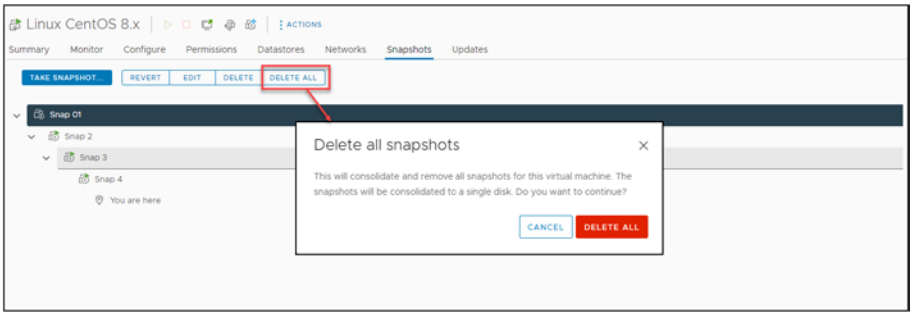


***Figure 22-12.*** *(Snapshots 13 of 14)*

## 22.4.6 Consolidate Disks vs. Delete All Disks

The *Delete all* disks option is similar to the *Consolidate disks* option insofar as both options are available to manage virtual machine disk files, but they serve different purposes. Let's break down the differences:

- **Delete all snapshots**
  - **Purpose**: This option removes all snapshots of a virtual machine, and the changes stored in the snapshot delta disks are committed back to the original base disk.
  - **How it works**: When you choose this option, vSphere commits the most recent snapshot disk changes into the base disk. Once that's done, it moves to the next snapshot in the hierarchy, and so on, until all snapshot delta disks are committed and deleted.
  - **Use case**: This option is typically used when you no longer need any of the snapshots you have created. For instance, after testing a software patch, if everything works fine, you might decide to delete all snapshots to reclaim storage space and reduce complexity.
- **Consolidate disks**
  - **Purpose**: This option is used when orphaned snapshot delta disk files are not associated with any snapshot entry in the Snapshot Manager. This can happen due to failed snapshots or backup operations.

- **How it works**: When you choose this option, vSphere checks for any orphaned delta disks and, if found, merges the changes from those delta disks back into the base disk or parent snapshot disk.
- **Use case**: This option is used when there is a discrepancy between the Snapshot Manager and the actual snapshot files present in the datastore. For instance, if the Snapshot Manager shows no snapshots, but there are still delta disk files in the datastore, you use *Consolidate* to clean up and merge those files.

*Delete all snapshots* is a proactive action you take when you want to remove all snapshots and their associated delta disks.

*Consolidate* is more of a corrective action used to resolve inconsistencies between the Snapshot Manager and the actual snapshot files on the datastore.

The following image provides a quick guide to the differences:

| Feature | Delete All Snapshots | Consolidate Disks |
|---|---|---|
| Removes snapshots | Yes | No |
| Removes delta disk files | Yes | Yes (redundant only) |
| Revert to snapshots | No | Yes (not deleted) |
| Frees up storage space | Yes | Yes (if redundant delta disk files are large) |
| Performance impact | May impact performance | May impact performance if started while VM is powered on |

One trick when it is not possible to consolidate the disks (error or files not properly deleted) is to create a new snapshot (even if there are no snapshots in the Snapshot Manager) and after the snapshot is created, select the option **Delete all snapshots**.

This trick can fix the problem and bypass the issue with the consolidation disks.

As previously explained, all files are merged to the VM disk in both scenarios, but in a different way.

Figure 22-13 provides a schematic view of a VM with multiple snapshots and the base disk. It illustrates the consolidation process, where all delta disks associated with the snapshots merge back into the base disk of the VM. This diagram is particularly helpful in understanding the concept of snapshot consolidation and the 'Delete all Snapshots' method, which is useful for resolving certain consolidation issues.

