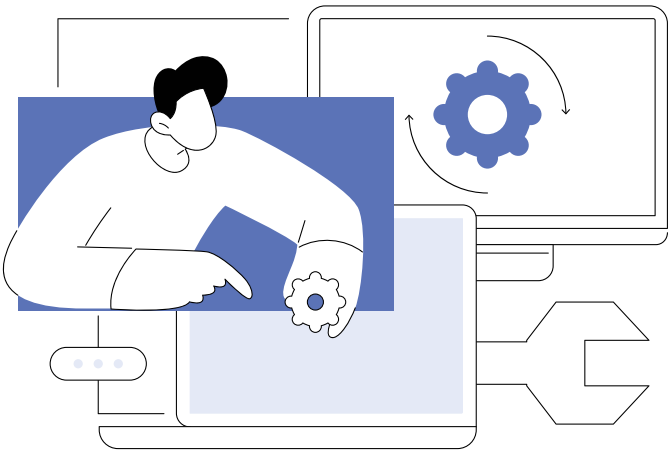


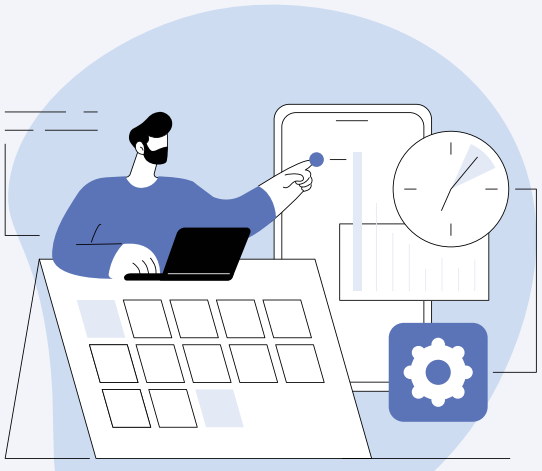
Complete laptop and desktop component replacements with ease

In our repairability testing with four Dell systems and four Apple systems, it took less time and effort to replace several key components in the Dell devices

When you have a serious technical problem with your laptop or desktop, you have three choices: fix it yourself, call tech support, or buy a new device. A shiny new system might be tempting, but the latest devices are expensive. Cost is an even greater consideration if you're making a choice for not just yourself but for a fleet of hundreds or thousands of employees' devices. In these cases, your organization's sustainability goals are also a factor—throwing away an entire device generates much more waste than disposing of or recycling just one broken component.

The less costly and more sustainable option is to fix the problem so you can continue using the device you already have. And while device manufacturers and third parties offer support plans that could handle this work, you may want the option to make the fix yourself, to save time, to maintain total control over the system, or just because you enjoy the work.

We set out to see how easy it was to remove and replace key components on several systems from Dell and Apple, looking at eight total devices for comparisons of laptops, mobile workstations, and desktops. We found that it was easier to complete the replacements on the Dell™ systems than on the Apple® systems, and some of the components on the Apple devices were impossible to remove. For users or IT departments seeking systems that they can easily repair without help from manufacturer support plans, this report outlines the advantages of the Dell systems we tested.



Save time on DIY repairs

Up to 90% less time to replace components

Replace several components more easily

Up to 89% fewer steps to replace components

Our approach

Fixing a laptop or desktop hardware issue often involves replacing a faulty part. Manufacturers offer support plans that can help, but some IT departments—not to mention DIY-minded users—may prefer to solve the problem themselves. For this group, clear documentation is valuable, as is the ability to quickly, and easily swap out broken fans, storage, and other parts.

We looked at removing and replacing key components on eight devices, four from Dell and four from Apple. We also searched for documentation on each system. Our study included the following systems:

Laptops

- Dell Latitude™ 7340
- Apple MacBook Air® 13.6"

Desktops

- Dell OptiPlex™ Micro 7010
- Apple Mac® mini

Mobile workstations

- Dell Precision™ 5680
- Apple MacBook Pro® 16"

All-in-one (AIO) desktops

- Dell OptiPlex AIO 7410
- Apple iMac®

We performed each component replacement three times and report the median time here. For full details of the systems we used in testing and what steps we took for each component replacement, see the science behind the report.

