



## Everything you need to know about Apple File System for macOS

Picture it: the ship date for macOS High Sierra has arrived. Sweat drips down your face; your hands shake as you push “upgrade.” How did I get here? What will happen to my policies? Is imaging dead?

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Fear not, because the move from HFS+ (the current Mac file system) to Apple File System (APFS) with macOS High Sierra is a good thing. And, with this handy guide, you’ll have everything you need to prepare your environment. In short, don’t fear APFS.

# Wait, how did we get here?

HFS, and the little known MFS, were introduced in 1984 with the original Macintosh. Fast forward 13 years, and HFS+ served as a major file system upgrade for the Mac. In fact, it was such a robust file system that it's been the primary file system on Apple devices. That is all about to change with APFS.

Nineteen years after HFS+ was rolled out, Apple introduced APFS, the next generation file system, which is already running on iOS, tvOS and watchOS. But, come the fall of 2017, APFS will ship with macOS High Sierra, which will become the standard file system for devices that have Solid State Drives (SSD).

APFS represents the first large-scale file system change for Apple and the Mac since the advent of Mac OS X (now called macOS), and will bring with it new workflows, features and benefits. Specifically, IT and users benefit from a modern 64-bit file system that helps with space savings and performance improvements, including Flash/SSD-optimization and modern snapshotting techniques. But, APFS also means we have to re-evaluate existing workflows that many rely on in their environments today.

If you're ready to talk imaging, [jump to page 3!](#)

# What's in it for me?

Apple administrators across the globe are attempting to wrap their minds around the impact of the shift to APFS. Consider these benefits to your environment and end users:

- You're probably already using APFS because it first shipped with iOS 10.3, tvOS 10.2 and watchOS 3.2. You're likely using APFS today across other devices in your environment, such as the Apple Watch, Apple TV, iPad or iPhone. And, with macOS High Sierra, Apple extends APFS to the Mac. From the Apple Watch to MacBook Pro, APFS will be the standard across all of the Apple devices in your environment.

- After upgrading to macOS High Sierra, end users will likely see less total space consumed on a volume due to new cloning options. Bonus: End users can store up to nine quintillion files on a single volume.
- APFS provides us with a new feature called snapshots. Snapshots make backups work more efficiently and offer a new way to revert changes back to a given point in time. As snapshots evolve and APIs become available, third-party vendors will be able to build new workflows using this feature. One potential use case in the future includes an administrator taking a snapshot prior to making policy changes. This makes it easier to roll back changes if new policies or scripts result in unintended consequences on systems. Because, let's face it, sometimes you need a roll back. Warning: be careful of data loss for files that changed between a snapshot and rollback.

Unlike the days when all software was shipped on a physical medium, like a CD, Apple has been distributing all of their software over the internet since 10.7 (Lion). This means large spikes in network traffic whenever there is an update.

Thankfully, Apple is addressing this by moving caching services out of macOS Server and making caching directly available within every macOS client using the Sharing System Preference pane. When enabled, the caching service speeds up downloads of Apple software by storing copies on devices on your network.

It also means every device on your network doesn't have to individually download content from Apple every time there is an update. Instead, one copy will be downloaded to a Mac running the caching service and other devices on your network will grab the locally cached version from a Mac with caching services turned on. This also means that if you want to block some clients from caching, you'll want to add an extension attribute to track any users that enable the feature.



# That's great, but what about imaging?

Imaging is a set of technologies used in a variety of deployment scenarios to prepare computers to be put into the hands of end users. This is commonly known as provisioning. A modern provisioning technique involves Apple's Device Enrollment Program (DEP), which automatically configures systems by loading a Mobile Device Management (MDM) profile onto devices when those devices initially connect to the internet. This makes devices more secure, and forces all devices to comply with organizational standards, with IT departments having zero-touch configuration of endpoints.

But, what about software upgrades and updates? Other native Apple tools replace the concept of loading these onto system images, and do so much more securely. With these advancements in deployment technology, there's almost no need to "nuke and pave" a hard drive in a modern Mac deployment. Let's look at the ways IT has used imaging up until this point:

## Monolithic imaging

Where you erase an entire hard drive or volume and re-write it with entirely new data, including the operating system (OS), customizations and applications.

