Pfeiffer Report

Creative Cloud on Apple Silicon: Key Speed Measures

About this Benchmark Project

This report presents the findings of a market-specific benchmarking project conducted by Pfeiffer Consulting for Adobe. The main aim of the research was **to measure the performance of Creative Cloud flagship apps on the newly introduced Apple M1 MacBook Pro**, compared to the performance of these apps running on an otherwise identical, similarly priced Intel MacBook Pro.

Benchmarks were executed using *Pfeiffer Consulting's Methodology for Productivity Benchmarking*, which has been fine-tuned over more than a decade, and measures the time experienced operators take to execute specific tasks. Please refer to the Methodology section on the last page of this document for more information.

About the Apple M1 Platform

In November 2020, Apple started **transitioning the main processor architecture** used in its desktop and laptop computers from the previously used Intel architecture to Apple Silicon to enable **better performance and lower power-consumption** through the use of a more efficient processor architecture.

This benchmark project analyzes in detail how the first generation of Apple Silicon hardware, the **M1 MacBook Pro, performs in the context of creative workflows**. Benchmarks covered seven essential Creative Cloud applications: **Photoshop**, **Illustrator**, **InDesign**, **XD**, **Premiere Pro**, **Lightroom** and **Lightroom Classic**. Operations benchmarked covered **a wide range of time-consuming tasks** specific to each individual workflow.

Creative Cloud Apps Performance on Apple M1 MacBook Pro

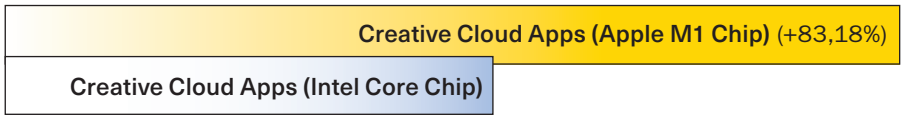


Chart based on the average of all benchmarks of seven essential Creative Cloud apps.
A total of **774 individual benchmark measures** were taken. **Longer is better.**

Executive Summary

- This document presents key results from a benchmark project **comparing performance of Creative Cloud apps** on the recently released Apple M1 hardware platform.
- Individual, segment-specific benchmarks were conducted with **seven essential Creative Cloud apps**.
- Benchmarks showed that, based on all benchmarks conducted, Creative Cloud is **on average over 80% faster using the Apple M1 system** when compared to an identically configured Intel system.
- **Adobe Sensei-powered features** that have been optimized for the Apple M1 machine learning architecture can result in **up to 4x - 6x performance gains.**

How fast is it really? Creative Cloud Application Speed on Apple's M1 platform

The Hardware Conundrum

Reliable, fast hardware is absolutely essential for creative professionals to get their work done. It's not surprising, therefore, that Apple's announcement in 2019 that the company would start transitioning away from the tried and tested Intel architecture used in Macs for almost fifteen years was met with intense interest from professionals around the world.

How smooth could such an important transition be? How long would it be before essential applications such as Photoshop and Illustrator would run natively on the new platform? And, crucially, **how well would these native apps perform**, given the innovative approach Apple was taking?

The Question of Performance

Just seven months after the introduction of the first generation Apple Silicon Macs, **all key Creative Cloud apps are now available** in 'universal binary' versions, meaning that the same program can run on both Intel and Apple Silicon platforms.

But what about performance? **How well do these apps take advantage of hardware features unique to Apple's processor design**, in particular aspects such as unified memory? How does the presence of the **Neural Engine in Apple's chips impact Adobe Sensei-driven features** in Photoshop, Premiere Pro and other apps?

To answer these questions we conducted **comprehensive real-world benchmarks** with seven essential Creative Cloud apps, covering aspects as diverse as application launch, opening and processing complex data-sets, and more. For each individual app—Photoshop, Illustrator, InDesign, XD, Premiere Pro, Lightroom and Lightroom Classic—**the most time-consuming features were measured**.

The results were surprising: There was not a single benchmark where the M1 hardware was slower than the Intel version. There is one caveat, however: to ensure a coherent comparison, **we used identical hardware configurations for both Intel and M1** (See sidebar.) For features that rely heavily on GPU acceleration, however, an Intel Mac with a discreet, powerful GPU can still outperform the current generation of M1 Macs in some areas. There is little doubt, however that Apple will address this in the future as new generations of M1 Macs close any remaining gaps with new Apple Silicon-based Macs.

Benchmark Configurations

▹ **Apple M1:**

13 inch **M1 MacBook Pro**
16GB RAM, 2TB of SSD

▹ **Intel:**

13 inch **Intel Core i5 MacBook Pro**
16GB RAM, 2TB of SSD

Both systems were connected to an **Apple Pro Display XDR** for benchmarks

(See last page for complete Methodology.)

How Creative Cloud Applications Perform on M1

	Intel	Apple M1	*M1 Productivity gains over Intel*
Photoshop – Average of all benchmarks	**22,57**	**11,97**	**+89%**
Top Results Photoshop			
Content Aware Fill 1	37,88	12,62	+200%
Select Subject 1	4,91	1,92	+156%
Illustrator – Average of all benchmarks	**25,96**	**15,73**	**+65%**
Top Results Illustrator			
Scrolling performance (complex vector drawing)	28,15	5,74	+390%
Open file with 31 complex artboards	20,76	9,50	+119%
InDesign – Average of all benchmarks	**22,21**	**13,94**	**+59%**
Top Results InDesign			
Open graphics-heavy file – CPU	6,50	2,28	+185%
Scrolling 100 page book project – GPU	25,23	14,14	+78%
XD – Average of all benchmarks	**10,06**	**5,60**	**+80%**
Top Results XD			
Open complex app prototype	43,11	16,07	+168%
Insert graphic from CC Libraries (copy)	4,48	2,18	+105%
Premiere Pro – Average of all benchmarks	**291,31**	**164,05**	**+78%**
Top Results Premiere Pro			
Scene Edit Detection – 4K	25,51	3,70	+430%
Import XAVC S 4K 100p	19,02	6,63	+187%
Lightroom – Average of all benchmarks	**77,00**	**45,54**	**+69%**
Top Results Lightroom			
Super Resolution	29,87	5,75	+420%
Full-Screen Image Review (Twenty 61MP Images)	71,50	31,74	+125%
Lightroom Classic – Average of all benchmarks	**139,60**	**64,54**	**+116%**
Top Results Lightroom Classic			
Apply Settings (1000 images)	65,23	14,59	+347%
Super Resolution	36,39	9,60	+279%
Average of all benchmarks (774 individual benchmarks measures)	**84,10**	**45,91**	**+83%**

Photoshop Speed on Apple M1

What We Benchmarked

Photoshop performance benchmarks focussed on areas where a user is the most likely having to wait for the program to complete an operation: **opening** or **saving and closing** large files, **resampling** documents of varying size and complexity, and **applying time consuming affects** or processes, such as *Content-Aware Fill* or processing a panorama from several high-resolution files.

Assets used for the benchmarks ranged from **large flat images files**, to **documents with complex pixel-layer structures** and/or **multiple effects layers.**

Analysis of Benchmark Results

On average, **Photoshop was almost 89% faster on M1** than on Intel. Performance gains ranged from just 17% faster for saving and closing a 60MB file **to two to three times faster performance for Adobe Sensei powered features** such as *Content-Aware Fill* or *Select Subject*.

In any case, benchmarks showed that **performance gains scale with the complexity of an operation**: Thus, resampling a relatively small image composition with dozens of layers shows more performance gains than resampling a flat image file.

