



Retrospect Backup

File-Based vs Image-Based Backup and Retrospect's Data-Centric Approach

Backup Less. Manage Less. Worry Less.

Businesses have two critical needs for data protection and recovery:

- **Individual Files:** Recover a file or a set of files, in their original location or in a new location.
- **Entire Systems:** Recover an entire system using disaster recovery or bare-metal recovery (BMR), in a similar hardware configuration, a different hardware configuration, or in a virtual machine (VM).

Data protection solutions have two different approaches to these: file-based backup and image-based backup. Both approaches, done correctly, allow businesses to recover both individual files and entire systems.

Let's look at the benefits and tradeoffs of the two approaches.

File-Based Backup

File-based backup uses the file system to read and protect data. Some solutions, like Retrospect Backup, utilize file-based backup with additional tools to support file recovery and system recovery.

Most cloud backup services use the file-based approach. They focus on folders that customers typically store data in (e.g. "My Documents" on Windows and "Documents" on macOS), and they back up those folders automatically to cloud storage, running periodically to check for new or changed files. While this approach reduces the time that a backup takes and satisfies a significant number of customers, excluding data from the backup will miss important files and prevents disaster recovery.

Other file-based solutions can back up the entire contents of a system, including the system state, application state, disk layout, and boot information. This approach allows businesses to leverage the speed of file-based recovery, restoring a file to the Desktop or to the original location. IT administrators can

even restore an entire folder structure based on settings like "Do not replace newer files", allowing IT to recover a large folder structure in place without determining while files have been touched more recently than the backup. With a file-based backup along with system state, organizations can recover individual files as well as entire systems using the saved disk layout and boot information from Windows.

To capture an accurate backup of a system, file-based backups solutions like Retrospect need to utilize Windows Volume Shadow Copy Service (VSS) to snapshot the system. Retrospect will initiate a VSS Snapshot during every backup, creating an unchanging point-in-time version of the system that it can back up, while the actual system continues to be used. Once the backup is complete, Retrospect lets Windows forget that snapshot and resume writing to the file system normally.

To reduce storage footprint, file-based backups can include or exclude files based on the knowledge of the IT administrator. Cache files, Windows page files, or even music and videos can be excluded, without compromising the ability to restore an entire system. Some also use incremental backups to minimize the storage footprint while ensuring synthetic full backups are available for restore, and they can use block-level incremental backup (BLIB) to only back up the blocks of a large file that changed, further reducing the storage footprint.

Certain file-based backup solutions also support granular backup for applications, such as Microsoft SQL Server and Microsoft Exchange. For instance, Retrospect Backup uses its incremental-for-ever approach to application-aware backups of both SQL and Exchange, reducing the storage required and leveraging its flexible file-based approach.

File-based backup is an extremely flexible approach, letting the IT administrator make intelligent choices specific to their business. However, there are limitations. File-based backup, particularly those using incremental backups to save storage space, do not support

instant system recovery, where an IT administrator is able to launch a system directly from the backup to utilize immediately as a VM. The incremental backups need to be combined into a synthetic full backup for the system to be available. There are paths to mitigate this, such as periodically restoring to a cloud instance that IT can failover to in case of disaster.

Advantages of File-Based Backups

Let's recap the advantages of file-based backups:

- Fine control over every aspect of your backup routine.
- Ability to work with small sets of files which is not usually possible with image backups.
- File fragmentation is greatly reduced if not nearly eliminated in backup archives.
- Easier to restore full backups or migrate data to new or different hardware.
- Generally, more practical for remote backups over a network or Internet. (Note: Some new block level copy technologies are helping image-based backups to gain some ground in this area as well)
- File versioning.
- Deduplication technologies work better on file-based systems.
- Considered by many to be more resilient to error or corruption than imaging technologies.

Image-Based Backup

Image-based backup uses the blocks of data on a volume to read and protect data. Some solutions use image-based backup with additional intelligence to support file recovery and system recovery.

Many enterprise data protection solutions use this approach. They focus on the entire volume, copying all used blocks on a volume for a full backup and then subsequent changed blocks for incremental backups. This approach allows customers to restore entire systems, but it loses the file-level granularity of file-based backup.

To allow better flexibility, a number of solutions also support file-level restore. This granular recovery lets businesses quickly choose a point-in-time recovery for a system, launch, and attach to it, and then retrieve the individual file that they needed. This workflow enables IT administrators to quickly retrieve a lost file. However, no solutions integrate that file-level restore into the original system with ability to leave files that are newer in that folder structure.

Finally, many image-based solutions provide granular recovery protection for applications, such as Microsoft SQL Server and Microsoft Exchange.

For virtual environments, data protection solutions like Retrospect Virtual use this image-based backup approach to protect systems, offer a basic file-level restore workflow, support instant VM recovery, and protect different hypervisors and different virtualized applications.