The Dell commitment to sustainability

According to the Dell Technologies FY23 ESG report, Dell Technologies "put[s] sustainability at the core of everything [they] do, setting strong commitments and taking the right actions to address climate change, minimize negative environmental impact and drive positive outcomes for business and society."[1] Packaging for Dell commercial laptops is 100 percent recyclable and "made from 100% recycled or renewable materials."[2] Dell also notes that it is committed to "keeping products and materials in circulation longer through repair, recovery and reuse," making easy repairability an important focus.[3]

Learn more about Dell sustainability initiatives for devices at https://www.dell.com/en-us/lp/dt/sustainable-devices.

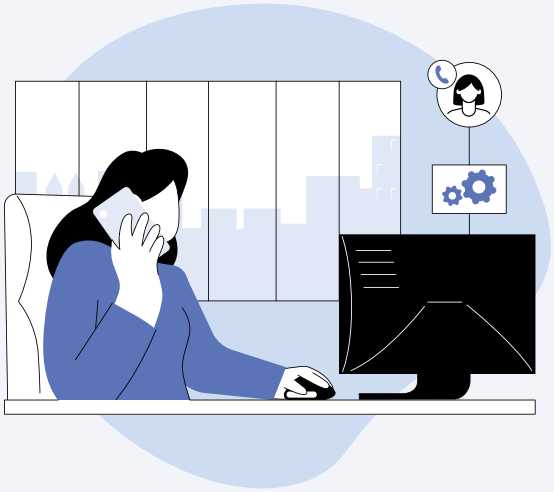
Documentation

Many of us have had the experience of sitting on the living room floor, surrounded by furniture parts and loose screws, looking in despair at assembly instructions that seem to have been written in runes. Unlike couches and coffee tables, computers typically come fully assembled. But even the most reliable device will inevitably experience a technical issue or two. When something goes wrong, clear, and comprehensive documentation can make the difference between hours of frustration and an easy answer.

As of October 2023, all eight of the devices we tested had user manuals freely available on the manufacturers' websites, although the manuals for the MacBook Pro and Mac mini were for older models than the ones we tested. (See the science behind the report for links to all eight manuals.) Table 1 gives an overview of the information included in manuals from each manufacturer. Notably, the Dell manuals included several sections that the Apple manuals did not: diagnostic fault and error codes, how to contact repairers, information on failure detection, and actions to mitigate those failures. Apple users would also need to look outside the manual for instructions on software and firmware reset, which are available on the Apple website but not in the manuals.

Table 1: Documentation available for the eight systems we tested as of October 2023. Source: Principled Technologies.

	Dell systems we tested	Apple systems we tested
Self-service repair manual available	Yes	Yes, but the MacBook Pro and Mac mini manuals are for older models
Identification of the product	Yes	Yes
Disassembly map or exploded view of the device	Yes	Yes
Electronic board diagrams	No	No
List of necessary equipment for repair	Yes	Yes
Instructions for repair of specific parts	Yes	Yes
Diagnostic fault and error codes	Yes	No
Component and diagnosis information	Yes	Yes
Instructions for software and firmware reset	Yes	Yes, but this information is available on the Apple website, not in the manuals
Information on how to access internal data records of failure incidents	Yes	Yes
Guidance and suggestions for self-service repair	Yes	Yes
Contact information for repairers	Yes	No
Failure detection and required action	Yes	No
Information about types of updates	Yes	Yes
Free remote assistance	Yes, online and through SupportAssist	Yes, via a diagnostics application
Ability to reset software	Yes	Yes



Out-of-band manageability with Intel vPro

All four of the Dell systems we tested have Intel® vPro®, which comes with Intel Active Management Technology and Intel Endpoint Management Assistant (Intel EMA). These technologies allow IT to "remotely discover, repair and protect PCs across your entire organization."[4] Intel vPro allows for out-of-band management separate from the operating system, so you can monitor Intel vPro enabled devices even when the OS is down.[5] The ability to diagnose issues remotely means that a central IT group could quickly see and communicate the problem, allowing the user or a remote IT group to start the repair process.