To sum things up, it seems clear that **Photoshop strongly benefits from, among other aspects, the unified memory architecture of the M1 chip**, as well as **from the acceleration provided for Adobe Sensei-powered features by the Neural Engine** of the chip, as can also be seen in benchmarks of other Creative Cloud apps.

Major Points

- On average, based on 19 workflow benchmarks conducted for this research, Photoshop was **almost 90% faster** using the Apple M1 system.
- Benchmarks of Photoshop on the Apple M1 system seem to indicate **that performance gains increase with the complexity of the assets**, underlining the fact that Photoshop benefits from the advances in the Apple M1 hardware architecture.
- Adobe Sensei-powered features, such as *Select Subject* and *Content-Aware Fill* showed **particularly strong performance gains** over the Intel platform.

Photoshop: Average of all Benchmarks

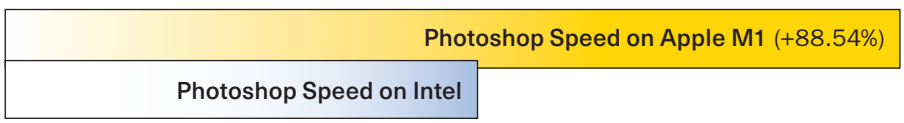


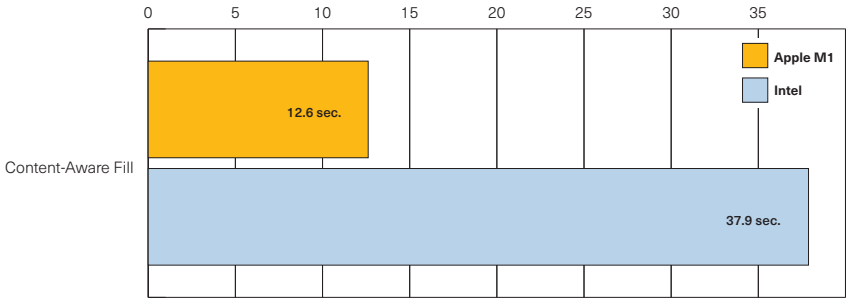
Chart based on the average of 19 workflow benchmarks conducted with Photoshop.
A total of **114 individual benchmark measures** were taken.
Longer is better.

Photoshop on Apple M1: Key Benchmark Results

Content-Aware Fill: To assess the performance of *Content-Aware Fill*, we used a 61MP 16-bit photograph and selected a specific portion of the image, corresponding roughly to 20% of the overall surface. We timed execution from the moment the operation was triggered in the *Content-Aware Fill* dialog.

Photoshop on M1 was **over three times faster** completing the operation.

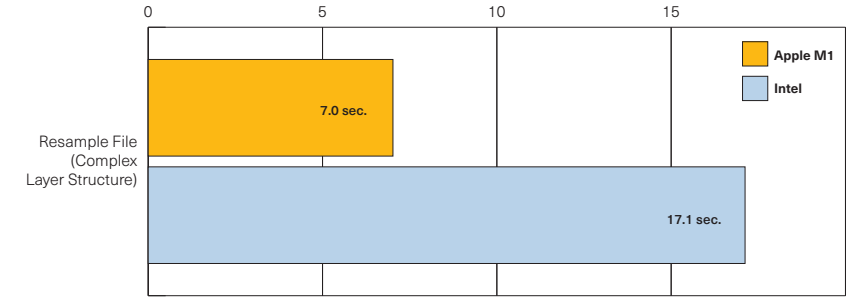
Photoshop Apple M1 Benchmarks: Content-Aware Fill (61MP Image)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Resample File with Complex Layer Structure: The Photoshop composition used for this benchmark was a 45MB professional Illustration with dozens of pixel layers, which was resampled to 200%, using default settings.

Running on the M1 platform, **Photoshop was almost 1.5 times faster** than running on the Intel system.

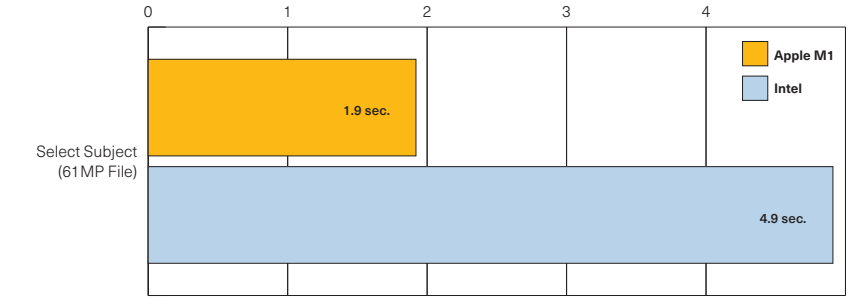
Photoshop Apple M1 Benchmarks: Resample File (Complex Layer Structure)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Select Subject: *Select Subject* relies on Adobe Sensei technology to automatically select the subject in a picture. To benchmark the feature, we used a 61MP 16-bit photograph. Timing was triggered when clicking on the *Select Subject* button, and ended when the selection was processed.

The operation was **three times faster with Photoshop on M1.**

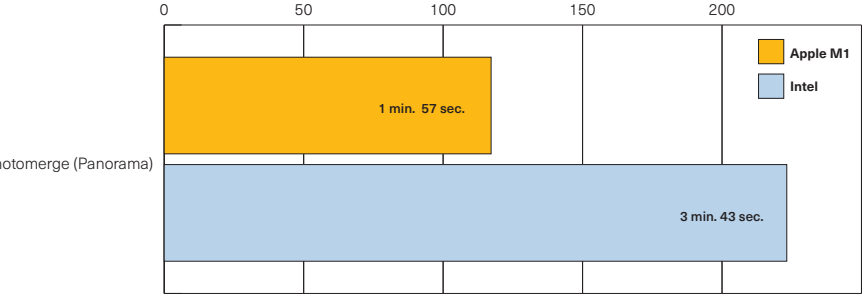
Photoshop Apple M1 Benchmarks: Select Subject (61MP File)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Photomerge (Panorama): This benchmark was conducted using three 61MP 16-bit architectural photographs, using the 'Auto' setting with the option to apply content-aware fill to transparent areas in the resulting panorama.

Photoshop was **almost twice as fast** completing the operation on the M1 system

Photoshop Apple M1 Benchmarks: Photomerge (Panorama)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Illustrator Speed on Apple M1

What We Benchmarked

While Illustrator is most widely known as a vector drawing and design tool, it has over the years become **an extremely powerful and multi-facetted design environment** that can handle a variety of data types and design processes.

Our benchmarks took this diversity into account: We used several different kinds of real-world assets, and conducted benchmarks that reflected typical bottlenecks when working with them. Specifically, we benchmarked performance with **purely vector-based illustrations**, files with **dozens of complex artboards**, as well as **design projects including multiple embedded high-resolution pixel images**.

Analysis of Benchmark Results

On average, based on 16 different workflow benchmarks, **Illustrator on M1 was 65% faster** than on Intel; all benchmarks showed performance increases over the older platform.

That being said, it is clear that there is **a notable difference in performance increase depending on the functions benchmarked and the complexity of the benchmark assets**: While the *Export for Screens...* feature shows only comparatively modest performance gains (+22% in case of PNG as output option), other seemingly simple features can show spectacular performance gains. A good example is **scrolling of a complex vector drawing,** which was **almost four times faster on the M1 system.** (See following page for details.) Even **opening complex files was over twice as fast** on the new hardware.

