

Resilient File System Overview

19 out of 34 rated this helpful - [Rate this topic](#)

Published: February 29, 2012

Updated: November 1, 2013

Applies To: Windows 8.1, Windows Server 2012, Windows Server 2012 R2

This topic describes Resilient File System (ReFS), a new file system in Windows Server 2012, the deployment scenarios for the new file system, and the new and changed functionality for ReFS in Windows Server 2012 R2.

Feature description

Windows customers want a cost-effective platform that maximizes data availability, scales efficiently to very large data sets across diverse workloads, and guarantees data integrity by means of resiliency to corruption (regardless of software or hardware failures). ReFS is a new file system that targets these needs while providing a foundation for significant future innovations. By utilizing an integrated storage stack comprising ReFS and the new Storage Spaces feature in Windows Server 2012, customers can now deploy the most cost-effective platform for available and scalable data access using commodity storage.

Storage Spaces protects data from partial and complete disk failures by maintaining copies on multiple disks. ReFS interfaces with Storage Spaces to automatically repair the corruption. For more information about Storage Spaces, see [Storage Spaces Overview](#) and the [Storage Spaces](#) Microsoft TechNet blog.

The key attributes of ReFS include:

- Maintaining a high level of data availability and reliability, even when the individual underlying storage devices experience failures.
- Providing a full, end-to-end resilient architecture when used in conjunction with Storage Spaces. When used together, ReFS and Storage Spaces provide enhanced resiliency to storage device failures.

For information about new and updated functionality in Windows Server 2012 R2, see [New and updated functionality](#) later in this topic.

Deployment scenarios

ReFS provides functionality that helps customers store and protect data, regardless of the reliability of the underlying hardware and software stack. This minimizes the cost of storage and reduces capital expenditures for businesses. Customers can deploy a Windows Server 2012 R2 file server attached to a just a bunch of disks (JBOD) storage configuration with Serial ATA (SATA) or Serially Attached SCSI (SAS) drives. Additionally, the deployment could include failover clustering where the customer deploys a scale-out, two-node file server cluster with Storage Spaces, where the cluster uses a shared JBOD storage configuration with SAS drives.

Important functionality

The significant functionality included with ReFS is described as follows:

- **Integrity.** ReFS stores data in a way that protects it from many of the common errors that can normally cause data loss. When ReFS is used in conjunction with a mirror space or a parity space, detected corruption—both metadata and user data, when integrity streams are enabled—can be automatically repaired using the alternate copy provided by Storage Spaces. In addition, there are Windows PowerShell cmdlets (**Get-FileIntegrity** and **Set-FileIntegrity**) that you can use to manage the integrity and disk scrubbing policies.
- **Availability.** ReFS prioritizes the availability of data. Historically, file systems were often susceptible to data corruption that would require the system to be taken offline for repair. With ReFS, if corruption occurs, the repair process is both localized to the area of corruption and performed online, requiring no volume downtime. Although rare, if a volume does become corrupted or you choose not to use it with a mirror space or a parity space, ReFS implements *salvage*, a feature that removes the corrupt data from the namespace on a live volume and ensures that good data is not adversely affected by nonrepairable corrupt data. Because ReFS performs all repair operations online, it does not have an offline **chkdsk** command.
- **Scalability.** As the amount and size of data that is stored on computers continues to rapidly increase, ReFS is designed to work well with extremely large data sets—petabytes and larger—without performance impact. ReFS is not only designed to support volume sizes of 2^{64} bytes (allowed by Windows stack addresses), but ReFS is also designed to support even larger volume sizes of up to 2^{78} bytes using 16 KB cluster sizes. This format also supports $2^{64}-1$ byte file sizes, 2^{64} files in a directory, and the same number of directories in a volume.
- **Proactive Error Correction.** The integrity capabilities of ReFS are leveraged by a data integrity scanner, which is also known as a *scrubber*. The integrity scanner periodically scans the volume, identifying latent corruptions and proactively triggering a repair of that corrupt data.

New and updated functionality

The following table lists the features and functionality that are updated or new to ReFS in Windows Server 2012 R2.

Feature/functionality	New or updated	Description
Corruptions on parity spaces	Updated	When a corruption occurs on a parity space, ReFS automatically corrects the corruption.
Subfolder recovery from ReFS metadata corruption	Updated	When corruption of ReFS metadata occurs, subfolders and their associated files are automatically recovered.
ReFS is available on client operating systems	New	ReFS is now available to use on Windows 8.1.
ReFS registry entry	New	The new RefsDisableLastAccessUpdate registry entry is equivalent to NtfsDisableLastAccessUpdate .
Storage cmdlets in Windows	New	New storage cmdlets, Get-FileIntegrity and Set-FileIntegrity , are available to manage integrity and disk scrubbing policies.

[Corruptions on parity spaces](#)

ReFS can automatically correct corruption on a parity space when integrity streams are enabled to detect corrupt data and because ReFS examines the second (and third) copies that the data parity spaces contain. ReFS then uses the correct version to correct the corruption.

Note

ReFS can already detect corruption on mirrored spaces and automatically repair those corruptions.

[Subfolder recovery from ReFS metadata corruption](#)

When the metadata for a ReFS directory is corrupted, subfolders and their associated files are automatically recovered. ReFS identifies and recovers the files while ReFS remains online. Unrecoverable corruption of the ReFS directory metadata affects only those files that are in the directory in which the corruption has occurred.

[ReFS is available on client operating systems](#)

In Windows 8.1, you have the option to format a storage space as ReFS using mirrored Storage Spaces in Control Panel. ReFS also supports alternate data streams (up to 128K for both Windows 8.1 and Windows Server 2012 R2), which enables Office document thumbnails, Mark of the Web (MOTW), and similar features available on Windows 8.1.

[ReFS registry entry](#)

ReFS includes a new registry entry, **RefsDisableLastAccessUpdate**, which is the equivalent of the previous **NtfsDisableLastAccessUpdate** registry entry. For more information, see [NtfsDisableLastAccessUpdate](#).