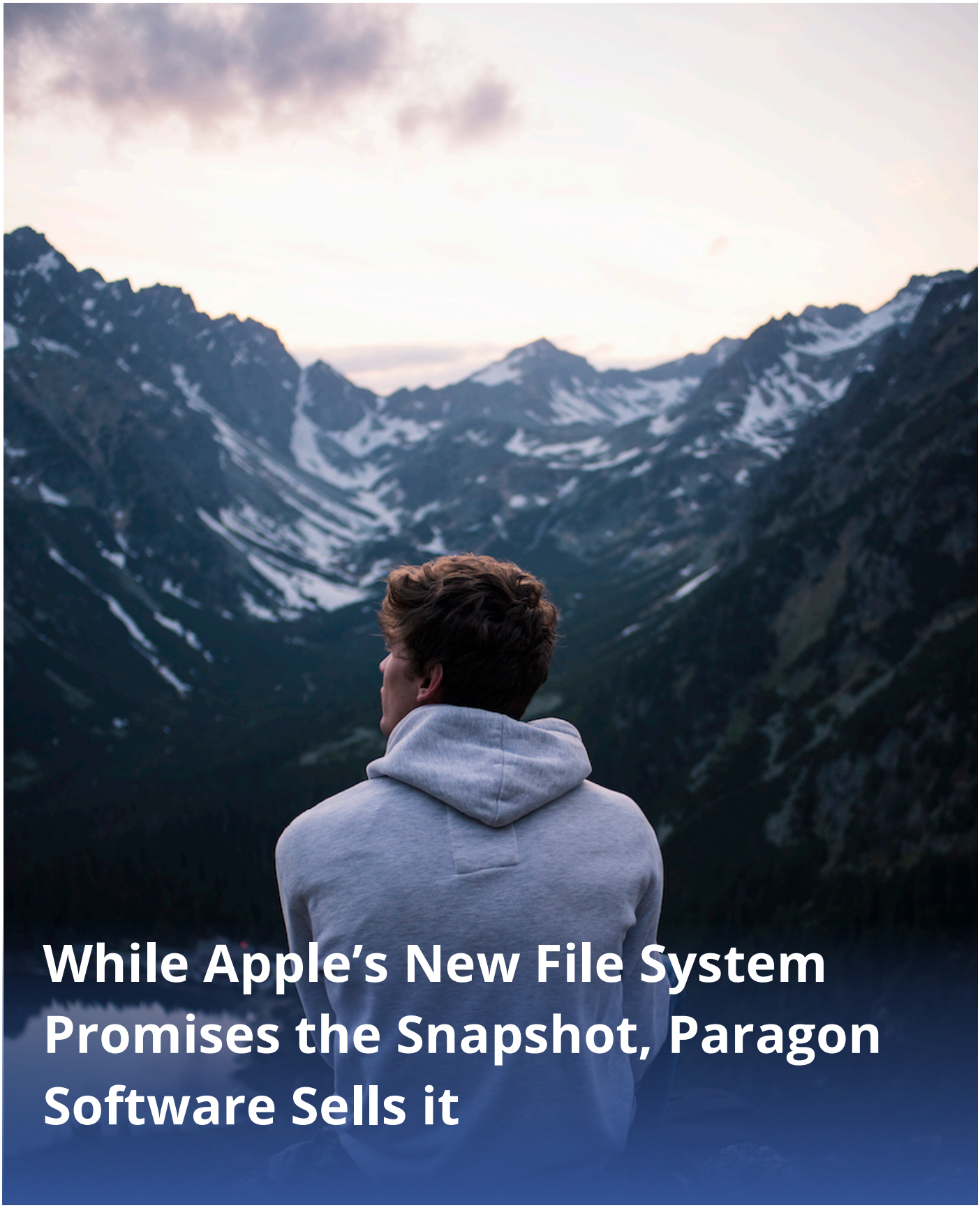

While Apple's New File System Promises the Snapshot, Paragon Software Sells it

Apple File System introduction

One of the most exciting features announced by Apple at WWDC 2016 was a new file system APFS (Apple File System) that's going to replace CoreStorage, FileVault, FusionDrive, and more than a decade old HFS and become the default file system for all Apple gadgets in the coming years, from Apple Watch to Mac computers.