**New for macOS High Sierra:** Apple does not recommend or support monolithic system imaging when updating or upgrading macOS. See Apple's [Knowledge Base](#) article for more details.

## Modular imaging

Similar to monolithic imaging, the entire hard drive is erased. However, a known good operating system is applied first, then components such as configurations and applications are applied on top of it.

## Thin imaging

While technically not imaging, this method assumes the shipping version of macOS is good and simply



applies settings, configurations, and applications on top of the shipping OS via a management tool like Jamf. This is often called "user-initiated enrollment," since it requires a user or IT to manually install an enrollment package. This method is great for scenarios where DEP is not available.

The ecosystem of imaging technologies may be impacted by the advent of APFS. It's increasingly clear that Apple has been pushing IT Admins to convert from device imaging to Apple's DEP-based workflows for some time and for good reason. Traditional imaging techniques can be time consuming to build and maintain because software is updated often and new hardware usually ships with different macOS build numbers.

With a device management solution like Jamf Pro and DEP, you can easily deploy and configure macOS, iOS and tvOS devices at scale without ever physically touching the devices. An end user can take a device out of a box, connect it to the network and the device will automatically enroll into and check in with an MDM solution. An MDM solution then automatically performs all of the configurations required, which allows users to get working quickly (e.g. set up mail clients, distribute certificates, install apps, etc.). Beyond MDM for Mac, Jamf Pro installs the unique Jamf agent, giving IT unparalleled control over devices via scripts, package installations, extension attributes and other technologies.

# Provisioning, re-provisioning, and upgrades OH MY!

Given the time and cost savings, as well as the end-user benefits of DEP, it's no wonder Apple and many Jamf customers are singing DEP's praises. And, with the shift to APFS, DEP offers a solution for organizations looking to bring their workflows up to snuff. It's time to imagine (or re-imagine) the possibilities for your environment. Deployment workflows allow IT to standardize certain settings (Wi-Fi), meet security compliance (enforce a passcode ) and enable end users (customized app set). Here are the three primary deployment workflows to consider and adopt:

**1. Provisioning** – The act of preparing a new device for a user. With macOS High Sierra, organizations should leverage DEP to provision new devices whenever possible. Not only does DEP give your coworkers a world-class end-user experience, it makes life easier for you. Organizations using Jamf Pro can run policies with the Jamf agent and send configuration profiles after DEP enrollment, so the device is set up completely for users while preserving that special Apple experience of opening the box for the first time.

**2. Re-Provisioning** – Re-issuing old hardware to new users often requires erasing the device and starting over – this is where re-provisioning comes into play. You can use Internet Recovery to reinstall macOS High Sierra and leverage DEP (if the device is eligible) to re-enroll. User-based enrollment can be used for non-DEP eligible devices, allowing a user to visit a webpage and walk through a personalized device enrollment experience.

**3. Upgrades** – Installing the latest operating system on a device. When it comes to the latest Apple operating systems upgrades, it is increasingly becoming important to leverage the macOS installer. You must be connected to the internet when you upgrade macOS. This is due to the firmware updates Apple installs on the Mac, further strengthening the security of your fleet. Only the macOS installer can download and install these firmware updates,

validating Apple as the source of the critical firmware. In fact, **installing macOS High Sierra on a Mac connected by Target Disk Mode is no longer a supported installation method.** Here are the recommended paths to addressing upgrades:

- a. For Mac devices that were originally enrolled via DEP and running macOS 10.11 and above, you can utilize the “Download Updates” or “Download and Install Updates” MDM commands to download the latest operating system. This includes major updates like macOS High Sierra. The commands are “Download Updates” or “Download and Install Updates.”
- b. Another option is to pre-package the macOS installer for your users and push it out via a policy. This is known as an “in-place upgrade” and can be deployed on IT's schedule. You can also put it in your enterprise app catalog (such as Jamf Self Service) for the end user to install on their own time.
- c. Use the App Store! If your users are local admins, there's no reason not to get the OS upgrade via Apple's trusted source. It's a good experience for the end user, and you empower them to upgrade on their own. Note: End users can download the app from the Mac App Store for free. Additionally, you can assign the macOS Installer via the Volume Purchase Program (VPP). The installer is deployed to end users, who then need to start the install process on their own (admin rights are required).
- d. Use NetInstall with System Image Utility. NetInstall is technology bundled in macOS Server that is used to cast an installer over a network, and thus bundle software installers, configuration profiles, and other automations on top of the installer. NetInstaller can still be used because it uses the native macOS installers to perform upgrades rather than system images.