Intel vPro is not available on the Apple devices we tested. Instead, there are many third-party mobile device management (MDM) solutions available for Apple devices. Apple does offer a feature called Lights Out Management that allows IT to remotely shut down, start, and restart devices; however, this is available for only some Apple devices, and only after they are enrolled in an MDM solution. Of the systems we tested, only the Mac mini would be eligible.[6]

Repairing and replacing components

Whether you're part of an IT department that regularly deals with broken systems or an individual interested in how your computer functions, the ability to replace a broken component on your own can be a boon. Even if you're happy with the support plan you've chosen from the manufacturer, a quick and easy DIY swap for a faulty battery or broken fan might still save you time compared to calling support and help you get the device back to work faster.

For each of the pairs of devices, we assessed whether it was possible to safely remove and replace several different components, and if so, how long it took us to make the swap. Because the components we were swapping weren't actually broken, we removed each component and replaced it by putting that same component back in. We looked at replacing the fan and storage for all four system pairs; the other components varied depending on the comparison.

Dell Latitude 7340 vs. Apple MacBook Air 13.6"

In our first comparison, we attempted to remove and replace the devices' batteries, storage, and speakers, as well as the fan in the Dell Latitude 7340. (The MacBook Air does not have a fan.) Figure 1 shows the time and effort required to complete these tasks.

We were able to make these replacements quickly and easily on the Dell Latitude 7340. The task that took the most time and effort, swapping the fan, required just over 6 minutes and 16 steps. The other three tasks all took less time and the same or fewer steps. In terms of tools, we needed only a Phillips-head screwdriver and plastic scribe, an inexpensive prying tool that can help open closed compartments without abrading the chassis. Our testing indicates that if you had an issue with the fan, battery, storage, or speakers on the Dell Latitude 7340, you could replace that component in under 10 minutes with just a few basic tools.

Replacing the components in the MacBook Air was more complex. Removing and replacing the speakers took 12 minutes and 37 seconds, more than double the time required to replace the speakers on the Dell Latitude 7340. The difference in ease was even more pronounced for the battery replacement, which required us to disconnect and reconnect many different connectors and cables and remove the logic board. In full, the replacement took more than half an hour and over 50 steps, including over 2 minutes just to remove the battery adhesive tabs that secured the battery in place.

This was made more difficult by the fact that the MacBook Air uses pentalobe screws, a proprietary screw type that requires a unique third-party screwdriver for easy removal. (Or, of course, you could skip buying the screwdriver and take a DIY approach—a quick Google search offers methods involving rubber bands, superglue, and a dremel, among other options.) We used an iFixit toolkit that included the multiple screw bits we needed.

We were entirely unable to remove the storage on the MacBook Air, because it is soldered to the motherboard. This means that in the event of an issue with the storage, a consumer can't replace it themselves.