«Snapshot lets you get an instant copy of a file system at a specific point in time, in other words to "freeze" on-disk data, and continue to use and modify that file system while keeping the old data intact»

Among other novelties APFS, whose beta is part of Mac OS Sierra, brings a long anticipated file system mechanism called the *snapshot*. In short, the snapshot lets you get an instant copy of a file system at a specific point in time, in other words to "freeze" on-disk data, and continue to use and modify that file system while keeping the old data intact. It does so in a space-efficient manner, where changes are tracked and only new data blocks take up additional space, which is extremely valuable for regular backup.

There are various snapshot technologies on the market, but the most well-known of all today is Microsoft Volume Shadow Copy Service (VSS), which is integrated into all Windows OS editions since XP. It's no wonder most PC backup vendors are utilizing it instead of developing their own to do online backup of Windows machines. Invoked by a VSS-aware backup utility (*requestor* in terms of Microsoft), VSS saves initial (at the moment of taking a snapshot) state of data blocks resided on disks by creating shadow copies for each volume involved in the process as virtual read-only devices. The backup utility then copies data from these shadow copies to a backup location, while OS and applications keep writing to original volumes. This trick enables to ensure consistency of backup data at a given moment, while allowing standard read/write operations for target storage devices during a backup process. Once the backup task is completed, the shadow copies are deleted.

Obviously, appearance of the snapshot in APFS promises big changes to Time Machine as it could totally replace the creaky and aging mechanism of hard links that it builds and maintains – a slow and resource-consuming process. Currently, Time Machine has to wait until user applications are closed and locked files become available to process, while ignoring system files at all, that's why Mac OS X has a two-step restore procedure: first the user re-installs the operating system and then rolls in-app and user files from a backup image. The snapshot opens a way for fast regular backup imaging of the

«Meanwhile, the only snapshot technology available to Mac users is provided by Paragon Software, one of the leaders in storage management, data backup and migration solutions»

entire system including user files, running applications and OS. And by only saving changes every time a file is updated, a snapshot-based backup app also requires much less disk space. All this promises that in the not-too-distant future Time Machine backups are going to be faster and occupy less space.

Meanwhile, the only snapshot technology available to Mac users is provided by Paragon Software, one of the leaders in storage management, data backup and migration solutions. The concept of the Paragon Snapshot for Mac technology is based on embedding a special filter driver into a kernel input-output (I/O) stack between a block device and a file system. It is aimed at saving initial (at the moment of taking a snapshot) state of data blocks on a disk to provide backup data consistency, while OS or applications keep modifying data on this disk.

So, when attempting to write something to a block device, which snapshot has been taken, the filter driver first copies existing data from the targeted blocks to a special temporary file called the backstore and only then the writing operation is allowed. This way Snapshot for Mac doesn't prohibit re-writing data on the "snapshotted" block device, but only postpone it until the old data is copied to the backstore. Thus, for changed data blocks after taking a snapshot, Snapshot for Mac provides a backup engine the initial data from the backstore, while for unchanged blocks – those stored directly on the block device.

With Snapshot for Mac Paragon Software is offering Mac developers a robust technology to build competitive live imaging and migration utilities. Currently this technology is integrated to the brand-new Paragon Hard Disk Manager for Mac, a powerful all-in-one tool to protect, maintain, and manage OS X systems. This unique software covers all aspects of a Mac's computer life cycle, from drive partitioning and regular backup to system migration, flexible disaster recovery options, and secure wiping of recycled storage.

For more details about the new product or the snapshot technology specifics, please visit our website at http://www.paragon-software.com/technologies/components/snapshot-mac/ or http://www.paragon-software.com/home/hdm-mac/.

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