10 Featured Articles from the Home of Tech Enthusiasts

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Linux Everywhere

Premium article published on Thurrott.com April 23, 2018 by Paul Thurrott

Bill Gates once remarked that Windows was the most versatile software that the world had ever seen. But one might much more easily make that case for Linux, a free and open source software stack that has proven far more adaptable to far more usage scenarios than Windows.

Yep, it's a Linux world. And we're just living in it.

A decade or so ago I was considering writing a book called *Windows Everywhere*. The title was an updated riff on the phrase "NT Everywhere," which I had secretly witnessed the NT team chanting at an internal meeting following the release Windows NT 5.0 Beta 2, in 1998. It was going to be the inside story about how Windows took over the personal computing world.

And for a few years after that milestone, it looked like Windows was set to do just that. Microsoft merged its consumer-oriented Windows 9x releases with NT, and it established Windows Server as the de facto platform for the Fortune 500, establishing its enterprise cred in the process. Microsoft applied the name "Windows" to just about anything it could, and some it shouldn't have. More important, it shut down any internal projects that would in any way threaten its core product and revenues earner. Windows everywhere, indeed.

Among the many successes of that era, it seemed, was the defeat of Linux on the PC desktop. Aside from a brief and temporary surge with netbooks, which Microsoft quickly defeated by creating the low-ball Windows XP Starter Edition, Linux never took off with end users in any meaningful way. And what was once seen as a very credible threat to Windows was minimized, and even openly mocked.

We were so naive.

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I have two personal ties to Linux. The first came in the mid-1990s, when I was working in one of the computer labs at Scottsdale Community College in Scottsdale, Arizona. As a life-long tech enthusiast, I had long been curious about UNIX, though it was always some unattainable, high-end system. And then I heard about Linux, the free UNIX-like OS. Which was distributed in floppy disk-sized downloads.

Looking at an early version of Slackware Linux, which installed using a delightful, DOS-like text interface and then also ran mostly in a DOS-like text interface since the X-Window system was so buggy and hardware-specific, I wondered. Here was a system that could possibly do most of what Windows could do. There were free office productivity suites in the works, too, like StarOffice (later, OpenOffice). What if. What if those two products together could do even the top 20 percent of what users expected from Windows and Office? And do it for free.

What if.

My second major tie to Linux came in 2000. I was in Israel consulting with a company in Herzliya, and the CEO suddenly popped his head in the room. "You write about Microsoft, right?" he asked me. Yes. "Well, I have two guys in my office you need to speak with."

The two guys, as it turns out, were from a company called Mainsoft, which had been secretly commissioned by Microsoft to explore what it would take to create a version of the Office productivity suite for Linux. So I spoke with them—using the CEO as a translator—for quite a while, got in touch with a third person they recommended I speak with, and took some notes. Which I then promptly sat on.

Paul Thurrott, ace reporter.

A week or so later, however, I consulted my notes and started doing some research. Mainsoft, as it turned out, had deep ties to Microsoft. Had, in fact, received access to the Windows NT/2000 source code at a time when such access was quite rare. It had also been porting Microsoft's Win32 applications to UNIX for several years by that point. **So I wrote it up**. It's still an interesting read, almost 20 years later, if I do say so myself.

Microsoft never did release a version of Office for Linux, of course. But I suspect that the real story there was that the company correctly saw Linux as the threat that it was, and that it wanted to hedge its bets. The recent meme that Microsoft has somehow only recently caught the cross-platform bug is, of course, nonsense. But we forget because Windows was so dominant for so long, and Microsoft got caught up in that too.

In any event, I'm sure Linux's defeat on the desktop was reassuring to Microsoft. And, of course, it had other, even bigger worries in that era, like the sweeping antitrust cases that would distract it for over a decade.

But during this time, personal computing began a shift that would culminate in a new era defined by mobile and the web/cloud. And as it turns out, Linux—and not Windows—was uniquely positioned to capitalize on this change. Windows had won the PC generation. But the next generation—"mobile first, cloud first," or whatever you want to call it—would be dominated by others.

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I probably don't need to explain the percentage of Internet servers that run on Linux and free and open source (FOSS) solutions like Apache. Or that the dominant personal computing platforms of today are based on Linux (Android) and Linux-like (iOS) kernels.

Less clear, perhaps, is the way that Linux has spread to virtually every kind of computing device imaginable, thanks to its small size, modular design, and, I bet, its low costs. It's in smart devices of every kind, embedded devices in switches, cars, home security systems, and more. It is, quite literally everywhere.

Microsoft's recent move to use Linux for the client OS part of its Azure Sphere stack is just the latest example of both the pervasiveness of Linux and of Microsoft's ongoing embrace of this system. Combined, these two things tell us more than anything that the very notion of *Windows everywhere* was, at best, a temporary condition impacting a relatively small market. And that *Linux everywhere*, while possibly temporary as well, impacts a far bigger audience. Exponentially bigger.

If you're looking for a comparison, consider my comments about antitrust with regards to Microsoft and Google, respectively. Whatever issues Microsoft may have caused, the potential audience there was about 1 billion people at best, and it impacted a market in which 200-300 new PCs were purchased every year. Google's potential impact, meanwhile, is literally the entire planet: Through its web- and cloud-based services, Google can reach all of us.

Linux works the same way. It's a platform with a nearly unlimited potential audience size. And each of use will interact with multiple Linux devices, including sensors, each day. Instead of just one Windows PC.

Windows everywhere. How cute.

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Microsoft Moves Aggressively to Secure Its Future

Premium article published on Thurrott.com April 17, 2018 by Paul Thurrott

This week's blockbuster Azure Sphere announcement represents an astonishing confluence of several big themes we've discussed here on Thurrott.com in recent weeks. This is a *big* story. And not just for the obvious reasons.

And certainly not because of security. Because it was announced at the security-themed RSA Conference this week, Azure Sphere is being positioned by many as "IoT security." But that's only part of the story. The least interesting part, frankly. Since I've been obsessing over what Microsoft will do next on the client now that it has publicly demoted Windows, **I of course focused on the Linux-based OS that the software giant is making**. But that, too, is just part of the story. An interesting part, for sure. But only a part.

So let's step back for a moment and consider what's really happening here.

Microsoft often speaks about the digital transformation that is sweeping the industry and about its role helping its enterprise customers, in particular, make this transition. But there is a less-frequently communicated digital transformation happening here, too, and it's the one I care about the most: Microsoft's. Microsoft, which once lorded over the personal computing industry, is now trying to find its way in a more heterogeneous world that it focused on cloud and mobile.

Microsoft's epic defeat in mobile is well-understood and doesn't need to be repeated here. Likewise, the software giant's future in the cloud is as well-understood. Just note that all of the software giant's moves in recent years can be viewed through the lens of these two initiatives, one a success and one a failure.

So what is Azure Sphere really about? At a high level, Azure Sphere supports the premise of my commentary of two weeks ago, **Microsoft's Role in the Next Wave** (Premium). Which is that the "next wave" is what I call ambient computing.

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Today, ambient computing is mostly about digital personal assistants on phones and in smart speakers. But those are limited and transitionary markets. According to Microsoft, the industry already ships over 9 billion IoT devices every year. That compares to about 1.5 billion smartphones and about 250 million PCs. *That's* the potential here. Something that swaps even the smartphone market.