In any case, **the performance increase due to the M1 platform was consistent across the board**—despite the fact that the benchmark systems were used with a 6K display.

Illustrator: Average of all Benchmarks

Chart based on the average of 16 workflow benchmarks conducted with Illustrator.
A total of **96 individual benchmark measures** were taken.
Longer is better.

Major Points

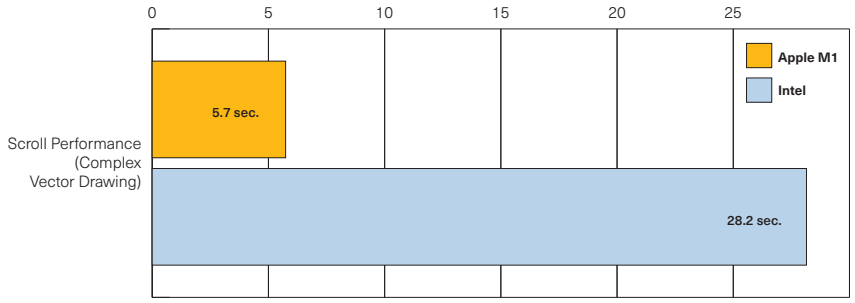
- On average, based on 16 workflow benchmarks conducted for this research, Illustrator was **over 65% faster** using the Apple M1 system.
- **Performance gains tend to increase** with the complexity of benchmark assets.
- Opening complex files was **over two times faster** on the Apple M1 system than on Intel.
- Scrolling a complex vector illustration showed a **4x performance increase** using the new hardware platform.

Illustrator on Apple M1: Key Benchmark Results

Scrolling Performance (Complex Vector Drawing): To benchmark scrolling performance, we displayed a very complex vector illustration at 300% zoom, then clicked and held the scroll arrow in the scroll-bar until the picture had completely scrolled through.

Illustrator on M1 took on average **less then six seconds** to complete the test — compared to **almost 30 seconds** on the Intel system.

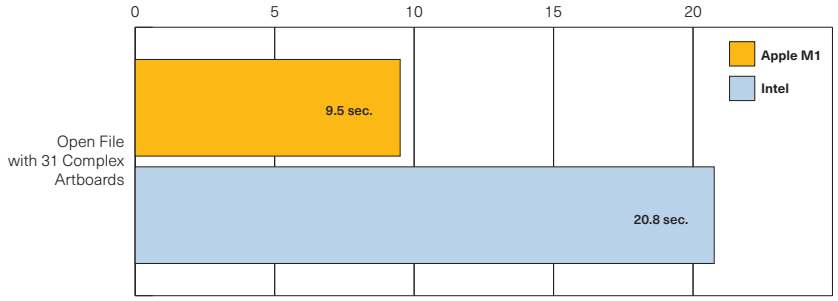
Illustrator Apple M1 Benchmarks: Scrolling Performance (Complex Vector Drawing
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Open File with 31 Complex Artboards: Opening complex files can take some time. For this benchmark we used a complex design project with 31 densely packed artboards. The timer was stopped when all artboards were displayed.

Opening the file was **over two times faster** with Illustrator running on the M1 system.

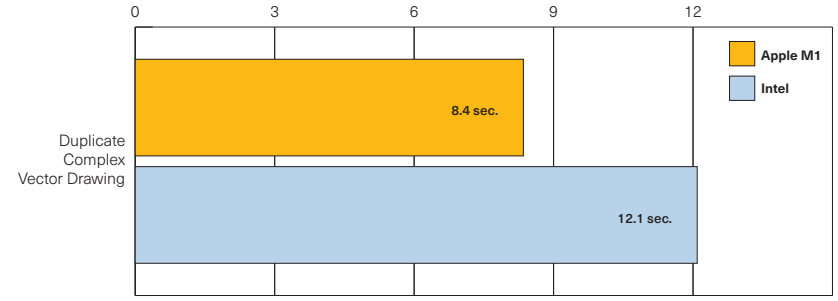
Illustrator Apple M1 Benchmarks: Open File with 31 Complex Artboards
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Duplicate Complex Vector Drawing: Benchmarking duplication of a complex vector drawing was tested by option-dragging the selected Illustration to a new location, and measuring the time necessary for the duplicate to display at the new location.

The operation **took on average just over 8 seconds** on the M1 system, compared to over 12 seconds on Intel.

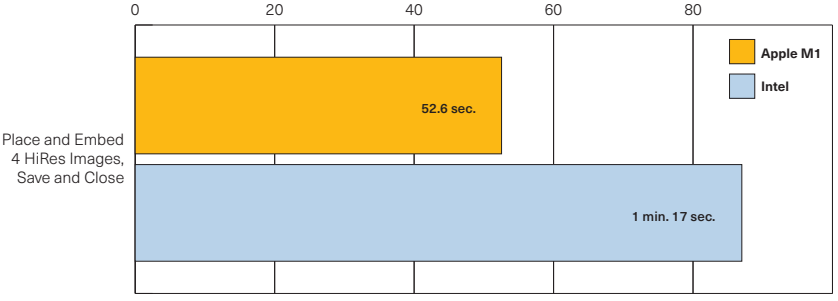
Illustrator Apple M1 Benchmarks: Duplicate Complex Vector Drawing
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Place and Embed 4 HiRes Images: To measure the time it really takes to complete the embedding process, we not only loaded and placed the images, we also saved and closed the document. The timer was stopped when the document window disappeared.

Illustrator on M1 **was almost twice as fast** at this task.

Illustrator Apple M1 Benchmarks: Place and Embed 4 HiRes Images, Save and Clos
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



InDesign Speed on Apple M1

What We Benchmarked

Since InDesign is most widely used for design projects that **result in multi-page, often very complex documents** that integrate a variety of images, graphics and illustrations, performance issues usually do not show up in relatively simple projects; once one works with **real-world designs** such as brochures incorporating many high resolution images or book-projects that can run into hundreds of pages of densely composed text, however, performance can slow down. **That's the context we reproduced in our benchmarks.**

Analysis of Benchmark Results

Our 15 individual workflow benchmarks covered **file handling** (opening, saving and packaging InDesign projects), **display performance**, as well es **editing performance.**

On average, **InDesign on M1 was almost 60% faster** than on the older hardware platform. Performance gains for most operations were in the range of 40% to 80%, while others were **two to three times faster** than on the Intel system.

In other words, **InDesign on M1 significantly speeds up many common operations** such as scrolling complex documents (both long-form book projects or design-projects with high resolution graphics.) **File handling was on average over twice as fast** than on the older hardware platform.

Finally, **GPU acceleration on M1 also produced significantly faster performance** than the integrated GPU on the Intel platform, as the 'Modify Composition' benchmark shows. (See next page for details.)

Major Points

- On average, based on 15 workflow benchmarks conducted for this research, InDesign was **almost 60% faster** using the Apple M1 system.
- Packaging a graphics-heavy design-project on Apple M1 took just over **half the time necessary using the Intel system**.
- Scrolling designs with high-resolution images **was over 50% faster** using InDesign on the Apple M1 system.
- Modifying composition settings for a 250 page Book design showed a **performance increase of +69%**.