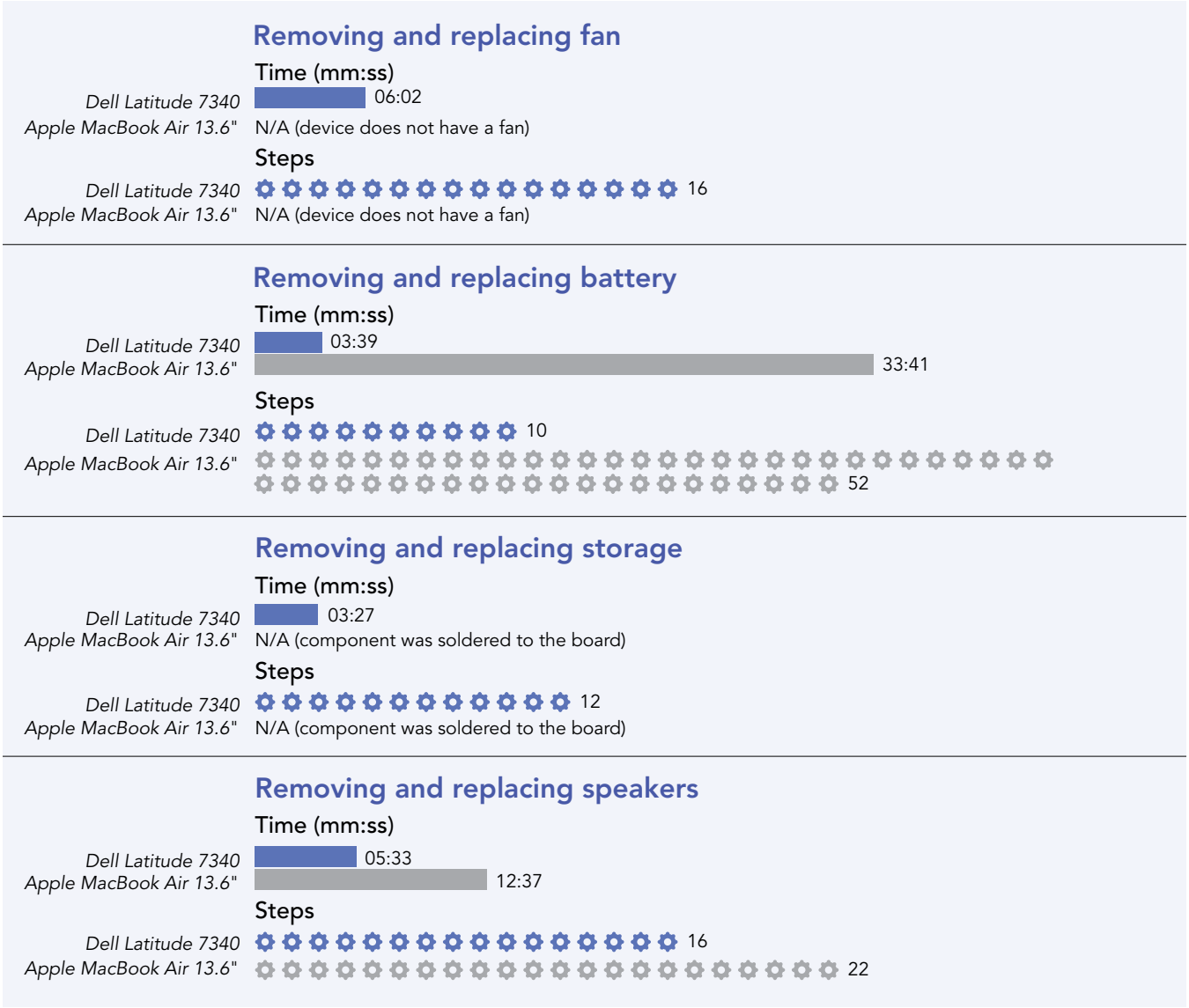


Figure 1: Time and steps required to remove and replace four components from the Dell Latitude 7430 and Apple MacBook Air 13.6". Lower is better. Source: Principled Technologies.

Dell Precision 5680 vs. Apple MacBook Pro 16"

For this comparison, we looked at removing and replacing the devices' fans, batteries, storage, and heatsinks. We chose the heatsink instead of the speakers for this comparison because on the MacBook Pro, the speakers are adhered to the chassis without adhesive tabs—so by removing them, we would have risked damaging the system or the speakers themselves. Again, we could not replace the storage on the MacBook Pro, because it was soldered to the motherboard. Figure 2 shows how much time and how many steps it took to complete the replacements.