## Anything else?

In addition to imaging, provisioning and upgrades, there are a few other workflow considerations to review with your team before you upgrade to macOS High Sierra:

- A new critical step happens during the upgrade process for macOS High Sierra. A macOS firmware upgrade takes place, which allows systems to properly recognize the new file system, as well as other macOS components. This is run as part of the operating system upgrade.
- FileVault and file system reporting changes might mean you need to edit any extension attributes or scripts you previously created, as well as support the new FDE Recovery Key Escrow Payload from Apple.
- When you upgrade to macOS High Sierra on solid-state drives, it is automatically converted to APFS. Fusion Drives and hard disk drives are not converted. APFS may also not work with certain backup tools.
- You cannot share an APFS volume through Apple File Protocol (or AFP) – meaning that if you have a distribution point that leverages APFS, you will need to switch to sharing via SMB.
- Revisit any and all imaging workflows. Existing tools may not function as expected. This, in conjunction with the required firmware updates mentioned above, means IT should not use Block-Copy methods for upgrading to macOS High Sierra.
- Lastly, to ease the transition to the new file system, take advantage of the Apple Beta Software Program. Go to [Developer.Apple.com](https://developer.apple.com) for more details.

**Note:** Journaled HFS+ will continue to be the default file system for certain Macs shipping, like non-SSD drives, with macOS High Sierra.

## Additional Resources

Apple has put together a set of helpful articles on Apple's support website to reference prior to your macOS High Sierra upgrade:

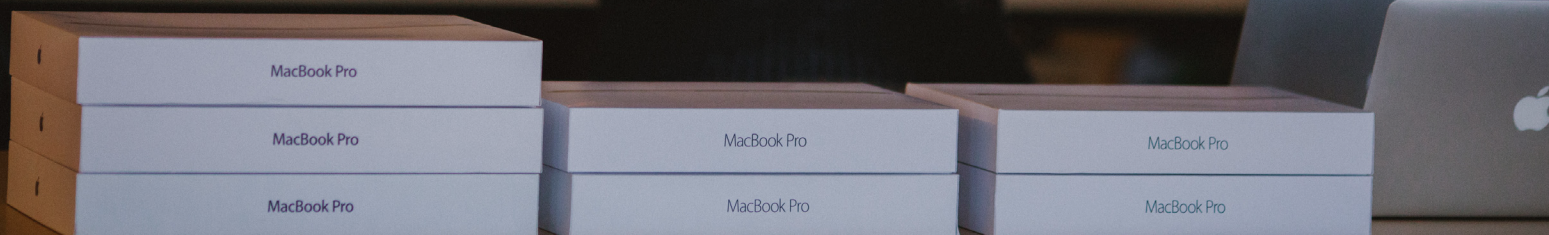
[Prepare your institution for iOS 11, macOS High Sierra or macOS Server 5.4](#)

[Upgrade macOS on a Mac at your institution](#)

[Prepare for APFS in macOS High Sierra](#)

[Prepare for changes to kernel extensions in macOS High Sierra](#)

**With the shift to APFS, DEP offers a solution for organizations looking to bring their workflows up to date.**





## Conclusion

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The moral of the story? The “F” in APFS doesn’t stand for fear. With this guide and the ability to test macOS High Sierra compatibility with Jamf Pro 9.100 and support for new features in Jamf Pro 9.101, you’ve got a full toolbox with everything you need to get ready for APFS. Go you!

Are you ready for macOS High Sierra, iOS 11 and tvOS 11? With Jamf Pro, you will be. Contact us today to learn about Jamf Pro’s upgrade assistance and zero-day support for new features. See why Jamf is the organization trusted by those who trust Apple.



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