InDesign: Average of all Benchmarks

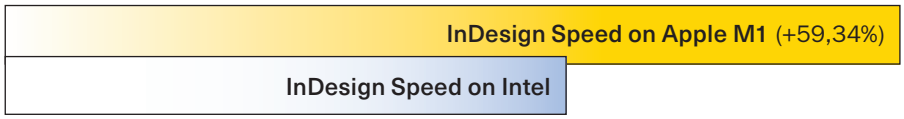


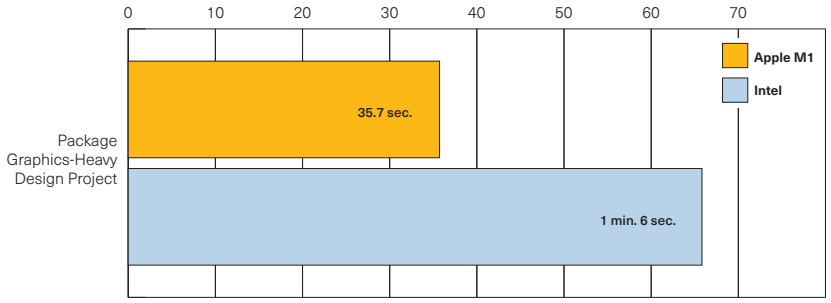
Chart based on the average of 15 workflow benchmarks conducted with InDesign.
A total of **90 individual benchmark measures** were taken.
Longer is better.

InDesign on Apple M1: Key Benchmark Results

Package Graphics-Heavy Design Project: The asset we used for this benchmark was a print-ready catalogue with dozens of high-resolution images (The project folder weighs in at around 6GB of data.) The benchmark consisted in packaging the project, copying linked files as well as generating a PDF file of the project.

InDesign completed the task **in 36 seconds** on the M1 system, compared to **over a minute** using the Intel platform.

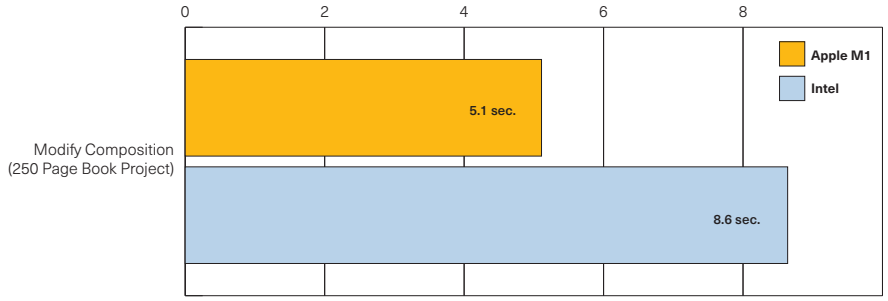
InDesign Apple M1 Benchmarks: Package Graphics-Heavy Design Project
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Modify Composition (250 Page Book Project): To assess if the M1 system would speed up composition, we worked with the design for a 250 page book, set in 10-point Adobe Caslon Pro using the Paragraph Composer. We benchmarked the time necessary to modify the totality of the body copy from *Align Left* to *Left Justify.*

InDesign on M1 was **twice as fast** completing the task.

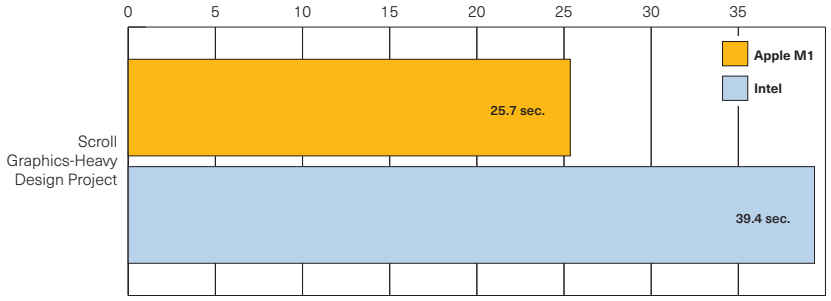
InDesign Apple M1 Benchmarks: Modify Composition (250 Page Book Project)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Scrolling Graphics-Heavy Design Project: Scrolling an InDesign project is very fast with the *Typical Display* option enabled. Finalizing a design project, however, usually requires high quality display. To benchmark this feature, we jumped from spread to spread in a print-ready catalogue, waiting for each spread to fully load before moving to the next.

InDesign on M1 took **only 26 seconds** to complete the task, compared to **almost 40 seconds** on Intel.

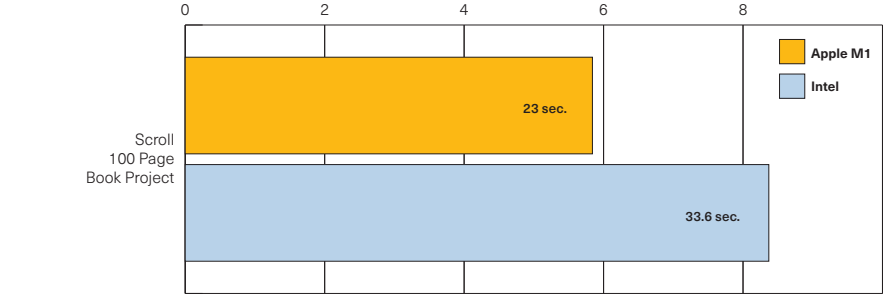
InDesign Apple M1 Benchmarks: Scrolling Graphics-Heavy Design Project
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Scrolling 100 Page Book Project: In order to measure the display performance of text-based designs, we loaded a shorter version of the book design mentioned above, set zoom level to 300% to display the text-composition full-screen, then pressed the down-arrow on the scroll bar until we reached the end of the document.

InDesign on the M1 system **was over ten seconds faster** than on the Intel system.

InDesign Apple M1 Benchmarks: Scrolling 100 Page Book Project
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



XD Speed on Apple M1

What We Benchmarked

XD draws its strength as a design environment **from an extremely flexible architecture and user interface**, that allows for the program to be used as the backbone for a complete design system. Interestingly, XD can be used for extremely straightforward designs, such as simple web-pages or interactive presentations—but also for extremely complex, multi-platform app development. As a result, **XD prototypes can run into hundreds, if not thousands of individual (but interconnected) artboards**, that usually integrate hundreds of assets from other applications.

Our benchmarks focused on different performance aspects related to different file and asset types, ranging from opening **a complex smartphone app prototype**, to opening or importing **Illustrator or Photoshop files**, and working with **Creative Cloud Library assets**.

Analysis of Benchmark Results

Based on the 14 workflow benchmarks conducted for this project, **XD was on average 80% faster on the M1 system** than on Intel hardware. Opening a complex smartphone prototype with hundreds of artboards was **over 1.5 times faster** using the new Apple hardware; opening **a complex vector illustration or placing an asset from CC Libraries took half the time necessary on Intel hardware**.

These performance gains are **particularly important in the specific context of the typical XD workflow**, which is heavily based on integration with the variety of data-types used to populate XD projects, such as Illustrator or Photoshop assets, and more.

Major Points

- On average, based on 14 workflow benchmarks conducted for this research, XD was **almost 80% faster** using the Apple M1 system.
- Opening and displaying a complex app protoype with hundreds of artboards and placed assets was **almost three times faster** on the Apple M1 system, compared to Intel.
- Opening or importing Photoshop and Illustrator files **was up to two times faster on Apple M1** than on the Intel system.
- Accessing assets on CC Libraries showed a **performance increase of +70 to over +100%** using the Apple M1 system.