But Azure Sphere isn't a big story just because Microsoft intends to play a role in ambient computing. Of course it does. It's a big deal because Microsoft, very explicitly, intends to play a major role at every level of the stack imaginable. It's not just providing AI-based cloud services and an Internet of Things (IoT) software platform. It's doing *everything*.

Put simply, this is a public declaration by Microsoft that it will not miss the next wave.

The name Azure Sphere is interesting on two levels. Most obviously, it ties the platform into Microsoft's Azure cloud services family. Less obviously, it kicks the Windows brand to the curb. This is the first public-facing operating system from Microsoft to not bear the Windows name since ... when? OS/2, I think. Which Microsoft last contributed to in, oh, about 1990.

(Pedant alert: Yes, products like Zune, Xbox, and maybe some others could have had non-Windows-based OSes. But this wasn't something Microsoft ever discussed publicly, with the exception of the Xbox One's OS, which Microsoft clearly identified as being Windows.)

Anyway, the Azure Sphere name very correctly identifies that the rest of the platform will utilize, if not completely rely on, cloud-hosted Azure services. I find it interesting that very little was actually said about the top-level Azure services that may of most use in this market. Perhaps there is nothing new to say there, or perhaps it is waiting for Build.

Below this, the new Azure Sphere Security Service will securely broker communications between the cloud and compatible IoT devices, and from IoT device to IoT device. This piece explains the announcement's RSA setting, I guess, and it is absolutely a differentiator for Microsoft. The theory here is that businesses need a trusted partner to move forward with their digital transformation. Microsoft is obviously that partner for the enterprise. Azure Sphere shows it wishes to bring that reputation and capability set to IoT as well.

Microsoft is also providing two platform components on what we used to call the client. The more traditional of the two, Azure Sphere OS, is that thing we often associate with Microsoft, an operating system. But it is not based on Windows. Instead, Azure Sphere OS is based on Linux. It is, Microsoft says, the first time it has ever distributed a custom Linux kernel.

(Pedant alert: Back during the Middle Ages, Microsoft did distribute its own UNIX variant called Xenix. And more recently, Microsoft has used Linux in its Azure datacenter switches. And added Linux capabilities to Windows 10. Whatever.)

Transitions like this are interesting, right? When Microsoft decided to kill the NT brand with Windows 2000— a product that was originally called Windows NT 5.0—it provided the product with the redundant tagline, "Built on Windows NT technology."

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That was 20 years ago. Today, Microsoft is similarly transitioning us from the old to the new, in this case claiming that Azure Sphere OS "combines security innovations pioneered in Windows" with its new custom Linux kernel and a "security monitor." The result? "A highly-secured software environment and a trustworthy platform for new IoT experiences."

Windows diminished, indeed.

The second client component is as unexpected as the first: Microsoft isn't just making a new OS for IoT. It's designing and making a new hardware platform, too.

As you may recall from my article **Serious About Software? Make Your Own Hardware!** (Premium), all major software platform makers are expanding their reach to include hardware components. In Microsoft's case, the most visible example, so far, has been **the Pixelsense Accelerator chip in its Surface PCs**. But the software giant has also touted its custom component work in Azure datacenters and in its Xbox consoles too.

For Azure Sphere, Microsoft has created a new MCU (microcontroller unit), a tiny system on a chip (SoC) design that provides multiple ARM processor cores (of both performance and efficiency types), SRAM, flash storage, a security subsystem, multiplexed IO, and Wi-Fi networking on a wafer that is smaller and thinner than a fingernail. The silicon reportedly uses technology that Microsoft first developed for Xbox, though details on that relationship are scarce.

What this new MCU enables is "the intelligent edge" in the smallest possible form factor. As you may know, Microsoft's "intelligent cloud and intelligent edge" mantra isn't just marketing: The next wave will require AI smarts both in the cloud and at the edge (the client). These MCUs "enable ambient intelligence" in an MCU for the first time, the software giant says. Microsoft is making its own intelligent edge software *and* hardware. It's a complete platform.

So here's Microsoft. It just demoted Windows. It's been busy embracing Linux in every way imaginable for the past several years. And yet. It was shocking—at least to me—to see the software giant announce its own Linux like this.

But this decision was pragmatic, a Microsoft hallmark, and it fits neatly into **my "right tool for the job" mantra, which I've been writing about and discussing for years**. Microsoft has spent—literally—decades componentizing Windows and trying to create various embedded versions of the OS over the years. And one is correct to wonder what this change means for Windows 10 IoT.

But the market—and basic reality—have spoken. Linux, for whatever reason, is smaller, lighter, and better-adapted for this usage. So Microsoft is adopting Linux where it makes sense to do so. It's the right tool for the job.

There is still so much more to discuss here. But Azure Sphere demonstrates that Microsoft is serious about playing a major role in the future. And in doing so, perhaps side-step its presumed fate as the next IBM.

More soon.

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Microsoft's Opportunity To Capitalize on Data Privacy

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The past few weeks have been filed with headlines with everything from your entire digital life has been stolen to images of Mark Zuckerberg testifying before Congress. While the verdict is still out if the Cambridge Analytics scandal is going to have any significant impact on Facebook's longevity, it has done one thing, opened the door to the conversation about your digital privacy.

It's almost a bit humorous too, that this is the topic that is making consumers become aware of how they can be exploited online. No, it's not the almost weekly data breaches that expose your financial information to the criminals of the world, it's that a company was able to scrape all your likes and activity to be targeted for political gains.

But, at the end of the day, people are now more seriously looking at the data they give to these services and while I don't believe this will have any noticeable impact on the networks where consumers interact, for companies who own this type of data, they are now finding themselves in the spotlight.

It's because of this that Microsoft has a chance to grow its presence and confidence with consumers, an opportunity that does not come up very often. While the company does have its Bing search engine, when compared to Google, Facebook, and many other sites that are primarily driven by advertisement revenue, Microsoft fills out its bottom line mostly with services like Office, Azure, Windows, Xbox, Surface and many other non-advertisement driven revenue channels.

In a recent poll by **Recode**, it showed that Facebook is the least-trusted company of those in the survey, with 56% reporting that they did not trust the company followed by Google and then Uber. Keep in mind, this is stack ordered, so even though Google is only at 5%, this means that they are the second-least trusted of the possible options which include other companies like Apple, Amazon, Microsoft and many others. While 5% is significantly lower than Facebook's result, this means that 5% of the respondents thought Facebook was more trustworthy than Google.

While I wouldn't personally put a lot of weight into the poll, it does provide a small look at how the American population is viewing these companies.

And for its part, Microsoft has done a good job of showing that it cares about your data and trying to protect it. The company's Chief Legal Office, Brad Smith has been a vocal advocate for protecting data and of course, the company's legal battles over data stored in an Irish data center show that the organization doesn't simply roll-over every time they get a government request for data.

Further, the company has started bringing enterprise-level security protections to the **consumer SKUs of Office** and you have to acknowledge that Windows Defender is also another example of the company actively protecting its users from malicious activity. While I know users are still asking for an 'off' switch to telemetry collection in Windows 10, the company has **significantly improved visibility into these practices** with the latest version of Windows 10.

That being said, Microsoft needs to establish a far-ranging marketing effort to show not just corporations but also the consumers that the company is protecting your data and that you should trust the company with uploading content to OneDrive or using Outlook.com. Because of the heightened sensitivity to this topic, a marketing campaign that targets this topic would build a serious amount of good-will for the Redmond based company.

