



Are Wireless Networks More Energy-Efficient Than Wired LANs?

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Sustainability and decreased energy consumption are hot topics these days -- both at home and in business network settings. Larger enterprises often have energy management teams or contract out that functionality to try to lower power consumption by eliminating wasted light and HVAC usage.

But what about the network infrastructure itself? And, more specifically, what about the question of wired Ethernet versus Wi-Fi when it comes to potential energy savings? And what about resiliency as organizations consider the question of Ethernet versus Wi-Fi power savings? As with everything in networking, the answers are complicated.

Before Wi-Fi became the dominant network access method for most environments, PCs were tethered to the network switch ports by patch cables. And Ethernet switches only needed to be equipped with enough onboard operating power to keep Ethernet functionality going. At the time, Power over Ethernet (PoE) wasn't a thing, and fewer devices were on the network overall.

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As networks and devices modernized, Ethernet switches also needed to provide operational power via PoE for VoIP phones, IP cameras and Wi-Fi access points (APs), and the overall number of wired and wireless client devices increased exponentially.

Does Wi-Fi reduce energy consumption?

It's impossible to answer this question without situational context. Let's consider two scenarios:

1. **Switch to an all-wireless office.** For the sake of conversation, let's say there's an environment with 200 Ethernet-connected PCs and printers. This requires seven Ethernet switches. All desktop PCs are converted to Wi-Fi laptops that connect to six Wi-Fi 5 APs, and five switches are eliminated. This should be an obvious energy win, yes? Maybe. The remaining two switches need to be upgraded to PoE-capable models with heftier power supplies for the wireless APs. So, you'd have to do some math between the old and new switches to know if any energy is saved. The same notion applies to the PCs themselves. Are the new laptops less power-hungry than the old PCs? You would hope, but the specifics need to be analyzed.
2. **Fewer wired PCs but almost as many switch ports.** As an organization modernizes, it removes 300 desktop PCs and moves to 100 Wi-Fi laptops for workers who continue to go into the office. The company also reduces its staff significantly, and the remaining employees work remotely. A slew of network devices are also added, including wired VoIP phones, closed-circuit TV cameras, networked storage, card access and Wi-Fi 6E APs that require more PoE voltage

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than legacy APs. Fewer switches clutter the network closet, but overall, the closet consumes more energy after the modernization.

Wi-Fi doesn't operate in a vacuum. Sometimes, it can consume less energy than the LAN connectivity paradigm it displaces. But, in other cases, any power savings are negated by other changes taking place in the environment at the same time.

One area related to power where Wi-Fi arguably has advantages is in designing power resiliency. When APs get their power from network switches, it becomes easy to plan for reliability. Key elements include staying within PoE budget for a switch, using dual power supplies on the switch and connecting to a decent uninterruptible power supply (UPS) on one side and street power on the other.

Nothing is straightforward about the power efficiency paradigm when it comes to wired or wireless networking.

By reducing the number of switches needed because more end devices are on Wi-Fi, the budget can go to better switch power supplies and UPS appliances.

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Better Wi-Fi should mean better efficiency

With every new wireless standard, the 802.11 Working Group introduces new power-saving features that work at the wireless protocol level to extend the life of client device batteries. A variety of techniques enable each client's wireless adapter to take a micronap frequently enough where battery life is extended and charging requirements are reduced. This is an area that gets a lot more developer attention than it ever did in the wired Ethernet realm.

In the aggregate, the latest Wi-Fi power-saving features should result in power consumption reduction per device over its lifetime, but then again, this can be rendered inconsequential by a huge increase in connected device counts.

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