XD: Average of all Benchmarks

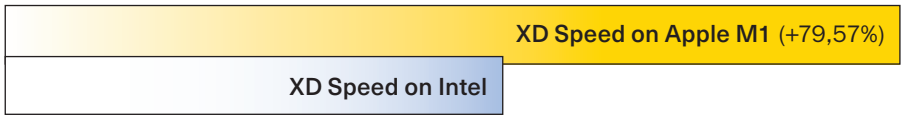


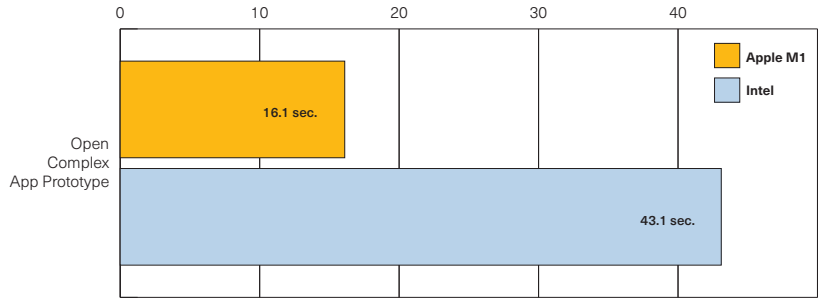
Chart based on the average of 14 workflow benchmarks conducted with XD.
A total of **84 individual benchmark measures** were taken.
Longer is better.

XD on Apple M1: Key Benchmark Results

Open Complex App Prototype: The word 'complex' is an understatement: For the file open benchmark, we used a fully-fledged app prototype for a dating app with hundreds of artboards containing a variety of images and graphic elements each.

Loading and displaying the file took over 40 seconds using the Intel system. XD running on the M1 platform opened the same file **almost three times faster.**

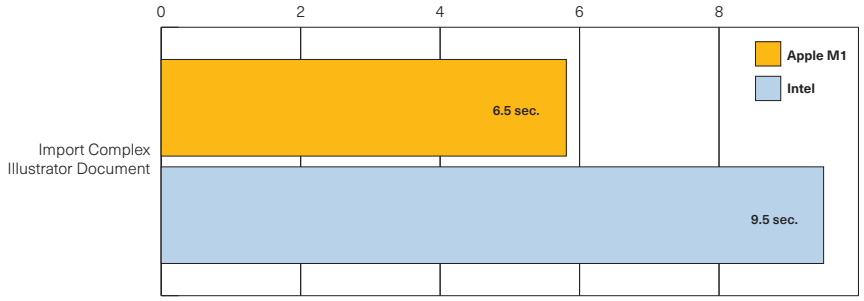
XD Apple M1 Benchmarks: Open Complex App Prototype
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Import Complex Illustrator Document: Integration with Illustrator and Photoshop is key to the XD workflow. The program can both import or directly open files from these programs. This benchmark measured the time to import a complex vector drawing in Illustrator format.

XD on the M1 system was **over 40% faster** completing this task.

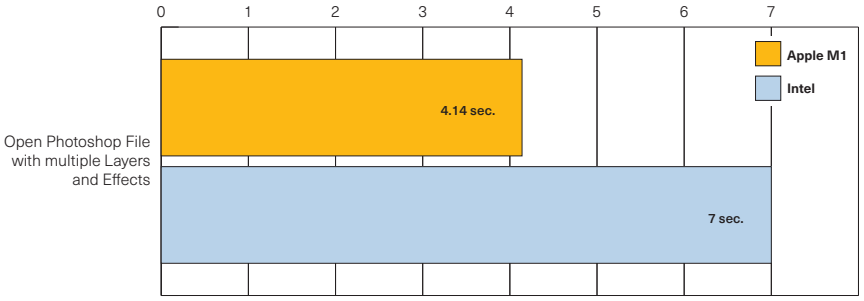
XD Apple M1 Benchmarks: Import Complex Illustrator Document
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Open Photoshop File with Multiple Layers and Effects: XD can not only import Photoshop files, it can also open them directly, preserving the layer structure of the file in the process. We benchmarked this feature using a high resolution images with several effect- and adjustment-layers.

XD on M1 completed the task **in just over four seconds, compared to seven seconds** running on the Intel system.

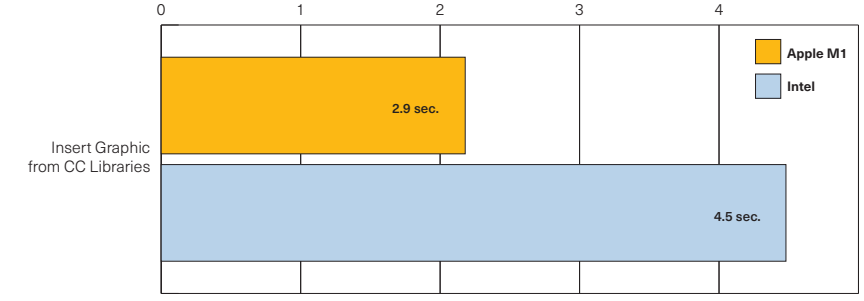
XD Apple M1 Benchmarks: Open Photoshop File with Multiple Layers and Effects
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Insert Graphic from CC Libraries: Integration with CC Libraries is another key aspect of XD. In this benchmark, we placed an Illustrator design element from CC Libraries and measured the time for the graphic to display. While an individual instance may only take a few seconds, these performance gains can scale considerably over time.

XD on M1 was **over two times faster** than on the Intel system.

XD Apple M1 Benchmarks: Insert Graphic from CC Libraries
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Premiere Pro Speed on Apple M1

What We Benchmarked

Few areas of content production require as much computing power as video: Given the variety, complexity and large file sizes of modern video formats, fast processing is essential when editing and outputting professional video.

Our benchmarks of Premiere Pro focussed on exactly these aspects: **Importing** a variety of video formats in different frame rates; **encoding video** to commonly used codecs (such as H265 or ProRes), as well as **effects performance**, and finally **playback performance** with different video formats, measured in terms of frames per second (FPS) .

Analysis of Benchmark Results

On average, based on 23 workflow benchmarks, **Premiere Pro was almost 80% faster on M1** than on Intel hardware. What is remarkable, though, is the acceleration of specific operations and effects that fully leverage features of the M1 hardware platform.

The **most spectacular cases are features that are powered by Adobe Sensei**, such as *Scene Edit Detection,* a feature that inserts cut-points at each scene change in a video: In our benchmarks, this feature was **over four times faster on M1** when working with a 4K video stream, and **almost six times faster** working with HD.

While playback performance was faster on M1 with all formats used for benchmarking, it varied depending on the type of footage used: **XAVC S 100p played back at almost 98 FPS** on the M1 system, compared to only 18 FPS on Intel, while **iPhone 4K 60p footage played back at 60FPS**—compared to 48FPS on the older hardware. (See next page for details.)

Major Points

- On average, based on 23 workflow benchmarks conducted for this research, Premiere Pro was **almost 80% faster** on the Apple M1 system.
- Importing footage in four different video formats showed **performance gains ranging from +67% to +187%** over the Intel system.
- Playback performance of footage showed that Premiere Pro on Apple M1 can **play back 4K high-framerate video without dropped frames**.
- Adobe Sensei-powered features such as *Scene Edit Detection* can be processed **up to five or six times faster** on Apple M1 systems.

