



Apple Changes the PC Again

By Mark Costlow, SWCP President

Unnoticed outside technical circles, Apple recently introduced a new range of laptops using their own CPU chips called **Apple Silicon**, the first being designated as M1.

Often called the computer's "brain", the **CPU** (Central Processing Unit) is the very core of its being. Changing to a different, new, non-compatible CPU affects everything. All electronics must be modified, and every piece of software must be adapted or rewritten, from basic code users never see to the operating system to every app used. It's an enormously complex, expensive undertaking, so why do it?

At first, it may seem to be all about costs. Since the CPU is one of the most expensive single parts of the laptop, building them in-house will be cheaper and there are follow-on savings from not having to rely on an outside company for such a critical component. Apple could create a much tighter, faster feedback loop between CPU design and overall computer design, speeding innovation. Since the new M1 chips are based on the **ARM architecture** that Apple uses in their phones and tablets, it should also reduce many efforts duplicated by product teams.

But cost savings may not be the reason. The real goal is an even more tightly integrated computer system, one Apple controls from top to bottom. It's a logical next step in Steve Jobs' grand plan. People worried his passing in 2012 would leave the company rudderless, but this shows Apple is following his vision, doubling down on his core concepts.

To see how this is an extension of Jobs' plan that may have influence far beyond Apple, it's necessary to look back at the early iPhone and iPad development.

Introduced in 2008, the first iPhone used a Samsung ARM chip repurposed from TV set-top boxes. Apple quickly realized no chip available could support their new devices. They needed powerful chips which take little power because battery life is such a big deal for mobile devices.

For the first iPad in 2010, Apple designed their own CPU, the A4. Licensing the ARM architecture, they built the chip using those instructions. Later that year, the new iPhone 4 also used the new A4 chip, which was backward-compatible with existing iPhone software.

Apple began adding new subsystems to their phones and tablets, such as the motion processor to track movements, security used by fingerprint scanners and

payment solutions, plus GPUs needed for ever-flashier graphics performance. Building each of these as individual subsystems requires precious physical space and battery power. Integrating them with the CPU along with memory and data storage on a single microchip, the so-called "**System On a Chip**" (SoC), saves time, space, and power.

The typical objection is that such a tight amount of integration makes it hard to improve one subsystem on its own since a few parts in the assembly line can't just be replaced for the new features. A whole new SoC has to be built with updated subsystems.

But Apple WANTS to be in control of every aspect of their system. Plus, iPhones and iPads have always had a relentless update schedule. Every September a new iPhone comes out with revisions to the CPU and other improvements. Changes come fast enough that advancements to any one subsystem won't be delayed long before the next product release. For instance, the A4 chip introduced in 2010 has been improved every year: the 2020 version is called the A14.

For a decade, Apple has doggedly increased the power and capability of its phones and tablets, while extending battery life. But such improvements are only incremental. SoCs allow both bigger batteries and lower power draw by saving more room in the phone case for batteries, and sipping less power.

PC and laptops, on the other hand, are meant to be plugged into the wall. Laptop batteries allow untethered roaming for a while, but not for long periods. Laptop users can get away with a power-hungry CPU and less-integrated components. Fans can even be put inside the laptop to keep a white-hot CPU from melting the case.

Apple has struggled for years to advance their laptops, aiming for lighter and faster machines with longer battery life. But the power-gorging Intel chips at their core have hindered this progress. Apple has been frustrated by this situation for a few years, granting Intel several chances to improve, but finally gave up. However, I think they've planned this split much longer, maybe as far back as 2012.

Intel-based laptops generally post high benchmark numbers, but they can be misleading, as they are only attained while running at full speed, which they can't do for very long. When running intensive tasks like encoding a long video or full-screen 3D gaming, the fans noisily engage to keep the system cool enough. But as soon as the heat buildup becomes too much, the system automatically

throttles back the speed to avoid physical damage (as well as burned thighs).

The new M1 Macbook Air using the new Apple Silicon chip does not ship with a fan. That means passive cooling (i.e. a heat sink) is enough to allow sustained operation. Yet the highly-integrated M1 SoC appears to perform just as well as all but the most powerful (and pricey) Intel-based Macbook models.