As Microsoft continues to move through this awkward period of where they have consumer services but the enterprise is the focus, building trust with consumers is a long-term strategy that has little downside and right now is the time to go on a media-blitz to capitalize on the market momentum.

It's Easier to Add than Subtract

Premium article published on Thurrott.com April 9, 2018 by Paul Thurrott

Watching Chromebooks evolve into truly capable PC replacements is a fascinating reminder that it's easier to add than subtract.

This is a topic I've raised from time-to-time, and it has important implications for Microsoft and Windows, in particular.

When we look at the evolving state of personal computing, we can see very clearly that mobile devices—mostly smartphones, but also tablets—have long outstripped traditional PCs and Macs. This is true of both unit sales, or marketshare, and usage. The PC once dominated personal computing but it is now a bit player.

To adapt to this seismic shift, Microsoft has tried to simplify its aging, legacy Windows platform. In doing so, it is, in effect, trying to *subtract* from Windows. It is trying to make Windows simpler or, using its own terminology, more streamlined.

But you can't subtract from a complex, well-understood platform like Windows without losing functionality. And in many cases, this makes the platform less usable and familiar. And less useful, especially to the billions of people who rely on things working a certain way.

The best-known example of this subtraction, S mode, is artificial. While running in S mode, Windows 10 still includes all of the functionality needed to run desktop applications and other software. It's just hidden from the user. And it hasn't gone well at all, as is well-understood.

This approach makes sense, at least conceptually. As it turns out, Windows actually requires all of that legacy desktop code to run. Windows isn't just not the same without it. It's nothing. Hiding its legacy past is just about as sophisticated as this will ever get. Microsoft would pretty much need to start over otherwise,

and its previous attempt at doing so—Windows Mobile nee Windows Phone nee Windows Mobile again—failed about as hard as anything can fail.

And that's too bad. Because it's much easier to add than to subtract.

As I wrote two years ago in **Can Google and Apple Pull the Plug on the PC Market?**—and have discussed many other times, both in writing and on podcasts—the makers of simpler mobile platforms face an easier task than Microsoft does with Windows. They can simply add capabilities to their platforms over time, as they have, and make the products more sophisticated.

That said, Android and iOS have both moved awkwardly into this future. In the two years since I wrote that article, Android has continued to fail on tablets and has never emerged as a serious contender on PC-type devices. And the multitasking features Apple has added to iOS on iPad Pro are almost laughably bad: They are impossible to discover organically, do not work logically, and are further hampered by Apple's tunnel-vision on the separation of desktop PC and device.

These failures would give Microsoft and Windows some breathing room if it weren't for one little problem: Chromebook. Google's browser-based OS provides the right mix of "good enough" and "it just works" to trigger an education market revolution both in the U.S. and abroad. And the arrival of Android app support and the Google Play Store has finally put this platform over the top for mainstream consumers and business users too.

The melding of Chrome OS with Android isn't completely seamless, for sure. But it's a lot more useful than Microsoft's addition of a mobile apps platform in Windows 10.

And you can see the growing maturity of this combined platform in modern Chrome devices that can better take advantage of all the new capabilities. The **Google Pixelbook** may be a tough sell at $999, but it's a truly lust-worthy and aspirational convertible 2-in-1 Chromebook whose design rivals any MacBook or Surface PC. The recently-announced **Acer Chromebook Tab 10** is the first of what will no doubt be many Chrome-based tablets. And now we have **the first Chromebook detachable 2-in-1, the HP Chromebook x2**.

A quick look at this device will show that it very closely mimics the Envy x2, which comes in both Qualcomm/ARM and Intel variants. It features lower-end specifications, but it can because Chrome OS doesn't require all that overhead. The result is a device that looks just as good as its Windows-based siblings but costs much less, at $600.

Some will argue that it also "does" less, but that's myopic. This device, with its Chrome and Android app compatibility, does exactly what most people need. Only a handful of niche vertical markets for hard-core gamers, developers, graphic artists, video editors, and the like would not be served by such a machine.

As such, this new generation of Chromebooks constitutes a serious threat to Windows. And it comes at a dangerous time because productivity is pretty much the only big market that Windows has left. These new Chromebooks may be better than just "good enough." They may be … gulp … *better*.

I mean that in a very general sense, of course. And I know that for my own personal use that a Windows PC remains the right choice. This is true for many of you as well, obviously. But if you look past your own needs, preferences, and deeply-ingrained expectations, I think you will you agree that Chromebooks have evolved to the point where they are serious competition when it comes to the mainstream mass market of users. It's pretty obvious.

We used to joke that [insert year here] was "the year of desktop Linux." That fantastical alternate reality never happened, of course. But it is quite possible that Google, after many fits and starts and broken promises, has finally arrived at something even more chilling: The year of the Chromebook. And this hybrid system, unlike Linux, isn't just a viable alternative to Windows. It's one that is simpler and, in most cases, less expensive. In short, better.

And it just isn't clear how Microsoft subtracting from Windows 10 will ever rival Google adding to Chrome OS. In fact, this contest may already be over.

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Thinking About Apple's Education Play

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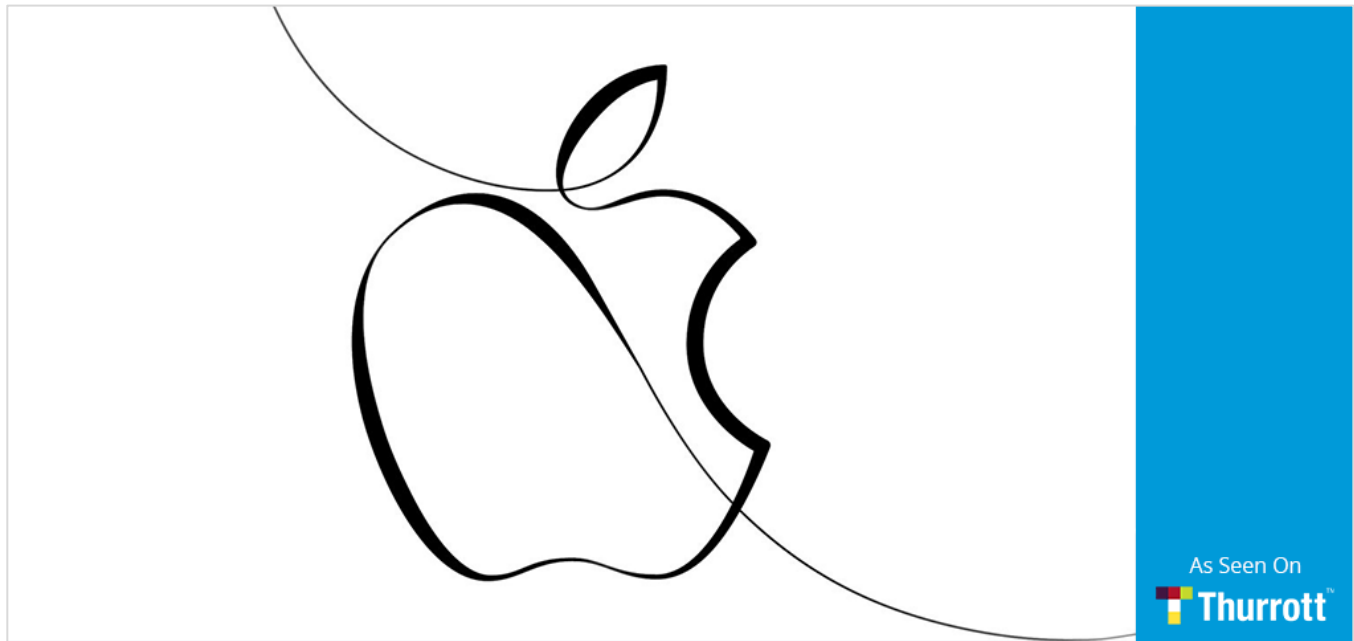
Yesterday, Apple revealed its belated response to Chromebook's domination in education. But once you get past the marketing whitewash, it's not clear why any credible K-12 institution would take up Apple on its new efforts.