Premiere Pro: Average of all Benchmarks

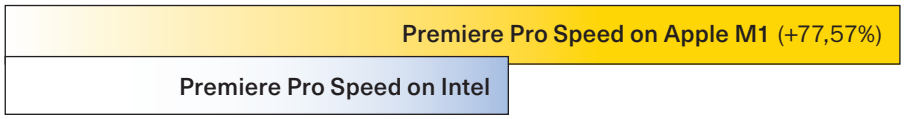


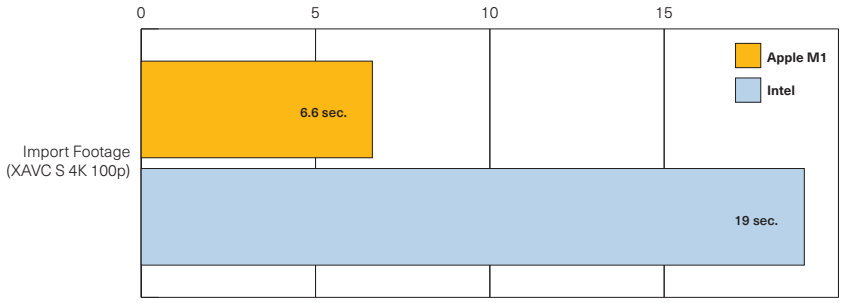
Chart based on the average of 23 workflow benchmarks conducted with Premiere Pro.
A total of **138 individual benchmark measures** were taken.
Longer is better.

Premiere Pro on Apple M1: Key Benchmark Results

Import Footage (XAVC S 4K 100p): Given the amount of media modern video pros need to manage, importing speed is essential. This benchmark consisted in importing twelve XAVC S 4K 100p clips to the media bin. The timer was stopped when all clips displayed the preview images.

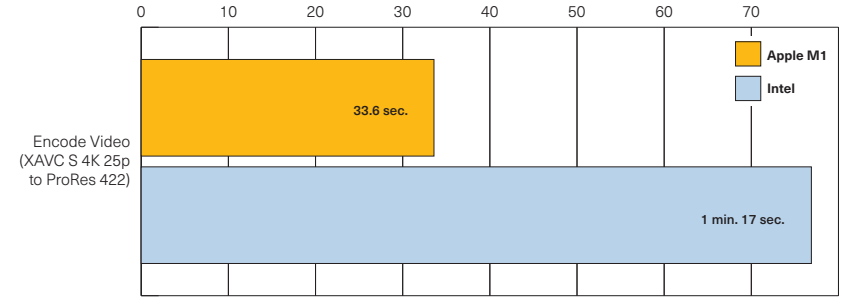
Premiere Pro on the M1 system **was almost three times faster** completing this task.

Premiere Pro Apple M1 Benchmarks: Import Footage (XAVC S 4K 100p)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Encode Video (XAVC S 4K 25p to ProRes 422): Encoding video is dependent both on the source footage and the chosen export codec. Our benchmarks showed improved performance for all codecs we benchmarked with Premiere Pro. While some show only modest performance gains, other formats, such as ProRes, render significantly faster: **XAVC S 4K 25p encoding to ProRes 422 was over two times faster** on the M1 system in our benchmarks.

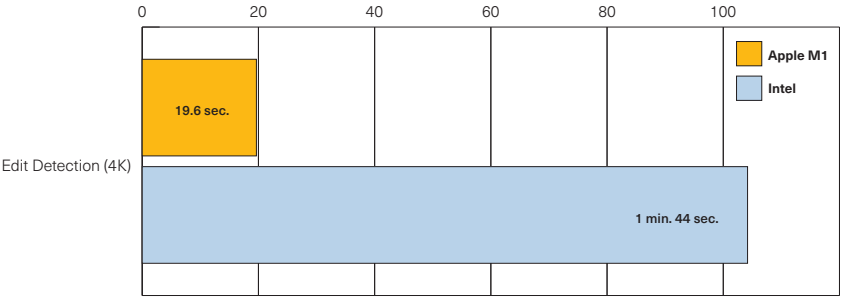
Premiere Pro Apple M1 Benchmarks: Encode Video (XAVC S 4K 25p to ProRes 422
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Scene Edit Detection: This feature, powered by Adobe Sensei, automates the tedious task of inserting precise cut-points at scene changes in a video.
For the benchmarks of this feature, we used a minute-long 4K video containing a dozen different individual scene changes.

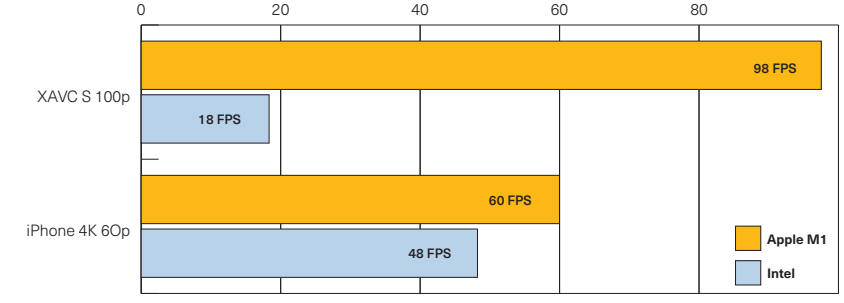
On the M1 system, Premiere Pro managed to perform the task **over five times faster** than on Intel.

Premiere Pro Apple M1 Benchmarks: Scene Edit Detection (4K)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Playback Performance (FPS): We used Premiere Pro's Debug Monitor to measure the actual frame-rate displaying different types of footage. While some of the highest-quality recording formats (such as XAVC HS 4K 50p) require top of the line hardware to display fluidly, Premiere Pro on M1 managed to **display both XAVC S 100p and iPhone 4K 60p footage at their nominal speed**. By comparison, the Intel system only managed 18FPS and 48FPS, respectively.

Premiere Pro Apple M1 Benchmarks: Playback Performance (FPS)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Longer is better.



Lightroom Speed on Apple M1

What We Benchmarked

Lightroom is available not only as the desktop application benchmarked here, it also exists on **mobile platforms such as iPhone and iPad**, and is **geared towards cloud storage** as repository, allowing users to work from different devices on the same set of images. (Benchmarks for this project were conducted using local storage only, however, to avoid possible fluctuations in network bandwidth to skew results.)

Benchmarks of Lightroom covered the essential aspects of RAW image management: **Importing** 1000 RAW images, **synchronizing settings** between the same set of images, **full screen image selection** as well as **JPG export**. Finally, **Merging** and **enhancing RAW images** was also covered.

Analysis of Benchmark Results

On average, **Lightroom was almost twice as fast on M1** than on the Intel system. **Importing and exporting RAW files showed roughly a +40% to +60% performance increase**, while the full-screen selection and rating process, which consists in displaying images to be sorted full screen, moving from one to the next only when it is fully resolved, **took less than half the time necessary on the Intel system**. (See next page for details.)

Processing operations, such as **merging several RAW images into a panorama or into a HDR images were over twice as fast** than using the Intel system. As with Photoshop, Premiere Pro and Lightroom Classic, **Sensei-powered features produced the most spectacular performance gains:** Enhancing a RAW image using ***Super Resolution*** **was over four times faster on M1**, underlining the potential of the M1 platform for features relying on machine-learning.

Major Points

- Lightroom on the Apple M1 platform showed **significant performance gains** in many common time-consuming operations.
- On average, Lightroom was close to **70% faster on Apple M1** than on Intel in these benchmarks.
- Full-screen review workflow benchmarks provided an **over 2x performance gain** over the Intel-based system.
- Adobe Sensei-powered features such as *Super Resolution* could be processed **up to five times faster** on the Apple M1 system.