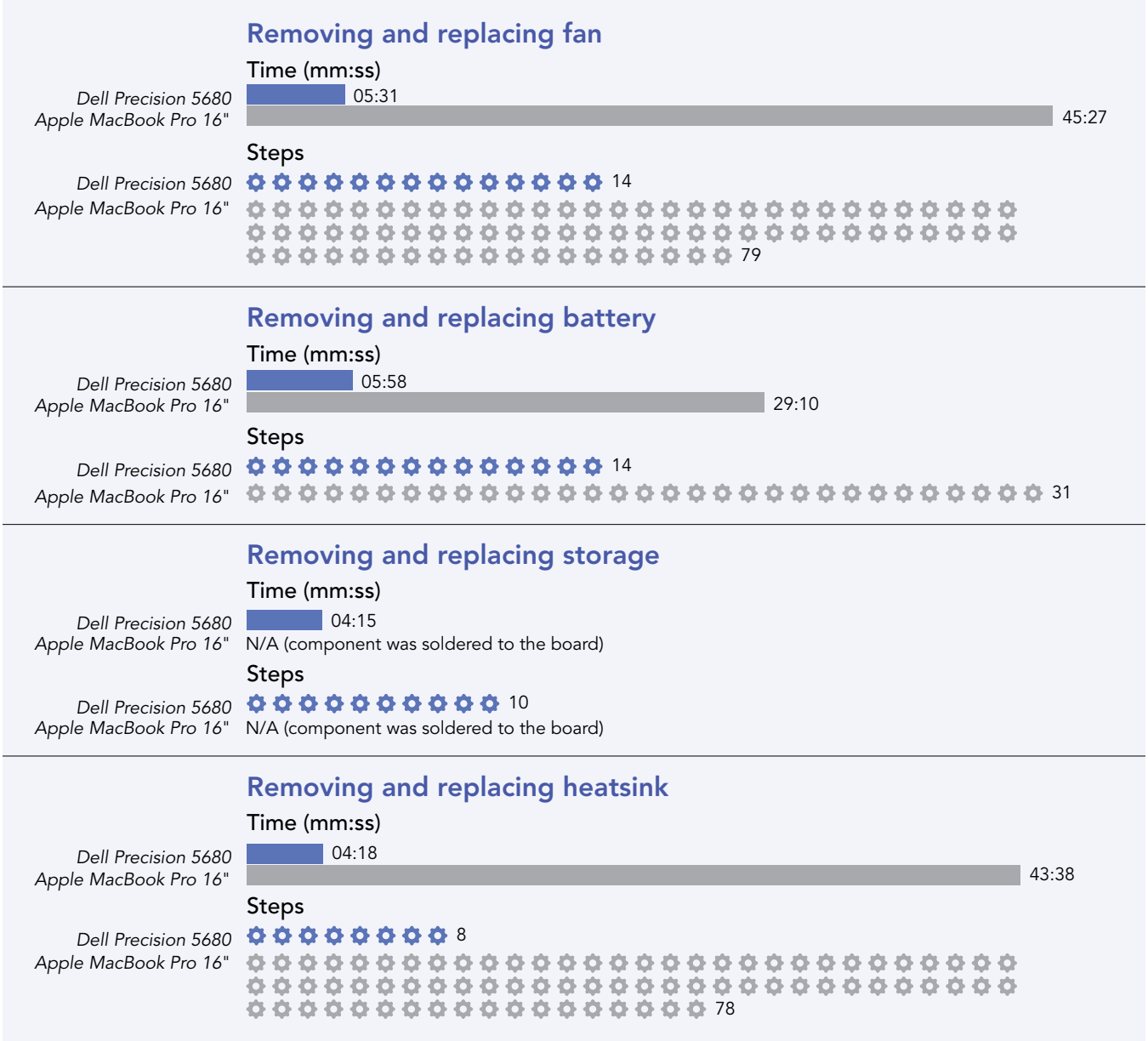
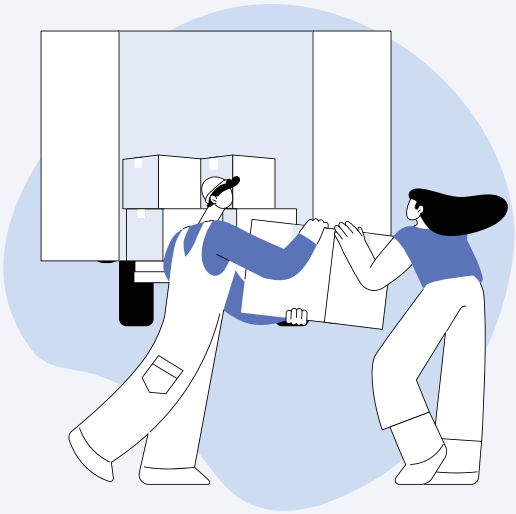


Figure 2: Time and steps required to remove and replace four components from the Dell Precision 5680 and Apple MacBook Pro 16". Lower is better. Source: Principled Technologies.