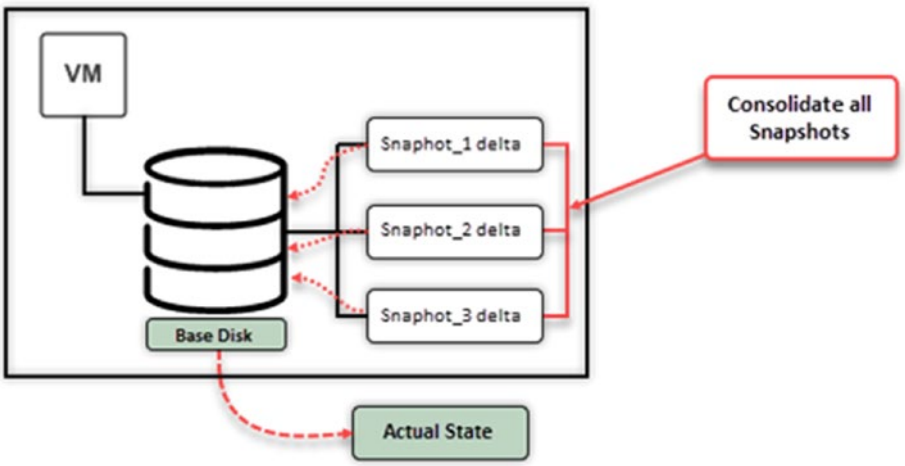


***Figure 22-13.*** *(Snapshots 14 of 14)*

Monitoring the progress and ensuring storage capacity in the datastore is crucial to prevent any problems. Furthermore, carrying out these tasks during periods is advisable to minimize any potential impact on performance.

While consolidating disks or deleting all snapshots, there will be some storage I/O, so performing this operation during off-peak hours or maintenance windows is an excellent idea to minimize any potential performance impact.

## 22.5 Snapshot Best Practices

First and foremost, it's essential to reiterate: *snapshots are not backups.* They are meant to capture the state of a VM at a specific point in time, providing a temporary safety net for short-term tasks like testing or troubleshooting. They are not designed for long-term data retention or recovery.

The following are some guidelines to create and manage your snapshots:

- **Limit the number**: Avoid having too many snapshots for a single virtual machine. It's generally recommended to keep only a few snapshots and not to rely on them as long-term backups.
- **Retain them no longer than 48 hours**: Best practices recommend that snapshots be retained for no longer than 24 to 48 hours, for the following reasons:
    - **Performance**: The longer a snapshot is kept, the larger its associated delta file grows. This growth can lead to increased I/O operations, impacting the performance of the VM and potentially the entire datastore.
    - **Storage**: Extended retention of snapshots can consume significant storage space, leading to potential issues if the datastore runs out of space.
    - **Complexity**: The more snapshots you have, especially in a chain, the more complex and time-consuming the consolidation process becomes.
    - **Reality check**: Despite these guidelines, it's not uncommon to find VMs with snapshots that have been retained for weeks or even months.

  - **Lack of awareness**: Some administrators might not fully understand the implications of retaining snapshots for extended periods.
  - **Forgetfulness**: In busy IT environments, administrators might create a snapshot and then forget to delete it after the intended task is completed.
  - **Misuse**: Sometimes, due to misconceptions or lack of proper backup solutions, snapshots are incorrectly used as a pseudo-backup mechanism.

  Snapshots are best used for short-term purposes, like testing a new patch or configuration. It's a good idea to delete snapshots once they're no longer needed, to free up Storage and maintain performance.

- **Monitor storage**: Snapshots can quickly consume storage space, especially if there's a lot of disk activity. Regularly monitor your Storage to ensure you don't run out of space.
- **Avoid chain reactions**: Try not to create long chains of snapshots. The longer the chain, the more complex the merge process becomes when you decide to delete or revert.
- **Document**: Always document the reason for creating a snapshot, its expected lifespan, and any other relevant details. This makes management easier, especially in environments with multiple VMs and administrators.
- **Regularly review**: Periodically review and manage your snapshots. Old and unnecessary snapshots can be deleted to reclaim Storage and improve performance.