All indications are that this is a huge improvement in computing efficiency, spoken of in the somewhat fuzzy metric of "performance per watt". Users can buy another laptop which is as fast as the M1 Macbook Air, but hotter, louder, using more power to empty its battery sooner.

This is an important change. Apple is one of the very few companies that has truly disrupted a market segment or whole industry, not once but several times. Such products are never the very first of their kind, yet they somehow capture the imagination and dominate other players, at least for a while. They sometimes even create entirely new markets that nobody else believed existed.

- The iPod, combined with iTunes and deals that Jobs forged with record labels, revolutionized portable music players. Before that, music piracy was destroying labels' business. iTunes gave users an easy and legal way to buy digital music, and the iPod's promise of "1,000 songs in your pocket" made consumers want to do it.
- The iPhone created the smartphone market. When the first came out in 2007, I had owned what passed for a smartphone for four years but still didn't think web browsing would ever be done on our phones. The iPhone showed it was possible, pleasant, and not tedious. Apple dominated the market completely, though now they share it with Android-based phones. All other players are gone (or at least their smartphones are).
- In 2010, the iPad launched tablet computing, which before only existed in tiny niche markets. The tablet was an instant hit. Millions were sold in the first year and every year since. As with smartphones, iPads now share that market with Android-based tablets.

So why do I think the new M1 machines represent such a huge change? They aren't revolutionary. Right now, they just do the same things a bit faster, quieter, cooler, and maybe cheaper. But they have shown that these "low-power" CPUs, before only useful in tiny low-power devices, can in fact be full-fledged computing monsters, if the SoC they use is designed to fit the target user's applications.

The M1 is a big brother of the A14 chip in the latest iPhones and iPads, scaled up to take advantage of the larger battery and heat-dissipation available in laptops. The chips have more cores and more memory – just the same things a little bigger. But M1 instantly leverages all the hard work gone into making the A14 a speedy, low-power chip.

Apple is not the first company to produce laptops using ARM-based chips. But other offerings in this area have been unsatisfying and clunky. They don't have the tight integration that helps the M1 perform so well, or the other ace up its sleeve: **emulation assistance**.

A huge cost of changing the CPU used in an entire product line is the customers' investment in software that only runs on the older system. The new chip must be able to work like the old chip or users might revolt. It's this clunky emulation layer that sunk other ARM-based laptops trying to run software compiled for Intel-based chips.

Since Apple controls the M1 completely, they were able to add things to the basic ARM design to help it run Intel-based programs faster and more easily than generic ARM emulators. For this "new" approach to reach beyond Mac users, it would have to be adopted by Windows PC manufacturers. That's unlikely right now, as an off-the-shelf ARM design can't be slapped into a PC to run Windows.

Apple did not produce this SoC overnight. They've been working on it for over a decade, investing billions to build their in-house chip design teams. Low-margin PC sellers (HP, Dell, Lenovo) likely do not have either the cash or patience to execute such a feat on their own.

One scenario where it might happen is if x86 Windows could be run on M1 Mac laptops. While this is not possible today, people are working on it. If this occurs, those PC companies might start to see market pressure from Windows users opting to buy Mac hardware, which might encourage them to follow the same path.

But, there is another market where Apple Silicon could potentially make an even bigger splash: the **datacenter**. We'll look at that in a future issue.

Online Sign ups for Covid Vaccinations

To get on the COVID Vaccination waiting list, you must register with the **NM Dept. of Health**. As their website is a work in progress, you will need to visit again to add information and to schedule appointments later on.

First, click on the box which allows you to create an account. Enter as much of your info as you can, including phone number and email address so it can send you a confirmation code. With it, you can return to update your registration and eventually set up an appointment.

The site wants to know whom to charge (don't worry – you will **not be billed** for the shot or appointment) and what health conditions you might have to determine when you can get the jab. Remember, you will require TWO SHOTS, about 3-4 weeks apart, which you must schedule.

The site WILL NOT ask for personal information such as Social Security numbers. If you are somewhere that wants that, you're in a *very* wrong place. Leave immediately.

Vaccine info: <https://cv.nmhealth.org/covid-vaccine/>

To register for COVID vaccination:

<https://civaccine.nmhealth.org/registration.html>



New Mexico's Expert Internet Service Provider since 1994

505-243-SWCP (7927) © SWCP.com © Help@swcp.com

5021 Indian School NE, Suite 600, Albuquerque, NM 87110