On the Dell Precision 5680, the replacements were relatively fast and simple. No replacement took more than 6 minutes or fourteen steps to complete. These replacements did require more tools than the swaps on the Latitude 7430—a T5 Torx screwdriver, two sizes of Phillips-head screwdrivers, and the plastic scribe—but none of the screws on the Precision 5680 were proprietary. With the ability to swap components easily, you could get up and running faster after dealing with a faulty battery or broken fan.

The three replacements we were able to complete on the Apple MacBook Pro 16" were more complicated, taking between 29 and 45 minutes and between 31 and 79 steps. These steps involved dealing with several delicate components that we didn't have to touch for the same replacements on the Dell Precision 5680. For example, to replace the battery on the MacBook Pro, we had to remove and reconnect the trackpad, and to replace the heatsink, we had to remove and reconnect the logic board. Additionally, each repair was further complicated by the fact that the MacBook Pro 16" also uses pentalobe screws, so we needed to use a pentalobe-specific third-party screwdriver—in this case, one with two different sizes of screw bit. These replacements also required three sizes of Torx screwdriver and a 4mm hex screw bit.



Dispatch new parts yourself with TechDirect

If you're the administrator of a fleet of Dell systems with warranties, you can join Dell TechDirect for free. TechDirect is a self-service management portal that can help with the deployment and management of new PCs as well as allow you to dispatch new Dell parts yourself, skipping engagement with tech support.[7] TechDirect also allows for remote support via Dell ProSupport Plus, as we saw in a recent study on ProSupport Plus and SupportAssist.[8]

To learn more, visit https://tdm.dell.com/portal/.

Use what's in your toolbox

We've all been there: You sit down to finally deal with that squeaky drawer or broken sink and find that you need a specialized tool you've never heard of. A problem is easier to solve if you already have the tools to fix it. We looked at the bestselling toolbox on Amazon[9] and found that it included almost everything we needed to complete the replacements on the Dell systems we tested. The only exception is the plastic scribe. While everyone's toolbox is different, you may well have these tools in your closet already.

OptiPlex Micro 7010 vs. Apple Mac mini

To compare the repairability of the Dell OptiPlex Micro and Apple desktops, we aimed to remove and replace the devices' fans, memory, storage, and wireless cards.

Of these components, we were only able to replace the fan in the Mac mini. We could not get to the memory, storage, or wireless card because they are soldered to the motherboard, which means they are not consumer-replaceable. Replacing the fan in the Mac mini took 4 minutes 47 seconds, over five times as long as the 50 seconds it took for the Dell OptiPlex Micro 7010 (see Figure 3). The Mac mini replacement also required four more steps.

The rest of the component replacements on the Dell OptiPlex Micro 7010 were straightforward. Each of the swaps took less than two minutes, and the task that required the most steps—removing and replacing RAM—matched the effort of the Mac mini fan replacement at fourteen steps. The replacements for both systems used basic tools, although the Mac mini fan replacement required two sizes of Torx screwdrivers and the plastic scribe, while we needed only a Phillips-head screwdriver for the OptiPlex Micro 7010.

Figure 3: Time and steps required to remove and replace four components from the Dell OptiPlex Micro 7010 and Apple Mac mini. Lower is better. Source: Principled Technologies.

OptiPlex AIO 7410 vs. Apple iMac

For this all-in-one comparison, we planned to remove and replace the devices' fans, memory, storage, and wireless cards.