Remember, snapshots are resource-intensive and can affect performance if not managed well, so it's best to use them wisely.

## 22.6 Impact on VM Performance and Storage Performance

As discussed in previous section, snapshots can significantly impact your VM and Storage performance. Snapshots, while incredibly useful, come with their own set of challenges, especially when not managed appropriately. The impact on both VM performance and Storage can be significant, and understanding these implications is crucial for any administrator.

### 22.6.1 Impact on VM Performance

When not managed correctly, snapshots can introduce several performance-related challenges for virtual machines.

When a snapshot is created, the virtual machine's disk is split into two parts: the base disk and the delta disk. The base disk contains the original state of the virtual machine's disk, and the delta disk contains the changes made to the disk since the Snapshot was created.

When the virtual machine is running, all writes to the disk are first written to the delta disk. The delta disk is then periodically merged back to the base disk. This process can slow down the virtual machine's performance, especially if many changes are being made to the disk.

The number of snapshots taken can further exacerbate the performance impact of snapshots. Each snapshot creates a new delta disk, adding up to a significant amount of disk space. This can lead to storage fragmentation, further slowing down the virtual machine's performance.

Understanding the impacts of snapshots on VM performance is crucial for effective virtual infrastructure management. Here are some key factors to consider:

- **Disk I/O overhead**: With the creation of a snapshot, a new delta file is formed. All new writes to the VM's disk are redirected to this delta file, while the original disk becomes read-only. This redirection process adds extra I/O operations, potentially slowing down the VM, especially when multiple chained snapshots exist.
- **Snapshot consolidation**: When you decide to delete or consolidate snapshots, the data from the delta files needs to be merged back into the main disk. This merging process is I/O intensive, which can lead to noticeable performance degradation for the VM during the consolidation period.
- **Memory overhead**: If the VM's memory state is included in a snapshot, it can impact the VM's performance, because the snapshot will consume additional Storage equivalent to the VM's allocated RAM, which can affect the VM's operations, especially if memory resources are constrained.
- **Fragmentation**: As snapshots are created and deleted, disk fragmentation can occur. Fragmented snapshot delta files can result in slower disk access times, which in turn affects the VM's responsiveness.

## 22.6.2 Impact on Storage Performance

The implications of snapshots extend beyond just the VM's performance. Snapshots can also have a significant impact on Storage.

A new file is created on the storage device when a snapshot is created. This file can be quite large, especially if many changes have been made to the virtual machine's disk since the last snapshot was created.

The creation of new snapshot files can put a strain on the storage device, especially if there are a lot of snapshots being created. This can lead to performance degradation, such as increased latency and reduced throughput.

In addition, the need to merge delta disks back to the base disk can also put a strain on the storage device. This process can be especially time-consuming if there are a lot of delta disks to merge.

Considering the impact of snapshots on storage utilization is essential for maintaining a healthy virtual environment. Here are some factors to keep in mind:

- **Storage space consumption**: Delta files grow as they accumulate changes. If snapshots are retained for long durations, these delta files can consume a large portion of storage space. This diminishes available space in the datastore and can lead to scenarios where VMs might pause or even crash if the datastore runs out of space.
- **Memory storage**: Snapshots that include the VM's memory state will use additional Storage equivalent to the VM's allocated RAM. In environments with multiple memory-intensive VMs, this can quickly consume significant Storage.

To mitigate these performance and storage issues, follow these (previously discussed) best practices:

- Limit the duration and number of snapshots.
- Monitor Storage regularly to ensure adequate free space.
- Delete old snapshots regularly.
- Schedule snapshot-related tasks during off-peak hours to minimize disruption.
- Consider using faster storage solutions, like SSDs, for datastores that frequently use snapshots.