One workflow where image-based backups excel is instant

VM recovery. For businesses that have a large VM footprint, it's important to have the ability to quickly spin up a VM that goes down, in minutes rather than hours. By letting the virtual infrastructure read directly from the backup storage to read the VM image, the virtual instance can be up and running in a couple minutes.

There are a number of tradeoffs for image-based backups. They can be tied to a certain volume size. If a backup for a 2TB volume only has 250GB of data, the solution might still require a 2TB volume for the recovery. Moreover, image-based backup cannot exclude files that are unnecessary to the system, such as cache files, Windows temporary files, or even music and video. Businesses can achieve system recovery with image-based backups, but they lose the flexibility that file-based backups can provide.

Advantages of Image-Based Backups

Let's recap the advantages of an image-based backup:

- Allows for rapid full system restores including the operating system on the same or very similar hardware.
- Speed and simplicity are unsurpassed when working with large numbers of files.
- Many modern image formats can be mounted and used like any other drive making accessing backed up files very user friendly.
- Performing image backups is generally much less resource intensive than file backups.

Comparison between File-Based Backup and Image-Based Backup

Comparing file-based backups and image-based backups comes down to three main points:

- Disaster Recovery Support
- Restore Flexibility
- Storage Efficiency

Disaster Recovery

Not all file-based solutions offer the same level of protection. To greatly simplify disaster recovery, Retrospect protects different types of data:

- User data files
- System and application state
- Disk layout and boot information for Windows systems

Image-based solutions can be technically simpler because they back up used blocks, capturing the exact state of the disk. File-based solutions are more complicated but can support disaster recovery by backing up every file and folder, including their access rights and other attributes.



Retrospect supports disaster recovery.

Restore Flexibility

File-based backups provides great flexibility in how you choose to restore your data:

- Individual files

- Entire folder hierarchies
- Full systems

Image-based backup focuses on restoring entire systems. A number of solutions can restore very quickly by mounting a backup as an image, but image-based backup solutions fail at advanced file restore support.

✓ Retrospect provides restore flexibility.

Storage Efficiency

File-based backups often require less storage due to a number of reasons.

• **Excluding unneeded files** - OS and applications routinely create various temporary, cache and log files that are unnecessary for disaster recovery. On Windows, some of the large files created by Volume Shadow Copy Service (VSS) and other Windows features under the System Volume Information folder are unnecessary for disaster recovery.

Several image-based products can skip disk blocks occupied by the OS's page file and hibernation file, but not blocks of many of the other large unnecessary files.

• **Not affected by defragmentation** - Mac OS and Windows automatically move files to reduce file system fragmentation.

This causes disk block changes which are backed up unnecessarily by image-based products.

• **Flexibility on what to back up** - File-based backup provides great control for selecting what not to back up, further reducing storage space requirement.

Image-based backup lacks this flexibility and is larger.

✓ Retrospect backups are much smaller than image backups.

Retrospect's Data-Centric Approach

With Retrospect, businesses can recover both individual files and entire systems, both physical servers and endpoints, NAS

volumes and cloud locations, and VMware and Hyper-V virtual environments.

Retrospect Backup uses several different technologies to protect physical servers, desktops, laptops, NAS volumes, email accounts, and cloud locations:

- **File-Based Backup:** User data files and permissions, system and application state, and disk layout and boot information for Windows systems
- **Incremental-Forever:** Incremental backups that Retrospect seamlessly combines into synthetic full backups
- **Windows VSS Snapshots:** Snapshot of Windows servers and desktop systems for a clean backup
- **Block-Level Incremental Backup:** Partial backups of changed blocks within a file to reduce storage
- **Filtering:** Advanced filtering for including or excluding exactly what's needed
- **Scheduling:** Flexible scheduling customizable to any business
- **Policy-Based Backup:** Intelligent backups scheduled based on a business's policy window
- **Automatic Backup Health:** Verification scripts run on a schedule to periodically check and auto-heal backups
- **Disaster Recovery/BMR:** Full system recovery in case the worst happens

For virtual environments and Office 365, Retrospect Virtual provides a great solution for protecting virtual environments with several helpful features:

- **Hypervisor Support:** Support for VMware and Hyper-V
- **Granular Application Support:** Protection for Microsoft SQL, Exchange, and SharePoint
- **File-Level Restore:** Restore individual files and folders from a mounted VM
- **Instant Recovery:** Launch VMs directly from backups to access within minutes
- **Office 365 Support:** Protection for Office 365 online accounts

With Retrospect Backup and Retrospect Virtual, businesses can use Retrospect's data-centric approach to quickly recover from any data loss scenario, either a single file or entire systems.

About Retrospect, Inc.

Retrospect Backup has been protecting data for small and medium businesses for thirty years. We support businesses where they are, with local sales representation and thousands of partners across the world, on six continents and seven languages. Contact us at https://www.retrospect.com/contact_sales.



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