



Mac OS X Server

File System Journaling

Enhances the availability and fault resilience of server and storage systems.

Features

- Rapid recovery of large file systems following an unplanned shutdown or power failure
- Automatic logging of file system transactions to ensure file system consistency
- Full compatibility with earlier versions of the Mac OS Extended file system on new or repurposed systems
- Default feature of new volumes created on Mac OS X and Mac OS X Server v10.3

Apple's Mac OS Extended (HFS+) file system offers a robust journaling feature that enhances server availability and improves fault resilience. Journaling protects the integrity of the file system on Xserve and other Mac OS X Server-based systems in the event of an unplanned shutdown or power failure. It helps maximize the uptime of servers and server-attached storage devices by dramatically expediting repairs to the affected volumes when the system restarts.

When a power outage or system failure occurs, it interrupts read and write processes, which can cause discrepancies between the file system directory and the actual location and structure of stored files. In an unjournaled file system, drives are in an unknown state after a failure—meaning there's no record of their activity just prior to the shutdown. Before the server can restart and resume services, it must perform a consistency check throughout the entire file system, block by block. On a multi-terabyte volume, this process can take hours, resulting in unacceptable server downtime.

With journaling in Mac OS X Server, the server automatically tracks file system operations and maintains a continuous record of these transactions in a separate file, called a journal. After an unexpected shutdown, the operating system can use the journal to return the file system to a known, consistent state. This eliminates the need to perform a consistency check on the entire file system during startup. Instead, when the server is restarted, Mac OS X Server simply replays recent transactions in the journal, bringing the system up to date and resuming operations that were interrupted during the failure. With a journaled file system, bringing a volume back online takes just seconds—regardless of the number of files or the size of the volume.

Backward Compatibility

With file system journaling, Mac OS X Server can maintain a write-ahead, block-level journal that provides a record of all file system transactions for a particular volume. Apple's journaling implementation is fully compatible with earlier versions of the Mac OS Extended file system, so it can be applied to an existing volume, without requiring disk reformatting. It can even be applied to an existing RAID set, whether created using software or hardware RAID.

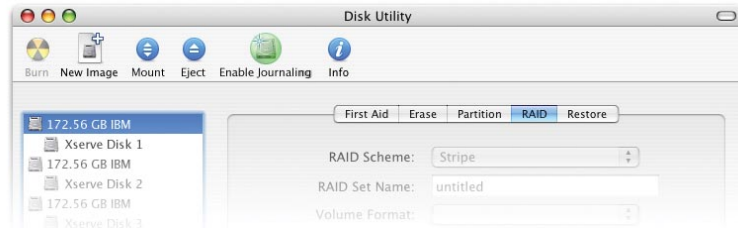
Journaling is transparent to applications running on the server and does not affect compatibility with networked clients. Most third-party disk utilities can be used on journaled Mac OS Extended volumes.*

The Mac OS Extended file system

The Mac OS Extended (HFS+) file system supports 64-bit disk space addressing and features 32-bit file allocation blocks, which maximize disk efficiency by decreasing the disk space usage on large volumes and volumes containing a large number of files. It also allows more descriptive filenames, with support for up to 255 characters and Unicode text encoding for international and mixed-script filenames. Mac OS X Server v10.3 now offers an optional case-sensitive file system format for HFS+, allowing administrators to safely host files for use by UNIX applications that require case sensitivity.

Journaling in Mac OS X Server

Mac OS Extended with journaling is now the default file system for all volumes created in Mac OS X and Mac OS X Server v10.3. You can enable journaling on existing volumes, such as external drives, without reformatting and with only minimal interruption in services. Using the Disk Utility application, select a volume and click Enable Journaling in the toolbar.



Data Protection and Availability

File system journaling is one of several measures recommended to ensure the availability and integrity of business-critical data on servers and server-attached storage devices. However, since journaling does not safeguard the actual contents of files or prevent data loss resulting from a hardware failure, it should be used in conjunction with protected RAID storage and an appropriate backup strategy. RAID technology enables a storage volume to survive a hard drive failure without compromising data integrity or accessibility; backing up the storage system ensures data recoverability in case of a catastrophic system failure. These three techniques—journaling, protected RAID, and backup—together provide maximum protection and availability for your digital assets.

Apple Server Solutions

File system journaling is one of the powerful technologies built into Apple's UNIX-based Mac OS X Server operating system. Combining the latest open source technologies with Macintosh ease of use, Mac OS X Server unleashes the power of Xserve, Apple's rack-optimized server hardware. With phenomenal performance, massive storage capacity, high-bandwidth I/O, and integrated remote management tools, Xserve running Mac OS X Server is an unparalleled server solution for businesses, schools, and research centers.

For More Information

For more information about Mac OS X Server, Xserve, and other Apple server solutions, visit www.apple.com/server.

*Apple recommends checking with individual vendors for specific compatibility requirements.

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