## 22.7 Identifying and Resolving Snapshot Issues

Snapshots of machines are incredibly useful in managing VMware, as they provide flexibility in performing operations on VMs. However, it's important to be aware of issues that may arise when using them. In this section we will explore problems related to snapshots and practical solutions for resolving them. By understanding the strengths and limitations of snapshots, you can effectively utilize them while minimizing any impact on your virtual environment. This knowledge is crucial for maintaining the health and performance of your VMs, ensuring that snapshots serve as an asset rather than a hindrance in your infrastructure.

### 22.7.1 Orphaned Snapshots

As previously introduced, orphaned snapshots are snapshots that, for various reasons, exist on the datastore but don't appear in the Snapshot Manager. Navigating through the Datastore browser can help locate these

elusive files. Once identified, they can be manually deleted, but always ensure you have a backup before taking such actions. In situations where the path forward isn't clear, consolidating the VM's disks can be a safer approach, as it should integrate any data from orphaned snapshots.

## 22.7.2 Datastore Space Depletion

Datastore space depletion can be due to snapshots that have grown too large or have been retained for extended periods. When the datastore's space starts running low, VM operations can be interrupted, leading to potential downtime or data loss. Regularly monitoring the size and age of snapshots and being proactive in deleting those no longer needed can help mitigate this risk. In more dire situations, moving VMs to a different datastore might be necessary to free up space.

## 22.7.3 Performance Dips

Performance dips result from long snapshot chains or extended snapshot durations. In such cases, the VM might become sluggish, particularly in tasks that involve disk operations. Deleting or consolidating these snapshots can often alleviate performance issues and improve VM responsiveness. However, it's worth noting that certain snapshot operations, especially those involving quiescing the file system or capturing the VM's memory state, can cause the VM to momentarily "stun" or freeze. While this is expected behavior, it can be minimized by scheduling these operations during times when the VM's workload is light.

## 22.7.4 Failed Snapshot Operations

Sometimes, for various reasons such as lack of space, file locks, or other processes interfering, snapshot operations like creation, deletion, or reversion might fail. When this happens, it's essential to check the VM's

logs to get a clearer picture of the underlying issue. Resolving the problem might involve freeing up space, releasing file locks, or using command-line tools to manage the snapshot.

### 22.7.5 Backup Software Clashes

Some backup solutions leverage VMware's snapshot technology to capture a point-in-time state of a VM. If not configured correctly, these tools might leave behind snapshots after the backup is completed. Regularly checking the backup software's logs and ensuring it's set up to delete snapshots post-backup can prevent this issue.

### 22.7.6 Misconfigured Alarms and Notifications

Ensuring that alarms and notifications related to snapshots are correctly configured is essential. These alarms can be invaluable in alerting administrators to potential issues, such as snapshots that have grown too large or retained for too long. Ensure correct configuration for timely alerts.

## 22.8 Summary

In this chapter you explored the intricacies and practical aspects of virtual machine snapshots, including how to manage and troubleshoot them.

We now shift our focus to a topic that greatly impacts the functioning of different VMware environments: Enhanced vMotion Compatibility (EVC) mode. Chapter 23 begins by explaining what EVC mode is and what purpose it serves in virtualized environments. This will involve examining the advantages and limitations of EVC mode, providing an understanding of how it optimizes VM migrations.

Next, we will explore the requirements for implementing EVC mode to ensure an understanding of what is needed for its effective use. We will then move on to discussing the aspects of enabling and configuring EVC mode. I'll provide you with step-by-step guidance to help you seamlessly integrate EVC into your VMware setup.

Finally, I'll cover some practices and considerations when working with EVC mode. We'll focus on maximizing its benefits while addressing any challenges. This chapter aims to equip you with the knowledge and skills to leverage EVC mode for enhanced compatibility and flexibility in your virtual machine operations.