Lightroom: Average of all Benchmarks

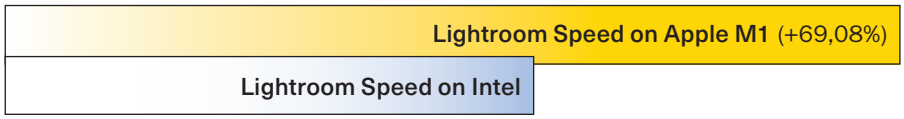


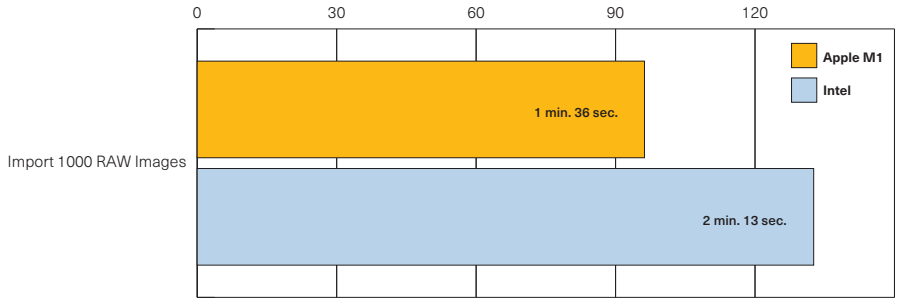
Chart based on the average of 9 workflow benchmarks conducted with Lightroom.
A total of **54 individual benchmark measures** were taken.
Longer is better.

Lightroom on Apple M1: Key Benchmark Results

Import 1000 RAW Images: For our benchmark, we imported 1000 12.4 MP RAW images into a Lightroom Classic catalogue. The benchmark result included the time necessary to generate and display previews for all imported images.

On the M1 system, **Lightroom was almost 30% faster** completing the import than on the Intel hardware.

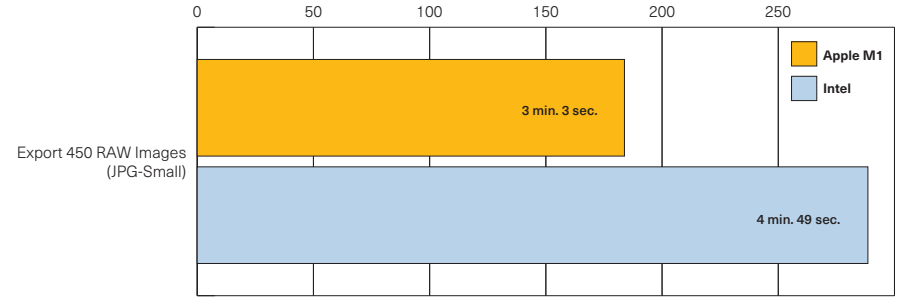
Lightroom Apple M1 Benchmarks: Import 1000 RAW Images
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Export 450 RAW Images (JPG-Small): The export benchmark consisted in saving 450 Images as JPG files to the local SSD, using the JPG-Small preset at 90% quality. The timer was stopped when all images were displayed in the destination folder.

Lightroom on the M1 system **took just over 3 minutes** for exporting 450 images. On the Intel platform, processing the export required almost five minutes.

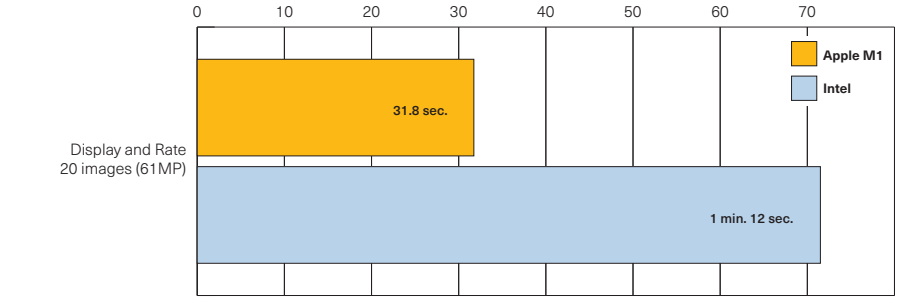
Lightroom Apple M1 Benchmarks: Export 450 RAW Images (JPG-Small)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Display and rate 20 Images (61MP): Sorting pictures after a shoot is an essential part of the photography workflow, and requires checking images individually at full resolution. To benchmark this process, we displayed images in *Detail* mode, waited until the image was fully loaded, then switched to the next image until all 20 images were reviewed.

Lightroom on the M1 system completed this process **over two times faster** than on the Intel hardware.

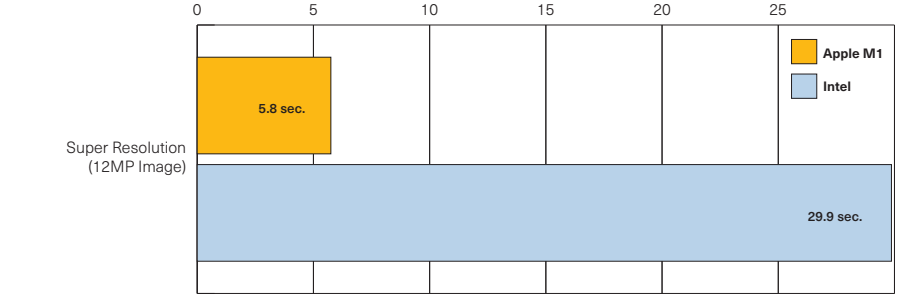
Lightroom Apple M1 Benchmarks: Display and Rate 20 images (61MP)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Super Resolution (12MP Image): Lightroom shares this feature for enhancing the resolution of RAW images (without introducing the artefacts image resampling would introduce) with Lightroom Classic.

On the M1 system, Super Resolution was processed **over five times faster** than on Intel, demonstrating again that M1 acceleration of Adobe Sensei features can produce very impressive results.

Lightroom Apple M1 Benchmarks: Super Resolution (12MP Image)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Lightroom Classic Speed on Apple M1

What We Benchmarked

Managing the thousands of photos that professional photographers have to deal with **requires a very specific feature set**, that combines not only powerful database functionality, but has to manage the process of importing, selecting, editing and outputting images in the most efficient way possible—often **working on hundreds of RAW images** at a time.

Our benchmarks covered **typical steps in the Lightroom Classic workflow**, ranging from **importing** a large batch of RAW images, to **synchronizing settings** and **applying a set of meta-data**, and finally to **exporting** a batch of images as JPG files for sharing or distribution. We also covered certain processing options, such as **merging multiple exposures** into an HDR image or a panorama, or **enhancing an image** using the newly introduced *Super Resolution* feature.

Analysis of Benchmark Results

Lightroom Classic on M1 showed remarkable performance gains compared to the Intel system: Exporting 1000 RAW images to full-size JPG files was over twice as fast, while **synchronizing settings between 1000 images was over 3.5 times faster**. This is remarkable considering that both systems use identical SSD hardware, which would indicate that **performance gains stem exclusively from the efficient use of the M1 hardware architecture.**

Likewise (as noted previously with regards to certain Photoshop and Premiere Pro features), **operations that rely an Adobe Sensei show spectacular results**, since they can use the potential of the machine learning cores in the M1 processors. As a results, **the Sensei-powered *Super Resolution* feature was almost three times faster on the M1** than on the Intel system.

Lightroom Classic: Average of all Benchmarks

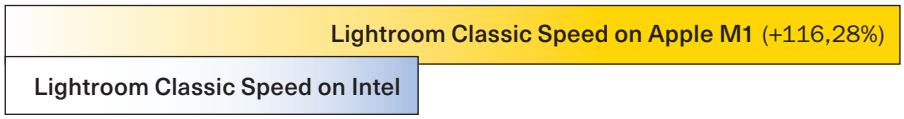


Chart based on the average of 10 workflow benchmarks conducted with Lightroom Classic.
A total of **60 individual benchmark measures** were taken.
Longer is better.