Apple faces **the same problem in education that Microsoft does**, especially in the United States, where Chromebook now accounts for more shipments to this market than all of their offerings combined. And it's simply stated: Losing the education market is tantamount to losing the future because students entering the workforce will expect—will *demand*—that they be able to use the technologies with which they are familiar.

Some have expressed doubt to me about this concept. But I'll just point out the obvious: Every major trend is IT over the past 20 years was driven by user demands, not by IT needs or wants. The consumerization of IT, the push to mobile and the BYOD (Bring Your Own Device) phenomenon, and user-managed solutions like SharePoint have all come about because of user frustrations. This isn't some future trend. It's all happening right now, and it will continue to happen.

In the wake of several initiatives—Windows 10 S, full Office in the Microsoft Store, education features in Microsoft Edge, the Set Up My School PCs program, Intune for Education, Minecraft Education Edition, and Office/Microsoft 365 among others—over the past year, **I graded Microsoft an "A+" for its education efforts back in January**. The point wasn't so much that Microsoft would win back share as a result of those efforts, but rather that the software giant was clearly taking the Chromebook threat seriously. And was doing everything it could to counter that threat as a result.

The army that Microsoft can go to war with here is straightforward and well-understood: It has excellent server and cloud services, great but complex client software, and a client platform—Windows—that has perhaps worn out its welcome. But it is at least a multipronged attack. And while some will correctly argue

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that Chrome retains an edge in some key areas that really matter in education—cost and simplicity, plus its growing recognition as an offering that just works—Microsoft, too, has its advantages.

But what about Apple? It wasn't that long ago that Apple's primary contribution to education came in the form of Mac hardware, which it still discounts for students, teachers, and others in education. But Apple's fortunes have shifted decidedly over the past decade. And these days, with iPhone responsible for about 70 percent of its revenues and iOS overall combined with services responsible for about 95 percent, Apple's focus is quite different. And that is clearly impacting its education strategy.

For a brief moment in the early 2010's, it appeared that the iPad would be a huge success in education. And that this success could lead to the fulfillment of Steve Job's post-PC vision. But that success was short-lived: There are very few successful iPad deployments in education today. And many of the schools that did deploy were involved in high-profile controversies over the price/functionality of these devices. Some were even issued refunds. The iPad, to date, has been a disaster for Apple in education.

So it is curious to me that this firm—which, yes, is often comically tone-deaf when it comes to feedback it doesn't want to hear—is pushing an iPad-only strategy for education this year. That it is coming a full year after Microsoft's education "aha" moment makes it all the more confusing. Where Microsoft comes bearing a massive army, Apple comes with an iPad. And an Apple Pencil. And a handful of services.

Given the poor performance of iPad in education today, it should be obvious to Apple that this market has by and large figured out that Apple's fancy talk doesn't amount to results in the real world. And that more of the same isn't going to cut. But Apple released a barely-new iPad with the same price as last year ($329 to start, or $299 for education) and only one new feature: Apple Pencil support. There's no Smart Keyboard, which is probably a requirement for most educational purposes. But there are some new classroom services that mimic what Google and Microsoft offer. Probably poorly: Apple is about fluff, not substance.

What Apple didn't deliver is an inexpensive (for Apple) Mac for students and teachers. Or truly impressive discounts for education across the board. These are two things Apple *could* do. And I can only surmise that the reason it didn't do so is that it doesn't see the education situation as an extinction moment.

It could be right. Apple loses share in every market until it is a minority player by unit sales (marketshare) or usage share. But it generally makes more profits and revenues in these same markets than the competitors that are allegedly beating it. I can't speak to the worldwide market, but that is absolutely the case in the United States education market. Apple may be a distant third behind Google and Microsoft there. **But it is making more money from education than either**.

Tied to this is my notion of students entering the workforce and expecting to use familiar technology when they do so. This explains Microsoft's massive counter-attack against Chromebook in education. But for Apple, it has always retained such a huge and profitable share of device sales, especially in Western Markets, that it may not feel the threat as deeply as Microsoft does. After all, 50 percent of smartphones in the U.S. are iPhones. Who cares how well the Mac—or even the iPad—does? Apple may lose the education market by share, but it can still be profitable and will still derive massive usage elsewhere.

This doesn't explain Apple's strategy or lack thereof. Indeed, this is me just trying to figure out why yesterday's Apple education event was so tepid and uninteresting. Maybe that's all it needed to be.

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Suddenly, Amazon is Number Two

Premium article published on Thurrott.com March 21, 2018 by Paul Thurrott

Amazon founder Jeff Bezos may literally be the coolest guy in the world. Image credit: Getty Images

Amazon.com this week surpassed Google parent company Alphabet to become the world's second-largest corporation by market capitalization. And it has its sights on Apple, which is currently the world's largest and most successful company.

I'd like to consider what this means, solely within the context of personal technology. No, Amazon is not by any means a "pure" technology company: It is most widely known for its online retail store, of course. But then Alphabet/Google isn't arguably a "pure" technology company either, in that it makes over 90 percent of its revenues from advertising.

No matter: The success of these companies allows them to fund personal technology products and services that might not otherwise exist. And in doing so, they are having a dramatic impact on our daily lives, and purely from a personal technology perspective.

First, the numbers. Market capitalization is kind of a bullshit measurement because it relies so heavily on stock price, which I consider to be too volatile, especially for tech stocks, and overly-reliant on market black magic. But I'm not a financial expert, so let's not worry about that right now. Market capitalization is a figure that represents the "value" of a company. And as any Google search will tell you, it is calculated by multiplying the total number of a company's shares by its current share price.

Apple, the world's largest company, has a market cap of roughly $890 billion at the time of this writing. One of the big financial stories of 2017 was the expectation that Apple would be the first corporation to surpass a $1 trillion market cap sometime in 2018. But the disastrous iPhone X launch scuttled that notion somewhat, with analysts noting that Apple has now twice reduced component orders for the device. And the market has responded by halting Apple's previous stock growth trajectory. (Looking at the stock today, it

seems like Apple has actually rebounded in recent weeks, and after a February nosedive. Again, not a financial analyst.)

Amazon, meanwhile, just surpassed Alphabet/Google, with a market cap of $768 million, and its stock has been rocketing upward for the past year, with no interruptions at all. Alphabet/Google, with a more volatile and Apple-like stock price performance over the same time period, is settled in at $762 billion. The expectation is that Amazon will basically increase its lead over Alphabet/Google. And the conjecture, now, isn't *when* Apple hits $1 trillion. It's whether Amazon does it first.