Three out of four of these tasks were not possible on the iMac. The memory, storage, and wireless card in the iMac were soldered to the motherboard, meaning that a consumer cannot repair or replace them. The fourth task, replacing the fan, is technically possible on the iMac. However, the only way to get to the fan is through the screen, meaning that we would have needed to forcibly break the glue seal between the glass screen and the rest of the display. Even with great care, we felt that it was possible we would irreparably damage the screen by attempting this. We don't believe most end users would risk destroying the system's screen—one of the main selling points of the iMac[10]—to replace a fan, so we chose not to try.

On the other hand, replacing all four components was easy on the Dell OptiPlex AIO 7410. No component required more than three and a half minutes to remove and replace, and the replacements all took between 10 and 18 steps. We needed just two sizes of Phillips-head screwdriver to complete the replacements.

Figure 4: Time and steps required to remove and replace four components from the Dell OptiPlex AIO 7410 and Apple iMac. Lower is better. Source: Principled Technologies.

Extrapolating our results

If you're one person fixing your own laptop, a fast and easy repair is great: It lets you move on to the rest of your day with little disruption or frustration. The benefits of those time savings are magnified, however, if you're on an IT team tasked with managing and repairing dozens or hundreds of laptops. In a professional context, time savings can translate directly to cost savings. With the time you save making a component replacement, you can repair more laptops and deal with more service tickets—or maybe even turn your attention to those big-picture IT improvement projects that can sometimes fall by the wayside in favor of more urgent issues.

To look at how some of the time savings we found for Dell devices might scale with a large fleet, we envisioned a team of IT professionals working with a large fleet comprised of half laptops and half workstations. Though many of those systems would likely never need a component replacement, over the course of their life, some would have components fail and need a repair.

Figure 5 shows how long it would take to replace devices' batteries for larger and larger fleets based on our testing. We assume that the Dell fleet is comprised of half Dell Latitude 7340 laptops and half Dell Precision 5680 workstations, and that the Apple fleet is comprised of half Apple MacBook Air 13.6" laptops and half Apple MacBook Pro 16" workstations. (Note that not every device in a fleet will need a battery swap, so, for example, a team making 50 battery replacements would be working with a fleet much larger than 50 devices.)

The difference is large when we look at 50 replacements, with the hypothetical IT team for the Dell fleet saving 22 hours, or about two and a half eight-hour work days. Scaling up to 1,000 replacements, however, the team would save a staggering 443 hours: over 11 full 40-hour work weeks. While it's unlikely that any team would need to perform 1,000 battery replacements in a short time period, these time savings are just as significant spread out over several years as they would be in a single month or quarter.