Major Points

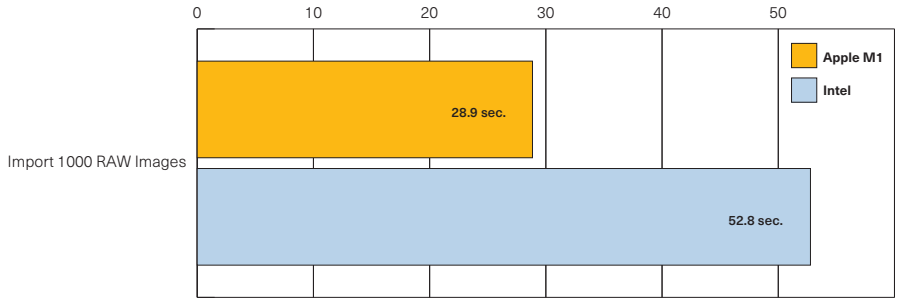
- On average, based on ten different workflow benchmarks, Lightroom Classic on the Apple M1 system showed **over 2x performance gains** over the Intel system.
- Synchronizing settings on 1000 RAW images was **almost four times faster** when executed on the Apple M1 system.
- Image enhancement using the *Super Resolution* feature on the M1 system showed a **279% Performance increase** over the Intel system.
- Exporting 1000 RAW images to full-size JPG files was **over twice as fast** using the Apple M1 platform.

Lightroom Classic on Apple M1: Key Benchmark Results

Import 1000 RAW Images: Importing images after a shoot can involve hundreds if not thousands of photos. For our benchmark, we imported 1000 12.4 MP RAW images into a Lightroom Classic catalogue. The timer was stopped when all standard previews had been generated and displayed.

On the M1 system, Lightroom Classic **completed the benchmark in 29 seconds**, compared to **over fifty seconds** on the Intel system.

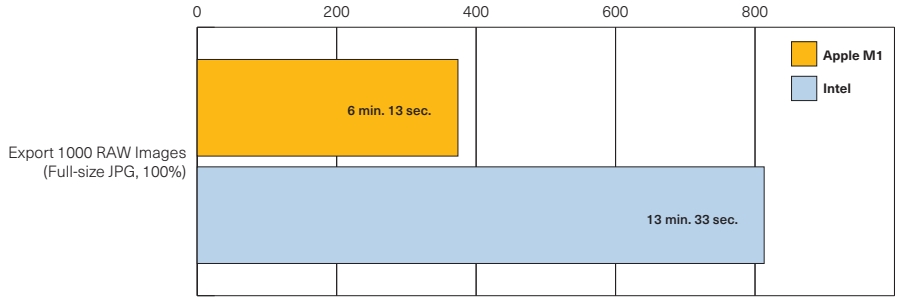
Lightroom Classic Apple M1 Benchmarks: Import 1000 RAW Images
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Export 1000 RAW Images: To benchmark the time necessary for exporting the entire series of 1000 RAW images, we chose full-size JPG export at 100% quality, saving the resulting files to the local SSD. The timer was stopped when all 1000 images were visible in the destination folder.

Lightroom Classic on the M1 system was **over two times faster** completing the export.

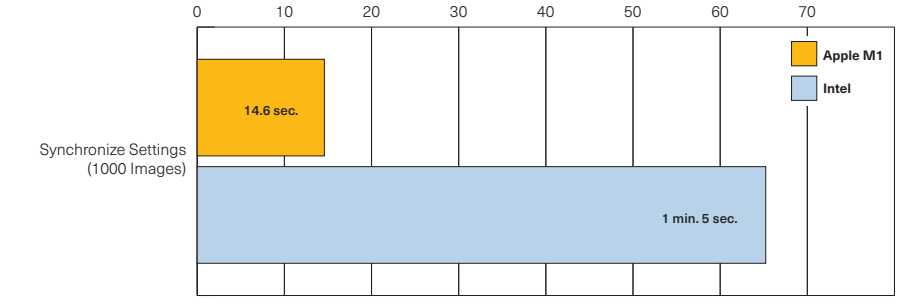
Lightroom Classic Apple M1 Benchmarks: Export 1000 RAW Images
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Synchronize Settings (1000 Images): For a batch of images taken in similar conditions, it is common procedure to make adjustments on one image, than synchronize these settings across the whole batch. Our benchmark consisted in synchronizing color adjustments across 1000 images. The timer was stopped when the modified settings were displayed on all previews.

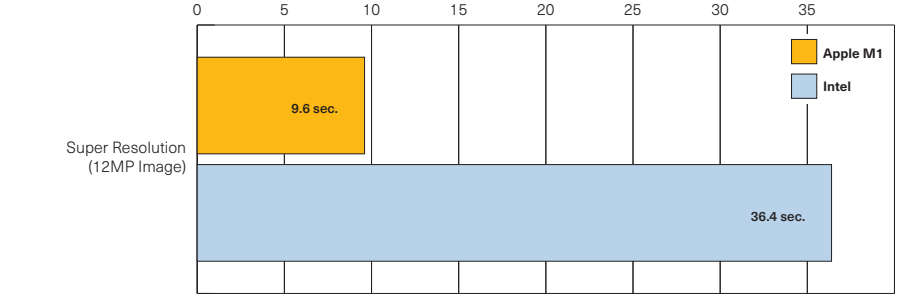
Lightroom Classic on M1 was **over four times faster** in this benchmark.

Lightroom Classic Apple M1 Benchmarks: Synchronize Settings (1000 Images)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Super Resolution (12MP Image): This recently introduced feature enhances the resolution of an image by using machine learning techniques, providing significantly better results than simply scaling up the picture. The downside can be processing speed: Even for the comparatively small image used for this benchmark, the Intel system took **over 36 seconds**. Lightroom Classic on the M1 system, on the other hand, completed the task **over three times faster**.

Lightroom Classic Apple M1 Benchmarks: Super Resolution (12MP Image)
Time-scale in seconds. All data are the average of 3 individual benchmarks
Shorter is better.



Methodology

This benchmark project was commissioned by Adobe and independently executed by Pfeiffer Consulting.

All the productivity measures presented in this document are based on real-world workflow examples, designed and executed by professionals with many years of experience with these applications and workflows.

How we measure productivity

The basic approach is simple: in order to assess productivity gains that a program or solution may (or may not) bring, we start by analyzing the minimum number of steps necessary to achieve a given result in each of the applications or workflows that have to be compared.

Once this list of actions has been clearly established, we start to execute the operation or workflow in each solution, with the help of seasoned professionals who have long-standing experience in the field and with the solutions that are tested.

Every set of steps is **executed three times**, the average of the three measures is used as final result.

Benchmark Configurations

Apple M1:

13 inch **M1 MacBook Pro**
16GB RAM, 2TB of SSD

Intel:

13 inch **Intel Core i5 MacBook Pro**
16GB RAM, 2TB of SSD

Both systems were connected to a
Apple Pro Display XDR for all benchmarks

Hardware Preparation for Performance Benchmarks

Before performance benchmarks, systems are completely re-initialized. Only apps necessary for the benchmarks are installed.

Only the internal SSD was used for storage and access of benchmark assets.

About Pfeiffer Consulting

Pfeiffer Consulting is an independent technology research and benchmarking operation focused on the needs of publishing, digital content production, and new media professionals.

For more information, please contact
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Pfeiffer Report