Microsoft, by the way, is world's fourth-largest company, with a market cap of $717 billion. Interestingly, its stock price growth over the past year is much more like Amazon's than it is like Apple's or Google's, meaning that it has experienced a near-uninterrupted upward trajectory over the past year. (There was a hiccup in February, at the same time that Apple experienced its biggest stock price dive in this time period.)

That Microsoft doesn't factor very much into any financial stories lately is interesting to me, but then Microsoft is often ignored for whatever reasons. (It's a younger company that Apple, for example, and Apple is a darling of both the personal technology industry and the financial markets.) More generally, it is also interesting that four of the top five corporations are in the tech industry. (The fifth is Berkshire Hathaway.) And five of the top ten are tech firms; Facebook inexplicably is the world's 8th largest company. I have no idea how that makes any sense.

That Apple, Google, and, to a lesser degree, Microsoft dominate personal computing would not surprise most people. That Amazon has been able to shoehorn itself into this club, however, is somewhat of a curiosity. Amazon's finances are about as mysterious as they can be, given the law. And its revenues from digital products and services, not to mention their relative successes, are particularly well-guarded by the firm. But there was **a recent blockbuster revelation of internal data around the firm's Prime subscription and Prime Video** that I think didn't get the attention it deserves. And that very much factors into this discussion.

These companies all exert some form of leverage of their users, and they do so by taking advantage of—illegally, as some may claim—their most dominant offerings.

Apple, to date, has utilized the purest form of leverage. Its iPhone is responsible for over 70 percent of Apple's direct revenues. But thanks to a halo effect, where Apple's hundreds of millions of faithful customers are so taken with the iPhone that they willing spend money on related products and services, the iPhone is really responsible for about 95 percent of Apple's revenues. This product is *so* successful that the services that serve iPhone users would constitute a large and powerful company all on their own.

Microsoft, of course, invented this strategy, though it beat it into the ground and kept trying long after it had stopped working. But Windows was *so* successful back in the day that Microsoft was able to enter and then dominate related markets for servers (first smaller, workgroup-type solutions, but eventually the enterprise) and office productivity software. Those two markets have evolved to accommodate the cloud era and are, somewhat ironically, now much bigger than Windows, and more crucial to Microsoft's future.

Amazon and Google, however, are different. And the ways in which they are different pose significant challenges to traditional tech firms like Apple and Microsoft. That is, these companies also leverage their

successes with some dominant offering. But their dominant offerings are not (at least directly) technology products.

Google, of course, owns the online advertising industry, and its success there funds digital products and services that, while good, would never amount to a very large or successful company on their own.

And Amazon is a retail store-killing tsunami thanks to its hugely-successful online store. As I've discussed so often, **Amazon has further bolstered its retailing success by weaving in an amazing array of digital services perks that make its core consumer offering, Amazon Prime, even more compelling**. This combination of physical and digital services is a huge advantage, and it is one that its competitors cannot match.

From the perspective of a Microsoft watcher, which I am, I have watched these companies usurp and then surpass Microsoft in many ways, and in some cases, even in core markets.

Microsoft and Google, for example, should own cloud computing in a duopoly, by all rights. But here, Amazon has usurped them both and is widely-regarded as the number one player thanks to AWS. Why does AWS even exist? Because Amazon, thanks to its fast growth and sheer size, needed a way to scale its online operations to match the up-and-down nature of retailing. And in doing so, it realized that this capacity was something that other companies would need, something it could *sell*. So Microsoft is number two here and Google is an also-ran.

Office productivity might be the next Microsoft pillar to take a hit. Today, Microsoft does dominate this market and, according to the most recent data, its revenues from Office 365 are many times the size of Google's comparable business. But Google's biggest success is coming from education, startups, and very small companies, and these markets together equate to the future. Plus, Amazon is getting involved too, with a quiet effort to build on its AWS success with Office 365-like products and services.

On the client, of course, it's already game over for Microsoft, thanks largely to the success of the iPhone and Android, and of Google's free (and advertising-funded) services. Here, Amazon plays a much smaller role: Its Alexa-based smart speakers are popular, but that is a small market and one that Google should be able to run away with. And Amazon's more traditional portable devices overall are a non-event, with relatively small numbers of tablets and e-book readers sold each year. Even the PC market looks impressive compared to those offerings.

But here, again, there is a path forward for Amazon, and it's part of an overall ecosystem strategy that actually makes sense. Amazon doesn't have to sell more tablets than Apple does iPads, per se. It just needs to continue offering a wide range of products and services that revolve around its core Prime subscription. And if these perks do nothing more than keep Prime members happy, and in the fold, great. That's how Amazon measures success. That's how Amazon *is* successful.

Well, that and market cap. It will be interesting to see whether Amazon's unique advantages allow it to catapult past Apple and achieve that $1 trillion market capitalization first. But in some ways, it almost doesn't matter. Yes, Amazon does compete with Apple, Google, and Microsoft in some ways. But in more important ways, it is a unique company that has no direct competition. There just isn't a company quite like Amazon anywhere. And I doubt there ever will be.

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Android Wear is Google's Windows Phone Moment

Premium article published on Thurrott.com March 12, 2018 by Paul Thurrott

Google controls the dominant personal computing platform. So why isn't Android Wear even remotely successful?

That's a great question, and it's an interesting problem for Google. And comes with obvious parallels to Windows phone and Microsoft's many other failed attempts at leveraging its own dominant platform.

First, some data.

Smartwatch marketshare and usage share numbers are a bit harder to come by than those for PCs, tablets, or smartphones. But what I was able to find is that smartwatch sales have seen **explosive growth** year-over-year. The **Apple Watch dominates** this market. And Gartner says that **they will continue to do so through at least 2021**.

Apple's dominance of the smartwatch market, at least from a unit sales perspective, is not assured: It's possible that smartwatches will follow the same trajectory as other personal computing markets of the past—PCs and phones—with lower-cost and more open offerings finally pulling ahead of Apple's more expensive and closed solutions. Or it's as possible that it will track like the tablet market, where Apple has maintained its lead and seen its dominance fade much more slowly.

It says something, perhaps, that the world's largest smartphone maker and biggest overall Android licensee, Samsung, doesn't even use Android Wear: It switched to Tizen for its own smartwatches. The question is *what* this says: As we've discussed in the past, Samsung has been trying to remove Google from its ecosystem as much as possible, and doing so in smartwatches may have just been an easy target.

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But it's not just Samsung. If you look at **the available smartwatches on the Android Wear website**, you'll see something interesting. Yes, a handful of Android handset makers—like Huawei, LG, and Motorola—are represented. But most of the models there are from traditional watchmakers like Casio, Fossil, and Tag Heuer, fitness brands like New Balance, or broader lifestyle brands like Guess, Kate Spade, and Tommy Hilfiger. The smartwatch market is not evolving like the smartphone market at all.

And that, of course, was the same problem that Microsoft faced back when Windows ruled the personal computing world. Its subsequent attempts to leverage the Windows brand and enter other markets all failed. Not just with Windows phone, though that is a high profile and recent example. Windows Media, Windows Media Center, and Windows Home Server, and many others fall into this same bucket. (One wonders how Microsoft Band escaped this branding mistake. Maybe not.)

Some may argue that some of these products didn't fail *because* of the Windows branding. But I think the brand actually played a role in each case. Deserved or not, Windows hasn't been a great brand from a positive connotation perspective for quite some time. Many simply associate it with the drudgery of work at best or with instability and malware at worse.