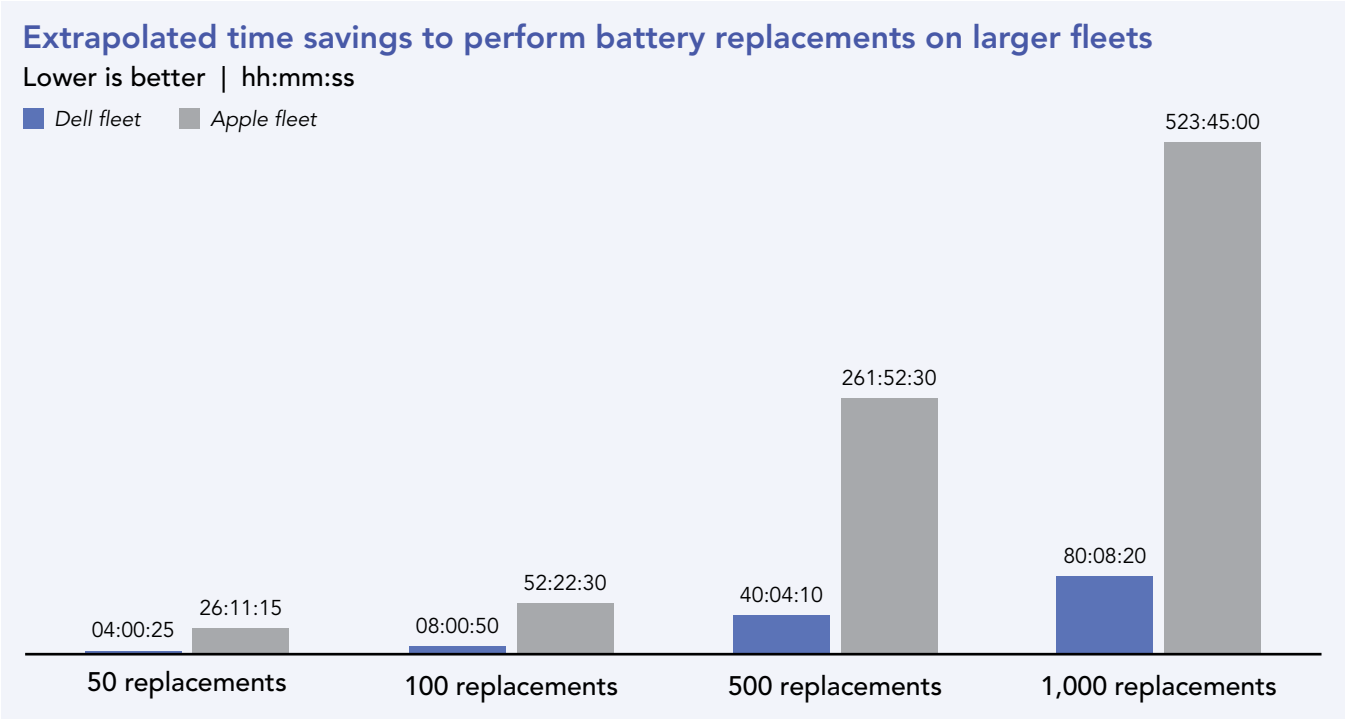


Figure 5: Extrapolation of how long it would take to replace batteries on 50, 100, 500, and 1,000 devices, with the Dell fleet comprised of half Dell Latitude 7340 laptops and half Dell Precision 5680 workstations, and the Apple fleet comprised of half Apple MacBook Air 13.6" laptops and half Apple MacBook Pro 16" workstations. Source: Principled Technologies.

Conclusion

When you have a device problem that you can solve by switching out a part, it's a cost-saving and sustainable choice to make that fix rather than purchasing a new system. Doing the repair yourself rather than calling support can lead to further time savings—but only if that repair is quick and easy.

In comparisons of two laptops, two mobile workstations, two desktops, and two all-in-one desktops from Dell and Apple, we found that it was easier and faster to swap out key components on the Dell devices than it was on the Apple systems. Across our testing, for the components we were able to replace on both the Dell and Apple systems, it took an average of 23 minutes 55 seconds—or 84.7 percent—less time and 34 fewer steps to swap components on the Dell systems. The Apple systems had more components that we could not remove, and several devices used a proprietary screw type that required a nonstandard screwdriver. If repairability is important to you, choose devices that make changing components fast and simple.

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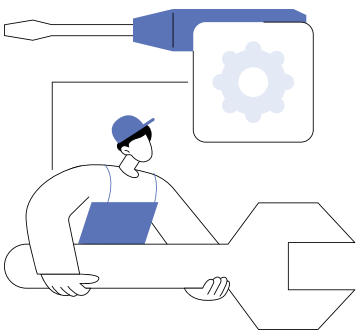
9. "CARTMAN 39 Piece Tool Set General Household Hand Kit with Plastic Toolbox Storage Case Orange," accessed October 27, 2023, https://www.amazon.com/CARTMAN-General-Household-Plastic-Toolbox/dp/B00RF9J8DY/ref=zg_bs_g_553402_sccl_1/137-9749768-4937052?th=1. This toolkit was the #1 Amazon best seller on October 27, 2023.
10. The "stunning 24-inch display" is the second feature listed on the iMac product page: iMac, accessed November 2, 2023, https://www.apple.com/imac/.



Read the science behind this report at https://facts.pt/qnj2uwS ▶

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