But it's not just the brand. The parallels between Android Wear and Windows phone are a bit deeper than that.

If you recall my original excitement about Windows phone when Microsoft first announced this system to the world back in February 2010, it wasn't because Microsoft was making it or because it was yet another Windows product. No, my excitement was pure: I was excited about Windows phone because it didn't copy the competition but instead offered a fresh approach to what a smartphone could be. Windows phone wasn't just different, it was innovative. It was *better*. (Well, that was the plan. History and the owners of the apps and services that would run on these devices had other plans, negating Windows phone's advantages.)

Today, Android Wear as a platform is to the Apple Watch as Windows phone was to iPhone/Android several years ago: Not just different, but better. The user interface is logical, unlike Apple's. It's easily learned because it leverages your smartphone navigation skills. Yes, Apple has fixed some of its nonsense Apple Watch user experiences in the most recent releases. But the gap remains. Android Wear is in some ways "better." But Apple Watch still dominates.

Of course, it's not all about the underlying platform either. A platform maker's related apps and services come to bear as well.

When it launched Windows phone, Microsoft did what it could to leverage its popular products and services. So Windows phone included a decent Microsoft Office experience, because that was a such a key asset. Today, you might think that Office on a phone isn't much of a selling point, but remember that Office was bigger than Windows, financially and in usage. You go to war with the army you have.

Today, Google is likewise leveraging its popular products and services in Android Wear. And one can make a great argument that its mobile-focused services—Google Maps, Photos, Search, and so on—make tons of sense. That what Google can do here is better than what Microsoft might have done with Windows phone.

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But these situations are closer to each other than may be immediately apparent. Google, like Microsoft before it, does have strong brands it can bring to bear in this new market. But this new market is still completely different from the dominant platform in question. Slapping the same brand on there won't necessarily seal the deal. Being better than the market leader might not either. And leveraging products and services that may or may not matter in this new market? Kind of a non-event.

The smartphone market, ultimately, bears little resemblance to the PC market, and the one thing that Microsoft could really leverage from the PC—Office—just hasn't amounted to much. Few people would ever edit documents on a phone. Of those that do, I suspect few people are excited about it. After all, it's still work.

As for the smartwatch market, simply providing yet another way to do phone stuff, but now on your wrist, hasn't proven particularly compelling. Smartwatches make for decent "front ends" to the smartphone, for things like notifications. And there are activities that make more sense on a watch than on a phone, like fitness tracking. But for the most part, the primary point of a smartwatch has little do with what's happening on a smartphone.

And that's why Android Wear is failing, ultimately. The smartwatch market is just too different.

Think about it. When Apple talks about Apple Watch compete, it doesn't mention Android Wear or Tizen. It talks about traditional watchmakers. Apple understands that *that* is what it is competing with. And Apple, unique among tech companies, is perfectly situated to compete in a market that prefers form over function. Where looking good is more important than working well.

Today's smartwatch market is really about style and fashion. No wonder Apple is doing so well. And no wonder why geeky, analytic Google is struggling.

This week, we are seeing rumors that Google will try to counter its smartwatch failures by rebranding Android Wear to Wear OS. This follows a similar move to brand Android Pay to Google Pay. And the theory here is that this all makes sense because these things are not specific to Android. After all, you could use Android Wear device in tandem with an iPhone. Sightings of such things are less common than those of Sasquatch, yes, but you get the idea.

None of this matters. Google can rename Android Wear all it wants. It will never have the cachet or luxury appeal of Apple, and that's true no matter whom it partners with. Yes, I do expect Android Wear—or Wear OS, or whatever—to make some inroads on Apple Watch over time. But it will be slow going, a slog. This isn't going to be the smartphone market all over again.

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Flutter, PWAs, and Xamarin, Oh My!

Premium article published on Thurrott.com March 12, 2018 by Paul Thurrott

Google Flutter helps developers more easily create mobile apps that run on both Android and iOS. So how does this release impact PWAs? … is a question I've received from several readers. And usually in the form of an accusation. Like, "but you said that PWAs were the future!"

Relax, guys. PWAs—Progressive Web Apps—*are* the future. And while it's fair to say that Flutter "competes" in some ways with PWAs, in the sense that both are a means to a cross-platform end, these technologies are also, in some ways, unrelated.

The developers in the audience may be rolling their eyes by now. That's fine. But this discussion is for the non-developer, for the most part, and it's a great example of how my developer background really pays off. I've long understood that knowing what's going on in the developer space is a key way for even non-developers to best understand any software platform.

For example, if you want to know what's *really* new in the latest release of Windows 10, iOS, Android, or whatever, you need to read up on the APIs and the developer documentation that the platform makers provide. Think about it: Build, Google IO, and WWDC, which are all developer conferences, and each is literally the single biggest event that each of those companies each year.

And here's a very recent example of this phenomenon: Last week, we learned that **Store apps in Windows 10 version 1803 will finally support multi-instancing**, meaning the ability to have multiple copies of the same app running at the same time. That information came via something that most non-developers would assume is boring: **A live developer broadcast called the Windows Community Standup** featuring Microsoft's Kevin Gallo and Andrew Whitechapel. I watched it live because, again, developer background. (**A previous episode of the Windows Community Standup has great info about Always Connected PCs**. See how this works?)

OK, so what about Flutter and PWAs?

As Mehedi reported this week, Google has announced the first public beta of Flutter, which it **describes** as a "new mobile UI framework that helps developers craft high-quality native interfaces for both iOS and Android."

The basic idea here is very common in the developer space: Developers wish to reuse as much code as possible, and ideally they could create a single app that would run anywhere. That kind of nerdvana, however, is elusive, and the history of personal computing is littered with various high-profile defeats, including most notably, Java and it's "write once, run anywhere" mantra. Which was more ideal than reality.

Flutter, more specifically, is an attempt to let developers create truly native apps that run on the only mobile platforms that matter, Android and iOS. So "write once, run on both Android and iOS." Which is the same as "anywhere" when it comes to mobile.

What Flutter requires of developers is learning yet another programming language (called Dart, which is itself yet another C-like language) and a new UI framework that ensures that the created apps look and work correctly on each platform.

There's a Flutter editor, but Flutter also works within established developer tools like Android Studio (which is used to create Android apps) and Visual Studio Code, Microsoft's extensible developer editor. ("Full" Visual Studio is a more powerful, full-featured IDE, or integrated development environment that can be used to target a well-spring of application types, services, and more.) This means there's one less thing to learn, since you can use it with the tools you already know.

Flutter is the real deal, and Google has multiple high-quality examples of real-world apps for you to sample. These include **Hamilton: The Musical**, **Google AdWords**, and **Flutter Gallery**, which demonstrates what's possible with this technology.

And for you tech enthusiasts in the audience, here's an enticing bit to consider: Flutter is core to Fuschia, the secretive new OS that Google is building. Any app created with Flutter will also run on Fuschia, Google says. And this suggests that Google is positioning Flutter as a possible model for native app development of the future, when and if it shifts from Android and Chrome OS to Fuschia.

So what about PWAs? How does Flutter compete—or compare—with PWAs?

On the surface, both are similar, a way to create a single app that runs on multiple platforms. But that's where the similarity ends.s

Flutter apps are truly native. PWAs are "nativish" web apps that provide access to native platform features like offline use, push notifications, and the like. And platform makers can (and do) extend PWA to support features that are native, and unique, to their platforms. PWAs are supported on Android today, and they will be supported in Windows 10 version 1803 soon. PWA support is also coming to iOS/macOS/Safari, and these apps are, or soon will be, available via any mobile web browser. So if jump forward in time, say, 6 months, PWA support will be much broader than that for Flutter.

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But the big difference is that Flutter and PWAs target different kinds of developers.

Flutter is aimed at native mobile app developers who, to date, have had to learn multiple programming languages, APIs, and frameworks in order to target the most popular platforms. Developing with Xcode using Objective C/Swift on a Mac is a far cry from using Android Studio with Java/Kotlin on a PC or Mac. So Flutter is a way for mobile developers to create a single code base, a single project, a single app, that works on both Android and iOS.

PWAs are aimed at web developers. These folks can work on virtually any platform—Windows, Mac, Linux—and typically use JavaScript, HTML, and CSS in standalone editors like Visual Studio Code, Sublime, or Atom (and many others) with whatever web server of their choice (Google Chrome has one built-in). PWAs are a modern version of something the web developer community has been working on for a while: A way to bring native—"nativish"—platform features to the web. Most notably with something called React Native, which lets developers use JavaScript and the React user interface libraries to create mobile apps.

PWAs as originally envisioned were, of course, for the web: Google invented this technology to target Android. With Microsoft adopting the technology, however, PWAs are now coming to the desktop too, with Windows 10 version 1803. And Google is following them by adding PWA support to Chrome OS this year too.

The reasons I feel that PWAs are the future are many-fold. These apps target *all* major personal computing platforms, and not just mobile. The technology itself is far more approachable, making it ideal for beginners and students, but also for any developer coming from a different space. And with support from all the major platform makers, PWAs have a bright future: Google, Microsoft, and (we think) Apple all fully support this technology. It's not going anywhere.

[When Google first announced the Flutter beta, I flippantly tweeted the following](#):

Google just kicked Xamarin in the nuts.

This set off the usual round of stupidity that one sees on Twitter, with some pedantically arguing that Flutter and Xamarin don't directly compete with each. This is worth exploring further too.

As you may know, Microsoft's Xamarin technology is a way for Microsoft-focused developers (e.g. those who came of age on the "Microsoft stack," meaning .NET and C#, for the most part) to use their skills to create mobile apps that run on Android and iOS. This explains my tweet, in a way. But it also provides fire for those who disagreed with what I meant mostly as a joke: Flutter targets web developers while Xamarin targets Microsoft stack developers.

They're right. But when you look at the addressable market more broadly, and the fact that both Flutter and Xamarin are thematically identical ("write once, run on Android and iOS"), my point is made: Flutter targets a much bigger audience than does Xamarin. Much bigger. And when it comes to developer allegiances, I think it's fair to say that most developers targeting mobile would be far more likely to trust Google than Microsoft. Given history. And given the reality of the market.

But as far as all of these technologies go, yes, they do in many ways "compete" with each other. Because each targets developers, each provides some form of cross-platform "write anywhere" functionality. But they are also, if not truly complementary, at least isolated from each other in some ways, too. Few developers who are looking to build a mobile app would actually consider Flutter, Xamarin, and PWAs side-by-side and then choose one.

More specifically, I see Flutter as a solution for today's mobile app developers, something that will make their lives easier right now. I see PWAs as a solution for today's web app developers, and something that will help them broaden their reach by taking on native platform features over time. In other words, I see PWAs as the future because PWAs can do it all.

Which, when you think about it, is what I've been saying all along.

The Essentials: The Missing Piece to My Cord Cutting Home

Premium article published on Thurrott.com February 21, 2018 by Brad Sams

The Essentials is a reoccurring column where I talk about what I use to write, work and honestly, survive the week.

A few weeks ago, I learned that I will spend $100 to not get off of the couch. Ok, that might be a bit of an exaggeration but in my pursuit to find the optimal cord-cutting setup, I believe I have completed my transition from subscribing to a cable service to moving completely to alternative solutions.

I've written about my experiences previously and you can read about that **here**, so consider this a small update rather than a detailed look at my entire setup.

Because we purchase movies on iTunes, our 'cord-cutting' pivots around an Apple TV as we have them connected to our two primary TVs. Last month, I finally upgraded my Apple TVs (second gen…these things were old and didn't support 1080P or have access to an app store) to the 4k iterations which opened up new options for consuming content.

The biggest change with the new boxes is that it allowed us to use the app store on the devices. Because of this, I finally stopped using an antenna inside my house and purchased and HDHomerun and let me tell you, this was an excellent move.

The device costs $75 for the two-tuner model (there is a 4 tuner model for about double the price) and what this allows you to do is to take the digital over-the-air TV signals and pump them across your home network. With this box, you can watch TV on your phone, laptop, tablet, and yes, an Apple TV.

It was incredibly easy to setup; connect it to your antenna, hardwire it to the router, and navigate to one webpage. The device was recognized instantly, it took about 2 minutes of it to scan and identify the channels and that was it.

But here's an annoying catch, there isn't a native app from SiliconDust (makes of the HDHomeRun) for the Apple TV but there is a third party solution called Channels, while excellent, is $25. All-in, I'm $100 down but what this allows me to do is to watch over-the-air TV through my Apple TV on both of our primary TVs without having to change the TV input; yes, I spent $100 so I don't have to change the input on my TV.
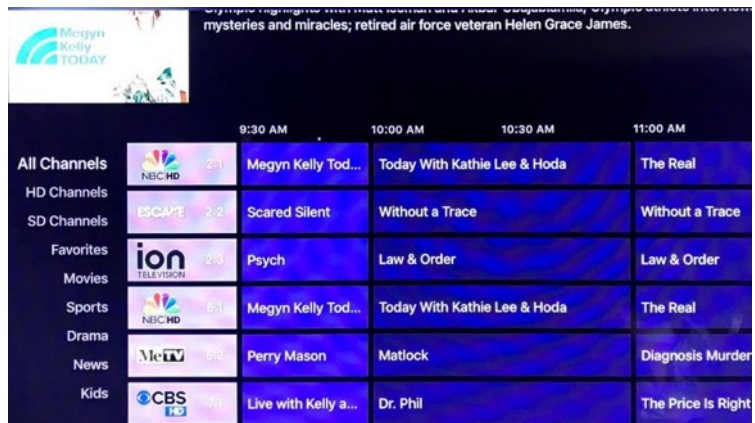
It's a bit more complicated than not wanting to get off the couch. By utilizing an antenna that connects to your router, this allowed me to move my antenna which made it significantly easier to put it outside where reception is much better (seriously, if I had the blinds closed, CBS would cut-out).

The image to the right is a poorly shot picture of the Channels app on the Apple TV (no functionality for a screenshot, sadly) that shows a guide of what is playing on all the available channels (I currently can watch about 40 channels of OTA content).

If you have been **watching my Twitter feed this week**, the next 'problem' I encountered, if you want to call it that, is pushing uncompressed HD video across your home network can be a fun stress test on the airwaves. While I haven't had any major issues, I did purchase a switch to make it possible to hardware up a few more components in my house (primarily the two Apple TVs) to make watching OTA content a perfect, no-pixel-dropped, experience. My Amplifi HD wireless setup works well but the router portion only has four ports and with my entire home office hardwired, this left no room for the Apple TVs; thus, I purchased a switch.

For those who don't own an Apple TV but want to down this route, there are apps for the Xbox (and every other major platform) to accomplish this same result.

This is something I should have done when we initially cut the cord but seeing as we didn't have the Apple TVs that supported this setup, moving to this layout is not exactly cheap which is why I waited until this month. That being said, now that the setup is fully deployed, I am extremely happy with how it has worked and fully recommend the HDHomeRun.

Microsoft Wins Today, but Google Wants Productivity's Future

Premium Article published on Thurrott.com February 8, 2018 by Paul Thurrott
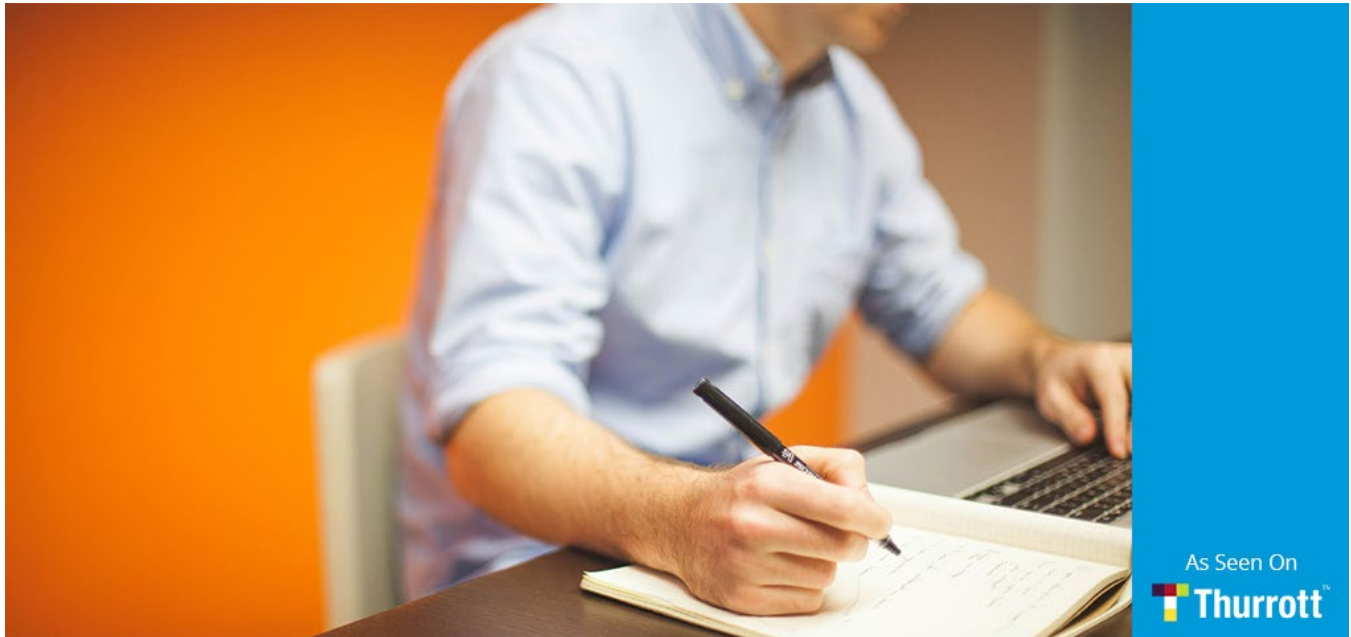
When it comes to traditional office productivity, Microsoft has no peer. But thanks to Google, it may also have no future. I know this one is going to be controversial in certain circles.

And that's because Microsoft's office productivity solutions—let's just call it Office 365 to simplify matters—is more full-featured and powerful than any of the competition, including Google's offerings, which we'll just call G Suite for the same reason.

It's also fair to say that the battle between these two products has, thus far, been quite one-sided, at least on paper. According to **the latest data**, Office 365 is almost exactly 10 times as big as G Suite from a revenues perspective.

In other words, Office 365 is more functional *and* generates many times the revenues of G Suite. Game over, right? Not exactly. Microsoft sees its biggest success today with the largest and most established companies on earth. Google, by comparison, is largely focused on schools and new businesses. There are two ways to view these types of businesses. Microsoft's focus is where the money is today. Google's focus is on the future.

I've already made the argument why Google's focus is a problem for Microsoft: With over half of U.S. schools now using Google products and services, an entire generation of students is going to graduate and enter the workforce just as the current generation of IT pros and decision makers are retiring. And they are going to demand access to the tools with which they are familiar, just as new employees do today.

Put another way, though, when was the last time that giant enterprises—Microsoft's most lucrative installed base—led the way in innovation or in adopting new technology? Right. Never.

Put yet another way, what Microsoft is doing, largely, is transitioning existing customers from on-premises solutions like traditional Office and Exchange to Office 365. What Google is doing is racking up new customers at a faster pace. This is a battle of installed base vs. growth.

When I look at the trends, I see two major warnings signs for Microsoft. One is external and one is internal. First, Google is undergoing a wartime-like effort to rapidly add new features to G Suite in order to bridge the most important functional gaps with Office 365 and improve compatibility with legacy Microsoft Office document formats and capabilities. The tenacious search giant cites over 250 new features in the past year alone. Including, most recently, **the ability to comment on Office documents from G Suite's native viewer experiences**.

Obviously, both sides are going to add features. But while there is nothing Microsoft can do to prevent Google from catching up functionally, it has likewise harmed its own efforts by completely bungling its client productivity strategy. It's biggest problems are self-inflicted.

Over several years now, Microsoft has displayed what can only be described as a complete lack of direction and leadership by squandering its lead and confusing customers with an expanding range of clients that lacks cohesion and direction. At various times, Microsoft has vacillated between a combination of legacy desktop apps and often weird new mobile experiences, mobile versions of legacy desktop apps, web versions of legacy desktop apps, and "containerized" Store versions of legacy desktop apps, and any and all combinations of the above.

Seriously. What *is* Office anymore? What is the direction forward? One gets the idea that even Microsoft doesn't know. That it is, in fact, making up the strategy as they go.

Part of the problem, of course, is the failure of the Microsoft Store, which probably triggered a rethinking of one clear strategy forward. But instead of embracing the right technology, Microsoft has just kept trying different ideas in small pockets. It has added features to certain versions of certain Office apps on certain platforms at certain times. It has created a mess.

Guys. It's not that hard. But while the world has shifted to mobile and web, Microsoft has been forced to retreat back to the desktop. It's most recent release, literally, is a version of the Office 2016 suite that is distributed through the mobile app-based Microsoft Store in Windows 10. Its *next* releases will be more versions of those apps plus a *new* legacy suite of apps, Office 2019.

Stop. Please. Is there hope for Microsoft? Of course. Microsoft Teams shows that the software giant can, in fact, create major new platform-level Office solutions and not just throwaway mobile apps. That Teams is based on web technologies is excellent, and correct. And the firm has pledged to transition Teams into a full-featured Progressive Web App (PWA) that will work across all platforms, not just Windows. *That* is the future, both for Office and for the entire world.

Does Microsoft have the intestinal fortitude and strategic sense to rattle its Office cage that hard? It had better. Because the alternative is a slow and painful death at the hands of Google. And it is a death I am now monitoring in real time.

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